Topics for Today

1.) PPP + the Monetary Model of Nominal Ex. Rates (from last time)

2.) Empirical Evidence on PPP (from last time)

3.) Problems with PPP (from last time)

4.) The Balassa - Samuelson Model of Real Ex. Rates

5.) Empirical Evidence on Balassa-Samuelson

The Real Exchange Rate

$$q = \frac{EP^*}{P} = \frac{\dfrac{\text{dom. } \cancel{\text{curr.}}}{\text{for. } \cancel{\text{curr.}}} \times \dfrac{\cancel{\text{for.}} \text{ curr.}}{\text{for. goods}}}{\dfrac{\text{dom. } \cancel{\text{curr}}}{\text{dom. goods}}}$$

$$= \frac{\text{domestic goods}}{\text{foreign goods}}$$

$=$ price of foreign goods in terms of domestic goods

q is called the real exchange rate.

$q \uparrow \Longrightarrow$ real depreciation

$q \downarrow \Longrightarrow$ real appreciation

Note, absolute PPP implies q is constant and $q = 1$.

Relative PPP implies q is constant but allows $q \neq 1$.

Now the question becomes,

What determines q?

One leading theory links q to the relative price of non-traded goods.

$$P = \alpha(\text{price of non-traded goods}) + \beta\left(\begin{array}{c}\text{price of}\\\text{traded goods}\end{array}\right)$$

prices of traded goods equal across countries (Law-of-one-Price).

However, prices of non-traded goods may differ.

Countries where the price of non-traded goods is high, will have strong, apparently over valued currencies. Their real exchange rates will be low.

Balassa - Samuelson

The relative price of NT goods will be higher in countries experiencing relatively rapid productivity growth in the tradeable goods sector.

Rapid prod. growth in tradeables

$\Longrightarrow$ wages rise in tradeables sector (prices fixed in world mkts.)

$\Longrightarrow$ wages must rise in non-tradeables sector (labor mobility)

$\Longrightarrow$ prices of NT must rise (competition + zero profits)

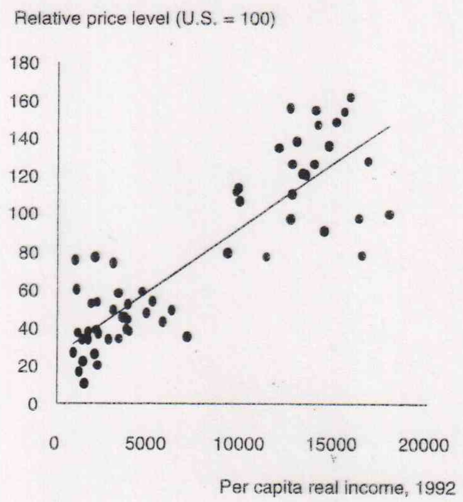


Figure 4.1
Real per capita incomes and price levels, 1992. (*Source:* Penn World Table)

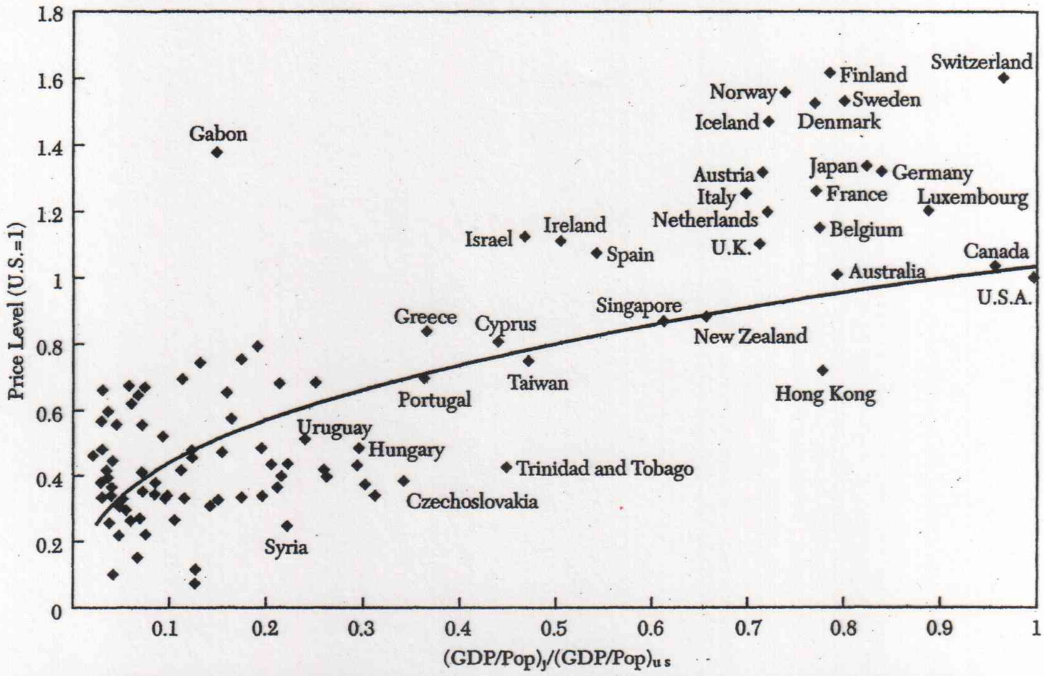


Figure 3. Price Level versus GDP per capita (U.S. = 1) 1990 $\log(P_j/P_{u.s.}) = \underset{(0.090)}{0.035} + \underset{(0.042)}{0.366} \log(Y_j/Y_{u.s.})$

Source: The Penn World Table, Aug. 1994

Balassa - Samuelson

Price Indices

$$P = P_T^{\gamma} \, P_{NT}^{1-\gamma} \qquad P^* = P_T^{\gamma} \, P_{NT}^{1-\gamma}$$

Assume traded goods are numeraire.

$$\frac{P}{P^*} = \left(\frac{P_T}{P_T^*}\right)^{\gamma} \left(\frac{P_{NT}}{P_{NT}^*}\right)^{1-\gamma}$$

By assumption, $P_T = P_T^*$

So,

$$\frac{P}{P^*} = \left(\frac{P_{NT}}{P_{NT}^*}\right)^{1-\gamma}$$

The Question is: Why might wealthy countries have higher relative prices of NT goods?

Balassa-Samuelson explains this via differences in sectoral productivities

Assumptions

1.) Each country produces 2 composite goods, an identical traded good and a NT good.

2.) Goods produced in competitive industries via CRS production functions.

3.) Capital is mobile internationally

4.) Labor is immobile internationally, but mobile across sectors within a country.

$$Y_T = A_T F(K_T, L_T) \qquad Y_N = A_N G(K_N, L_N)$$

$$L_T + L_N = \bar{L}$$

Assume tradeables are numeraire $\qquad p =$ price of NT in terms of tradeables

Profit-Maximizing FOCs

$k_T = K_T / L_T$

a.) $A_T f'(k_T) = r$

b.) $A_T [f(k_T) - k_T f'(k_T)] = w$

c.) $p A_N g'(k_N) = r$

d.) $p A_N [g(k_N) - g'(k_N) \cdot k_N] = w$

Productivity & the Real Ex. Rate

Zero Profit Conditions

(a) $A_T f(k_T) = r k_T + w$

(b) $p A_N g(k_N) = r k_N + w$

Log differentiate both sides,

(a) $$\hat{A}_T + \frac{f' \cdot k_T}{f} \hat{k}_T = \frac{r k_T}{A_T f} \hat{k}_T + \frac{w}{A_T f} \hat{w}$$

$$\Longrightarrow \hat{A}_T = \frac{w \cdot L_T}{A_T F(\cdot)} \hat{w} = \mu_{LT} \hat{w}$$

(b) $$\hat{p} + \hat{A}_N = \mu_{LN} \hat{w}$$

Sub-in from (a)

$$\boxed{\hat{p} = \frac{\mu_{LN}}{\mu_{LT}} \hat{A}_T - \hat{A}_N}$$

$$\frac{\mu_{LN}}{\mu_{LT}} > 1 \Longrightarrow \hat{p} \text{ rises when } \hat{A}_T > \hat{A}_N$$

Intuition

1.) When $A_T \uparrow$ wages in T-sector rise
(P_T + r fixed)

2.) Intersectoral labor mobility $\Rightarrow$ wages in NT rise

3.) Rise in NT wages forces p up. (zero profits)

Implications for Real Ex. Rate,

$$q = \left(\frac{P_N}{P_N^*}\right)^{1-\gamma}$$

$$\boxed{\hat{q} = (1-\gamma)\left[\hat{P}_N - \hat{P}_N^*\right] = (1-\gamma)\left[\frac{\mu_{LN}}{\mu_{LT}}\left(\hat{A}_T - \hat{A}_T^*\right) - \left(\hat{A}_N - \hat{A}_N^*\right)\right]}$$

Caveat

Assumption of identical T-goods could be important. Without this, there could be offsetting TOT effects. [Fitzgerald (2003)].

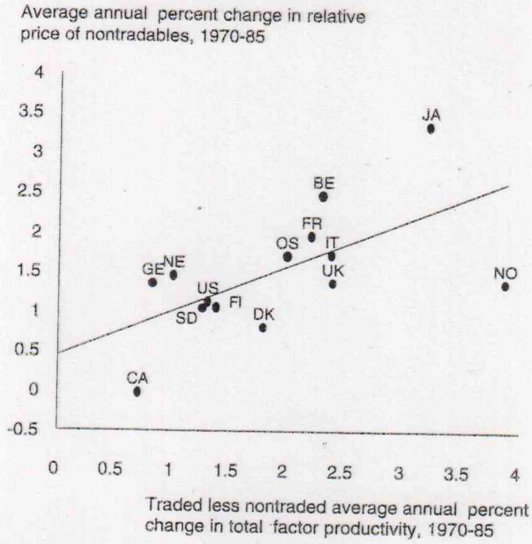


Figure 4.4
Differential productivity growth and the price of nontradables. (*Source:* De Gregorio, Giovannini, and Wolf, 1994)

Table 4.1
Average Annual Labor Productivity Growth in Manufacturing, 1979–93

Country	Productivity Growth (percent per year)
Belgium	4.3
Canada	1.7
Denmark	1.5
France	2.8
Germany	1.9
Italy	4.1
Japan	3.8
Netherlands	2.6
Norway	2.3
Sweden	3.2
United Kingdom	4.1
United States	2.5

Source: Dean and Sherwood (1994). Data for Italy cover 1979–92 only.

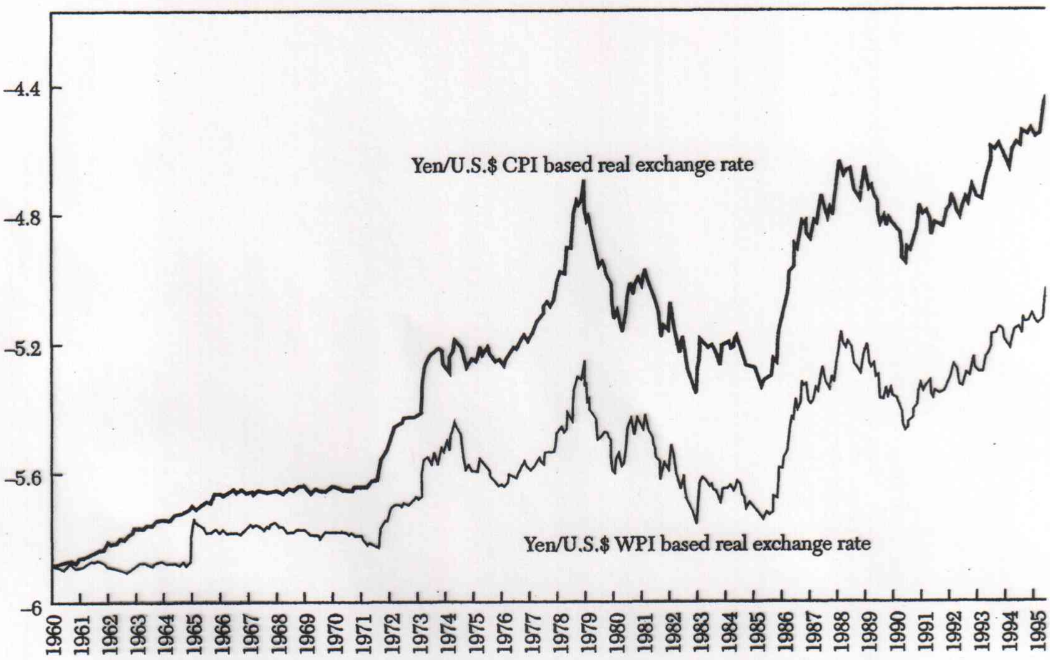


Figure 4. Yen/U.S.$ CPI and WPI based real exchange rates: Jan. 1960–Apr. 1995

Source: International Financial Statistics

Figure 1
Japan

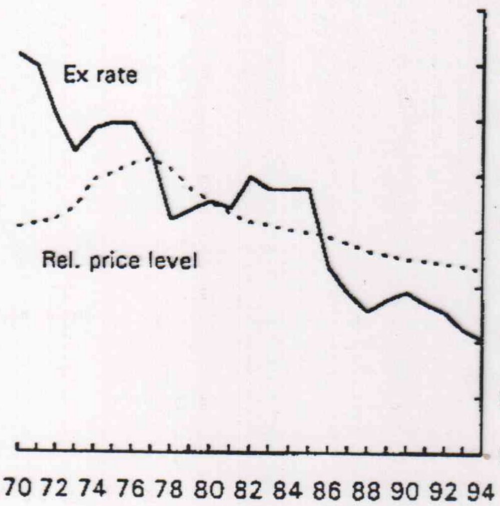
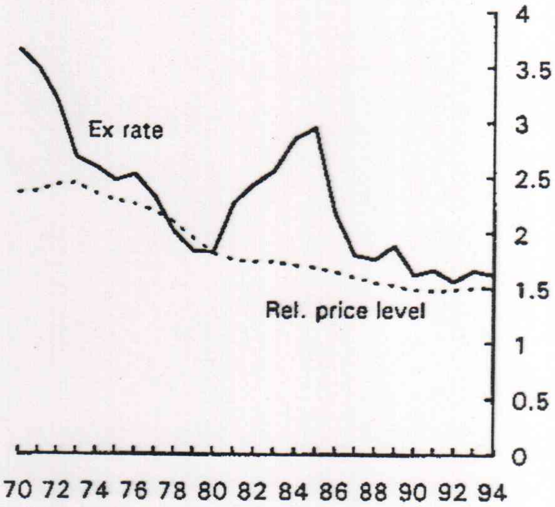


Figure 2
Germany



	Japan	Germany
Avg. Nominal depr.	4.9%	3.2%
$\pi - \pi^*$	0.9%	1.9%
Rel. prod. growth	2.1%	1.1%
	60% accounted for	90+ % accounted for

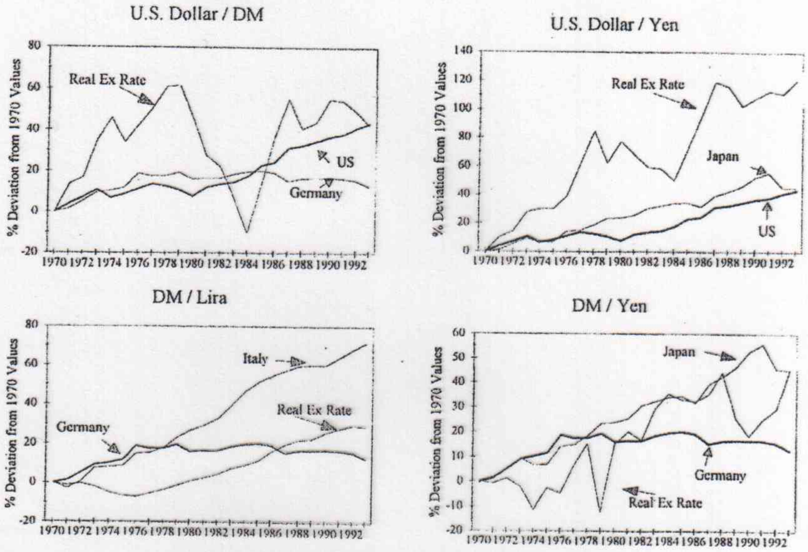


Fig. 1. Real exchange rates and relative labor productivities.

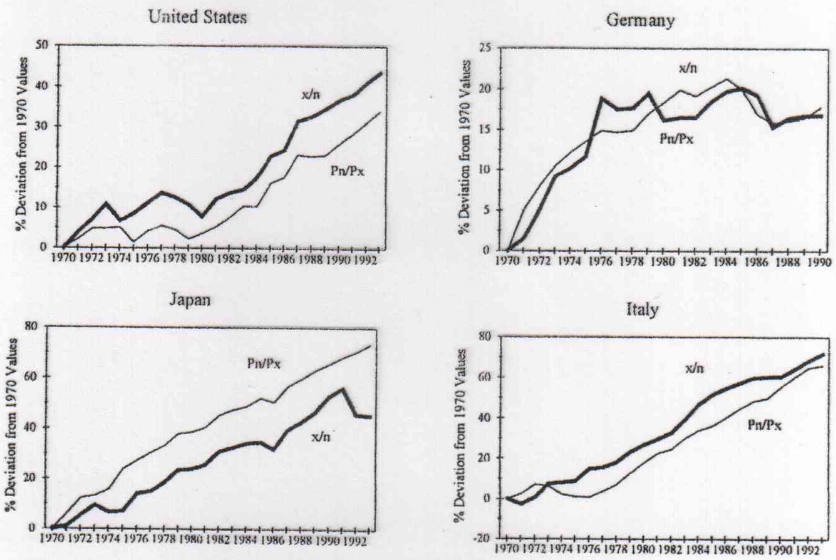


Fig. 2. Relative productivities and relative prices.