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On the Welfare Effects of Monetary Policy When Households Try to Keep Up with the Rest of the World

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On the Welfare Effects of Monetary Policy When Households Try to Keep Up with the Rest of the World

by

Christian Pierdzioch and Serkan Yener

January 2004

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On the Welfare Effects of Monetary Policy When Households Try to Keep Up with the Rest of the World

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Abstract

We develop a dynamic general equilibrium two-economy model in order to analyze the welfare effects of monetary policy in open economies. The model features two distortions: one distortion due to monopolistic competition, and one distortion due to a consumption externality. This consumption externality arises because households' preferences feature a "keeping up with the rest of the world" effect. This effect implies that households' utility depends upon the level of their consumption relative to the average consumption in the world. We show that, depending on the relative magnitude of the monopolistic distortion and the consumption externality, an expansive monetary policy can result in an increase or a decrease of households' welfare.

Keywords: Monetary policy; Consumption externality; Welfare effects

JEL classification: F41, F42

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1 Introduction

A key advantage of recent 'New Open Economy Macroeconomic' (NOEM) models over traditional open economy macroeconomic models is that NOEM models feature a full-fledged and explicit microeconomic foundation. NOEM models have, therefore, been used in the recent literature to study the welfare effects of macroeconomic policies in open economies. A key question in the NOEM literature that has attracted much attention is how monetary policy affects households' welfare.

In the prototype NOEM model developed by Obstfeld and Rogoff (1995) (henceforth OR), a monopolistic distortion on the goods market implies that an expansive monetary policy, irrespective of whether it takes place at home or abroad, increases households' welfare. A number of authors have extended the prototype NOEM model in order show that this result is sensitive to the specification of households' preferences. For example, Tille (2001) has developed an extension of the OR model in which the substitutability of goods plays a key role for the effect of monetary policy on households' welfare. In his model, monetary policy can be either a "beggar-thy-neighbor" or a "beggar-thyself" policy. In another extension of the OR model, Warnock (2003) has shown that an expansive monetary policy is a "beggar-thy-neighbor" policy if individuals have a strong home-bias in preferences. Thus, preferences matter for the welfare effects of monetary policy in open economies. Our contribution to the NOEM literature is that we explore the implications for the welfare effects of monetary policy of a new economically reasonable specification of households' preferences that has so far not been studied in the NOEM literature.

Our specification of households' preferences captures a key element of discussions that often take place in the policy arena and the general public. These discussions indicate that households' preferences may feature a non-negligible "keeping up with the rest of the world" effect. For example, the current debate on economic policy in Germany has been dominated

for quite a while by discussions of the causes and consequences of the fact that Germany is Europe's laggard with respect to economic performance. In these discussions, many political commentators have argued with a mixture of contempt and alarm that Germany had lost ground in economic terms *relative* to other EU countries. For example, *The Economist* (1999) wrote:

> *"Germans have become accustomed to being first, and deservedly so: in economic might as well as in football and much else besides. These are therefore angst-ridden times. Not only did a German football team lose the European Cup final to an English one (by the narrowest of squeaks); the German economy is currently the weakest in Western Europe (not by the narrowest of squeaks)."*

Because of the popularity of this argument among citizens, the poor relative economic performance of the German economy played a major role in the election campaigns of government and opposition parties in 2002.

In the literature on the modeling of closed-economies, our "keeping up with the rest of the world" effect has been known as the "keeping up with the Joneses" effect. A list of significant contributions to this literature includes the work by Abel (1990), Gali (1994), Campbell and Cochrane (1999), Ljungqvist and Uhlig (2000) and, most recently, Dupor and Lui (2003). Our "keeping up with the rest of the world" effect is an extension of the "keeping up with the Joneses" effect to the open economy. It captures the idea that a household feels better off if the other households in the world economy decrease their consumption. Because of this negative link between individual and world consumption, the "keeping up with the rest of the world" effect captures the effect of envy and jealousy on human behavior. Envy and jealousy, in turn, imply that the "keeping up with the rest of the world" effect gives rise to a consumption externality. This consumption externality arises because, in a decentralized economy, households do not take into account the effect of their consumption decisions on the utility derived by other households. This implies that, in a decentralized economy, consumption exceeds its socially optimal level. We study the implications of this

consumption externality for the welfare effects of monetary policy in open economies.

We organize the remainder of this paper as follows. In Section 2, we lay out the structure of our theoretical model. In Section 3, we analyze the steady state of our model. In Section 4, we analyze the dynamics of the model. In Section 5, we derive the welfare effects of a monetary policy shock. In Section 6, we summarize our results.

2 The Model

The basic structure of our model is as in OR. Because their model has become the workhorse model of the NOEM literature, this guarantees that our results will not hinge upon uncommon and arbitrary assumptions. In the OR model, the world is made up of two economies which are populated by infinitely-lived identical consumer-producer households of total measure unity. Households are internationally immobile. All households have identical preferences and maximize their lifetime utility. Lifetime utility of home household j is defined as $U_t(j) = \sum_{s=t}^{\infty} \beta^{s-t} u_s(j)$, where $0 < \beta < 1$. The period–utility function, u_t, of household j is given by

$$u_t(j) = \log\left(C_t(j) - \gamma C_t^W\right) + \chi \log\left(M_t(j)/P_t\right) - \kappa y_t^2(j)/2 \ , \tag{1}$$

with $\kappa > 0$, $\chi > 0$, $0 \leq \gamma < 1$, where $j \in [0, n]$, $0 < n < 1$ for a domestic household and $j \in (n, 1]$ for a foreign household. In Equation (1), $C_t(j)$ denotes a real CES index of consumption goods, C_t^W denotes the aggregate population–weighted world consumption, $y_s(j)$ denotes the output of the single differentiated good produced by household j, and $M_t(j)/P_t$ denotes holdings of real money balances (there is no currency substitution). The consumption index, $C_t(j)$, is defined over the continuum of differentiated, perishable domestic and foreign consumption goods indexed by $z \in [0, 1]$. This consumption index is defined as $C_t(j) = \left[\int_0^1 c(j, z)^{(\theta-1)/\theta}\, dz\right]^{\theta/(\theta-1)}$, where $\theta > 1$ denotes the elasticity of substitution between

differentiated goods. The consumer price index is defined as $P_t = \left[\int_0^1 p(z)^{(1-\theta)}\, dz\right]^{1/(1-\theta)}$, where $p(z)$ denotes the price of a single differentiated product. The foreign price index is defined by a similar formula. The law-of-one-price holds for each differentiated good. In consequence, purchasing power parity holds: $P_t = S_t P_t^*$, where an asterisk denotes a foreign variable and S_t denotes the nominal exchange rate.

In contrast to the period-utility function used by OR and their successors in the NOEM literature, the period-utility function we specify in Equation (1) implies that household j not only derives utility from consuming the consumption index, $C_t(j)$. Rather, households also derive disutility from aggregate world consumption, C_t^W. This is the effect we term the "keeping up with the rest of the world" effect. Our period-utility function resembles the type of period-utility functions studied in the literature on the "keeping up with the Joneses" effect. In this literature, households' derive disutility from aggregate domestic consumption rather than world consumption (see, e.g., Ljungqvist and Uhlig 2000).

Our period-utility function implies $\partial u_t(j)/\partial C_t(j) = 1/(C_t(j) - \gamma C_t^W) > 0$, $\partial u_t(j)/\partial C_t^W = -\gamma/(C_t(j) - \gamma C_t^W) < 0$, and $\partial u_t(j)/\partial y_t(j) = -\kappa y_t(z) < 0$. In line with the definition put forward recently by Dupor and Lui (2003), the fact that $\partial u_t(j)/\partial C_t^W < 0$ implies that households' preferences exhibit jealousy. Jealousy implies that, for any given level of their own consumption, households' utility is lower the higher the level of consumption of all other households in the world economy.

In order to study the "keeping up with the rest of the world" feature of the period-utility function, we have to consider the marginal rate of substitution between production and consumption. The marginal rate of substitution is defined as $MRS_t \equiv [\partial u_t(j)/\partial y_t(j)]/[\partial u_t(j)/\partial C_t(j)]$. Because $\partial MRS_t/\partial C_t^W = \gamma\kappa y_t(z) > 0$, households' preferences feature a "keeping up with the rest of the world" effect. The reason for this is that an increase in world consumption raises the marginal utility of consumption of household j relative to the

marginal disutility the household derives from production. This, in turn, gives rise to a decrease in the level of utility the individual household j attains and, thereby, increases the marginal utility household j derives from consuming the consumption basket, $C_t(j)$.

Home household j maximizes lifetime utility subject to this period budget constraint:

$$P_t B_t(j) + M_t(j) = P_t(1 + r_{t-1})B_{t-1}(j) + M_{t-1}(j) + p_t(j)y_t(j) - P_t C_t(j) - P_t T_t(j) \ , \quad (2)$$

where r_t denotes the real interest rate on domestic bonds, $B_t(j)$, between t and $t+1$ and $T_t(j)$ denotes real taxes paid by the household to the government. The bond is denominated in terms of the consumption index, $C_t(j)$, and is traded in an integrated international bond market. Abstracting from government purchases of consumption goods, the budget constraint of the government implies that real taxes are equal to changes in the real money supply.

When maximizing lifetime utility subject to the budget constraint in Equation (2), household j has to take into account that the demand curve for the for differentiated product j is given by $y_t(j) = (p_t(j)/P_t)^{-\theta} C_t^W$, where $C_t^W \equiv nC_t + (1-n)C_t^*$ denotes the world consumption demand. The first-order conditions for the households' optimization problem are (dropping the household index from now on)

$$C_{t+1} - \gamma C_{t+1}^W = \beta(1 + r_{t-1}) \left(C_t - \gamma C_t^W\right) \ , \quad (3)$$

$$\chi \left(M_t/P_t\right) = \left(C_t - \gamma C_t^W\right) (1 + i_t)/i_t \ , \quad (4)$$

$$y_t^{(\theta+1)/\theta} = \left[(\theta - 1)/\theta\kappa\right] \left(C_t^W\right)^{1/\theta} \left(C_t - \gamma C_t^W\right)^{-1} \ , \quad (5)$$

where i_t denotes the nominal interest rate, which is linked to the real interest rate, r_t, through the Fisher parity condition, $1 + i_t = (1 + r_t)P_{t+1}/P_t$. Similar first-order conditions can be derived for foreign households.

Households have monopoly power on the goods market and, in consequence, treat the price they set for the differentiated product they produce as a choice variable. This implies

that one has to specify a price-setting mechanism. We follow OR in assuming that the domestic currency price of goods produced in the domestic economy, $p(h)$, and the foreign currency price of goods produced abroad, $p^*(f)$, are set one period in advance. This assumption has two implications. First, it implies that it takes one period to reach a steady state after a monetary policy shock. Second, it implies that output is demand determined in the time period following the monetary policy shock (i.e., in the short run).

3 Steady–State Analysis

We assume that, before a monetary policy shock, the world economy has settled in a symmetric steady state. We assume that in this steady state the net foreign assets position of domestic and foreign households is zero, i.e., $\bar{B} = 0$ and $\bar{B}^* = 0$, where barred variables denote steady-state values. In addition, we have $\bar{r} \equiv \delta = (1-\beta)/\beta$, $\bar{p}(h)/\bar{P} = \bar{p}^*(h)/\bar{P}^* = 1$, and $\bar{y} = \bar{y}^* = \bar{C}^W = \bar{C} = \bar{C}^*$. These steady-state conditions in conjunction with the first-order condition given in Equation (5) yield an equation for the steady-state output level:

$$\bar{y}^* = \bar{y} = \left(\frac{\theta - 1}{\theta\kappa}\frac{1}{1-\gamma}\right)^{1/2} . \tag{6}$$

Equation (6) shows that, in a decentralized economy, the steady-state output level differs from the socially optimal level of steady-state output. This follows from the fact that a benevolent social planner would solve the problem $\max_{\bar{y}} (\log((1-\gamma)\bar{y}) - \kappa\bar{y}^2/2)$ when deriving the socially optimal steady-state level of output. The result of the planner's problem is

$$\bar{y}^{OPT\,*} = \bar{y}^{OPT} = \left(\frac{1}{\kappa}\right)^{1/2} , \tag{7}$$

which is identical to the solution of the problem solved by the social planner in the model developed by OR. A comparison of Equation (6) with Equation (7) reveals that the relative

magnitude of the "keeping up with the rest of the world" effect, represented by the parameter γ, and the monopolistic distortion on the goods market, represented by the parameter θ, determines whether the output level that results in a decentralized economy, $\bar{y}$, is too low as compared to the socially optimal output level, $\bar{y}^{OPT}$, that would be realized if a social planner dictated the households' production decisions. The output level that results in a decentralized economy is below the socially optimal output level if $\gamma < 1/\theta$. Thus, if the monopolistic distortion on the goods market dominates the "keeping up with the rest of the world" effect, the socially optimal level of output tends to exceed the level of output that results in a decentralized economy. In the special case of $\gamma = 0$, our model degenerates to the OR model. In the OR model, the socially optimal output level always exceeds the output level realized in a decentralized economy.

In contrast, if $\gamma > 1/\theta$, the "keeping up with the rest of the world" effect dominates and the output level that obtains in a decentralized economy exceeds the output level that a social planner would choose. The "keeping up with the rest of the world" effect raises the steady-state output level in a decentralized economy because households do not take into account that their consumption has spillover effects on the consumption of the other households in the world economy. This spillover effect implies that consumption and, therefore, equilibrium production is sub-optimally high.

4 The Dynamics of the Model

Before studying the implications of the "keeping up with the rest of the world" effect for the welfare effects of a monetary policy shock, we must study the dynamics of the model. In order to study the dynamics of the model, we analyze the short-run and long-run effects of a monetary policy shock. The short run is the period of time immediately following the shock (i.e., the period of time during which households do not change the prices of their

goods). Concerning the notation, we assume that a hat over a variable denotes the short-run percentage deviation of a variable from the steady state derived in Section 3. A hat and a bar over a variable denote percentage changes in the steady-state value of a variable. In our analysis, we assume that a monetary policy shock takes place only at home. When we study the steady–state value of a variable, we drop the time index. The monetary policy shock is unanticipated and permanent (i.e., $\hat{M}_t = \hat{\overline{M}} > 0$ and $\hat{M}^*_t = \hat{\overline{M}}^* = 0$). To start our analysis of the dynamics of the model, we log-linearize the model around the steady state described in Section 3. The log-linear versions of the households' first-order conditions are given by:

$$(\hat{C}_t - \gamma \hat{C}^W_t)/(1-\gamma) = (\hat{\overline{C}} - \gamma \hat{\overline{C}}^W)/(1-\gamma) - \hat{r}_t \delta/(1+\delta) \ , \tag{8}$$

$$\hat{M}_t - \hat{P}_t = (\hat{C}_t - \gamma \hat{C}^W_t)/(1-\gamma) - \hat{r}_t/(1+\delta) - (\hat{\overline{P}} - \hat{P}_t)/\delta \ , \tag{9}$$

$$\hat{y}_t(\theta+1)/\theta + (\hat{C}_t - \gamma \hat{C}^W_t)/(1-\gamma) = C^W_t/\theta \ . \tag{10}$$

In addition to Equations (8) – (10), the log-linear model consists of the log-linear versions of the price indexes, the bond market equilibrium condition, the goods demand curve, and the definition of world consumption.

$$\hat{P}_t = n\hat{p}_t(h) + (1-n)[\hat{S}_t - \hat{p}^*_t(f)] \ , \tag{11}$$

$$n\hat{B}_t + (1-n)\hat{B}^*_t = 0 \ , \tag{12}$$

$$\hat{y}_t = -\theta(\hat{p}_t(h) - \hat{P}_t) + \hat{C}^W_t \ , \tag{13}$$

$$\hat{C}^W_t = n\hat{C}_t + (1-n)\hat{C}^*_t \ . \tag{14}$$

We also know that the steady-state version of the consolidated budget constraints of the home and foreign economy are given by

$$\hat{\overline{C}} = \delta \hat{\overline{B}} + \hat{\overline{p}}\,(h) - \hat{\overline{P}} \ , \tag{15}$$

$$\hat{\overline{C}}^* = -\delta\hat{\overline{B}}n/(1-n) + \hat{\overline{p}}^*(f) - \hat{\overline{P}}^* \ . \tag{16}$$

Equations (15) and (16) as well as Equations (8) – (14) together with their foreign counterparts suffice to determine the short-run and long-run effects of a monetary policy shock. In order to solve this system of equations, we proceed as in OR. In a first step, we compute the steady–state solution of the model. To this end, we use the steady-state versions of Equations (10) and (13), their respective foreign counterparts, and Equations (14) – (16) in order to compute the solutions for $\hat{\overline{C}}^W$, $\hat{\overline{C}}$,$\hat{\overline{C}}^*$, $\hat{\overline{y}}$, $\hat{\overline{y}}^*$, $\hat{\overline{p}}\,(h) - \hat{\overline{P}}$, and $\hat{\overline{p}}\,(h)^* - \hat{\overline{P}}^*$ as a function of $\hat{\overline{B}}$. With these solutions in hand, we use Equation (9) and its foreign counterpart to determine $\hat{\overline{P}}$ and $\hat{\overline{P}}^*$ as a function of $\hat{\overline{B}}$. Equipped with the price levels, we can use the condition of purchasing power parity in order to compute $\hat{\overline{S}}$. In a second step, we compute the short-run solution of the model. To this end, we use the fact that $\hat{p}_t(h) = \hat{p}_t^*(f) = 0$ because prices are, by assumption, sticky. Moreover, we use Equations (8), (9), (11), (13), their foreign counterparts, and the short-run versions of the consolidated budget constraints

$$\hat{\overline{B}} = \hat{y}_t - (1-n)\hat{S}_t - \hat{C}_t \ , \tag{17}$$

$$-\hat{\overline{B}}^* n/(1-n) = \hat{y}_t^* - n\hat{S}_t - \hat{C}_t^* \ . \tag{18}$$

Upon solving the model, one can show that its dynamics are qualitatively similar to the dynamics of the OR model. Thus, the "keeping up with the rest of the world" effect does not change the qualitative effects of a monetary policy shock. However, the "keeping up with the rest of the world" effect has implications for the quantitative effects of a monetary policy shock. This can be seen from the following solutions for key endogenous variables of the model:

$$\hat{S}_t = \hat{\overline{S}} = \frac{\gamma - 2\theta + \gamma\theta + \delta(\gamma-1)(1+\theta)}{(1+\delta)\gamma(1+\theta) - \theta(2+\delta+\delta\theta)}\,\hat{\overline{M}} > 0 \ , \tag{19}$$

$$\hat{R}_t = -\frac{(1+\delta)n}{\delta}\,\hat{\overline{M}} < 0 \ , \tag{20}$$

$$\hat{C}_t^W = n\,\hat{\overline{M}} > 0\ , \tag{21}$$

$$\hat{C}_t - \hat{C}_t^* = \hat{\overline{C}} - \hat{\overline{C}}^* = \frac{\delta(\gamma-1)(\theta^2-1)}{(1+\delta)\gamma(1+\theta)-\theta(2+\delta+\theta\delta)}\,\hat{\overline{M}} > 0\ , \tag{22}$$

$$\hat{y}_t - \hat{y}_t^* = \frac{\theta[\gamma-2\theta+\gamma\theta+\delta(\gamma-1)(1+\theta)]}{(1+\delta)\gamma(1+\theta)-\theta(2+\delta+\theta\delta)}\,\hat{\overline{M}} > 0\ , \tag{23}$$

$$\hat{\overline{B}} = \frac{(1-n)(\theta-1)(\gamma-2\theta+\gamma\theta)}{(1+\delta)\gamma(1+\theta)-\theta(2+\delta+\theta\delta)}\,\hat{\overline{M}} > 0\ , \tag{24}$$

where the signs of the expressions on the right-hand-side of Equations (19) – (24) are derived at the end of the paper (Technical Appendix). Equation (19) shows that, as in the OR model, there is no overshooting of the nominal exchange rate in the aftermath of a monetary policy shock. From Equations (20) and (21) it follows that, as would have been expected, an expansive monetary policy shock leads to a temporary decrease in the real interest rate and to a temporary increase in world consumption demand. In addition, because goods prices are sticky, the relative price of domestic goods decreases with a depreciating exchange rate, implying that the domestic economy slides down its demand curve. Equation (22) reveals that this implies that the international consumption differential becomes positive. Further, the depreciation of the nominal exchange rate gives rise to an expenditure switching effect because goods prices are sticky in the short run. This, in turn, implies that the international output differential becomes positive, too. Finally, Equation (24) demonstrates that a positive domestic monetary policy shock results in an international reallocation of wealth: the domestic economy accumulates foreign bonds because the expenditure switching effect gives rise to a current account surplus.

In order to study in more detail the implications of the "keeping up with the rest of the world" effect for the quantitative effects of a monetary policy shock, we compute the partial derivatives of Equations (19), (22), and (23) with respect to the parameter γ. The result is:

$$\frac{\partial \hat{S}_t}{\partial \gamma} = -\frac{\delta(1+\delta)(\theta-1)(1+\theta)^2}{[(1+\delta)\gamma(1+\theta)-\theta(2+\delta+\delta\theta)]^2}\,\hat{\overline{M}} < 0\ , \tag{25}$$

$$\frac{\partial(\hat{C}_t - \hat{C}_t^*)}{\partial\gamma} = -\frac{\delta(\theta-1)^2(1+\theta)(1+\delta+\delta\theta)}{[(1+\delta)\gamma(1+\theta)-\theta(2+\delta+\delta\theta)]^2}\hat{\overline{M}} < 0\ , \tag{26}$$

$$\frac{\partial(\hat{y}_t - \hat{y}_t^*)}{\partial\gamma} = -\frac{\theta\delta(1+\delta)(\theta-1)(1+\theta)^2}{[(1+\delta)\gamma(1+\theta)-\theta(2+\delta+\delta\theta)]^2}\hat{\overline{M}} = \theta\frac{\partial\hat{S}_t}{\partial\gamma} < 0\ . \tag{27}$$

Equation (25) shows that an increase in the strength of the "keeping up with the rest of the world" effect dampens the impact of a monetary policy shock on the exchange rate. Because the exchange rate is determined by both the international money supply differential and the international consumption differential, the economic intuition for this dampening effect can be highlighted by studying Equation (26). A stronger "keeping up with the rest of the world" effect implies that the marginal utility of consumption of both domestic and foreign households increases. However, this effect is more pronounced abroad because the monetary-policy-induced expenditure switching effect implies that the consumption of domestic households exceeds the consumption of foreign households. As a result, a stronger "keeping up with the rest of the world" effect gives rise to a closer comovement of domestic and foreign consumption. Because this closer international comovement of consumption cushions the exchange-rate effect of a monetary policy shock, an increase in the parameter results in a smaller international output differential (Equation (27)).

5 Welfare Analysis

We now study the welfare effects of a one-time, unanticipated, permanent monetary policy shock. For concreteness, we assume that this shock takes place in the domestic economy. Following OR, we measure the welfare effects of a monetary policy shock by computing the total differential of the real part of the lifetime-utility function of households. In order to obtain the real part of the lifetime-utility function, we set the utility effect of real balance holdings equal to zero. The total differential of the real part, U^R, of the lifetime-utility

function for a home household is given by

$$dU^R = \frac{1}{1-\gamma}\left[(\hat{C}_t - \gamma\hat{C}_t^W) - \frac{\theta-1}{\theta}\,\hat{y}_t + \frac{1}{\delta}\left((\hat{\overline{C}} - \gamma\hat{\overline{C}}^W) - \frac{\theta-1}{\theta}\,\hat{\overline{y}}\right)\right] . \tag{28}$$

Plugging the results for the short-run and long-run effects of a monetary policy shock derived in Section 4 into Equation (28) yields

$$dU^R = dU^{R*} = \frac{\gamma\theta - 1}{\theta(\gamma-1)}\, n\hat{\overline{M}} . \tag{29}$$

In the case $\gamma = 0$, Equation (29) simplifies to $dU^R = dU^{R*} = n\hat{\overline{M}}/(2\theta)$, which is identical to the welfare effect of a monetary policy shock derived by OR. Equation (29) shows that, as in the model developed by OR, the welfare effect of a monetary policy shock is symmetric across countries. Moreover, the relative magnitude of the monopolistic distortion and the consumption externality due to the "keeping up with the rest of the world" effect determines whether monetary policy is beneficial. This can be seen by inspecting the signs of the numerator and denominator of Equation (29). Because $0 \leq \gamma < 1$, the denominator of Equation (29) is always negative. Thus, for welfare of households to increase, it must be the case that the numerator is also negative. The numerator is negative if $\gamma < 1/\theta$, i.e., if the consumption externality is dominated by the monopolistic distortion. The economic intuition behind this result is routed in the fact that the monopolistic distortion makes the level output suboptimally low as compared to the socially optimal level of output. In contrast, the consumption externality tends to raise output above its socially optimal level. Thus, if $\gamma < 1/\theta$, output is suboptimally low, and as in the model developed by OR, an expansive monetary policy increases households' welfare. However, in the opposite case of $\gamma > 1/\theta$, an expansive monetary policy decreases households' welfare. In this case, the consumption externality caused by the "keeping up with the rest of the world" feature of households' utility function dominates.

6 Summary

In the recent literature on open-economy macroeconomics, NOEM models have become the standard platform for the discussion of the welfare effects of macroeconomic policies in general and of monetary policy in particular. In NOEM models, the welfare effects of monetary policy depend upon the specification of households' utility function. We have analyzed the welfare effects of monetary policy in a NOEM model which features a generalization of the utility function studied by OR. The utility function we have studied features a "keeping up with the rest of the world" effect.

We believe that the "keeping up with the rest of the world" effect captures an argument one often encounters in policy discussions and election campaigns of political parties. According to this argument, the economic well-being of households not only depends upon their own consumption, but also upon the level of their consumption relative to that of households in other countries. This argument indicates that envy and jealousy are important determinants of economic agents' emotions and actions.

We have shown that, if this argument provides a reasonable descriptions of households' utility function, it has important implications for the welfare effects of monetary policy. Our main result is that if the "keeping up with the rest of the world" effect is sufficiently strong, the implications of the OR model for the welfare effects of monetary policy are reversed. The reason for this is that the "keeping up with the rest of the world" effect gives rise to a consumption externality which, in turn, implies that consumption is suboptimally high. In consequence, it can be the case that an expansive monetary policy is no longer welfare improving as in the OR model, but has an adverse effect on the welfare of economic agents.

Technical Appendix

In this appendix, we determine the sign of the expressions in Equations (19) – (24). We first prove three useful propositions.

Proposition 1 $(1+\delta)\gamma(1+\theta) - \theta(2+\delta+\delta\theta) < 0.$

Proof: Rewriting and rearranging this expression to yield $\delta\gamma+\delta\gamma\theta+\gamma+\gamma\theta < \delta\theta+\delta\theta^2+\theta+\theta$, *we note that all parameters are positive so that the sums on each side of this inequality are positive as well. Upon recalling that* $0 \leq \gamma < 1$ *and* $\theta > 1$ *and comparing each addend on the left-hand side with its respective counterpart on the right-hand side, it is easy to verify that the inequality holds for all admissible parameter values.* □

Proposition 2 $\gamma - 2\theta + \gamma\theta + \delta(\gamma-1)(1+\theta) < 0.$

Proof: Rewriting and rearranging the above expression to yield $\delta\gamma+\delta\gamma\theta+\gamma+\gamma\theta < \delta+\delta\theta+\theta+\theta$, *we note that all parameters are positive so that the sums on each side of the inequality are positive as well. Upon recalling that* $0 \leq \gamma < 1$ *and* $\theta > 1$ *and by comparing each addend on the left-hand side with its respective counterpart on the right-hand side, it follows that the inequality holds for all admissible parameter values.* □

Proposition 3 $(1-n)(\theta-1)(\gamma-2\theta+\gamma\theta) < 0.$

Proof: Because $1-n > 0$ *and* $\theta - 1 > 0$, *we must show that* $\gamma - 2\theta + \gamma\theta < 0$. *Rewriting this latter expression to yield* $\gamma + \gamma\theta < \theta + \theta$, , *we note that each addend on the left-hand side is smaller than its respective counterpart on the right-hand side because* $0 \leq \gamma < 1$ *and* $\theta > 1$ *and this completes the proof.* □

From these three propositions, the following results follow.

Corollary 1 $\hat{S}_t$ *in Equation (19) is negative because of Propositions 1 and 2.*

Corollary 2 *The denominator of* $\hat{C}_t - \hat{C}_t^W$ *in Equation (22) is negative because of Proposition 1, and the numerator is negative because* $0 \leq \delta, \gamma < 1$ *and* $\theta > 1$.

Corollary 3 *The denominator and the numerator of* $\hat{y}_t - \hat{y}_t^*$ *in Equation (23) are both negative because of Proposition 1 and Proposition 2.*

Corollary 4 $\hat{\overline{B}}_t$ *in Equation (24) is negative because of Proposition 1 and Proposition 3.*

Remark: $\hat{R}_t$ in Equation (20) is negative because all parameter values are positive. The same rationale applies to Equation (21), rendering $\hat{C}_t^W$ positive.

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