Msc Macro: Exchange Rate Economics

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Introduction

- Medium-term behaviour of real exchange rates
- Invariant to exchange rate regime
- Relation to macroeconomic fundamentals

Balassa-Samuelson Model

- Small open economy
- Two sectors: traded and nontraded
- International capital mobility
- Intersectoral labour mobility
- Real exchange rate driven by productivity differential

Model Specification

- Production technologies in traded and nontraded sectors

$$
\begin{aligned}
Y_T &= A_T F(K_T, L_T) \\
Y_N &= A_N G(K_N, L_N)
\end{aligned}
$$

- Labour market

$$L = L_T + L_N$$

- Unique wage w
- Exogenous interest rate r
- Relative price of nontradables p
- Nontraded good: consumption; Traded good: consumption and investment

Profit Maximisation by Firms

- Traded-sector firms maximise

$$\sum \left(\frac{1}{1+r} \right)^{s-t} \left[A_{Ts} F(K_{Ts}, L_{Ts}) - w_s L_{Ts} - \Delta K_{Ts+1} \right]$$

- Nontraded-sector firms maximise

$$\sum \left(\frac{1}{1+r} \right)^{s-t} \left[p_s A_{Ns} G(K_{Ns}, L_{Ns}) - w_s L_{Ns} - \Delta K_{Ns+1} \right]$$

Profit Maximisation by Firms

- Denote capital-labour ratio $K/L = k$ and output-labour ratio $Y/L = y$
- Per-worker production functions $y_T = A_T F(k_T),\ y_N = A_N G(k_N)$

First-Order Conditions

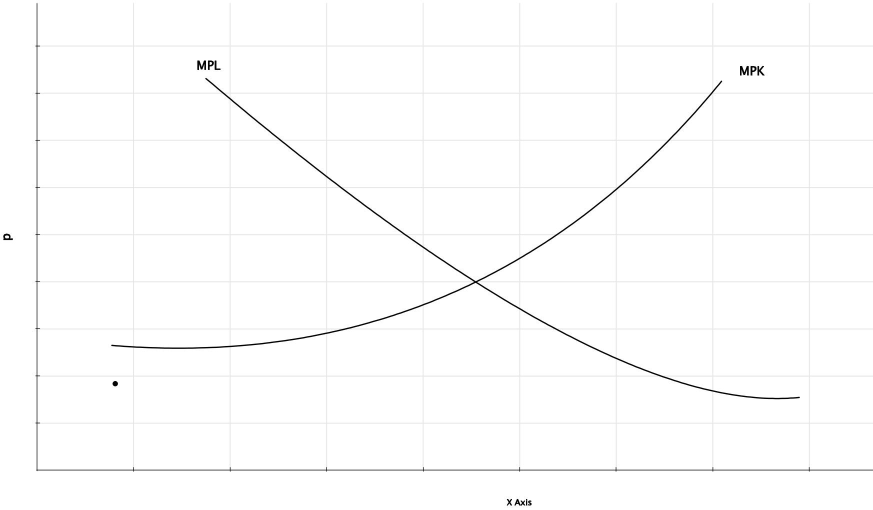
1. $MP_{K_T} = r \Rightarrow A_T f'(k_T) = r$
2. $MP_{L_T} = w \Rightarrow A_T[f(k_T) - f'(k_T)k_T] = w$
3. $VMP_{K_N} = r \Rightarrow pA_N g'(k_N) = r$
4. $VMP_{L_N} = w \Rightarrow pA_N[g(k_N) - g'(k_N)k_N] = w$

Recursive Solution

- $k_T = k_T(A_{T,}r)$
- $w = w(k_T) = w(A_T, r)$
- Equations (3)-(4) jointly determine p, k_N

B-S Graph I

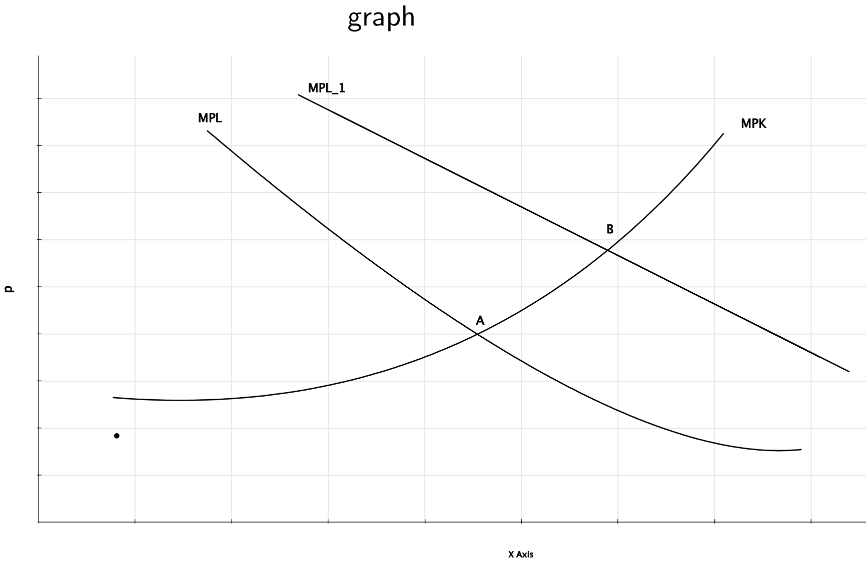
graph



$_1.pdf$

B-S Graph: Increase in A_T

II



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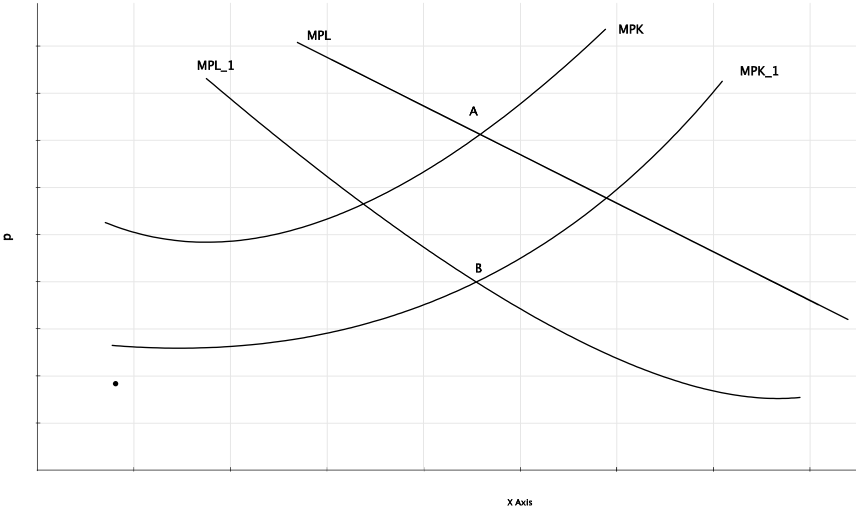
B-S Graph: Increase in A_N

graph

III



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General Solution

- $\mu = labour\ share$
- $\hat{p} = \frac{\mu_{L_N}}{\mu_{L_T}} \hat{A}_T - \hat{A}_N$

General Productivity Increase

- $\hat{A}_T = \hat{A}_N = \hat{A}$
- $\hat{p} = [\frac{\mu_{L_N}}{\mu_{L_T}} - 1]\hat{A}$

Limits to Balassa-Samuelson

- Incomplete explanation, especially within advanced-country group
- Demand-side factors if diminishing returns to scale in nontraded sector (e.g. role of a fixed factor)
- Role of aggregate labour supply if diminishing returns to scale in nontraded sector

More Limits to Balassa-Samuelson

- product variety and product quality
- Price discrimination in traded goods prices
- High-productivity enclaves within traded sector
- Limited inter-sectoral labour mobility
- Shifts in sectoral expenditure shares
- Prices in regulated sector
- Taxes
- Housing sector

Consumption Dynamics, the Price Level and the Real Interest Rate

- Can smooth tradables consumption through imports/exports
- Nontradables consumption limited by output of nontradables

$$
\begin{aligned}
U_t &= \sum_{s=t}^{\infty} \beta^{s-t} u(C_s) \\
C &= \Omega(C_T, C_N) = \left[\gamma^{\frac{1}{\theta}} C_T^{\frac{\theta-1}{\theta}} + (1-\gamma)^{\frac{1}{\theta}} C_N^{\frac{\theta-1}{\theta}}\right]^{\frac{\theta}{\theta-1}} \\
\theta &> 0,\ \gamma \in (0,1)
\end{aligned}
$$

- Define relative price of nontradables as p
- Define price level P as minimum expenditure such that $C = \Omega(C_T, C_N) = 1$, given p

$$P = \left[\gamma + (1-\gamma) p^{1-\theta}\right]^{\frac{1}{1-\theta}}$$

Intra-Temporal Optimisation

- Maximise $u(C)$ subject to $Z = C_T + pC_N$

$$\begin{aligned}
\frac{C_N}{C_T} &= \frac{(1-\gamma)}{\gamma} p^{-\theta} \\
C_T &= \left[\frac{\gamma}{(\gamma + (1-\gamma)p^{1-\theta})} \right] Z = \gamma \left(\frac{1}{P} \right)^{-\theta} C \\
C_N &= \left[\frac{p^{-\theta}(1-\gamma)}{(\gamma + (1-\gamma)p^{1-\theta})} \right] Z = (1-\gamma) \left(\frac{p}{P} \right)^{-\theta} C
\end{aligned}$$

- $(Z = PC)$

Inter-Temporal Optimisation

Maximise U_t subject to

$$\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(P_sC_s) = (1+r)B_t + \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(Y_s)$$

Can write

$$U_t = \sum_{s=t}^{\infty}\beta^{s-t}u\left[\frac{(1+r)B_s - B_{s+1} + Y_s}{P_s}\right]$$

Optimality requires

$$\begin{aligned}
\frac{u'(C_s)}{P_s} &= \beta(1+r)\frac{u'(C_{s+1})}{P_{s+1}} \\
u'(C_s) &= \beta\frac{(1+r)P_s}{P_{s+1}}u'(C_{s+1}) = \beta(1+r^c_{s+1})u'(C_{s+1}) \\
(1+r^c_{s+1}) &= \frac{(1+r)P_s}{P_{s+1}}
\end{aligned}$$

- r^c : consumption-based real interest rate

Resource Constraints

- GDP $Y_s = Y_{T,s} + pY_{N,s}$
- $Y_{N,s} = C_{N,s}$

$$\sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(C_{T,s}) = (1+r)B_t + \sum_{s=t}^{\infty}\left(\frac{1}{1+r}\right)^{s-t}(Y_{T,s})$$

$$\begin{aligned}
\frac{u'(C_s)}{P_s} &= \beta(1+r)\frac{u'(C_{s+1})}{P_{s+1}} \\
C_{s+1} &= \left[\frac{(1+r)P_s}{P_{s+1}}\right]^{\sigma}\beta^{\sigma}C_s \\
C_{T,s+1} &= \left(\frac{P_s}{P_{s+1}}\right)^{\sigma-\theta}(1+r)^{\sigma}\beta^{\sigma}C_{T,s}
\end{aligned}$$

Resource Constraints

$$C_{T,s+1} = \left(\frac{P_s}{P_{s+1}}\right)^{\sigma-\theta}(1+r)^{\sigma}\beta^{\sigma}C_{T,s}$$

- $\sigma = \theta$
- $\sigma > \theta$
- $\sigma < \theta$

$$\begin{aligned} CA_t &= B_{t+1} - B_t = rB_t + Y_{T,t} + p_t Y_{N,t} - C_{T,t} - p_t C_{N,t} \\ &= rB_t + Y_{T,t} - C_{T,t} \end{aligned}$$

Distribution Sector

- Pure tradables very limited part of consumption
- Retail prices of tradables have large non-traded component

$$P_T^C = P_T^P + \psi P_N$$

where P_T^C is consumer price of tradable good, P_T^P is producer price of tradable good and ψP_N is distribution cost

Productivity and the Terms of Trade

- Terms of trade decline may offset BS effect
- Depends on nature of trade expansion: intensive margin versus extensive margin
- Distribution sector: terms of trade may improve in short run

Government Spending and the Long-Run Real Exchange Rate

- IMF: higher government consumption associated with substantial real appreciation
- Impact of government investment more ambiguous
- "The Composition of Government Spending and the Real Exchange Rate" (Galstyan and Lane, JMCB, 2009)