ECON 6356
International Finance and Macroeconomics

Lecture 7b: Welfare and Macroeconomic Interdependence

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Introduction

The Obstfeld and Rogoff (1995) (OR95) approach made important process in providing the microfoundations for the behaviour of the exchange rate and current account. However, it made use of restrictive assumptions (perfect foresight, non-stationarity) that limited its results.

Corsetti and Pesenti (2001), building on the approach of Cole and Obstfeld (1991) and try to build a version of the OR95 model that can be solved in closed form and can deal with the stochastic analysis.

Note: CO1991 central result implied that a unitarity of elasticity of substitution between home and foreign goods in consumption implies no movement in the net foreign assets.

Introduction (cont.)

First, they observe that in OR95 there is no distinction between the elasticity of substitution (ES) between goods produced inside the home economy and the ES between home and foreign goods. They are both $\theta > 1$.

This assumption makes impossible to disentangle between the two forms of monopoly power and their effects.

Then, CP add monopolistic power of: (two sources of monopolistic power)

- Firm over its good
- Country over its basket of goods

No empirical support for symmetric elasticities: $\text{ES}_{\text{within}} > 1$, $\text{ES}_{\text{between}} \approx 1$

CP apply such elasticities with competitive goods but differentiated labor inputs (analogous to monopolistic competition wiht competitive labor).

Model

Two countries, each produces a traded good. Population size normalized to 1.

Home agent preferences:

The home agent $j \in [0, 1]$ has an expected intertemporal utility

$$U_t(j) = \mathbb{E}_t \sum_{\tau=t}^{\infty} \beta^{\tau-t} \left[\frac{C_\tau(j)^{1-\rho}}{1-\rho} + \chi \ln \frac{M_\tau(j)}{P_\tau} + V(G_\tau) - \frac{\kappa}{2} l_\tau(j)^2 \right], \quad \beta = \frac{1}{1+\delta},$$

where G is government spending, $V(\cdot)$ is a function, C is consumption, l is labor, M/P are real money balances.

The representative foreign agent $j^* \in [0, 1]$ maximizes an analogous function but the model allows for different specifications of the parameters $\chi^*,\ \kappa^*,\ V^*(\cdot)$.

Consumption

The consumption basket is a CD aggregate of home and foreign goods

$$C_t(j) = C_{H,t}(j)^{\gamma} C_{F,t}(j)^{1-\gamma}, \quad C_t^*(j^*) = C_{H,t}^*(j)^{\gamma} C_{F,t}^*(j)^{1-\gamma}, \; 0 < \gamma < 1.$$

the CD aggregate implies an ES$_{H,F} = 1$. Also, γ can differ from $1/2$, but since the weight associated to the home good is equal (γ) in both locations, there is no home bias in consumption.

Prices

Let $\gamma_W \equiv \gamma^{\gamma}(1-\gamma)^{1-\gamma}$, then the home and foreign CPI's are

$$P_t \equiv \frac{1}{\gamma_W}(P_{H,t})^{\gamma}(P_{F,t})^{1-\gamma}, \quad P_t^* \equiv \frac{1}{\gamma_W}(P_{H,t}^*)^{\gamma}(P_{F,t}^*)^{1-\gamma},$$

where $P_{H,t}$ and $P_{F,t}$ are the prices of the home and foreign goods in the home country (in home currency), and $P_{H,t}^*$ and $P_{F,t}^*$ are the prices of the home and foreign goods in the foreign country (in foreign currency).

Technology

$$Y_t = \left(\int_0^1 l_t(j)^{\frac{\phi-1}{\phi}} \right)^{\frac{\phi}{\phi-1}}, \ \phi > 1.$$

differentiated labor inputs,
$\text{ES}_{\text{within}} = \phi > 1.$

Households are monopolistically competitive suppliers of specific labor inputs.

The firms, in contrast, will act competitively.

The FOC of the firm's PMP with respect to labor demand is:

$$l_t(j) = \left(\frac{W_t(j)}{P_{H,t}} \right)^{-\phi} Y_t.$$

A similar condition holds for foreign firms (ES can differ and be $\phi^* > 1$).

Note: This model yields exactly the same result that one in which the labor market is competitive and there are monopolistically competitive firms at home and abroad, with single goods produced replaced by consumption sub-baskets over a continuum of good varieties: $C_{H,t} = \left(\int_0^1 C_{H,t}(j)^{\frac{\phi-1}{\phi}} dj \right)$, and $C_{F,t} = \left(\int_0^1 C_{F,t}(j)^{\frac{\phi-1}{\phi}} dj \right)$.

LOP and PPP:

There are no impediments to trade, then the LOP holds,

$$P_{F,t} = \varepsilon_t P^*_{F,t}, \;\; P_{H,t} = \frac{1}{\varepsilon_t} P^*_{H,t}$$

The consumption basket (and preferences) are the same in both locations, an so the PPP holds too: $P_t = \varepsilon_t P^*_t$.

Additionally, (as in OR95) the TOT, $P_{H,t}/(\varepsilon_t P^*_{F,t})$, will move in response to shocks.

Budget and Resource Constraints

Incomplete asset markets: Only one non-contingent bond is traded. It is denominated in terms of home currency. The bond pays a risk-free nominal interest rate i_t, and the Fisher parity hold: $1 + r_t = (1 + i_t)P_{t-1}/P_t$.

The budget contraints are:

$$B_{t+1}(j) + M_t(j) \leq (1 + i_t)B_t(j) + M_{t-1}(j) + W_t(j)l_t(j) - P_tT_t(j) \\ - P_{H,t}C_{H,t}(j) - P_{F,t}(j)C_{F,t}(j)$$

$$\frac{B^*_{t+1}(j^*)}{\varepsilon_t} + M^*_t(j^*) \leq (1 + i_t)\frac{B_t(j^*)^*}{\varepsilon_t} + M^*_{t-1}(j^*) + W^*_t(j^*)l^*_t(j^*) - P^*_tT^*_t(j^*) \\ - P^*_{H,t}C^*_{H,t}(j^*) - P^*_{F,t}(j^*)C^*_{F,t}(j^*)$$

where B is the nominal bond position of home households (B^* that of the foreign household), T (T^*) a lump-sum tax. Also, notice the foreign return for buying the international bond is $(1 + i_t)\varepsilon_{t-1}/\varepsilon_t$.

Government

The government has full Home Bias and only consumes goods produced domestically (simplification). In addition it sets G_t, $T_t(j)$, and $M_t = \int_0^1 M_t(j)dj$ s.t.

$$M_t - M_{t-1} + P_t\int_0^1 T^*_t(j)dj \geq P_{H,t}G_t.$$

An analogous condition holds for the foreign government.

Market Clearing

Asset Markets: Zero net supply (at the world level)

$$\int_0^1 B_t(j)dj + \int_0^1 B_t^*(j^*)dj^* = 0.$$

Final goods: In each location (worldwide resource constraint for each good)

$$Y_t \geq G_t + \int_0^1 C_{H,t}(j)dj + \int_0^1 C_{H,t}^*(j^*)dj^*$$
$$Y_t^* \geq G_t^* + \int_0^1 C_{F,t}(j)dj + \int_0^1 C_{F,t}^*(j^*)dj^*$$

Nominal Rigidities

Wages rigidity: Predetermined 1-period nominal wages. $W_t(j)$ is set in $t-1$

Household j is a monopolistic supplier (of labor). It takes demand ($l_t(j) = \left(W_t(j)/P_{H,t}\right)^{-\phi} Y_t$) into account when setting wage.

FOC for wage setting problem:

$$\mathbb{E}_{t-1}\left[\kappa l_t(j)^2\right] = \frac{\phi-1}{\phi} W_t(j) \mathbb{E}_{t-1}\left[\frac{1}{P_t}\frac{l_t(j)}{C_t(j)^\rho}\right].$$

exp. labor disutility = exp. utility from extra wage by increasing labor

This FOC can be rewritten as

$$W_t(j) = \underbrace{\frac{\phi}{\phi-1}}_{\text{mark-up}} \frac{\mathbb{E}_{t-1}[\kappa l_t(j)^2]}{\mathbb{E}_{t-1}\left[\frac{1}{P_t}\frac{l_t(j)}{C_t(j)^\rho}\right]}$$

Wage is set as a mark-up over the expected cost of labor adjusted for utility value of labor income.

Nominal Rigidities (cont.)

Once the wages are set, agents are willing to meet unanticipated changes in labor demand (shocks) as long as: Real Wage $\geq MRS_{\text{cons,leisure}}$.

(Before: in a competitive world $\frac{W}{P}$ = MRS = MRT, but empirically $\frac{W}{P}$ is counter-cyclical, and thus the equality is not realistic. With a wedge, such as the mark-up, we obtain a more feasible condition $\frac{W}{P} = \gamma$MRS $= \gamma$MRT)

Thus, the participation constraint (such that the worker will provide labor) is:

$$\frac{W_t(j)}{P_t} \geq \kappa l_t(j) C_t(j)^{\rho}$$

CP assume shocks are given in a way that this constraint holds.

Equilibrium

As usual, due to symmetry we can drop the indexes j, j^*.

Also, we interpret the variables in per-capita terms.

In an equilibrium where $l_t(j) = l_t$, and $l_t(j^*) = l_t^*$, the output is a linear product of labor: $Y_t = l_t$, and $Y_t^* = l_t^*$.

Then, the labor demand at home becomes: $l_t = \left(\frac{W_t}{P_{H,t}}\right)^{-\phi} Y_t$.

From this output and its foreign analog it follows that the product prices are equal to the nominal wages: $W_t = P_{H,t}$, and $W_t^* = P_{F,t}$.

($\cancel{l_t} = \left(W_t/P_{H,t}\right)^{-\phi} \cancel{Y_t}$, and then $W_t = P_{H,t}$, from this we also have that wages and prices share the 1-period ridigity.)

Perfect foresight exercise as in Dornbusch-OR

As an illustration CP perform the same perfect-foresight exercise as in Dornbush (1976) and OR95: An unanticipated permanent increase in the money supply.

Start from the steady state with zero assets. Drop t subscripts, and denote the initial steady state with a 0 subscript, the variables in the new steady-state (long run) with upperbars, and variables in the short run without subindexes. Define the short-run as the duration of wage contracts (1-period).

Since all shocks are unanticipated, wages in the short run are set at the initial steady-state level: $W = W_0 = P_{H,0}$, and $W^* = W_0^* = P_{F,0}^*$.

Money shocks:

$$\bar{M} = M \geq M_0, \quad \bar{M}^* = M^* > M_0^*$$

Fiscal policy shocks: Let $g \equiv Y/(Y+G)$, $\bar{g} \equiv \bar{Y}/(\bar{Y}+\bar{G})$. A fiscal shock is an unanticipated change in $\bar{g}$ such that

$$g \geq g_0.$$

Similar definitions hold abroad.

The structural solution of the model is given as follows,

STRUCTURAL FORM OF THE MODEL

(17)	$C^{-\rho} = \beta(1+r)\bar{C}^{-\rho}$	$(C^*)^{-\rho} = \beta(1+r)(\bar{C}^*)^{-\rho}$
(18)	$\frac{\bar{M}}{P} = \chi \frac{1+i}{i} C^{\rho}$	$\frac{\bar{M}^*}{P^*} = \chi^* \frac{(1+i)\mathscr{E}}{(1+i)\mathscr{E} - \bar{\mathscr{E}}} (C^*)^{\rho}$
(19)	$\frac{\bar{M}}{\bar{P}} = \chi \frac{1+\delta}{\delta} \bar{C}^{\rho}$	$\frac{\bar{M}^*}{\bar{P}^*} = \chi^* \frac{1+\delta}{\delta} (\bar{C}^*)^{\rho}$
(20)	$B = P_{\mathrm{H}} \frac{Y}{g} - PC$	$-\frac{B}{\mathscr{E}} = P_{\mathrm{F}}^* \frac{Y^*}{g^*} - P^* C^*$
(21)	$\bar{P}\bar{C} = \bar{P}_{\mathrm{H}} \frac{\bar{Y}}{\bar{g}} + \delta \bar{B}$	$\bar{P}^* \bar{C}^* = \bar{P}_{\mathrm{F}}^* \frac{\bar{Y}^*}{\bar{g}^*} - \delta \frac{\bar{B}}{\bar{\mathscr{E}}}$
(22)	$\frac{P_{\mathrm{H}} Y}{P g} = \gamma(C + C^*)$	$\frac{P_{\mathrm{F}}^* Y^*}{P^* g^*} = (1-\gamma)(C + C^*)$
(23)	$\frac{\bar{P}_{\mathrm{H}} \bar{Y}}{\bar{P} \bar{g}} = \gamma(\bar{C} + \bar{C}^*)$	$\frac{\bar{P}_{\mathrm{F}}^* \bar{Y}^*}{\bar{P}^* \bar{g}^*} = (1-\gamma)(\bar{C} + \bar{C}^*)$
(24)	$\bar{Y} = \Phi \frac{\bar{P}_{\mathrm{H}}}{\bar{P}} \bar{C}^{-\rho}$	$\bar{Y}^* = \Phi^* \frac{\bar{P}_{\mathrm{F}}^*}{\bar{P}^*} (\bar{C}^*)^{-\rho}$
	$\Phi \equiv \frac{\phi - 1}{\kappa \phi}$	$\Phi^* \equiv \frac{\phi^* - 1}{\kappa^* \phi^*}$

Source: Corsetti and Pesenti (2001).

Equations (17) are the Euler Equations, equations (18), (19) describe the equilibrium in money markets in the short and long run. The steady-state nominal interest rate is δ. Equations (20) are the short-run current account identities (RHS: output minus absorption; LHS: Net asset position change —that considers the initial zero net assets position B_0), while (21) are the long-run current account identities. Equations (22), (23) are the short-run and long-run goods market clearing conditions, and (24) describe the trade-off between labor supply and leisure.

Perfect foresight exercise as in Dornbusch-OR (cont.)

From the short-run (20) and long-run current accounts (21), together with (22), and the PPP ($P_t = \varepsilon_t P_t^*$) we have

$$\frac{C + B/P}{C^* - B/P} = \frac{\gamma}{1-\gamma}, \quad \text{and,} \quad \frac{\bar{C} - \delta \bar{B}/\bar{P}}{\bar{C}^* + \delta \bar{B}/\bar{P}} = \frac{\gamma}{1-\gamma} \tag{+}$$

Now, the Euler equations for home and foreign consumption imply,

$$\frac{C}{C^*} = \frac{\bar{C}}{\bar{C}^*}$$

These equations, together with the observation that $(1+i)B = (1+\delta)\bar{B}$ imply that $B = \bar{B} = 0$ (the shock implies no movements in the NFA).

This implies a constant consumption ratio $C/C^* = \bar{C}/\bar{C}^* = \gamma/(1-\gamma)$ (or a zero non-consumption differential in log-linear terms).(thus mimicking a complete markets outcome and removing the non-stationarity problem.)

Implications: The adjustment to the shock occurs only through TOT changes.

Perfect foresight exercise as in Dornbusch-OR (cont.)

Intuition: (Price and quantity effects offset.)

In the CP model the elasticity of relative net output demand $(Y-G)/(Y^*-G^*)$ to the TOT $(P_H/(\varepsilon P_F))$ is 1, which is also the elasticity of substitution between home and foreign goods.

When $\downarrow$ TOT due to the $\uparrow$ ER depreciation (after money expansion), relative demand for home good increases in a proportional fashion. Home agents' nominal income increases relative to foreign agents', but their purchasing power declines proportionally, and there is no incentive to borrow/lend internationally.

If the elasticity of substitution were larger than 1, home agents' real income would increase relative to foreign and they would want to lend abroad.

The absence of NFA changes makes it possible to solve the model without any approximation. The model goes back to a unit root if initial assets are not zero.

Macroeconomic effects of a money expansion

$M \uparrow$ (by 1) $\rightarrow \varepsilon \uparrow$ (by 1 too —there is no overshooting) $\rightarrow (\varepsilon P_F^*) \uparrow$ (home imports price $\uparrow$, TOT $\downarrow$) $\rightarrow P_t \uparrow$ (inflation), but P_H is fixed (due to rigidity) and thus the price level change is $(1-\gamma) < 1$, then $\frac{M}{P} \uparrow \Rightarrow Y \uparrow$.

Intuition: P increases only by a fraction of the money supply increase, but the world interest rate falls (due to higher money supply at the world level), and consumption increases symmetrically in all locations.

Higher world consumption and higher relative price of foreign goods increase demand for home goods and short-run output increases.

Here there are no current account effects, and then the money is long-run neutral: $\bar{P}_H$ moves 1:1 with $\bar{M}$.
(consumption, output, real money and TOT returns to initial levels)

Welfare and Macroeconomic Interdependence (WAMI)

To analyze how welfare changes after the policy shocks (permanent change in M or g) CP use the fact that the economy reaches its new long-run position by the end of the position after the shock, and then, the lifetime utility is

$$U = \frac{C^{1-\rho}}{1-\rho} + \chi \ln \frac{\bar{M}}{P} + V(G) - \frac{\kappa}{2} Y^2 + \frac{1}{\delta} \left(\frac{\bar{C}^{1-\rho}}{1-\rho} + \chi \ln \frac{\bar{M}}{\bar{P}} + V(\bar{G}) - \frac{\kappa}{2} \bar{Y}^2 \right).$$

To see the effect of ΔM we can check:

$$\frac{\partial U}{\partial \bar{M}} = \frac{\gamma}{\rho \bar{M}} \left[C^{1-\rho} + \chi\rho - \kappa \frac{Y^2}{g} \left(1 + \rho \frac{1-\gamma}{\gamma} \right). \right]$$

(notice that in taking that derivative the derivation must take into account how these variables depend on $\bar{M}$ in the final solution table shown before)

Welfare and Macroeconomic Interdependence (WAMI) (cont.)

Small shocks: To gauge the effect of a small shock, evaluate $\frac{\partial U}{\partial \bar{M}}$ at $\bar{M} = M_0$. Abstracting from the government spending ($g = g_0 = 1$) and using the solution of the model we have:

$$\text{sign}\left(\frac{\partial U}{\partial \bar{M}}\right)|_{\bar{M}=M_0} = \text{sign}\left\{1 + \chi\rho\left[\gamma\gamma_W^{(1-\rho)/(1+\rho)}\Phi_W^{1/(1+\rho)}\right]^{\rho-1} - \frac{\phi-1}{\phi}\left(1-\rho\frac{1-\gamma}{\gamma}\right)\right\},$$

where $\Phi_W = \left(\frac{\phi-1}{\kappa\phi}\right)^{\gamma}\left(\frac{\phi^*-1}{\kappa\phi^*}\right)^{1-\gamma}$.

Key difference between closed and open economy analysis: In a closed economy $\gamma = 1$ and then the second term is zero and we would always get $\partial U/\partial \bar{M} > 0$, which would yield a welfare gain that only reflects the fact that extra utility of consumption effect dominates over the extra disutility of effort.

Due to a monopolistic power, wage setting yields inefficiently high real wages and low output. Then a small inflationary shock that lowers real wage, and increases output, consumption and employment is welfare-improving.

Open Economy: $\gamma < 1$

$\bar{M} \uparrow \rightarrow \varepsilon \uparrow \rightarrow TOT \downarrow \Rightarrow$ Purchasing power of home households $\downarrow$

The shock, then, delivers a positve $(+)$ Aggregate demand effect — erodes monopoly power, and a negative $(-)$ TOT effect. This second effect may overtake on the welfare effect of the money expansion (and deliver welfare losses).

$\frac{\partial U}{\partial \bar{M}} < 0$ when: $\begin{cases} \gamma \text{ is NOT very large (Foreign good matters a lot in CPI)} \\ \phi \text{ is NOT too small (not a large monop. power + endogenous labor distortion)} \end{cases}$

WAMI vs. OR: In OR there is no distinction between firm level and country level monopoly power. Then $\bar{M} \uparrow$ is always good (different to WAMI.)

Optimal Policy

Now, to define optimal level of money $\tilde{M}$ take $\frac{\partial U}{\partial \bar{M}} = 0$:

$$C^{1-\rho} - \kappa \frac{Y^2}{g} = -\chi\rho + \frac{1-\gamma}{\gamma}\rho\frac{Y^2}{g} \tag{1}$$

and solve for $C^{1-\delta} - \kappa\frac{Y^2}{g}$.

Recalling the participation constraint is $C^{1-\rho} \geq \kappa\frac{Y^2}{g}$, we have that the optimal policy in a closed economy is not feasible (with $\gamma = 1$ the RHS of (1) is $-\chi\rho$).

<u>Optimal policy in closed economy:</u> Set $\bar{M} \leq \tilde{M}$ such that the participation constraint holds. Bring output (employment) as close to the potential as possible.

In the closed economy case, as long as the participation constraint holds, it is beneficial to raise the money supply (non-systematically).

Optimal Policy (cont.)

In Open Economy: With $\gamma < 1$ the relation between money increases and utility has an inverted U shape.

The home M innovation that maximizes welfare is lower than the one closing the output gap $\bar{M} \leq \tilde{M}$

Only if increase in money is done in sync, such that, $\bar{M} - \bar{M}^* = 0$ (both ↑), the ER and TOT effect will disappear and each country benefits from expanding their money supply to the point output reaches their potential.

Intuition: M expansion mitigates distortion without TOT and expenditure switching cost.

If the M increase is not synchronized in this fashion, we have that the gains from appreciating the TOT at the margin offset the efficiency losses from setting a lower output than the potential.

International Monetary Spillover (increase in foreign money that appreciates ER)

Comparison to OR1995:

In OR: $M^* \uparrow \rightarrow M^W \uparrow \Rightarrow$ Welfare increases for home

In CP: $M^* \uparrow \rightarrow TOT \uparrow \rightarrow$ effect on home output depends on whether H and F goods are complements/substitutes.

The goods are complements if $U_{C_H, C_F} > 0$. In that case there is a positive effect on home output (from the higher demand for the foreign good).

Effect on Welfare:

$$\frac{\partial U}{\partial \bar{M}^*} = \frac{1-\gamma}{\rho \bar{M}^*} \left[C^{1-\rho} + \chi\rho - \kappa \frac{Y^2}{g}(1-\rho) \right] > 0$$

This expression is positive unambiguously as long as the participation constraint holds.

$\Rightarrow$ Monetary shocks have a prosper-thy-neighbor effect.

International Monetary Spillover (cont.)

Monetary shocks have a prosper-thy-neighbor effect.

$\Rightarrow$ OR and CP contradict usual beggar-thy-neighbor argument of money expansions.

Intuition: Foreign money expansion raises home welfare due to the TOT improvement which allows home households to finance higher consumption for any level of labor supply.

In OR there is also a prosper-thy-neighbor effect but for a different reason. In CP is due to the TOT effect rather than the mitigation of the distortion in the labor market.

Key policy implication: No incentive to engage in competitive devaluations.

International Policy Links

Rewriting the system of equations $\partial U/\partial \bar{M} = 0$, $\partial U^*/\partial \bar{M}^* = 0$

$$\left(\frac{\gamma}{\rho} + 2 - \gamma\right) \ln \frac{\bar{M}}{M_0} = -\ln\left[\frac{\phi - 1}{\phi}\left(1 + \rho\frac{1-\gamma}{\gamma}\right)\right] - \overbrace{(1-\gamma)\left(\frac{1-\rho}{\rho}\right)\ln\frac{\bar{M}^*}{M_0^*}}^{\text{policy interdependence due to trans. of monet. shocks}} - \ln\frac{g}{g_0}$$

$$\left(\frac{1-\gamma}{\rho} + 1 + \gamma\right) \ln \frac{\bar{M}^*}{M_0^*} = \underbrace{-\ln\left[\frac{\phi^* - 1}{\phi^*}\left(1 + \rho\frac{1-\gamma}{\gamma}\right)\right]}_{\text{Internal distortions (firm/HH mon. power) vs. External distortions (country mon. power on TOT)}} - \gamma\left(\frac{1-\rho}{\rho}\right)\ln\frac{\bar{M}}{M_0} - \ln\frac{g^*}{g_0^*}$$

First term in the RHS: The more open the economy the lower the incentives to shock inflation due to the effect on TOT (square brackets term will be larger than 1 $\rightarrow$ deflationary bias).

Unlike in a closed economy, domestic distortions will not necessarily impart an inflationary bias to optimal policies.

International Policy Links (cont.)

Rewriting the system of equations $\partial U/\partial\bar{M} = 0$, $\partial U^*/\partial\bar{M}^* = 0$

$$\left(\frac{\gamma}{\rho}+2-\gamma\right)\ln\frac{\bar{M}}{M_0} = -\ln\left[\frac{\phi-1}{\phi}\left(1+\rho\frac{1-\gamma}{\gamma}\right)\right] - \overbrace{(1-\gamma)\left(\frac{1-\rho}{\rho}\right)\ln\frac{\bar{M}^*}{M_0^*}}^{\text{policy interdependence due to trans. of monet. shocks}} - \ln\frac{g}{g_0}$$

$$\left(\frac{1-\gamma}{\rho}+1+\gamma\right)\ln\frac{\bar{M}^*}{M_0^*} = \underbrace{-\ln\left[\frac{\phi^*-1}{\phi^*}\left(1+\rho\frac{1-\gamma}{\gamma}\right)\right]}_{\substack{\text{Internal distortions (firm/HH mon. power) vs.}\\ \text{External distortions (country mon. power on TOT)}}} - \gamma\left(\frac{1-\rho}{\rho}\right)\ln\frac{\bar{M}}{M_0} - \ln\frac{g^*}{g_0^*}$$

Second term in the RHS: Policy interdependence due to international transmission of monetary shocks.

If the goods are complements, then $M^* \uparrow$ improves welfare. If in addition $\downarrow (M,\ \varepsilon)$ (appreciation), then welfare will improve even more due to reduced disutility of home work effort associated with the output expansion. (prosper-thy-neighbor, and the opposite happens if $\rho > 1$).

Foreign fiscal policy has indirect effect on home monetary policy via its effect on foreign money.

Summary:

- CP build on the approach of Cole and Obstfeld (1991) to provide a framework in similar spirit as OR95 but with less restrictive assumptions.

- Their work makes a key distinction between firm-level monopoly on individual good prices (or households on wages) and country-level monopoly power on the TOT (basket of goods).

- Important international policy spillovers.

- Monetary expansion can be *prosper-thy-neighbor* under some circumstances.

- CP, OR assume Producer Currency Pricing, which implies a complete pass-through from the ER to prices. This assumption, however, has less empirical support in the data, and also affect the setups' implications.

To explore the last issue further, a number of subsequent studies have explored the role of local-currency-pricing (LCP) in shaping these international policy spillovers and the cross-border macroeconomic interdependence.