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Monetary Policy: Prosper-thy-neighbour and Beggar-thyself?

By Jochen Michaelis*, Kassel

I. Introduction

This paper re-examines two popular views on the welfare effects of monetary expansions in an open economy. The "old view" states that such a policy is beneficial for the expanding country, but has negative repercussions on welfare abroad (beggar-thy-neighbour). By way of contrast, the so-called "new view", is that the most likely scenario will be a win-win outcome. The benchmark case is derived in the seminal work of Obstfeld and Rogoff (1995, 1996): the source of the monetary expansion does not matter, utility increases by the same extent in the expanding country and its neighbour. Compared to the Mundell-Fleming model, the workhorse model of the old view, the relative merit of the Obstfeld/Rogoff framework lies in its well-specified micro-foundation. The strand of research, launched by Obstfeld and Rogoff and excellently surveyed by Lane (2001), has identified several distortions which (i) modify the symmetry result and (ii) re-open the possibility of a beggar-thy-neighbour effect. These distortions are, among others, factor price rigidities, incomplete international asset markets, non-tradable goods, a pricing-to-market policy by firms, and monopoly power of a country in trade. However, the nature and magnitude of the inefficiencies are only one side of the coin. The other side are their interactions. As emphasised by Corsetti and Pesenti (2001, p. 422), the literature still lacks a comprehensive exploration of the interplay of the different sources of economic distortion. This paper seeks to shed some light on this issue by merging some of the extensions found in the literature. Such a unified framework enables us to re-examine the welfare effects of a monetary expansion.

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Our model extends the Obstfeld/Rogoff, henceforth OR, baseline set-up in three ways. First, we abandon the assumption of identical preferences by introducing a home bias in consumption as in Warnock (2003). Second, following Corsetti and Pesenti (2001) and Tille (2001), we allow for different degrees of competitiveness between two goods produced within a country and two goods produced in two different countries. Third, labour markets are assumed to be monopolistic. Each household supplies a different type of labour, nominal wages are predetermined. The introduction of these imperfections is motivated in terms of empirical plausibility and realism. This does not mean that other distortions are of minor importance, but including all these imperfections is too large a subject for this paper. See, for instance, Michaelis (2002) for optimal monetary policies in the presence of pricing-to-market.

In the literature, there is growing evidence that there is a significant degree of home bias in international trade (see McCallum (1995), Engel and Rogers (1996), Helliwell (1998)). The origins, however, remain cloudy (Obstfeld and Rogoff (2000a)). Two factors are put forward: (1) in a broad sense defined trade costs, and (2) an inherent preference for domestic goods per se. For a welfare analysis it would be very important to distinguish between these explanations and to know why such a bias exists, but unfortunately, the empirical findings are mixed. While Evans (2001), using OECD data, finds evidence for the trade costs explanation, the analysis of Wolf (2000) supports the preference hypothesis, he identifies a significant home bias even at the subnational level (within US States). We do not take a stand on these explanations, but decided to follow Warnock (2003) by assuming a home bias in preferences. As our analysis will show, a home bias goes in favour of the country where the monetary expansion takes place. One reason: an increase in domestic income is more heavily spent on domestic goods than on foreign goods. With respect to this issue a home bias is quite like introducing non-tradables (Hau (2000)).

The increase in domestic income stems from an increase in world demand and from a switch towards domestic goods caused by a worsening in the terms of trade. The expenditure-switching effect is decreasing in the home bias. Households are more reluctant to switch from foreign to domestic goods, relative prices matter less. Much the same follows from a low value for the elasticity of substitution between domestic and foreign goods. OR do not allow for a difference between the cross-country and the within-country substitutability of goods. As pointed out by Tille (2001), this is questionable for both theoretical and empirical rea-

sons. If trade integration leads to more regional concentration of industrial activities so that countries specialise in the production of certain types of goods, then it will be likely to be less substitutability between goods produced in different countries than between goods produced within a country. Backus et al. (1994a, b) argue that the most plausible range for the cross-country elasticity lies between 1 and 2, which is much smaller than the usual estimates for the within-country elasticity, which is about 6 as in Rotemberg and Woodford (1992).

In Corsetti and Pesenti (2001), the consumption index over domestic and foreign goods is of the Cobb-Douglas type. Restricting the elasticity of substitution between domestic and foreign goods to unity, however, shuts off the current-account channel of international interdependence, a very uncomfortable feature of the Corsetti-Pesenti scenario. Drawing on Tille (2001), we can set parametrically the degrees of competitiveness between (1) domestic and foreign goods and (2) between varieties produced within a country. If domestic and foreign goods are bad substitutes, a monetary expansion may be beggar-thyself. In this case the positive impact via a higher product demand is overcompensated by the worsening of the terms of trade which lowers the purchasing power of domestic income.

In addition to monopolistic competition on product markets we consider monopolistic competition on labour markets as a second internal inefficiency. Given the labour market outcome at least in Western Europe, the assumption of imperfect labour markets is self-evident. The existence of a second internal distortion strengthens the incentive to pursue expansionary monetary policies for two reasons: (1) wages (and prices) are suboptimally high so that consumption and employment are suboptimally low, and (2) the welfare gain becomes asymmetric, i.e., domestic residents will be better off relative to foreign residents.

The model we set up in the next section enables us to discuss the interplay between the external and internal sources of distortions in a very clear manner. Our main findings are: (1) a home bias in consumption reduces the terms-of-trade externality and thus shifts the welfare gain of a monetary expansion towards the country where it takes place; (2) the welfare gain is more likely to be concentrated in the expanding country if domestic and foreign goods are close substitutes and if the distortions on the goods and labour markets are high, and (3) for a wide range of parameter values the "old view" is reversed, a domestic monetary expansion deteriorates domestic welfare (beggar-thyself) but improves welfare abroad (prosper-thy-neighbour).

The paper is structured as follows. Section II. introduces the model, which we log-linearise around an initial steady state in Section III. Section IV. studies the transmission mechanism of monetary shocks, whereas the welfare implications are investigated in Section V. Section V. also provides a numerical example. Section VI. concludes.

II. The Model

The world is composed of two countries of identical size, Home and Foreign, and in each country there is a continuum of identical households with population size normalised to unity. Each household consumes, monopolistically supplies labour to domestic firms, holds money balances, bonds, and shares in domestic firms, which are assumed to be monopolistic producer of a single differentiated product which they sell at home and abroad. There is a continuum of goods and firms, indexed by i, in each country, Home firms produce goods on the interval $i \in [0,1]$, Foreign firms produce goods on the interval $i \in [1,2]$.

1. Households

Preferences of the representative Home household $j \in [0,1]$ are defined over the consumption index $C(j)$, real money balances $M(j)/P$, and total hours worked by the agent, $l(j)$. Household j maximises its lifetime utility which is given by

$$U_t(j) = \sum_{s=t}^{\infty} \beta^{s-t} \left[\ln C_s(j) + \delta \ln \frac{M_s(j)}{P_s} - \frac{\sigma}{2} [l_s(j)]^2 \right]. \tag{1}$$

Here, β $(0 < \beta < 1)$ is the discount factor, and δ and σ are positive constants. Because of providing liquidity services real money holdings enter the utility function. The third term in the period utility function captures the disutility of work. The consumption index is defined as:

$$C_s(j) = \left[\alpha^{\frac{1}{\theta}} \left(C_{H,s}(j)\right)^{\frac{\theta-1}{\theta}} + (1-\alpha)^{\frac{1}{\theta}} \left(C_{F,s}(j)\right)^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta}{\theta-1}}, \tag{2}$$

where $\theta > 0$ denotes the elasticity of substitution between the consumption basket of Home goods, $C_H(j)$, and the consumption basket of Foreign

goods, $C_F(j)$. These baskets are in turn CES aggregates across the brands produced in Home and Foreign,

$$(3) \quad C_H(j) = \left(\int_0^1 (C_H(j,i))^{\frac{\varepsilon-1}{\varepsilon}} di \right)^{\frac{\varepsilon}{\varepsilon-1}}; \quad C_F(j) = \left(\int_1^2 (C_F(j,i))^{\frac{\varepsilon-1}{\varepsilon}} di \right)^{\frac{\varepsilon}{\varepsilon-1}},$$

where $C_H(j,i)$ and $C_F(j,i)$ are respectively consumption of the Home variety $i \in [0,1]$ and consumption of the Foreign variety $i \in [1,2]$ by household j. The parameter $\varepsilon > 1$ denotes the elasticity of substitution between any two goods produced in the same country. Since ϵ turns out to be the price elasticity of demand faced by each monopolistic firm, this parameter serves as an index of monopolistic distortion on goods markets.

Home and Foreign are assumed to be mirror images, i.e., they are of equal size, households have identical discount rates and identical preferences towards liquidity services and labour, and, following Warnock (2003), they have an equal bias for their own domestically produced goods. The consumption index of Foreign household $j^* \in [0,1]$ is:

$$(4) \quad C_s^*(j^*) = \left[\alpha^{\frac{1}{\theta}} \left(C_{F,s}^*(j^*) \right)^{\frac{\theta-1}{\theta}} + (1-\alpha)^{\frac{1}{\theta}} \left(C_{H,s}^*(j^*) \right)^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta}{\theta-1}},$$

where the consumption baskets of Foreign and Home goods are:

$$(5) \quad C_F^*(j^*) = \left(\int_1^2 (C_F^*(j^*,i))^{\frac{\varepsilon-1}{\varepsilon}} di \right)^{\frac{\varepsilon}{\varepsilon-1}}; \quad C_H^*(j^*) = \left(\int_0^1 (C_H^*(j^*,i))^{\frac{\varepsilon-1}{\varepsilon}} di \right)^{\frac{\varepsilon}{\varepsilon-1}}.$$

The home-product bias is introduced by the parameter $\alpha (0 \leq \alpha \leq 1)$, which is the weight of domestically produced goods in preferences. For $\alpha > 1/2$ we have a home bias, that is, at given relative prices the ratio of Home goods to Foreign goods consumed in Home is higher than in Foreign. If $\alpha < 1/2$, there is a foreign bias in consumption, and if $\alpha = 1/2$, Home and Foreign households have identical preferences.

How is our specification of preferences related to the literature? OR (1995) assume identical preferences and do not distinguish between cross-country and within-country substitutability of goods. In our model, their results can be replicated by assuming $\alpha = 1/2$ and $\theta = \varepsilon > 1$. In Corsetti and Pesenti (2001), the consumption indexes (2) and (4) are of the

Cobb-Douglas type, hence, the elasticity of substitution between Home and Foreign goods, θ, is restricted to unity. Moreover, they assume identical preferences implying that, if $\alpha > 1/2$, Home as well as Foreign has a bias for Home goods. Additionally, all goods produced within a country are perfect substitutes, so that goods markets are perfectly competitive ($\varepsilon \to \infty$). Tille (2001) relaxes the assumption of $\theta = 1$, but maintains the assumption of identical preferences. Warnock (2003), on the other hand, introduces a home bias in consumption, but his set-up imposes $\theta = \varepsilon$. All these contributions are particular cases of our more general framework.

The consumption-based price indexes corresponding to our preference specification are:

$$P_s = \left[\alpha(P_{H,s})^{1-\theta} + (1-\alpha)(P_{F,s})^{1-\theta}\right]^{\frac{1}{1-\theta}}; \quad P_s^* = \left[\alpha(P_{F,s}^*)^{1-\theta} + (1-\alpha)(P_{H,s}^*)^{1-\theta}\right]^{\frac{1}{1-\theta}}$$

$$(6) \quad P_{H,s} = \left(\int_0^1 (P_{H,s}(i))^{1-\varepsilon} di\right)^{\frac{1}{1-\varepsilon}} \qquad P_{F,s} = \left(\int_1^2 (P_{F,s}(i))^{1-\varepsilon} di\right)^{\frac{1}{1-\varepsilon}}$$

$$P_{F,s}^* = \left(\int_1^2 \left(P_{F,s}^*(i)\right)^{1-\varepsilon} di\right)^{\frac{1}{1-\varepsilon}} \qquad P_{H,s}^* = \left(\int_0^1 \left(P_{H,s}^*(i)\right)^{1-\varepsilon} di\right)^{\frac{1}{1-\varepsilon}}.$$

Here, P_H and P_F are the prices of Home and Foreign goods in Home currency, P_H^* and P_F^* the prices of Home and Foreign goods in Foreign currency. We assume that there are no impediments to trade, so that the law of one price holds for each good. Let e be the nominal exchange rate (units of Home currency per unit of Foreign currency), then we have

$$(7) \qquad P_H = eP_H^*; \quad P_F = eP_F^*.$$

Since Home and Foreign households are assumed to have different preferences, the law of one price does not imply that the absolute purchasing power parity holds. The real exchange rate q, defined as $q \equiv eP^*/P$, may differ from unity.

Home household j holds two assets, domestic currency, M, and an internationally traded bond, B, denominated in Home currency. His budget constraint reads:

$$(8) \qquad \begin{aligned} &W_t(j)l_t(j) + \pi_t(j) + \tau_t(j)P_t + M_{t-1}(j) + (1+r_t)P_tB_t(j) = \\ &P_{H,t}C_{H,t}(j) + P_{F,t}C_{F,t}(j) + M_t(j) + P_tB_{t+1}(j) \end{aligned}$$

where $W_t(j)$ is j's nominal wage, $\pi_t(j)$ is j's share of aggregate profits, $\tau_t(j)$ is a lump-sum transfer from the government denominated in consumption units, $M_{t-1}(j)$ are nominal money holdings at the beginning of period t, and $B_t(j)$ are bonds accumulated during period $t-1$ and carried over to period t. The nominal yield of these bonds is i_t, their real rate of return is r_t with $1+r_t = (1+i_t)P_{t-1}/P_t$.

Foreign household j^* faces a similar budget constraint:

$$W_t^*(j^*)l_t^*(j^*) + \pi_t^*(j^*) + \tau_t^*(j^*)P_t^* + M_{t-1}^*(j^*) + (1+r_t)\frac{P_t}{e_t}B_t^*(j^*) = P_{F,t}^*C_{F,t}^*(j^*) + P_{H,t}^*C_{H,t}^*(j^*) + M_t^*(j^*) + \frac{P_t}{e_t}B_{t+1}^*(j^*). \tag{9}$$

Note that the Foreign real interest rate in terms of consumption units, r_t^*, with $1+r_t^* = (1+i_t)\frac{e_{t-1}P_{t-1}^*}{e_tP_t^*} = (1+r_t)\frac{q_{t-1}}{q_t}$ differs from the Home real interest rate, if the real exchange rate does not stay constant but shows some dynamics (violation of the relative PPP). In this case, perfect capital mobility does not ensure real interest rate equalisation across countries. We are aware that in this case the currency denomination of the bond matters, but we abstract from the investigation of alternative assumptions.

Home and Foreign consumers maximise lifetime utility subject to their budget constraint by making consumption decisions, choosing nominal money balances, and setting a nominal wage. The solutions of these maximisation problems can be derived in the usual way, the results are (the decision concerning the wage rate will be discussed in Section II.2.):

$$C_{t+1}(j) = \beta(1+r_{t+1})C_t(j); \qquad C_{t+1}^*(j^*) = \beta(1+r_{t+1}^*)C_t^*(j^*) \tag{10}$$

$$\frac{M_t(j)}{P_t} = \frac{\delta(1+i_{t+1})}{i_{t+1}}C_t(j); \qquad \frac{M_t^*(j^*)}{P_t^*} = \frac{\delta(1+i_{t+1})e_t}{(1+i_{t+1})e_t - e_{t+1}}C_t^*(j^*) \tag{11}$$

$$\begin{aligned}
C_H(j, i\in[0,1]) &= \alpha\left(\frac{P_H(i)}{P_H}\right)^{-\varepsilon}\left(\frac{P_H}{P}\right)^{-\theta}C(j)\\
C_F(j, i\in[1,2]) &= (1-\alpha)\left(\frac{P_F(i)}{P_F}\right)^{-\varepsilon}\left(\frac{P_F}{P}\right)^{-\theta}C(j)\\
C_F^*(j^*, i\in[1,2]) &= \alpha\left(\frac{P_F^*(i)}{P_F^*}\right)^{-\varepsilon}\left(\frac{P_F^*}{P^*}\right)^{-\theta}C^*(j^*)\\
C_H^*(j^*, i\in[0,1]) &= (1-\alpha)\left(\frac{P_H^*(i)}{P_H^*}\right)^{-\varepsilon}\left(\frac{P_H^*}{P^*}\right)^{-\theta}C^*(j^*)
\end{aligned} \tag{12}$$

Eq. (10) are standard Euler equations describing the optimal intertemporal allocation of consumption. The money market equilibrium conditions (11) state that in Home and Foreign real money demand is increasing in consumption and decreasing in the nominal interest rate. Foreign's real money demand is positively related to an increase in the exchange rate ($e_{t+1} > e_t$), since this lowers Foreign's real interest rate and hence its consumption opportunity costs of holding real balances. Equations (12) describe the consumption demand of Home household j and Foreign household j^* for Home varieties $i \in [0,1]$ and Foreign varieties $i \in [1,2]$, respectively. Aggregation over Home and Foreign households gives the negatively sloped world demand for variety i. An increase in the home-bias parameter α leads to an increasing domestic but a decreasing foreign demand for a domestic variety i.

Integrating demand for all Home varieties $i \in [0,1]$ and all Foreign varieties $i \in [1,2]$ gives world demand for Home and Foreign goods. Assuming a symmetric equilibrium where all households and all firms within a country are identical allows us to drop the indexes i, j and j^*, and to interpret the variables in per-capita terms. Since the population is normalised to unity, they can be interpreted as country-variables too. With these simplifications the aggregate product equilibrium conditions can be written as

$$Y = C_H + C_H^*; \qquad Y^* = C_F^* + C_F \tag{13}$$

with

$$\begin{aligned} C_H &= \alpha\left(\frac{P_H}{P}\right)^{-\theta} C; & C_H^* &= (1-\alpha)\left(\frac{P_H^*}{P^*}\right)^{-\theta} C^* \\ C_F &= (1-\alpha)\left(\frac{P_F}{P}\right)^{-\theta} C; & C_F^* &= \alpha\left(\frac{P_F^*}{P^*}\right)^{-\theta} C^*, \end{aligned} \tag{14}$$

where $Y(Y^*)$ is Home (Foreign) output. Note that consumption expenditure for domestic and imported goods adds up to total consumption expenditure:

$$PC = P_H C_H + P_F C_F; \qquad P^* C^* = P_F^* C_F^* + P_H^* C_H^*. \tag{15}$$

2. *Firms*

Each household is a monopolistic supplier of a different type of labour, and each Home firm $i \in [0,1]$ (Foreign firm $i \in [1,2]$) hires all Home (For-

eign) types of labour to produce its output. The technology is of the CES-type:

$$(16)\quad Y(i\in[0,1])=\left(\int_0^1 (l(j))^{\frac{\phi-1}{\phi}}dj\right)^{\frac{\phi}{\phi-1}};\qquad Y^*(i\in[1,2])=\left(\int_0^1 (l^*(j^*))^{\frac{\phi-1}{\phi}}dj^*\right)^{\frac{\phi}{\phi-1}}.$$

The elasticity of input substitution, $\phi(>1)$, serves as an index of labour market distortion. The lower ϕ, the less competitive is the labour market and the higher are the monopoly rents.

Profit maximisation requires that each firm sets its price as a mark-up on marginal costs:

$$(17)\quad \begin{aligned} P_H(i\in[0,1]) &= \frac{\varepsilon}{\varepsilon-1}\left(\int_0^1 (W(j))^{1-\phi}dj\right)^{\frac{1}{1-\phi}} \\ P_F^*(i\in[1,2]) &= \frac{\varepsilon}{\varepsilon-1}\left(\int_0^1 (W^*(j^*))^{1-\phi}dj^*\right)^{\frac{1}{1-\phi}} \end{aligned}.$$

The mark up, $\varepsilon/(\varepsilon-1)$, is decreasing in the elasticity of substitution in the product market and goes to unity in the case of perfect competition. By applying Shepard's lemma we can derive firm i's demand for each type of labour. Adding up firm demands gives aggregate demand for each type of labour. In a symmetric equilibrium this turns out to be:

$$(18)\quad l(j)=\left(\frac{\varepsilon}{\varepsilon-1}\frac{W(j)}{P_H}\right)^{-\phi}Y;\qquad l^*(j^*)=\left(\frac{\varepsilon}{\varepsilon-1}\frac{W^*(j^*)}{P_F^*}\right)^{-\phi}Y^*.$$

As stated above households have monopoly power with respect to the nominal wage for their specific type of labour. They set the wage to maximise their utility function, but they are constrained to a point on the labour demand curve (18). Inserting (18) into (8) and (9), and then maximising utility subject to the resulting budget constraint leads to:

$$(19)\quad \frac{W(j)}{P}=\frac{\phi}{\phi-1}\sigma C(j)l(j);\qquad \frac{W^*(j^*)}{P^*}=\frac{\phi}{\phi-1}\sigma C^*(j^*)l^*(j^*).$$

The optimal wage is a mark-up, $\phi/(\phi-1)$, on the marginal rate of substitution between consumption and leisure. The higher the mark-up, the higher the real wage and the lower the amount of labour compared to

perfect competition on the labour market, which clearly marks the social optimum.

3. Governments

We assume that government spending on goods is zero in both countries. Home and Foreign governments use their seignorage income to finance a lump-sum transfer to their residents. The government budget constraints thus read:

$$M_t - M_{t-1} = P_t \tau_t ; \quad M_t^* - M_{t-1}^* = P_t^* \tau_t^* . \tag{20}$$

4. The Current Account

The asset market equilibrium requires that aggregate Home assets (liabilities) must equal aggregate Foreign liabilities (assets):

$$B_t + B_t^* = 0. \tag{21}$$

The current account of Home and Foreign can be obtained by aggregation over the individual budgets constraints (8) and (9). Observing (15), (20) and (21) and noting that the sum of wage and profit income equals national income (output), we get to

$$P_H Y = PC + PB_{t+1} - (1 + r_t) PB_t ; \quad P_F^* Y^* = P^* C^* - \frac{P}{e_t} B_{t+1} + (1 + r_t) \frac{P}{e_t} B_t . \tag{22}$$

5. The Equilibrium with Flexible Prices

This section solves for the symmetric steady state around which we will log-linearise the model. Following OR (1995, 1996) and others we restrict the analysis to the special case of a steady state with zero net foreign assets to get a closed form solution for the aggregate variables. Steady state values of the symmetric equilibrium are marked by an overbar, a zero subscript denotes the initial steady state.

Since in a steady state consumption is constant, the Euler equations (10) tie down the steady state real interest rate in both countries: $\bar{r}_0 = \bar{r}_0^* = (1 - \beta)/\beta$. Combining the profit maximising price (17), the utility maximising wage (19) and the current account (for $B_t = B_{t+1} = 0$)

leads to $\frac{\varepsilon-1}{\varepsilon}\frac{P_H}{P}=\frac{W}{P}=\frac{\phi}{\phi-1}\sigma Cl=\frac{\phi\sigma}{\phi-1}\frac{P_H}{P}Yl$ and $\frac{\varepsilon-1}{\varepsilon}\frac{P_F^*}{P^*}=\frac{W^*}{P^*}=\frac{\phi}{\phi-1}\sigma C^*l^*=\frac{\phi\sigma}{\phi-1}\frac{P_F^*}{P^*}Y^*l^*$. Observing the production function (16) and rearranging gives the steady state level of aggregate output and labour supply in Home and Foreign:

$$\overline{Y}_0=\overline{Y}_0^*=\overline{l}_0=\overline{l}_0^*=\sqrt{\frac{1}{\sigma}\frac{\phi-1}{\phi}\frac{\varepsilon-1}{\varepsilon}}. \tag{23}$$

The higher the elasticity of input substitution, ϕ, and the higher the price elasticity of product demand, ε, the lower are the price mark-ups and the higher the labour and product demand which in turn enhance aggregate output. In a world of perfect labour and product markets ($\phi,\varepsilon\to\infty$), output and labour supply depend only on σ, the parameter for the disutility of work. Furthermore, in the initial equilibrium production and consumption is the same for each household in Home and Foreign, $\overline{C}_0=\overline{Y}_0$ and $\overline{C}_0^*=\overline{Y}_0^*$.

III. The Log-linearised Model

To analyse the impact of monetary shocks, we have to reformulate the model in terms of log-deviations from the initial steady state derived in section II.5. The shocks occur in period t and are assumed to be permanent. The economy needs just one period to adjust to the new steady state. In period t, we observe the short-run equilibrium which accounts for wage stickiness, that is, wage setters are assumed to set their wages before the shock can be observed. In the long run (from period $t+1$ onward), wages are flexible and all variables reach their new steady state values. In what follows short-run percentage deviations from the initial steady state are denoted by a tilde; thus for any variable, $\widetilde{X}\equiv(X_t-\overline{X}_0)/\overline{X}_0=dX/\overline{X}_0$. The (long-run) percentage change in the steady-state values are denoted by $\widetilde{\overline{X}}\equiv(\overline{X}_{t+1}-\overline{X}_0)/\overline{X}_0=d\overline{X}/\overline{X}_0$. The exception are bond holdings, which are scaled to consumption, $\widetilde{\overline{B}}\equiv d\overline{B}/\overline{C}_0$, since in the initial steady state $\overline{B}_0=0$. Furthermore, cross country differences are represented by $\Delta X\equiv X-X^*$. The log-linearised version of the model is given in the Appendix.

1. Short Run

To derive the short-run equilibrium we will begin with the product prices set by the firms. The optimum price is a constant mark up on marginal costs, but with pre-set wages and a constant price elasticity of product demand neither the mark up nor marginal costs change and hence the price of Home goods in Home currency does not change: $\widetilde{P}_H = 0$. Analogously, the price of Foreign goods in Foreign currency does not change: $\widetilde{P}^*_F = 0$. The law of one price (Eq. (7)), however, implies that there is a complete exchange-rate pass-through, that is, firms change their foreign market price in proportion to the exchange rate change: $\widetilde{P}^*_H = -\widetilde{e}$ and $\widetilde{P}_F = \widetilde{e}$. Combining the law of one price with the log-linearised versions of the consumption-based price indexes (6) leads to

$$\Delta\widetilde{P} \equiv \widetilde{P} - \widetilde{P}^* = 2(1-\alpha)\widetilde{e}. \tag{24}$$

Only if Home and Foreign have identical preferences ($\alpha = 1/2$), purchasing power parity will hold. For a home bias ($\alpha > 1/2$), the change in the relative price level is lower than the exchange rate change. Or to put it differently, when there is a home bias, the nominal exchange rate is more volatile than relative prices (see Warnock (2003)). Consequently, the change in the real exchange rate is increasing in the home bias; $\widetilde{q} = \widetilde{e} - \Delta\widetilde{P} = (2\alpha - 1)\widetilde{e}$.

Log-linearising the money demand function (11) and taking country differences gives

$$\Delta\widetilde{M} - \Delta\widetilde{P} = \Delta\widetilde{C} + \frac{1}{\bar{r}_0}(\widetilde{e} - \overline{\widetilde{e}}). \tag{25}$$

The relative change in real money demand is increasing in the relative change in consumption and the difference between the short-run and the long-run change of the exchange rate.

In the short run, aggregate output is demand determined. By combining the log-linearised versions of (13)–(15) we get for the country difference in output:

$$\Delta\widetilde{Y} = 4\alpha(1-\alpha)\theta\widetilde{e} + (2\alpha - 1)\Delta\widetilde{C}. \tag{26}$$

In the short run, a depreciation of the Home currency reduces the terms of trade one-to-one, $\widetilde{tot} = \widetilde{P}_H - \widetilde{e} - \widetilde{P}^*_F = -\widetilde{e}$. The decline in the relative price of Home goods causes a switch in consumption expenditure

towards Home goods. This effect – very well-known from the Mundell-Fleming framework – is increasing in the cross-country substitutability, θ, and reaches its maximum in a world of identical preferences ($\alpha = 1/2$). When there is a home bias, households are more reluctant to switch from Foreign to Home goods, relative prices matter less. For $\alpha > 1/2$, an increase in the consumption differential corresponds to a demand shift towards Home goods.

Log-linearising the production function (16) and taking country differences leads to

$$\Delta\widetilde{Y} = \Delta\widetilde{l}, \tag{27}$$

which states that the relative change in labour demand is proportional to the relative change in output. In the short run labour supply is not binding. Provided that the monetary shock does not cause the real wage to fall below the marginal rate of substitution between consumption and leisure, households will meet the additional labour demand. The case of large shocks, where this participation constraint is violated, is discussed by Corsetti and Pesenti (2001).

The linearised current account equations (22) lead to

$$2\widetilde{\overline{B}} = \Delta\widetilde{Y} - (\Delta\widetilde{P} + \Delta\widetilde{C}), \tag{28}$$

where we make use of $B_t = \overline{B}_0 = 0$. In the short run, Home runs a current account surplus, when the relative change in national income (output) exceeds the relative change in nominal consumption. Note that the net foreign asset stocks arising at the end of the post-shock period are equal to the new steady-state level.

Next consider the optimal intertemporal allocation of consumption given by the Euler equations (10). Subtracting the Foreign linearised Euler equation from its Home counterpart yields

$$\Delta\widetilde{C} = \Delta\widetilde{\overline{C}} + (\widetilde{e} - \Delta\widetilde{P}) - \left(\widetilde{\overline{e}} - \Delta\widetilde{\overline{P}}\right). \tag{29}$$

If there is no over- or undershooting of the real exchange rate, the optimum consumption profile will require an equalisation of the short- and the long-run relative consumption change. If, however, the real exchange rate overshoots in the short run, the Home currency will appreciate from the short to the long run. From the Foreign point of view, this increases the real interest rate it has to pay for its debt (provided $B^* < 0$) implying

a decline in its borrowing from Home. The decline in Foreign dissavings and thus in Home savings is mirrored by a relative increase in the short run consumption differential. Hau (2000) calls this as the differential return effect.

2. *Long Run*

In the long run, households adjust their wage according to (19) to the new steady state value, and firms adjust their home market price according to (18), so that $\widetilde{\overline{P}}_H = \widetilde{\overline{W}}$ and $\widetilde{\overline{P}}^*_F = \widetilde{\overline{W}}^*$. Inserting the linearised law of one price (7) into the linearised consumer price index (6) yields

$$\Delta\widetilde{\overline{P}} = (2\alpha - 1)\Delta\widetilde{\overline{W}} + 2(1-\alpha)\widetilde{\overline{e}}. \tag{30}$$

The long-run consumer price differential is influenced by the long-run change of the exchange rate and, provided that there is a home bias, by the long run wage differential. The latter causes deviations from the purchasing power parity even in the long run.

The remaining long-run equations for cross country differences can be obtained by linearising the product demand functions (13)–(15), the money demand function (11), the production function (16), the first-order condition for the optimal labour supply (19), and the current account (22):

$$\Delta\widetilde{\overline{Y}} = -4\alpha(1-\alpha)\theta\left(\Delta\widetilde{\overline{W}} - \widetilde{\overline{e}}\right) + (2\alpha - 1)\Delta\widetilde{\overline{C}} \tag{31}$$

$$\Delta\widetilde{\overline{M}} - \Delta\widetilde{\overline{P}} = \Delta\widetilde{\overline{C}} \tag{32}$$

$$\Delta\widetilde{\overline{Y}} = \Delta\widetilde{\overline{l}} \tag{33}$$

$$\Delta\widetilde{\overline{W}} - \Delta\widetilde{\overline{P}} = \Delta\widetilde{\overline{C}} + \Delta\widetilde{\overline{l}} \tag{34}$$

$$2r_0\widetilde{\overline{B}} + 2(1-\alpha)\left(\Delta\widetilde{\overline{W}} - \widetilde{\overline{e}}\right) = \Delta\widetilde{\overline{C}} - \Delta\widetilde{\overline{l}}. \tag{35}$$

Noting that the long-run terms of trade are given by $\widetilde{\overline{tot}} = \widetilde{\overline{P}}_H - \widetilde{\overline{e}} - \widetilde{\overline{P}}^*_F = \Delta\widetilde{\overline{W}} - \widetilde{\overline{e}}$, Eq. (31) reflects the negative relation between output and the terms of trade. A worsening (= decline) in the

terms of trade induces a consumption switching effect in favour of Home goods, and as already mentioned above, the magnitude of this effect is decreasing in the home bias and increasing in the cross-country substitutability between Home and Foreign goods. A higher consumption differential raises relative output, if $\alpha > 1/2$. Eq. (32) states that relative money balances are proportional to the consumption differential. Due to Eq. (33) labour moves one-to-one with output. Eq. (34) reflects the optimal labour supply, a higher relative real wage needs a relative increase in the marginal rate of substitution between consumption and leisure. From the long run current account (35) we can conclude that the returns on net foreign assets and an increase in the terms of trade can be used to increase relative consumption and to reduce relative labour supply.

IV. Monetary Policy – a Positive Analysis

Our focus will be on a permanent increase in the relative Home money supply. Assuming that the Foreign money supply stays constant, the policy experiment can be expressed as $\Delta\tilde{M} = \Delta\widetilde{\widetilde{M}} = \tilde{M} > 0$. Equations (24)–(35) form a system of twelve equilibrium conditions with twelve endogenous variables: $\Delta\tilde{Y}, \Delta\tilde{l}, \Delta\tilde{C}, \Delta\tilde{P}, \tilde{e}, \tilde{\tilde{e}}, \Delta\widetilde{\tilde{Y}}, \Delta\widetilde{\tilde{l}}, \Delta\widetilde{\tilde{C}}, \Delta\widetilde{\tilde{P}}, \Delta\widetilde{\widetilde{W}}, \widetilde{\tilde{B}}$. Given the solutions for the cross-country differences, it is straightforward to solve for the country specific values of all variables. (Part of) the solution is given in Table 1.

How does the transmission mechanism of an expansion in Home money supply look like? On impact, the actual balances exceed the desired nominal money balances. To reduce such a disequilibrium Home households expand their nominal spending on consumption. Since in the short run the price level does not move in proportion to the nominal money supply, we observe an increase in real money balances and thus an increase in Home's real aggregate demand (see Blanchard and Kiyotaki (1987)), which, in turn, spreads on both Home and Foreign goods.

Foreign goods have to be paid in Foreign currency, and therefore, the additional imports by Home translate into a higher demand for Foreign currency implying a depreciation of the nominal exchange rate. The nominal exchange rate instantaneously jumps to its new steady state value (see Eq. (36)). There is no short run over- or undershooting, since due to our specification of the utility function (1) the interest rate elasticity of money demand equals the consumption elasticity of money demand. For $\theta = 1$, the exchange rate change is proportional to the

Table 1

Solution of the Model

Exchange rate changes, the real interest rate and the current account

(36) $\tilde{e} = \bar{\tilde{e}} = \frac{D - 2\alpha\beta(1-\theta)}{A \cdot D}\tilde{M}$	nominal exchange rate
(37) $t\tilde{o}t = -\tilde{e}$	short-run terms of trade
(38) $\tilde{q} = \tilde{e} - \Delta\tilde{P} = \frac{(2\alpha - 1)[D - 2\alpha\beta(1-\theta)]}{A \cdot D}\tilde{M}$	short-run real exchange rate
(39) $t\bar{\tilde{o}}t = \Delta\bar{\tilde{W}} - \tilde{e} = \frac{-2\alpha^2(1-\beta)(1-\theta)}{A \cdot D}\tilde{M}$	long-run terms of trade
(40) $\bar{\tilde{q}} = \frac{2\alpha^2(1-\beta)(2\alpha-1)(1-\theta)}{A \cdot D}\tilde{M}$	long-run real exchange rate
(41) $\tilde{r} = \frac{-\alpha[1-(1-\alpha)(1-\beta)(1-\theta)]}{(1-\beta)D}\tilde{M}$	short-run real interest rate
(42) $\bar{\tilde{B}} = \frac{-2\alpha\beta(1-\alpha)(1-\theta)}{D}\tilde{M}$	current account

Determinants of Welfare

Cross-country differences

(43) $\Delta\tilde{C} = \dfrac{(2\alpha\theta - 1)D + 4\alpha\beta(1-\alpha)(1-\theta)}{A \cdot D}\tilde{M}$

(44) $\Delta\tilde{Y} = \Delta\tilde{l} = \dfrac{D - 4\alpha\beta(1-\alpha)(1-\theta)}{D}\tilde{M}$

(45) $\Delta\tilde{\tilde{C}} = \dfrac{-2\alpha(1-\alpha)(1-\beta)(1-\theta)(2\alpha\theta+1)}{A \cdot D}\tilde{M}$

(46) $\Delta\tilde{\tilde{Y}} = \Delta\tilde{\tilde{l}} = \dfrac{2\alpha(1-\alpha)(1-\beta)(1-\theta)}{D}\tilde{M}$

Individual variables

$$\tilde{C} = \frac{\alpha A - 2\alpha(1-\alpha)(1-\beta)(1-\theta)(1-\alpha+2\alpha\theta)}{A \cdot D}\tilde{M}$$

$$\tilde{C}^* = \frac{1 - 3\alpha + 2\alpha\theta + 2\alpha^2(1-\theta)[1 + (1-\alpha)(1-\beta)]}{A \cdot D}\tilde{M}$$

$$\tilde{Y} = \tilde{l} = \frac{1 - 2\alpha(1-\alpha)(1-\theta)}{D}\tilde{M}$$

$$\tilde{Y}^* = \tilde{l}^* = \frac{2\alpha\beta(1-\alpha)(1-\theta)}{D}\tilde{M}$$

$$\tilde{\tilde{C}} = \frac{-\alpha(1-\alpha)(1-\beta)(1-\theta)(2\alpha\theta+1)}{A \cdot D}\tilde{M}$$

$$\tilde{\tilde{C}}^* = -\tilde{\tilde{C}}$$

$$\tilde{\tilde{Y}} = \tilde{\tilde{l}} = \frac{\alpha(1-\alpha)(1-\beta)(1-\theta)}{D}\tilde{M}$$

$$\tilde{\tilde{Y}}^* = \tilde{\tilde{l}}^* = -\frac{\alpha(1-\alpha)(1-\beta)(1-\theta)}{D}\tilde{M}$$

where $A \equiv 1 - 2\alpha(1-\theta) > 0$ and $D \equiv 1 - 2\alpha(1-\alpha)(1-\beta)(1-\theta) > 0$.

change in money supply. For $\theta > 1 (\theta < 1)$, the exchange rate depreciates less (more) than proportionately in response to the money supply shock. Moreover, the larger the home bias parameter α, the smaller is the increase in the demand for Foreign goods and hence the smaller is the depreciation of the Home currency.

Since in the short run nominal domestic goods prices remain unchanged, Home terms of trade deteriorate by the change in e. The law of one price enforces Foreign firms to raise their price in Home currency, P_F, and Home firms to reduce their price in Foreign currency, P_H^*. Home goods become less expensive compared to Foreign goods causing the consumption switching effect. As explained in Section III.1., the switch is increasing in the substitutability between Home and Foreign goods and decreasing in the home bias.

Because of future inflation (we can show that $\tilde{\bar{P}} > \tilde{P}$ and $\tilde{\bar{P}}^* > \tilde{P}^*$) short-run real balances exceed long-run real balances in both countries. To smooth consumption the short-run monetary transfer should be used for higher consumption in all periods. But since future inflation also is reducing the real interest rate for bonds accumulated during period t and carried over to period $t+1$ (see Eq. (41)), households switch consumption from the future to the present magnifying the short-run increase in world product demand and counteracting the increase in long-run consumption. As it can be seen from (44), world demand and thus world output (employment) expands in proportion to the money supply: $\tilde{Y} + \tilde{Y}^* = \tilde{M}$.

A higher world demand combined with a positive demand shift unambiguously increases demand for Home products and thus Home's output. Foreign output can fall, since the increase in world demand and the relative price shift work in opposite directions. For $\theta > 1$ ($\theta < 1$), the switch away from Foreign products exceeds (does not offset) the impact of the increase in world demand, Foreign output declines (rises). For $\theta = 1$, Foreign output remains unchanged (see Eq. (44)).

Concerning the consumption differential (43) there are (at least) three effects: first, the demand shift towards Home goods implies an increase in relative output and thus an increase in relative consumption. Second, since the real exchange rate overshoots in the short run, from Eqs. (38) and (40) follows $\tilde{q} > \tilde{\bar{q}}$, the real interest rate Foreign has to pay for its debt (receives for its loans) goes up, which is an incentive to dissave less (to save more). Third, higher real money supply translates into higher

world demand, and when there is a home bias, the income and the consumption effect are concentrated in the expanding country.

Turning to the current account, Eq. (42) shows that the sign of Home's current account solely depends on the cross-country substitutability θ. In particular, the sign does not depend on the home bias. If Home and Foreign goods are close substitutes ($\theta > 1$), the consumption switching effect is large, so that the increase in relative output exceeds the increase in relative nominal consumption, $\Delta\widetilde{Y} > \Delta\widetilde{P} + \Delta\widetilde{C} = \widetilde{M}$ (see Eqs. (28) and (44)). Home smoothes consumption by a current account surplus and receives interest payments from Foreign in the long run. Home uses these transfers to raise consumption and to reduce output and labour (see Eqs. (45) and (46)). In order to "finance" the interest payments, Foreign reduces its consumption and enforces its output and labour (see again Eqs. (45) and (46)). Moreover, from Eq. (39), Home's terms of trade improve in the long run. For $\theta < 1$, a similar line of reasoning holds, but with reversed signs.

If the cross-country substitutability θ equals unity – this is the scenario in Corsetti and Pesenti (2001) – money is neutral in the long run. The short-run change in Home's income equals the short run change in its nominal consumption, and thus there are no net foreign assets and no interest payments. Consequently, in the long run all real variables, i.e., consumption, output and labour in Home and Foreign as well as the real exchange rate return to their pre-shock level. The nominal variables – wages, prices and the nominal exchange rate – move in proportion to the increase in domestic money supply.

V. Welfare Analysis

In this section we discuss the implications of a Home permanent monetary expansion on Home and Foreign welfare. In particular, we re-examine the two conflicting views found in the literature. The "old view" states that expansionary monetary policies and devaluations are welfare-improving for the expanding country, but have negative repercussions on welfare abroad (beggar-thy-neighbour). The "new view", however, states that a Home monetary expansion is a win-win policy. In the OR set-up Home and Foreign benefit to the same extent. Our analysis will respectively identify the conditions under which the old or the new view holds.

To evaluate the welfare effects, a well specified criterion is needed, and the most natural candidate is the utility function (1). Making use of the

assumption that from period $t+1$ onwards the economy is in the new steady state, the log-linearised version of (1) reads:

$$\partial U = \tilde{C} - \frac{\phi-1}{\phi}\frac{\varepsilon-1}{\varepsilon}\tilde{l} + \frac{1}{\bar{r}_0}\left(\tilde{\bar{C}} - \frac{\phi-1}{\phi}\frac{\varepsilon-1}{\varepsilon}\tilde{\bar{l}}\right). \tag{47}$$

A similar expression can be derived for the change in Foreign utility:

$$\partial U^* = \tilde{C}^* - \frac{\phi-1}{\phi}\frac{\varepsilon-1}{\varepsilon}\tilde{l}^* + \frac{1}{\bar{r}_0}\left(\tilde{\bar{C}}^* - \frac{\phi-1}{\phi}\frac{\varepsilon-1}{\varepsilon}\tilde{\bar{l}}^*\right). \tag{48}$$

We follow OR in focusing on the "real" part of the utility functions, i.e., on the terms depending on consumption and labour. The total welfare effect is the sum of the effect on short-run utility and the discounted present value of the changes in steady-state utility.

First consider the world welfare effect. By inserting the expressions from Table 1 we get for the sum of the changes in Home and Foreign welfare:

$$\partial U + \partial U^* = \left(1 - \frac{\phi-1}{\phi}\frac{\varepsilon-1}{\varepsilon}\right)\tilde{M}. \tag{49}$$

The world welfare effect is solely determined by the imperfections on the labour and product markets (internal distortions). The home bias and the cross-country elasticity of substitution have an impact on the terms-of-trade externality (external distortion), but this affects only the splitting of the welfare gain (see below). In the case of perfect competition on the labour and goods markets ($\phi \to \infty, \varepsilon \to \infty$) the expansion in Home money supply is a zero-sum game, or to put it differently, internal distortions are a prerequisite for a Home monetary expansion to be a positive-sum game. One of the two countries may be adversely affected but never both. Even if a country faces a utility loss, the gain of the winner always exceeds the loss of the looser. Moreover, the world welfare effect is identical to the increase in utility Home would obtain in the case of a closed economy ($\alpha = 1$).

Next consider the relative welfare effect. Since countries have monopoly power in trade, the welfare effect will in general differ across countries. The terms-of-trade externality is decisive for the splitting of the welfare gain among the two countries. The relative welfare effect is given by

$$\partial U - \partial U^* = \frac{1-2\alpha(1-\alpha)(1-\theta)}{D}\left[\frac{2\alpha\theta-1}{1-2\alpha+2\alpha\theta} - \frac{\phi-1}{\phi}\frac{\varepsilon-1}{\varepsilon}\right]\tilde{M}. \tag{50}$$

Eq. (50) is a central result from which some important conclusions can be drawn. Since the sign of the relative welfare effect corresponds to the sign of the term in the squared brackets, a positive relative welfare effect is more likely (1) if there is a strong home bias, (2) if Home and Foreign goods are close substitutes (high value of θ), and (3) if the distortions on the labour and the goods markets are high (low values of ϕ and ε).

If there is perfect competition on both the labour and the goods markets, the relative welfare effect is unambiguously negative whereas the world welfare effect is zero. Consequently, in a world with perfect competition we observe a welfare switch from the country the monetary expansion takes place to its neighbour ($\partial U < 0, \partial U^* > 0$). This mirrors Home's worsening of its terms of trade.

For the OR scenario of identical preferences ($\alpha = 1/2$), identical cross-country and within-country substitutability ($\theta = \varepsilon$) and perfect competition on the labour market ($\phi \to \infty$) Home and Foreign residents are symmetrically affected by the monetary expansion: $\partial U - \partial U^* = 0$. In utility units the increase in Home relative consumption is just absorbed by its additional effort (labour input).

If we modify the OR set-up by allowing for a labour market distortion, the bracketed term in (50) becomes $\frac{\theta-1}{\theta}\frac{1}{\phi} > 0$: Home is better off relative to Foreign. The less competitive the labour and the product market, the higher the wage and the price mark up, the lower the initial steady-state values of labour and consumption. Hence, in the initial steady state, the marginal utility of consumption is high and the marginal disutility of labour is low. Now the same shift in Home relative consumption and relative employment is not utility neutral any more but utility enhancing. Note that the price and wage mark ups are constant, so that their magnitude does not affect the solutions for $\tilde{C}$, $\tilde{l}$ and so on, which, in turn, ensures that the relative shifts in consumption and employment are the same indeed.

Tille (2001) allows for $\theta \neq \varepsilon$, but maintains the assumption of perfect labour markets ($\phi \to \infty$) and identical preferences ($\alpha = 1/2$). For this parameter combination the bracketed term in (50) simplifies to $\frac{\theta-\varepsilon}{\theta\varepsilon}$. If the cross-country elasticity is less than the within-country elasticity ($\theta < \varepsilon$) – empirically, this seems to be the most plausible constellation –, Home is worse off relative to Foreign. A limited substitutability between Home

and Foreign goods implies that the worsening of the Home terms of trade induces only a small consumption switching effect and thus only a small increase in Home relative consumption (see (43)). At the same time, because of more expensive imports Home faces a loss in the purchasing power of its income, whereas Foreign benefits from the decline in its price level by raising consumption for any given level of income.

As (50) indicates the inclusion of a home bias raises the probability of a positive relative welfare effect (the bracketed term is increasing in α, provided that $\theta > 0,5$). This is for two reasons. First, with a home bias the demand expansion is concentrated among Home goods. Second, the higher the home bias, the lower the share of imports and the less important the rise in domestic inflation, due to the depreciation and thus the loss in purchasing power of Home income.

Having analysed the world and the relative welfare effect, we now focus on the change in Home and Foreign utility in absolute terms. Combining (49) and (50) leads to:

$$(51)\quad \partial U = \frac{1}{2}\left[1 - \frac{\phi-1}{\phi}\frac{\varepsilon-1}{\varepsilon} + \frac{1-2\alpha(1-\alpha)(1-\theta)}{D}\left(\frac{2\alpha\theta-1}{1-2\alpha+2\alpha\theta} - \frac{\phi-1}{\phi}\frac{\varepsilon-1}{\varepsilon}\right)\right]\tilde{M}$$

$$(52)\quad \partial U^* = \frac{1}{2}\left[1 - \frac{\phi-1}{\phi}\frac{\varepsilon-1}{\varepsilon} - \frac{1-2\alpha(1-\alpha)(1-\theta)}{D}\left(\frac{2\alpha\theta-1}{1-2\alpha+2\alpha\theta} - \frac{\phi-1}{\phi}\frac{\varepsilon-1}{\varepsilon}\right)\right]\tilde{M}$$

For the special case of $\theta = 1$ these expressions simplify to

$$(53)\quad \partial U|_{\theta=1} = \left(\alpha - \frac{\phi-1}{\phi}\frac{\varepsilon-1}{\varepsilon}\right)\tilde{M}$$

$$(54)\quad \partial U^*|_{\theta=1} = (1-\alpha)\tilde{M}.$$

For $\theta = 1$, the overall welfare effect is restricted to the short run effects, the unchanged current account shuts off the channel to any long run implications. In the short run, Home consumption and labour input rise, implying an a priori ambiguous overall welfare effect. As (53) illustrated, the sign of the net effect is indeed ambiguous. For a prosper-thyself effect of monetary policy the home bias parameter α must exceed a critical threshold which is increasing in the degree of competitiveness on the labour and product markets (ϕ, ε high). Foreign, however, unambiguously benefits from a Home monetary expansion (prosper-thy-neighbour effect). The increase in world demand and the consumption switching

effect exactly offset each other, so that Foreign labour input remains unchanged. But Foreign consumption increases, due to the short-term improvement in its terms of trade. Despite an unchanged labour input Foreign is able to consume more.

Table 2

Welfare Effects

$\phi = 6$

	$\theta = 0,5$			$\theta = 1$			$\theta = 2$			$\theta = 6$		
α	0,5	0,7	0,9	0,5	0,7	0,9	0,5	0,7	0,9	0,5	0,7	0,9
∂U	–0,49	–0,53	–0,63	–0,19	0,01	0,21	0,01	0,19	0,29	0,36	0,47	0,42
∂U^*	0,80	0,83	0,93	0,50	0,30	0,10	0,29	0,11	0,02	–0,06	–0,17	–0,10

$\phi \to \infty$

	$\theta = 0,5$			$\theta = 1$			$\theta = 2$			$\theta = 6$		
α	0,5	0,7	0,9	0,5	0,7	0,9	0,5	0,7	0,9	0,5	0,7	0,9
∂U	–0,62	–0,65	–0,76	–0,33	–0,13	0,07	–0,16	0,03	0,14	0,08	0,21	0,22
∂U^*	0,78	0,82	0,92	0,50	0,30	0,10	0,33	0,14	0,03	0,08	–0,04	–0,05

In order to assess the absolute welfare effects for the more general case of $\phi \neq 1$, it is appropriate to run a quantitative calibration exercise. Following Tille (2001), we choose $\beta = 0,94$ for the discount factor, leading to a steady state real interest rate of 6%. The value of the within-country elasticity of substitution, ε, is set at 6, implying a mark-up of prices over wages of 20%. Home money supply is assumed to increase by 1% ($\widetilde{M} = 1$). Table 2 represents the welfare results for various values of the degree of labour market distortion, ϕ, the cross-country substitutability, θ, and the home bias parameter α.

For the OR scenario of perfect labour markets ($\phi \to \infty$), identical preferences ($\alpha = 1/2$) and identical cross- and within-country elasticities of substitution ($\theta = \varepsilon$), we replicate their result of a symmetrical welfare

effect. Introducing labour market imperfections goes in favour of Home, Home's increase (decrease) in utility is larger (smaller) than if there were no such distortions. For Foreign the picture is a bit more complex. If the cross-country substitutability, θ, is greater (less) than unity, Foreign will benefit less (more) from a Home monetary expansion compared to the case of perfect labour markets. Analysing the implications of a less competitive product market would generate the same results – qualitatively as well as quantitatively –, since the parameters for the labour and the product market distortion, θ and ε, enter the model symmetrically.

The lower the cross-country elasticity of substitution, the higher the probability that Home is adversely affected by its own monetary expansion. Because of a worsening of its terms of trade Home may face a beggar-thyself problem. As Table 2 indicates, this is possible even for values of θ between 1 and 2, which, due to the estimates of Backus et al. (1994a, b), is the most plausible range for θ. Foreign, on the other hand, benefits from a Home monetary expansion for almost all parameter constellations. The exception is a very large value for θ and thus a very large consumption switching effect away from Foreign goods which in turn overcompensates the improvement in Foreign's terms of trade.

The inclusion of a home bias is neutral for the change in world welfare, but it is decisive for the splitting of the welfare gain. The larger the home bias, the larger Home's and the lower Foreign's share of the welfare gain. In other words, a home bias goes against both the beggar-thyself effect and the prosper-thy-neighbour effect. Fig. 1 and 2 (see appendix) show how sensitive Home and Foreign welfare react to changes in the home bias parameter α. For (unrealistic) large values of α (and θ) Foreign faces a welfare loss, while Home gets a benefit that is even larger than if it were in a closed economy.

VI. Conclusions

This paper revisits the welfare effects of monetary expansions in an open economy, building on previous work by Obstfeld and Rogoff (1995, 1996). Our model extends the OR set-up in three ways. First, we abandon the assumption of identical preferences by introducing a home-product bias for domestically produced goods. Second, we allow for different degrees of competitiveness between two goods produced within a country and two goods produced in two different countries. Third, we relax the assumption of perfect labour markets and distinguish between

monopolistic competition on both the labour and the goods markets. Some of these extensions have been analysed separately in the literature, but by now it is well-known that the welfare effects very much depend on the interaction of all these distortions. The contribution of this paper is to provide a more general framework which seeks to capture these interactions. Our analysis shows that a) the world welfare effect is equivalent to the welfare effect one would obtain in a closed economy; b) the world welfare effect is solely determined by the (internal) distortions on the labour and goods markets; c) the impact of a home bias and the degree of substitution between home and foreign is restricted to the terms-of-trade externality and thus to the splitting of the gain; d) the welfare gain is more likely to be concentrated in the expanding country if there is a home bias, if domestic and foreign goods are close substitutes and if the distortions on the goods and labour markets are high; e) for a wide range of parameter values a domestic monetary expansion will deteriorate domestic welfare (beggar-thyself), whereas for almost all parameter values, a monetary expansion improves welfare abroad (prosper-thy-neighbour).

Our framework can be extended in several ways, for instance to include deviations from the law of one price as in Betts and Devereux (1996, 2000), who show that in the presence of pricing-to-market, monetary policy indeed becomes a "beggar-thy-neighbour" instrument. This in turn opens up questions of strategic interactions and retaliatory devaluations, an issue which is addressed in the three-country model of Corsetti et al. (2000). Further topics include the optimal choice of the exchange-rate regime (see Devereux and Engel (2001) or Bacchetta and van Wincoop (2000)), the introduction of uncertainty (see Obstfeld and Rogoff (2000b)), the incorporation of capital accumulation (see Lombardo (2002)), and the costs and benefits of international policy co-ordination.

Appendix

(A1) $\widetilde{P} = (1-\alpha)\widetilde{P}_F$ short-run price index

(A2) $\widetilde{P}^{\star} = (1-\alpha)\widetilde{P}^{\star}_H$

(A3) $0 = \widetilde{e} + \widetilde{P}^{\star}_H$ short-run law of one price

(A4) $\widetilde{P}_F = \widetilde{e}$

(A5) $\widetilde{\overline{C}} = \widetilde{C} + (1-\beta)\widetilde{r}$ Euler equation

(A6) $\widetilde{\overline{C}}^{\star} = \widetilde{C}^{\star} + (\widetilde{e} + \widetilde{P}^{\star} - \widetilde{P}) - (\widetilde{\overline{e}} + \widetilde{\overline{P}}^{\star} - \widetilde{\overline{P}}) + (1-\beta)\widetilde{r}$

(A7) $\widetilde{M} - \widetilde{P} = \widetilde{C} - \beta\widetilde{r} - [\beta/(1-\beta)](\widetilde{\overline{P}} - \widetilde{P})$ short-run money demand

(A8) $\widetilde{M}^{\star} - \widetilde{P}^{\star} = \widetilde{C}^{\star} - \beta\widetilde{r} - [\beta/(1-\beta)](\widetilde{\overline{P}} - \widetilde{P} + \widetilde{e} - \widetilde{\overline{e}})$

(A9) $\widetilde{Y} = \alpha\widetilde{C}_H + (1-\alpha)\widetilde{C}^{\star}_H$ short-run product demand

(A10) $\widetilde{Y}^{\star} = \alpha\widetilde{C}^{\star}_F + (1-\alpha)\widetilde{C}_F$

(A11) $\widetilde{P} + \widetilde{C} = \alpha\widetilde{C}_H + (1-\alpha)(\widetilde{P}_F + \widetilde{C}_F)$ short-run consumption

(A12) $\widetilde{P}^{\star} + \widetilde{C}^{\star} = \alpha\widetilde{C}^{\star}_F + (1-\alpha)(\widetilde{P}^{\star}_H + \widetilde{C}^{\star}_H)$

(A13) $\widetilde{C}_H = \theta\widetilde{P} + \widetilde{C}$ short-run consumption splitting

(A14) $\widetilde{C}^{\star}_F = \theta\widetilde{P}^{\star} + C^{\star}$

(A15) $\widetilde{Y} = \widetilde{l}$ short-run production function

(A16) $\widetilde{Y}^{\star} = \widetilde{l}^{\star}$

(A17) $\widetilde{P}_H = \widetilde{W} = 0$ short-run optimal goods price

(A18) $\widetilde{P}^{\star}_F = \widetilde{W}^{\star} = 0$

(A19) $\widetilde{\overline{B}} = \widetilde{Y} - \widetilde{P} - \widetilde{C}$ short-run current account

(A20) $-\widetilde{\overline{B}} = \widetilde{Y}^{\star} - \widetilde{P}^{\star} - \widetilde{C}^{\star}$

(A21) $\widetilde{\overline{P}} = \alpha\widetilde{\overline{P}}_H + (1-\alpha)\widetilde{\overline{P}}_F$ long-run price index

(A22) $\widetilde{\overline{P}}^{\star} = \alpha\widetilde{\overline{P}}^{\star}_F + (1-\alpha)\widetilde{\overline{P}}^{\star}_H$

(A23) $\widetilde{\overline{P}}_H = \widetilde{\overline{e}} + \widetilde{\overline{P}}^{\star}_H$ long-run law of one price

(A24) $\widetilde{\overline{P}}_F = \widetilde{\overline{e}} + \widetilde{\overline{P}}^{\star}_F$

(A25) $\widetilde{\overline{M}} - \widetilde{\overline{P}} = \widetilde{\overline{C}} - (1+\overline{r}_0)^{-1}\widetilde{\overline{r}}$ long-run money demand

(A26) $\widetilde{\overline{M}}^{\star} - \widetilde{\overline{P}}^{\star} = \widetilde{\overline{C}}^{\star} - (1+\overline{r}_0)^{-1}\widetilde{\overline{r}}$

(A27) $\widetilde{\overline{C}} = \widetilde{\overline{C}} + (1-\beta)\widetilde{\overline{r}}$ steady-state Euler equation

(A28) $\widetilde{\overline{Y}} = \alpha\widetilde{\overline{C}}_H + (1-\alpha)\widetilde{\overline{C}}^{\star}_H$ long-run product demand

(A29) $\widetilde{\overline{Y}}^{\star} = \alpha\widetilde{\overline{C}}^{\star}_F + (1-\alpha)\widetilde{\overline{C}}_F$

(A30) $\widetilde{\overline{P}} + \widetilde{\overline{C}} = \alpha(\widetilde{\overline{P}}_H + \widetilde{\overline{C}}_H) + (1-\alpha)(\widetilde{\overline{P}}_F + \widetilde{\overline{C}}_F)$ long-run consumption

(A31) $\widetilde{\overline{P}}^{\star} + \widetilde{\overline{C}}^{\star} = \alpha(\widetilde{\overline{P}}^{\star}_F + \widetilde{\overline{C}}^{\star}_F) + (1-\alpha)(\widetilde{\overline{P}}^{\star}_H + \widetilde{\overline{C}}^{\star}_H)$

(A32) $\widetilde{\overline{C}}_H = -\theta(\widetilde{\overline{P}}_H - \widetilde{\overline{P}}) + \widetilde{\overline{C}}$ long-run consumption splitting

(A33) $\widetilde{\overline{C}}^{\star}_F = -\theta(\widetilde{\overline{P}}^{\star}_F - \widetilde{\overline{P}}^{\star}) + \widetilde{\overline{C}}^{\star}$

(A34) $\widetilde{\overline{Y}} = \widetilde{\overline{l}}$ long-run production function

(A35) $\widetilde{\overline{Y}}^{\star} = \widetilde{\overline{l}}^{\star}$

(A36) $\widetilde{\overline{P}}_H = \widetilde{\overline{W}}$ long-run optimal goods price

(A37) $\widetilde{\overline{P}}^{\star}_F = \widetilde{\overline{W}}^{\star}$

(A38) $\widetilde{\overline{W}} - \widetilde{\overline{P}} = \widetilde{\overline{C}} + \widetilde{\overline{l}}$ long-run labour supply

(A39) $\widetilde{\overline{W}}^{\star} - \widetilde{\overline{P}}^{\star} = \widetilde{\overline{C}}^{\star} + \widetilde{\overline{l}}^{\star}$

(A40) $\widetilde{\overline{P}}_H + \widetilde{\overline{Y}} = \widetilde{\overline{P}} + \widetilde{\overline{C}} - \overline{r}_0\widetilde{\overline{B}}$ long-run current account

(A41) $\widetilde{\overline{P}}^{\star}_F + \widetilde{\overline{Y}} = \widetilde{\overline{P}}^{\star} + \widetilde{\overline{C}}^{\star} + \overline{r}_0\widetilde{\overline{B}}$

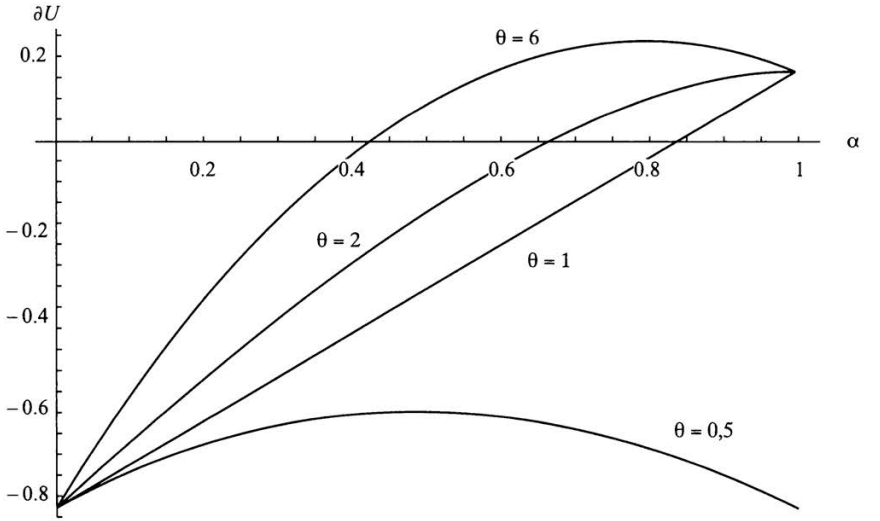

Figure 1: Home Welfare

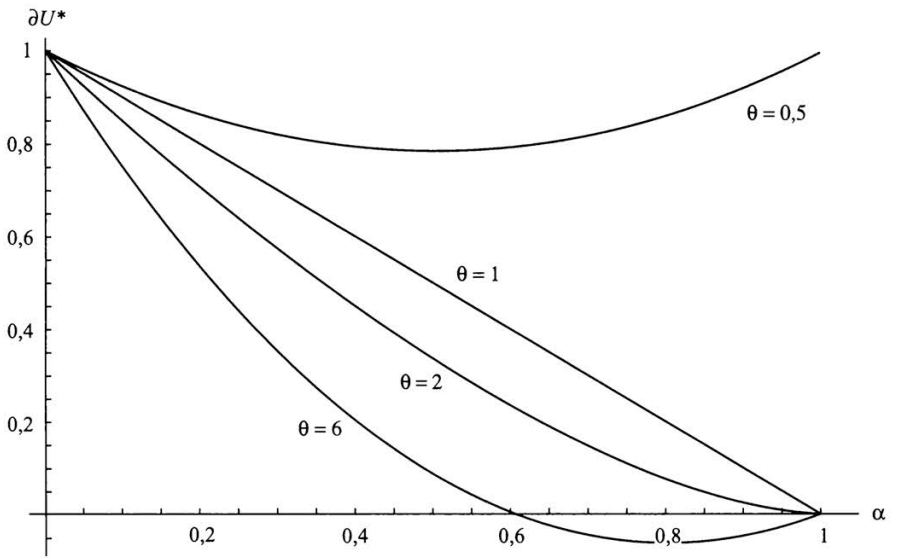

Figure 2: Foreign Welfare

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Summary

Monetary Policy: Prosper-thy-neighbour and Beggar-thyself?

This paper develops a general framework to analyse the welfare effects of monetary policies in an open economy, focusing on the interaction between internal and external sources of economic distortion. The internal sources are a monopolistic supply of both goods and labour, the external source is the monopoly power of a country on its terms of trade. Using the set-up developed by Obstfeld and Rogoff, we will show that (1) a home bias in consumption reduces the terms-of-trade externality and thus shifts the welfare gain of a monetary expansion towards the country where it will take place; (2) the welfare gain is more likely to be concentrated on the expanding country if domestic and foreign goods are close substitutes and if the distortions on the goods and labour markets are high; and (3) for a wide range of parameter values a domestic monetary expansion deteriorates domestic welfare (beggar-thyself) but improves welfare abroad (prosper-thy-neighbour). (JEL E40, F41, F42)

Zusammenfassung

Geldpolitik: Prosper-thy-neighbour und Beggar-thyself?

Im Rahmen eines Zwei-Länder-Modells à la Obstfeld/Rogoff werden die Wohlfahrtseffekte der Geldpolitik untersucht, wobei unvollständig kompetitive Güter- und Arbeitsmärkte sowie Monopolmacht im internationalen Güterhandel unterstellt werden. Die Hauptresultate sind: (1) Eine expansive Geldpolitik generiert stets einen positiven Wohlfahrtseffekt; (2) die Wohlfahrtssteigerung fokussiert sich umso eher auf das expansiv agierende Land, je ausgeprägter die Präferenzen für inländische Produkte, je besser die Substituierbarkeit zwischen in- und ausländischen Gütern und je imperfekter die Güter- und Arbeitsmärkte; (3) für plausible Parameterkonstellationen fällt die Verschlechterung der inländischen terms of trade so stark aus, dass eine inländische Geldmengenerhöhung das Inland schädigt, das Ausland aber besser stellt.

Résumé

Politique monétaire: Prosper-thy-neighbour et Beggar-thyself?

En utilisant le modèle à deux pays développé par Obstfeld/Rogoff, l'auteur de cet article analyse les effets de la politique monétaire sur le bien-être dans une économie ouverte caractérisée par une offre monopolistique de biens et de travail

et par un pouvoir monopolistique du pays sur ses termes d'échange. Les résultats principaux sont les suivants: (1) une politique monétaire expansive génère toujours un effet positif sur le bien-être ; (2) l'accroissement de bien-être se concentre dans le pays en expansion, et ceci d'autant plus que les biens nationaux et étrangers sont fortement substituables et que les distorsions sur les marchés des biens et du travail sont importantes ; (3) pour un grand nombre de paramètres, les termes d'échange nationaux se détériorent tellement qu'une expansion monétaire nuit au bien-être dans le pays (beggar-thyself) mais améliore le bien-être à l'étranger (proper-thy-neighbour).