Liberalisation of Trade and Capital

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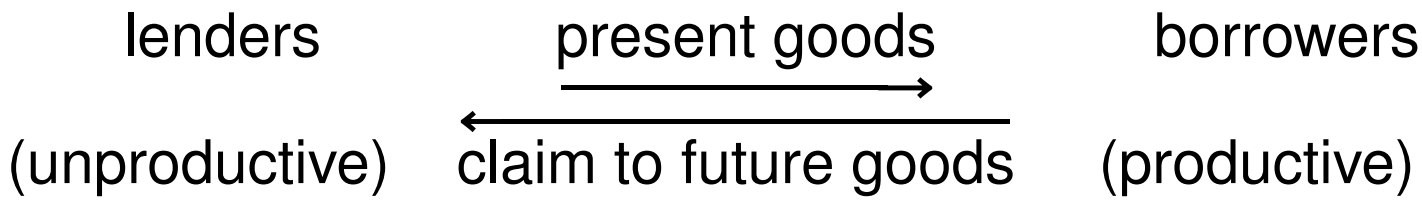
Question

What are the differences between liberalization of trade and financial assets in terms of their effects?

- Rough consensus on beneficial effects of trade on aggregate output
  Noguer-Siscart (2005) estimates 1% increase in trade share is associated with 1% increase in per capital GDP, controlling the effects of country population and area
- No consensus benefits of capital account liberalization
  Prasad, Rogoff, Wei and Kose (2003):
  - no robust relationship between liberalization and growth
  - benefits with strong institution, and costs outweigh with week institution

Idea



- Borrowers may not keep their promises ⇒ use collateral
- total assets > collateral for domestic loan
  > collateral for international loan

Implications

- Under autarky with limited collateral
  - unproductive agents with dominated technology produce
    $\Rightarrow$ low average productivity
- Trade liberalization provides gains from trade, but it does not change the relative allocation between productive and unproductive agents who produce identical goods

Implications of capital account liberalisation

- (i) "Good" capital account liberalization

underdeveloped:	unproductive	$\rightarrow$	productive
		$\searrow$	
developed:	unproductive	$\Rightarrow$	productive

  - World TFP and growth rate increase
- (ii) "Bad" capital account liberalization

underdeveloped:	unproductive	$\rightarrow$	productive
	$\Uparrow$	$\nearrow$	
developed:	unproductive	$\Rightarrow$	productive

  - World TFP and growth rate can decrease
- Allocation depends upon both absolute and relative levels of financial development

Model

- Based on Acemoglu-Ventura (2002), Kiyotaki (1998)
- Two countries: Home and Foreign
- A continuum of infinitely lived agents with fixed population in each countries
- One homogeneous final good
- Preference

$$E\left(\sum_{t=0}^{\infty}\beta^t \log c_t\right)$$

- Two intermediate goods: m_{ht} and m_{ft}
- Everyone can produce final good y_t from intermediate goods instantaneously

$$y_t = \left[\omega^{1/\sigma} m_{ht}{}^{(\sigma-1)/\sigma} + (1-\omega)^{1/\sigma} m_{ft}{}^{(\sigma-1)/\sigma}\right]^{\sigma/(\sigma-1)}$$

$\sigma > 1$ is elasticity of substitution
$\omega \in (0, 1)$ is weight of Home intermediate goods

- Production of intermediate goods from final good investment k_t (k_t^*) takes one period:

$$m_{ht+1} = a_t k_t, \qquad m_{ft+1} = a_t k_t^*$$

$$a_t = \begin{cases} \alpha, \text{ if the agent is productive} \\ \gamma < \alpha, \text{ if the agent is unproductive} \end{cases}$$

- Idiosyncratic transition of productivity of the individual agent:

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

- At date t
  - Entrepreneur A invests k_t to start production
  - Agent B lends and monitors
  - Agent C lends and does not monitor
- At date $t+1$ output of intermediate goods:
  - $m_{ht+1} = a_t k_t$ if A finishes
  - $m_{ht+1} = \theta a_t k_t$ if B finishes
  - $m_{ht+1} = \phi\theta a_t k_t$ if C finishes
- Only single home agent can be the monitor of each segment of project at home.

$$0 < \phi\theta < \theta < 1, \quad 0 < \phi^*\theta^* < \theta^* < 1 \quad (Assumption)$$

First best allocation

Only productive agents produce

$$\begin{aligned}
\text{W. output} &: Y_{t+1} = \left[\omega^{\frac{1}{\sigma}}(\alpha K_t)^{\frac{\sigma-1}{\sigma}} + (1-\omega)^{\frac{1}{\sigma}}(\alpha K_t^*)^{\frac{\sigma-1}{\sigma}}\right]^{\frac{\sigma}{\sigma-1}} \\
\text{Cons.} &: C_t = (1-\beta)Y_t \\
\text{H. inv.} &: K_t = \omega\beta Y_t \\
\text{F. inv.} &: K_t^* = (1-\omega)\beta Y_t \\
\text{W. TFP} &: A_t^w = \alpha \\
\text{growth rate} &: G_t^w = \alpha\beta
\end{aligned}$$

Competitive economy

- In Competitive Economy, the intermediate goods producer (borrower) cannot precommit to finish the production. No reputation
  $\Rightarrow$ Production project is imperfect collateral
- Each home agent takes prices $\left(p_{ht}, r_t, r_t^w\right)$ and initial net worth as given, and chooses quantities $(c_t, k_t, m_{ht+1}, b_{t+1}, b_{t+1}^w)$, subject to the flow-of-funds constraint:

$$c_t + k_t = p_{ht} m_{ht} - b_t - b_t^w + \frac{b_{t+1}}{r_t} + \frac{b_{t+1}^w}{r_t^w}$$

and the international and domestic borrowing constraints:

$$\begin{aligned} b_{t+1}^w &\leq \phi\theta p_{ht+1} m_{ht+1} \\ b_{t+1} + b_{t+1}^w &\leq \theta p_{ht+1} m_{ht+1} \end{aligned}$$

- Foreign agent chooses their quantities $(c_t^*, k_t^*, m_{ft+1}^*, b_{t+1}^*, b_{t+1}^{w*})$ subject to their borrowing constraints:

$$\begin{aligned} b_{t+1}^{w*} &\leq \phi^* \theta^* p_{ft+1} m_{ft+1} \\ b_{t+1}^* + b_{t+1}^{w*} &\leq \theta^* p_{ft+1} m_{ft+1} \end{aligned}$$

- The markets clear for intermediate goods, final goods, home and foreign domestic credits, and the international credit.
- We examine the balanced-growth path
- θ and θ^* : parameters of overall depth of domestic finance
- ϕ and ϕ^* : parameters of relative tightness of international borrowing

Autarky at Home

$\left(p_h, r, K_t, K'_t, Z_t, s, x\right)$ solves:
Intermediate-good price (p_h)

$$p_h = \omega^{1/(\sigma-1)}$$

Interest rate (r)

$$r \geq \gamma p_h, \quad (r - \gamma p_h) K'_t = 0$$

Investment of productive entrepreneur (K_t)

$$K_t \leq \frac{\beta s Z_t}{1 - \theta \alpha p_h / r}, \qquad = \text{holds if } \alpha p_h > r$$

Saving-investment (K': inefficient investment)

$$K_t + K'_t = \beta Z_t = \beta \omega^{1/(\sigma-1)} \left(\alpha K_{t-1} + \gamma K'_{t-1}\right)$$

Excess return of the productive (x)

$$x = \frac{\frac{(1-\theta)\alpha p_h}{1-(\theta\alpha p_h/r)} - r}{r} = \frac{\alpha p_h - r}{r - \theta\alpha p_h}$$

Transition of net worth (Z_t)

$$Z_{t+1} = r\,(1+sx)\,\beta Z_t$$

Share of the productive (s)

$$s = \frac{(1-\delta)(1+x)s + n\delta(1-s)}{1+sx} \equiv f(s,x)$$

- Foreign country has the same equations

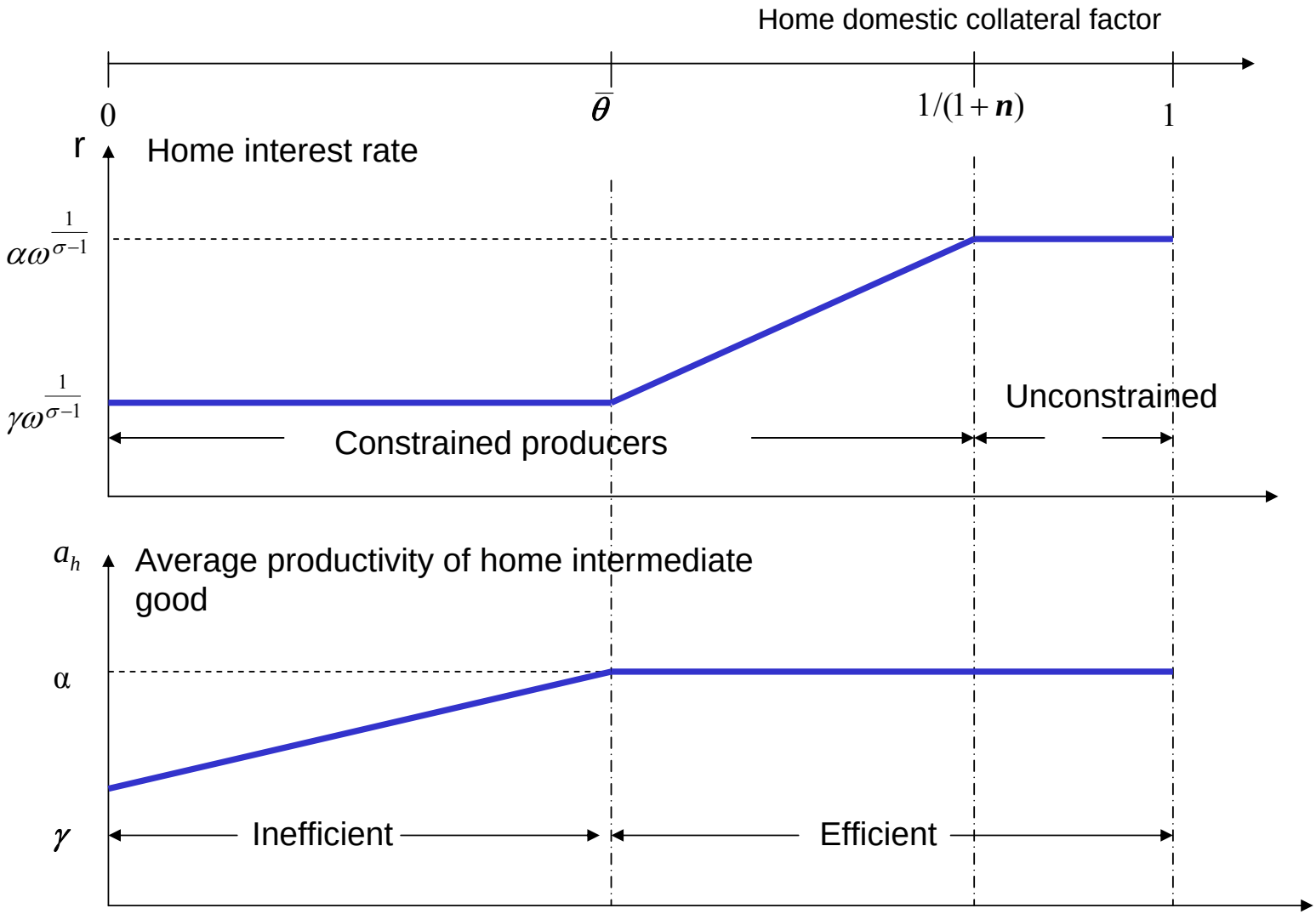
Autarky: no international transaction

- If domestic collateral is scarce $\theta < \overline{\theta} \equiv \delta / \left[(1+n)\delta + \frac{\alpha-\gamma}{\gamma} \right]$, then the unproductive agents do not lend all of their net worth, and produce themselves.

$$\text{Home growth rate:} \quad G = \beta \omega^{1/(\sigma-1)} a_h$$
$$\text{Foreign growth rate:} \quad G^* = \beta (1-\omega)^{1/(\sigma-1)} a_f$$

$a_h \equiv \frac{\alpha K + \gamma K'}{K + K'}$: average productivity of intermediate goods production

Fig. 1. Autarky Steady State



Free Trade & Financial Autarky: $\phi = \phi^* = 0$

Balanced growth path

- Through trade, both countries can use both Home and Foreign intermediate goods to produce final goods.
- New equations:

Market clearing for intermediate goods imply:

$$\frac{\alpha K_t + \gamma K_t'}{\alpha K_t^* + \gamma K_t^{*\prime}} = \frac{\omega}{1-\omega}\left(\frac{p_f}{p_h}\right)^{\sigma}$$

Price index:

$$1 = \left[\omega P_h^{1-\sigma} + (1-\omega) p_f^{1-\sigma}\right]^{\frac{1}{1-\sigma}}$$

- growth rates of both countries increases
- growth rates are equalized through the terms of trade adjustment in the long-run (Acemoglu and Ventura (2002))

$$\begin{aligned} G &= G^* = \beta \left[\omega a_h{}^{\sigma-1} + (1-\omega) a_f^{\sigma-1} \right]^{1/(\sigma-1)} \\ p_h\, a_h &= p_f\, a_f \end{aligned}$$

- Wealth distribution

$$\frac{Z_t}{Z_t^*} = \frac{\omega}{1-\omega} \left(\frac{a_h}{a_f} \right)^{\sigma-1}$$

- Trade does not change the relative investment between productive and unproductive agents
  $\Rightarrow$ no change in average productivity of intermediate goods at Home and Foreign.
- Reason: excess return x remains the same when $r = \gamma p_h$

$$x = \frac{\alpha p_h - r}{r - \theta \alpha p_h} = \frac{\alpha - \gamma}{\gamma - \theta \alpha}$$

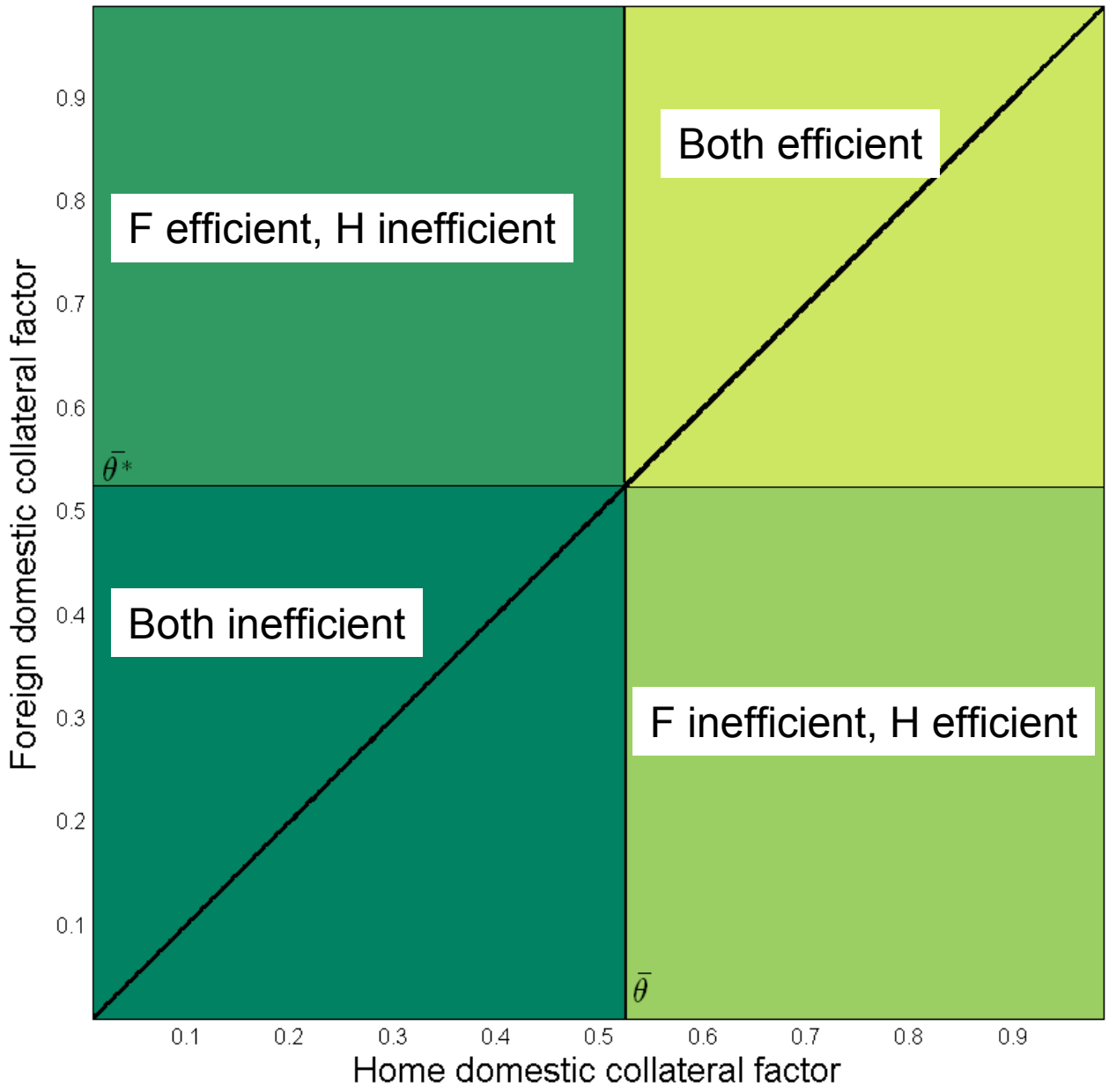
  Then the share of productive s remans the same.
- Remark: trade liberalisation does change prices:
  - autarky

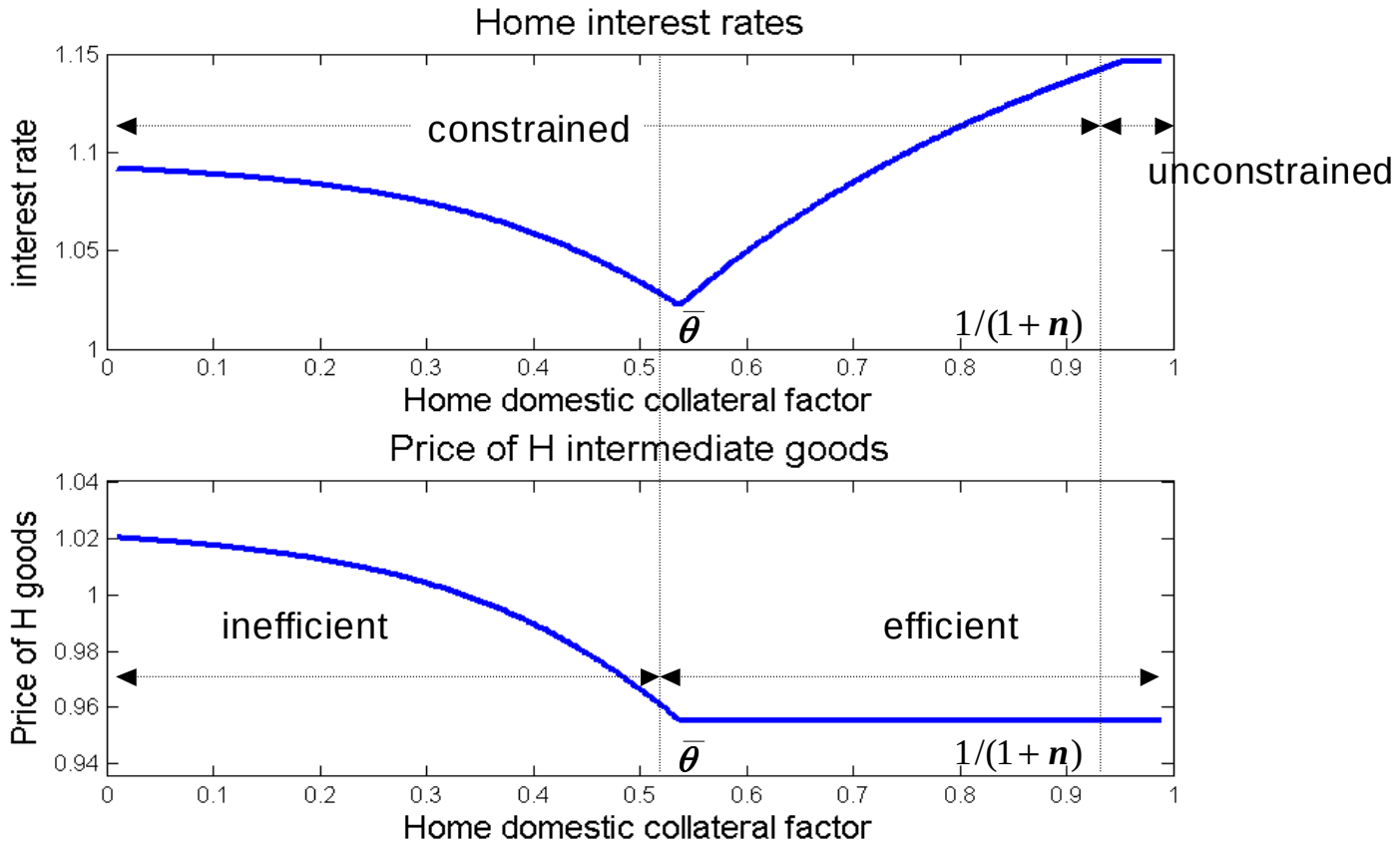
$$p_h = \omega^{1/(\sigma-1)}$$

  - trade liberaisation

$$p_h = \frac{1}{\left[\omega + (1-\omega)(a_h/a_f)^{1-\sigma}\right]^{1/(\sigma-1)}}$$

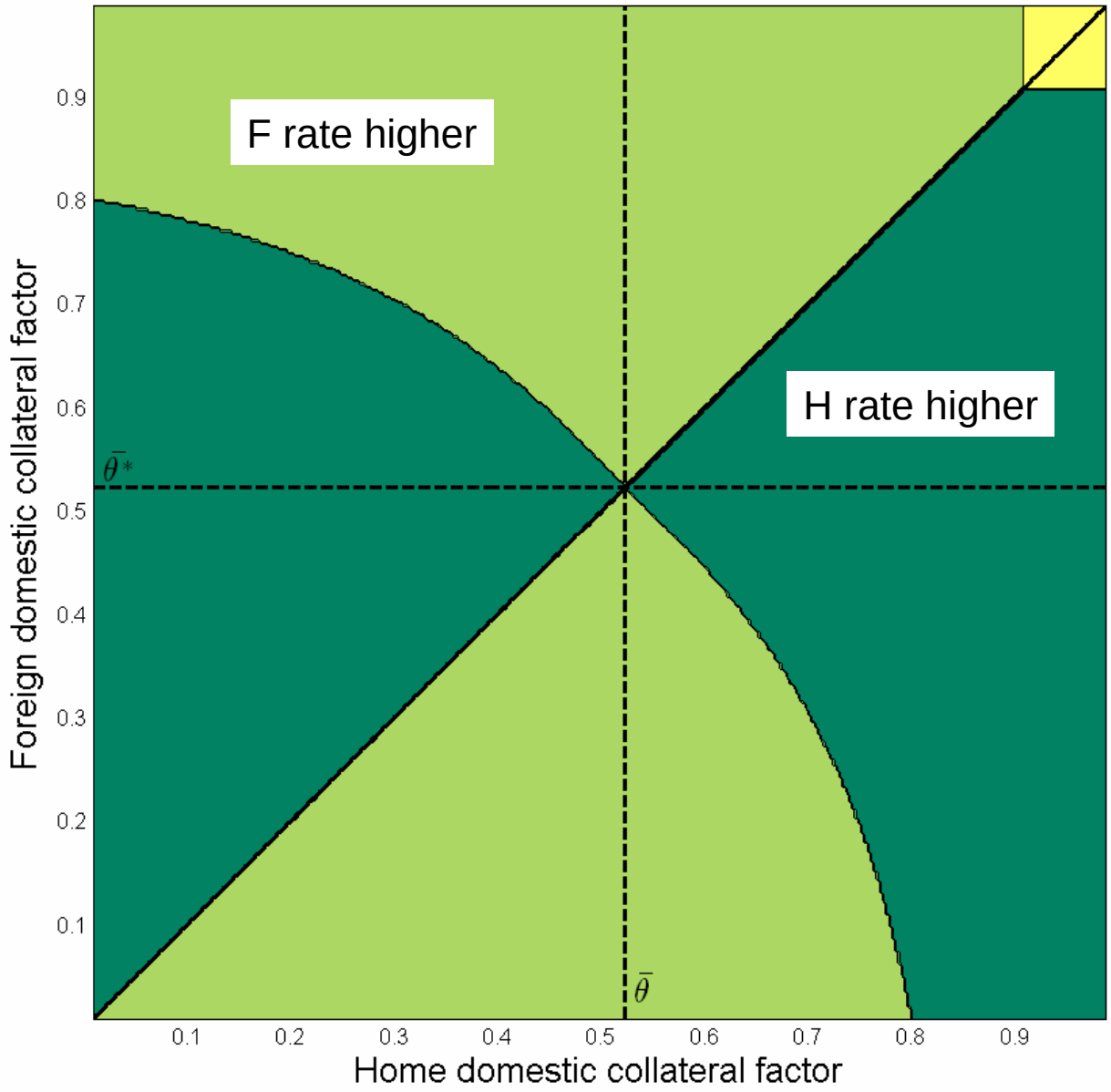
Fig. 2. Efficiency: financial autarky





- The Home interest rate depends on θ non-monotonically for given θ^* :
- increasing with θ for $\theta \geq \bar{\theta}$, because Home productive have larger borrowing capacity
- decreasing with θ for $\theta < \bar{\theta}$, because $r = \gamma p_h$ and Home unproductive enjoy favorable terms of trade

Fig. 4. Interest rates: financial autarky



- Home interest rate can be higher even when $\theta < \theta^*$

World after liberalization of trade and capital:

Balanced growth path

$$\left(p_h, p_f, r, r^*, r^w, K_t, K_t', Z_t, K_t^*, K_t^{*\prime}, Z_t^*, x, x^*, s, s^*\right)$$

Interest rates:

$$r^w = Min\left(r, r^*\right)$$

$$r \geq \frac{\gamma p_h (1-\phi\theta)}{1-\phi\theta\gamma p_h / r^w}, \quad r^* \geq \frac{\gamma p_f (1-\phi^*\theta^*)}{1-\phi^*\theta^*\gamma p_f / r^w}$$

Investment of the productive:

$$K_t \leq \frac{\beta s Z_t}{1-\theta\alpha p_h\left(\frac{\phi}{r^w}+\frac{1-\phi}{r}\right)}, \quad K_t^* \leq \frac{\beta s^* Z_t^*}{1-\theta^*\alpha p_f\left(\frac{\phi^*}{r^w}+\frac{1-\phi^*}{r^*}\right)}$$

International borrowing constraints:

$$K_t + K_t' \leq \beta Z_t + \frac{\phi\theta p_h}{r^w}\left(\alpha K_t + \gamma K_t'\right), \quad < \quad \Rightarrow r = r^w$$

$$K_t^* + K_t^{*\prime} \leq \beta Z_t^* + \frac{\phi^*\theta^* p_f}{r^w}\left(\alpha K_t^* + \gamma K_t^{*\prime}\right), \quad < \quad \Rightarrow r^* = r^w$$

World investment-saving

$$\beta(Z_t + Z_t^*) = K_t + K_t' + K_t^* + K_t^{*\prime}$$

Intermediate goods market clearing:

$$\frac{\omega}{1-\omega}\left(\frac{p_h}{p_f}\right)^{-\sigma} = \frac{\alpha K_t + \gamma K_t'}{\alpha K_t^* + \gamma K_t^{*\prime}}$$

$$1 = \left[\omega p_h^{1-\sigma} + (1-\omega)\, p_f^{1-\sigma}\right]^{1/(1-\sigma)}$$

Excess returns:

$$x = \frac{\frac{(1-\theta)\alpha p_h}{1-\theta\alpha p_h[(\phi/r^w)+(1-\phi)/r]} - r}{r}$$

$$x^* = \frac{\frac{(1-\theta^*)\alpha p_f}{1-\theta^*\alpha p_f[(\phi^*/r^w)+(1-\phi^*)/r^*]} - r^*}{r^*}$$

Net worth and shares:

$$\frac{Z_{t+1}}{Z_t} = r(1+sx)\beta = r^*(1+s^*x^*)\beta = \frac{Z_{t+1}^*}{Z_t^*}$$

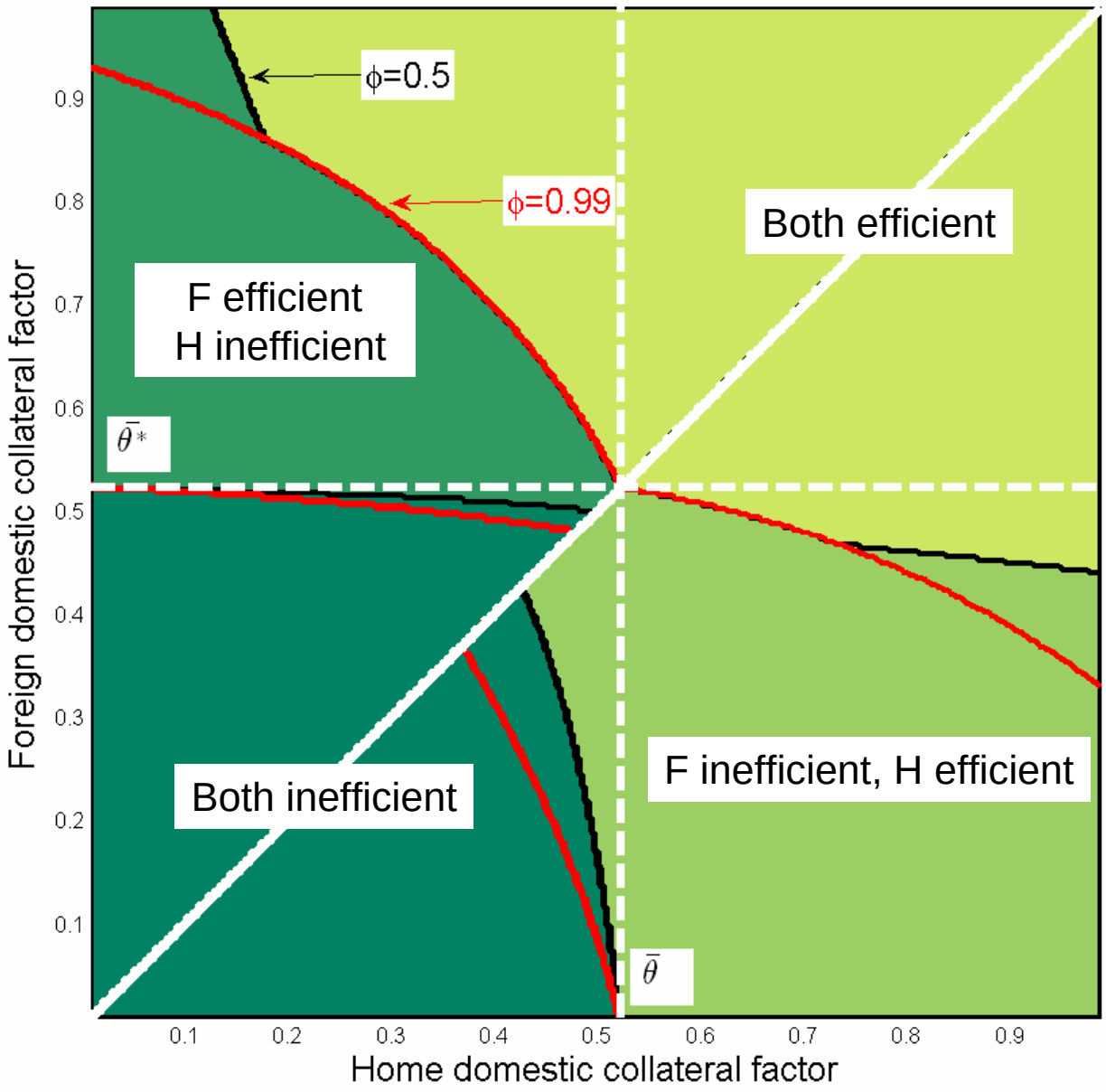
$$s = f(s,x), \quad s^* = f(s^*, x^*)$$

Capital account liberalisation

Proposition 1: Efficiency of intermediate goods production

(i) The parameter space in which both countries achieve efficiency in intermediate goods production EXPANDS
(ii) The parameter space in which both countries are inefficient in intermediate goods production SHRINKS

Fig. 5. Efficiency: financial liberalization



Capital account liberalisation

Proposition 2: World TFP and growth

Define TFP as

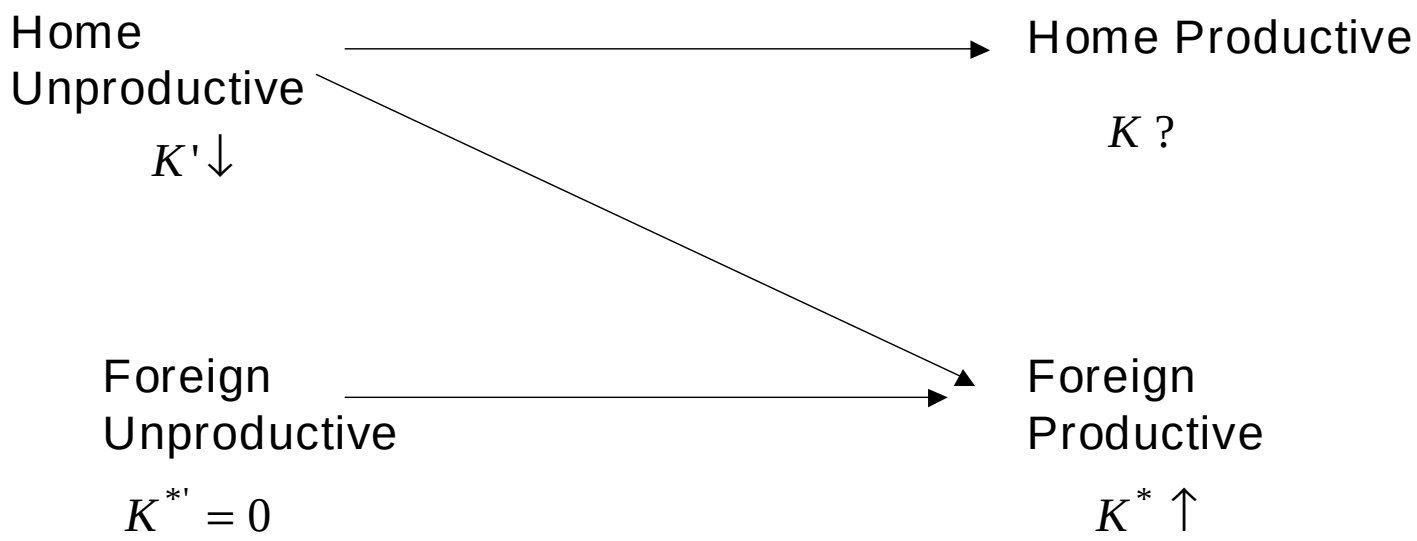
$$A = \frac{Y}{K + K' + K^* + K^{*\prime}}$$

(i) If the country with efficient intermediate goods production had a higher interest rate than the country with the inefficient production under financial autarky, then the world TFP and growth rate increase
(ii) If the country with inefficient production had a higher interest rate than the country with efficient production under financial autarky, then the world TFP and growth rate fall

Effects on financial flow and investment ($\theta < \theta^*$)

i) "*Good*" Capital Account Liberalization

$r^A < r^{*A} \Rightarrow$ Foreign Productive attract more funds

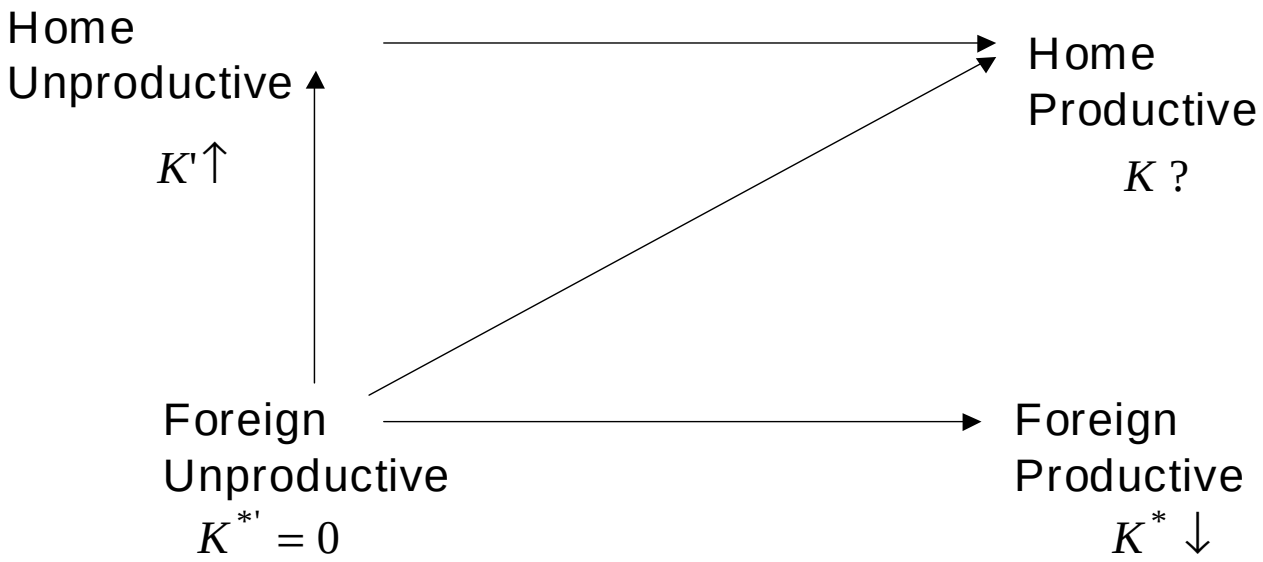


- Foreign provides better means of saving and eliminates inefficient production at Home.

Effects on financial flow and investment ($\theta < \theta^*$)

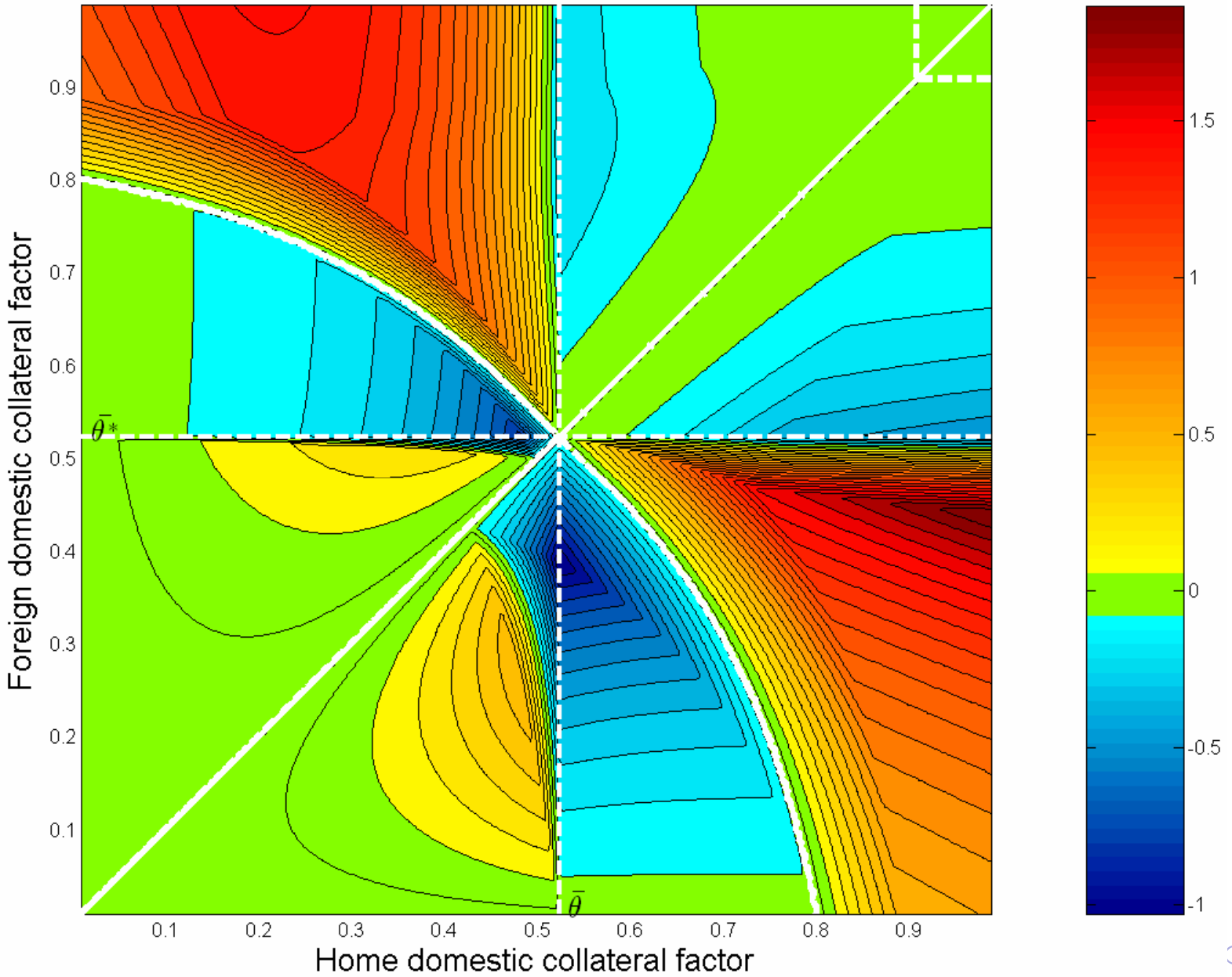
ii) "*Bad*" Capital Account Liberalization

$r^A > r^{*A} \Rightarrow$ Home Unproductive attract more funds



- Home interest rate higher because of favorable terms of trade
- Home unproductive expand production and act as financial intermediary

World TFP change: liberalisation-autarky



Conclusion

- Under autarky of trade and capital,
  1. the country can use only domestic intermediate goods to produce final goods
  2. with limited domestic collateral, both productive and unproductive agents produce
     ⇒ low average productivity of domestic intermediate goods

⇒ low growth rate

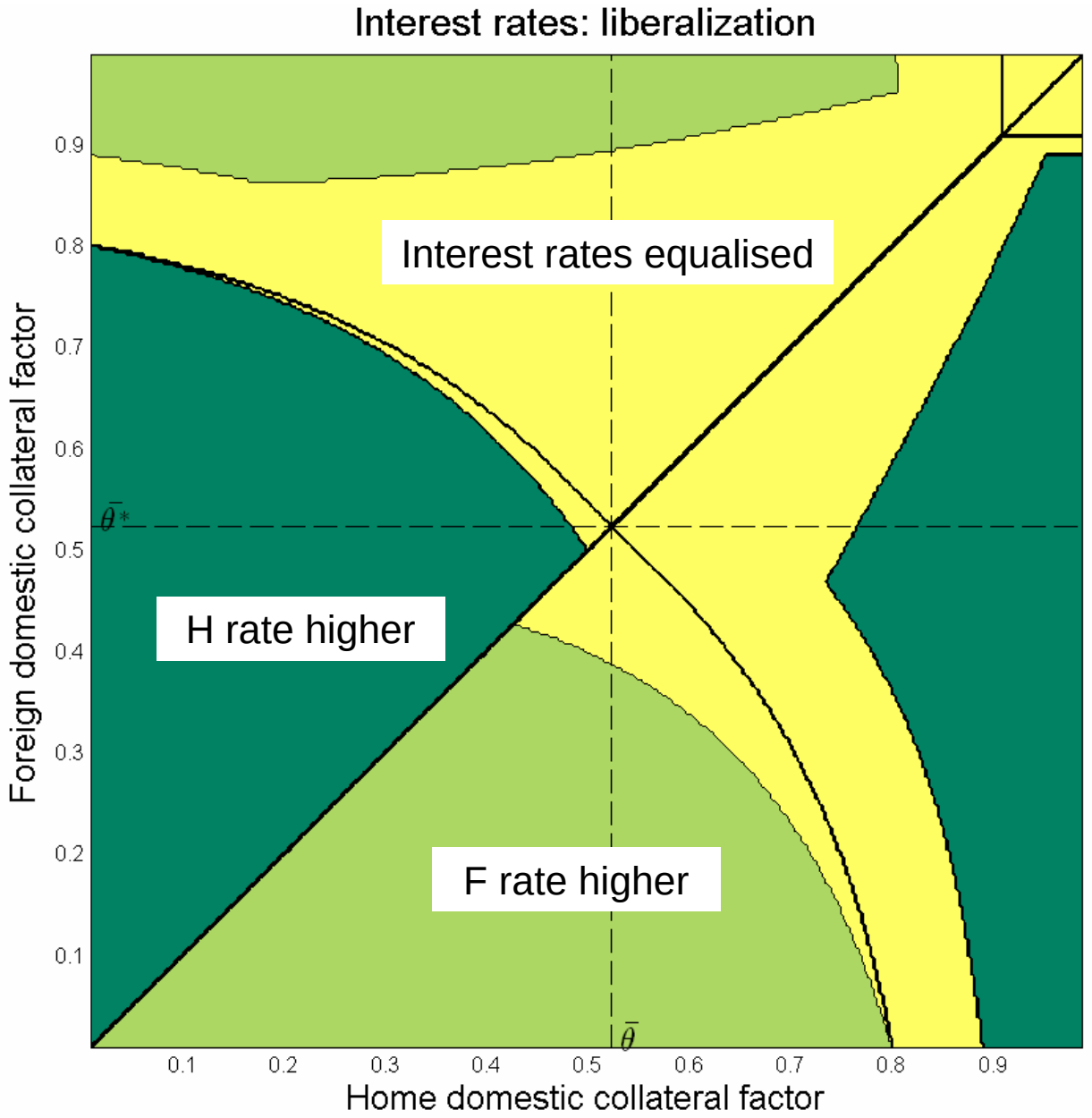
- Free trade & financial autarky,
  1. the country can use both Home and Foreign intermediate goods to produce final goods
  2. the low average productivity of domestic intermediate goods is unchanged
     $\Rightarrow$ growth rate increases

- Free trade + capital account liberalization

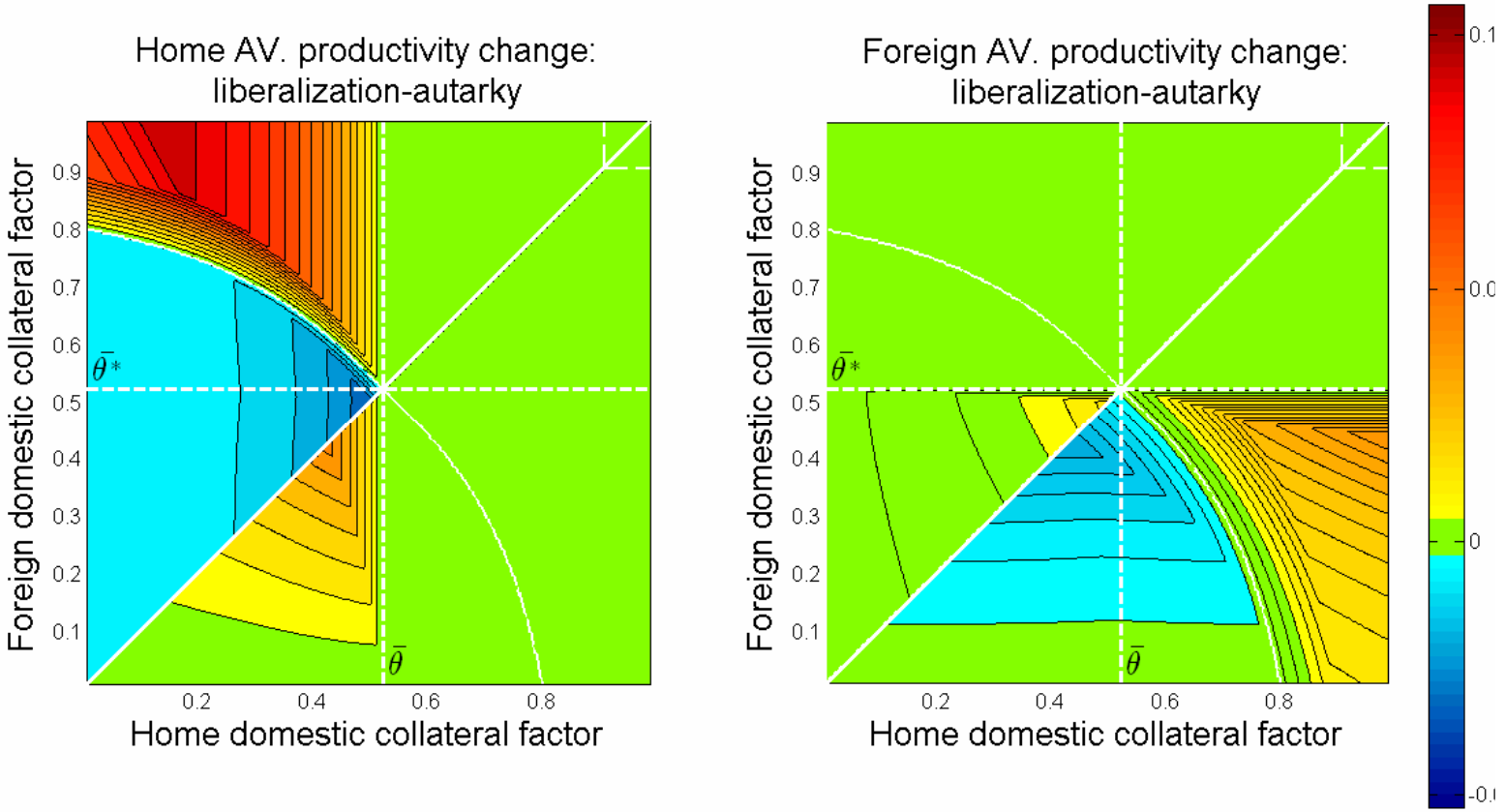
capital account liberalization changes domestic financial flow, and tends to increase the average productivity of domestic intermediate goods

development of domestic finance	growth rate
relatively high in aggregate	rises
marginal & asymmetric	can fall
low	not much effect

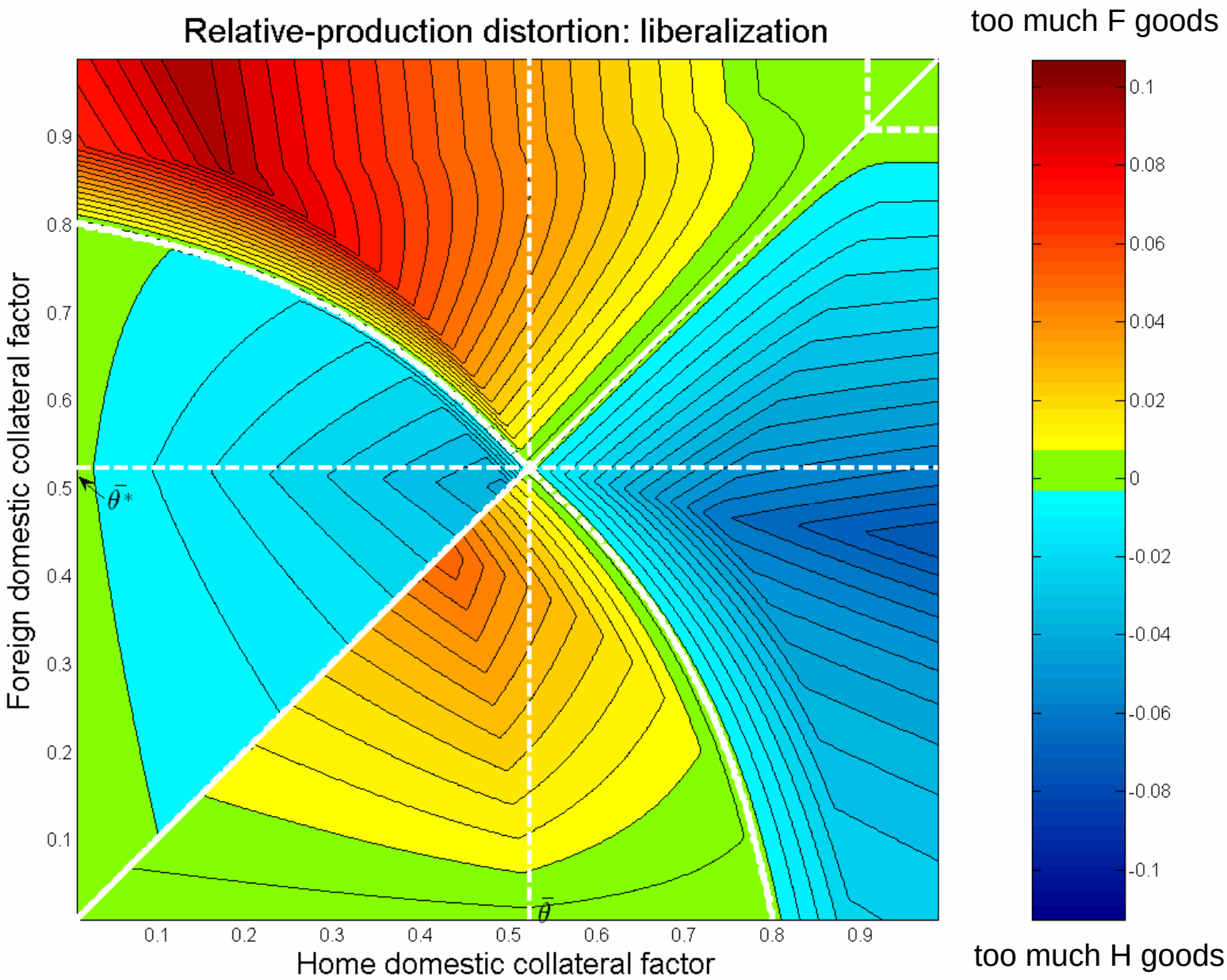
Interest rates



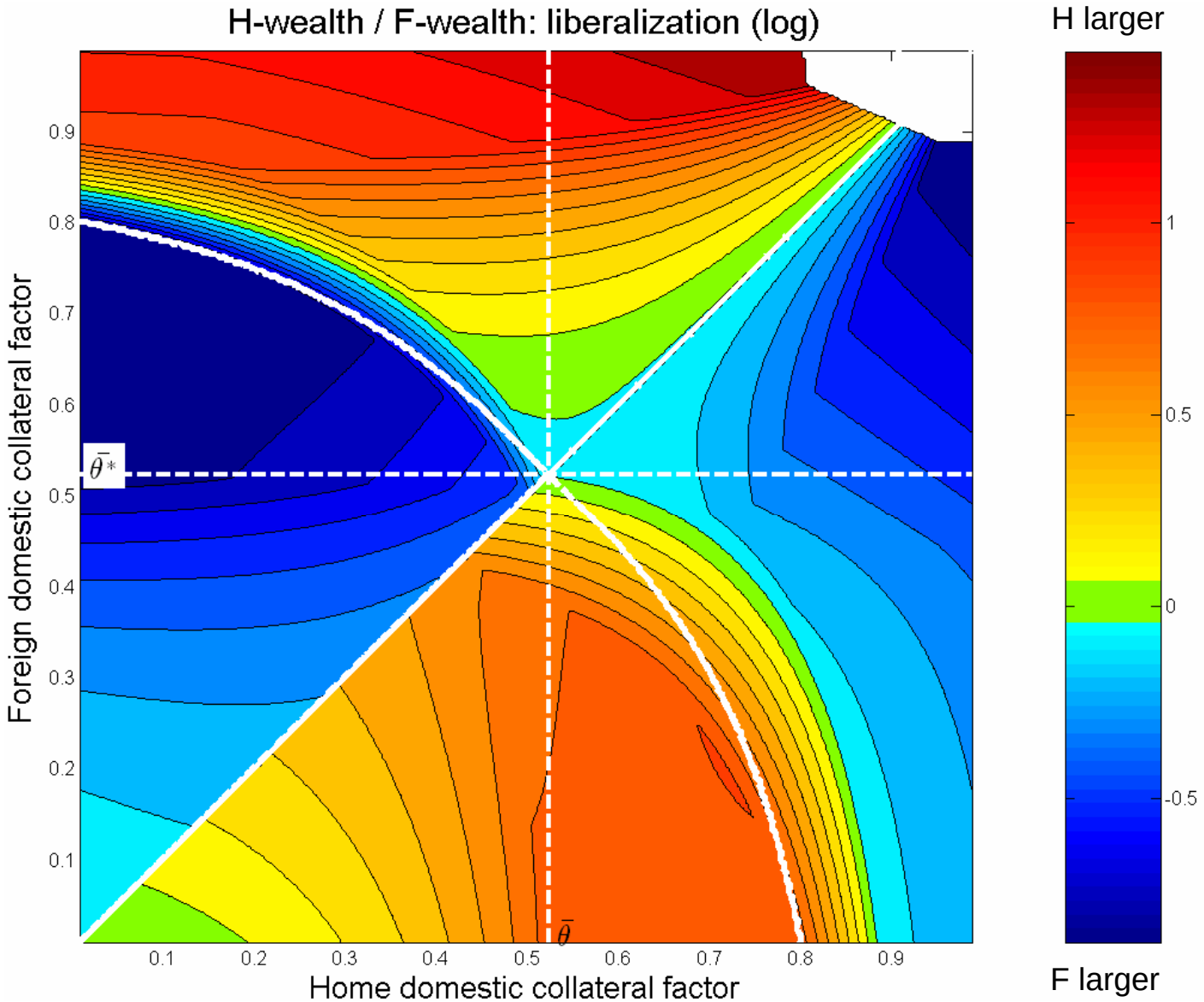
Productivity change



Relative-production distortion



Wealth


H-wealth / F-wealth: liberalization (log)
H larger
F larger
Foreign domestic collateral factor
Home domestic collateral factor
$\bar{\theta}^*$
$\bar{\theta}$
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0.5
0
-0.5