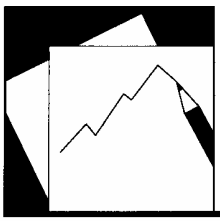
WP/04/102



IMF Working Paper

Public Spending Management and Macroeconomic Interdependence

Giovanni Ganelli

INTERNATIONAL MONETARY FUND

© 2004 International Monetary Fund WP/04/102

IMF Working Paper

Fiscal Affairs Department

Public Spending Management and Macroeconomic Interdependence

Prepared by Giovanni Ganelli [1]

Authorized for distribution by Manmohan S. Kumar

June 2004

Abstract

This Working Paper should not be reported as representing the views of the IMF.
The views expressed in this Working Paper are those of the author(s) and do not necessarily represent those of the IMF or IMF policy. Working Papers describe research in progress by the author(s) and are published to elicit comments and to further debate.

This paper studies, in the context of a New Open Economy Macroeconomics (NOEM) model, the effects of "public competition policies" aimed at improving the efficiency of public spending. Such measures are modeled as an increase in the price elasticity of public consumption. The paper finds that public competition policies significantly affect macroeconomic interdependence across countries. Following a domestic fiscal expansion, a higher public price elasticity increases the substitutability between goods purchased by the domestic and the foreign governments. The same exchange rate variation can therefore sustain larger shifts in relative demand for goods. The expenditure-switching effect is magnified, implying a larger change in relative output. In welfare terms, countries with a larger government sector have an incentive to promote public competition policies.

JEL Classification Numbers: E62, F41, H11

Keywords: Public competition policies, NOEM, macroeconomic interdependence, government spending

Author's E-Mail Address: gganelli@imf.org

---

[1] The author thanks Manmohan Kumar, Mark De Broeck, Philip Lane, Neil Rankin, and seminar participants at Trinity College Dublin and at the Royal Economic Society 2004 Conference for their comments and suggestions.

Contents Page

I. INTRODUCTION

The way in which governments manage public spending at a microeconomic level can have macroeconomic implications. The goal of this paper is to study how structural policies, aimed at improving the efficiency of public spending, can change the positive and normative interdependence pattern across countries that follows an asymmetric fiscal shock. In our analysis, by "improving efficiency" we mean the process of reducing the degree of monopoly power enjoyed by firms selling goods and services to the government, and therefore of bringing their prices closer to marginal costs.

Many of the structural measures that governments implement in order to achieve greater efficiency can be captured, in a stylized model, by an increase in the price elasticity of demand of government expenditure. An example is a situation in which a government decides to shift from volume planning to value planning of public spending. In economic terms, this means a change from fixing expenditure in real terms to fixing it in nominal terms, and therefore a change in the public price elasticity from zero to one. In the late 1970s, the U.K. government implemented such a change, in the context of a general effort to reduce the size of public spending that continued through the 1980s. Dixon and Rankin (1995) make the point that governments often conceive of policies as affecting the trade-off faced by market participants. From this perspective, it could be argued that one of the reasons behind the shift from volume to value planning was the desire to reduce the degree of monopolistic power in the economy, with the aim of reducing the trend rise in unemployment. This is consistent with the theoretical framework that we develop in this paper, in which the implementation of efficiency-enhancing measures by the government reduces monopolistic distortions, therefore raising the steady-state level of output and consumption. The seek for efficiency in public spending is part of the more general attempt to move away from a sub-optimal equilibrium toward the first best.

In addition to the example illustrated above, there are other measures aimed at improving the efficiency of public spending whose effects can be captured by an increases in the public price elasticity of demand. Examples are policies that oblige government departments to put the provision of certain goods and services out to tender, making private firms bid competitively to provide them. However, most existing macroeconomics models are not well equipped to capture the effect of the policies that we want to study. The standard way in which most macroeconomic models deal with government spending is to treat it as exogenous in real terms. This is true, for example, both in the Keynesian ad hoc tradition and in Real Business Cycle (RBC) models. These kind of models usually do not differentiate between the various goods that enter public consumption, therefore implicitly assuming that government demand for an individual good is also exogenous in real terms. In microeconomic terms, these assumptions imply a zero price-elasticity of government demand.

The New Open Economy Macroeconomics (NOEM) literature, by explicitly modeling imperfect competition, allows a differentiation between individual goods that enter public

consumption.[2] A limitation of the analysis carried out so far using NOEM models is, however, the fact that aggregate public consumption is built in the same way as private consumption, with the same elasticity of substitution between differentiated goods produced in the economy.[3] This rules out the possibility of analyzing the effects of structural government policies that can alter the elasticity of substitution in public consumption without affecting the private elasticity. In this paper we fill this gap in the literature, developing a NOEM model in which the private and public elasticities can be separated. This allows us to analyze the positive and normative implications for asymmetric fiscal shocks of policies that increase the public elasticity of substitution.

Throughout the paper we will refer to policies that imply an increase in the elasticity of substitution of government demand as "public competition policies." This semantic convention rests on the fact that, as we have stressed above, such policies reduce the degree of monopoly enjoyed by private producers when dealing with the government. It is important to note again that it would not be possible to capture the effects of such policies in a standard NOEM model that does not differentiate between the private and public elasticities. Obviously, in that case, a change in the public elasticity would mean that the private elasticity is changing as well, and it would not be possible to interpret the exercises on which we focus as consequences of structural reforms in the government sector.

Our model shows that such policies imply, on the positive side, a reduction of the negative effect on relative (i.e., domestic minus foreign) consumption that usually follows a balanced-budget asymmetric fiscal shock. As standard in the NOEM framework, the country that implements a balanced-budget fiscal shock still loses, in terms of short-run consumption, relative to the foreign country, but the international consumption gap can be reduced by the implementation of public competition policies. An increase in the elasticity of substitution also implies a larger expenditure switching effect. The short-run increase in relative output that follows a fiscal shock can therefore be quantitatively bigger, when public competition policies are implemented, even with a less depreciated exchange rate. On the normative side, our analysis shows that the implementation of public competition policies raises the level of welfare of the country with a larger public sector at foreign expense.

The structure of the paper is as follows: next section introduces the model; Section III investigates the positive effects of public competition policies, using some numerical examples based on the reduced forms derived from a linearized version of the model; Section IV discusses some welfare results; and Section V concludes.

---

[2] The supply side of the NOEM framework can be regarded as an extension of the closed-economy, static model presented by Blanchard and Kiyotaki (1987).

[3] For a survey of how fiscal policy has been introduced in the NOEM literature, see Ganelli and Lane (2003), Section IV.

II. THE MODEL

We use a standard NOEM model—similar to the one developed by Obstfeld and Rogoff (1995, 1996)—modified to allow for an elasticity of substitution in public consumption different from the one in private consumption. There are two countries in the world that we label Home and Foreign. The world population is normalized to one. Home agents are on the interval $[0,n]$, foreign agents on the interval $[n,1]$. Since we assume perfect symmetry in preferences and parameters, we will only present the equations for the domestic economy. All our assumptions are standard in the NOEM literature, except for the possibility of allowing public and private elasticities to be different.

A. The Domestic Representative Agent

The domestic representative agent gains utility from domestic private consumption, real balances and leisure. The agents' optimization problem is therefore the maximization of the intertemporal utility function

$$U_t^j = \sum_{s=t}^{\infty} \beta^{s-t}[\log(C_s) + \chi \log \frac{M_s}{P_s} - \frac{k}{2} L_s^2] \tag{1}$$

subject to the budget constraint

$$B_{t+1} + \frac{M_t}{P_t} = (1+r_t)B_t + \frac{M_{t-1}}{P_t} + \frac{W_t}{P_t} L_t + \frac{\Pi_t}{P_t} - C_t - \tau_t \tag{2}$$

where $0 < \beta < 1$ is the discount factor, all the parameters are positive and the last term in the utility function captures the disutility, in terms of reduced leisure, of supplying an amount of labor equal to L. The only internationally traded bond is a riskless real bond denominated in terms of the composite consumption good, that we denote with B, r_t is the real interest rate on this bond between $t-1$ and t. M_{t-1} denotes nominal money balances held at the beginning of period t.[4] Agents also supply labor in a perfectly competitive labor market, receive profits shares from domestic firms $\frac{\Pi_t}{P_t}$, that we assume to be uniformly distributed, and pay lump-sum taxes τ_t.

The private consumption index aggregates across the differentiated goods produced by all firms in the economy, both at home and abroad. Firms enjoy a certain degree of monopolistic competition when dealing with private consumers, specified by the magnitude of the parameter $\theta > 1$. Denoting with z a generic representative firm, with $c(z)$ the consumption of the differentiated output of this firm by the representative agent and with $p(z)$ the

[4] Note that we adopt Obstfeld and Rogoff (1996) timing convention, M_t therefore denotes money between period t and period $t+1$, while B_t denotes bonds between period $t-1$ and t.

domestic currency price of this output, the aggregate private consumption index and the corresponding price index take the following forms

$$C = [\int_0^1 c(z)^{\frac{\theta-1}{\theta}} dz]^{\frac{\theta}{\theta-1}} \tag{3}$$

$$P = [\int_0^1 p(z)^{(1-\theta)} dz]^{\frac{1}{1-\theta}} \tag{4}$$

B. The Government

As already stressed above, the main innovation of our model is that of allowing the elasticity of public spending to be different from the elasticity of private spending. In order to do this, we introduce a government whose consumption in real terms is an aggregate of all the differentiated goods produced in the economy, with a certain elasticity of substitution η that, unlike in previous NOEM models, is not restricted to be equal to θ. The Home government aggregate consumption and the corresponding government spending price index are therefore given by

$$G = [\int_0^1 g(z)^{\frac{\eta-1}{\eta}} dz]^{\frac{\eta}{\eta-1}} \tag{5}$$

$$P_G = [\int_0^1 p(z)^{(1-\eta)} dz]^{\frac{1}{1-\eta}} \tag{6}$$

The government follows a balanced-budget rule all the time.[5] We also rule out the possibility of seigniorage, implying that in every period $G_t = \tau_t$. The preferences and behavior of the foreign government are perfectly symmetric.

It is worth noticing two implications of our assumption of perfect symmetry. The first is that both governments consume all differentiated goods, regardless of their place of production, therefore eliminating the possibility of home bias in public spending. The second is that the parameter η is the same for both countries. This means that the public competition policies (i.e., the policies of increasing η) that we will consider should be thought of as global policies coordinated internationally, rather than implemented asymmetrically by one country. Introducing home bias in government spending and considering country-specific public competition policies would undoubtedly be of interest for future research, but we abstract from those possibilities in this paper.

C. Firms

We assume the existence of a continuum of measure one of firms in the world, n of which located in the Home country and $1-n$ in the Foreign country. We also assume that the law of one price (LOOP) holds, implying

[5] Because Ricardian Equivalence holds in the model, government debt would be redundant. Ganelli (2004) introduces deviations from Ricardian Equivalence in a similar framework.

$$p_t(z) = E_t p_t^*(z)$$

where E is the nominal exchange rate, defined as the price of the foreign currency in terms of the domestic currency and $p_t^*(z)$ is the foreign currency price of good z. The LOOP assumption and the definition of the price indexes imply that also the purchasing power parity (PPP) holds, both for private and for public consumption prices

$$P_t = E_t P_t^*$$
$$P_{Gt} = E_t P_{Gt}^*$$

The fact that the LOOP and the PPP hold, together with the specification of the private and public consumption indexes (equations 3 and 5), imply that the demand for the output of the representative firm z is given by

$$Y_t(z) = [\frac{p_t(z)}{P_t}]^{-\theta} C_t^W + [\frac{p_t(z)}{P_{Gt}}]^{-\eta} G_t^W \tag{7}$$

where the superscript W denotes world aggregates. Finally, we assume that for each firm output is simply equal to labor input according to the production function

$$Y_t(z) = L_t(z) \tag{8}$$

D. Current Account Equations

The model is completed by a short-run and a long-run version of the current account equations, where all the variables are expressed in terms of the composite consumption good

$$B_{t+1} - B_t = r_t B_t + \frac{p_t(h) Y_t}{P_t} - C_t - \frac{P_{Gt}}{P_t} G_t \tag{9}$$

$$\widehat{C} = \delta \widehat{B} + \frac{\widehat{p(h)}\widehat{Y}}{\widehat{P}} - \frac{\widehat{P}_G}{\widehat{P}} \widehat{G} \tag{10}$$

Equation (9) is valid in the short run (when the shock hits), while equation (10) is only valid across steady states.

E. Optimality Conditions

Using standard techniques, it is possible to show that the first order conditions for the private agent's maximization problem are given by

$$C_{t+1} = C_t[\beta(1 + r_{t+1})] \tag{11}$$

$$\frac{M_t}{P_t} = \frac{\chi(1+i_{t+1})}{i_{t+1}} C_t \tag{12}$$

$$kL_t = \frac{1}{C_t}\frac{W_t}{P_t} \tag{13}$$

where i_{t+1} is the nominal interest rate between t and $t+1$.
Equations (11) to (13) are respectively a consumption Euler equation, a money demand equation and a labor-leisure trade off equation, that equates the marginal utility of the real wage to the marginal disutility of supplying an additional unit of labor.

While the above equations are standard in models like the one we are presenting, the profit-maximization condition of the representative firm yields a less standard markup formula

$$p_t(z) = W_t \frac{\theta Y_t^{d,p}(z) + \eta Y_t^{d,g}(z)}{(\theta-1)Y_t^{d,p}(z) + (\eta-1)Y_t^{d,g}(z)} \tag{14}$$

where $Y_t^{d,p}(z)$ and $Y_t^{d,g}(z)$ are respectively the total private and public demands for the representative good z, defined as :

$$Y_t^{d,p}(z) = [\frac{p_t(z)}{P_t}]^{-\theta} C_t^W$$

$$Y_t^{d,g}(z) = [\frac{p_t(z)}{P_t}]^{-\theta} G_t^W$$

It should be noticed that equation (14) reproduces the usual markup of prices on wages, equal to $\frac{\theta}{(\theta-1)}$, in the special cases in which the public elasticity is equal to the private elasticity $(\eta = \theta)$ or world government spending is zero. In the more general case, the markup is endogenous and, in absence of price rigidities, private firms will set prices above marginal costs taking in to account both the private and the public elasticities, as well as the ratio of public to private demand for their products.[6] An increase in η, by reducing the monopoly power of firms, reduces the wedge between prices and wages, therefore generating lower profits.

However, since following Obstfeld and Rogoff (1995, 1996), we will assume one-period price rigidity in the producers' currency, $p(z)$ will be preset in the period in which a fiscal shock hits. Prices will be set according to equation (14) only in the period after the shock (that we define as the long-run), when they are free to adjust to their flexible-price values.

[6] Previous research has shown that an endogenous markup can also be derived either by explicitly modeling intraindustry collusion (Rotemberg and Woodford, 1992) or by assuming that the elasticity of substitution across goods in consumption differs from that in production (Gali, 1994).

The effects of the endogenous markup, nonetheless, will be reflected in short-run variables due to the presence of rational expectations.

F. The Initial Steady State

The numerical solutions that we will present in Section III are based on reduced forms derived from a log-linear approximation of the model around a symmetric steady-state. To be able to capture the effects of a different public-spending elasticity of substitution in the linearized equations, it is necessary to log-linearize the model starting from a nonzero government spending position.[7] In order to preserve symmetry, we consider an initial steady state in which the positive level of public spending is the same in both countries and initial net foreign assets are zero in both countries. Denoting the initial preshock values with the subscript $_{SS}$, in such a steady state the following relationships hold: $G_{SS} = G^*_{SS} = G^W_{SS} > 0$, $B_{SS} = B^*_{SS} = 0$, $p_{SS}(z) = P_{SS} = P_{G_{SS}}$, $p^*_{SS}(z) = P^*_{SS} = P^*_{GSS}$, $C_{SS} = C^*_{SS} = C^W_{SS}$, and $Y_{SS} = Y^*_{SS} = Y^W_{SS}$. Steady state levels of the main variables are given by :

$$\delta = r_0 = \frac{1-\beta}{\beta}$$

$$\frac{W_{SS}}{P_{SS}} = \frac{\theta - 1 + (\eta - 1)\lambda}{\theta + \eta\lambda}$$

$$Y_{SS} = \{\frac{(1+\lambda([(\theta-1)+(\eta-1)\lambda]}{k(\theta+\eta\lambda)}\}^{\frac{1}{2}}$$

$$C_{SS} = \frac{Y_{SS}}{1+\lambda} \quad ;$$

and

$$\frac{M_{SS}}{P_{SS}} = \chi \frac{1+\delta}{\delta} C_{SS}$$

where $\lambda = \frac{G_{SS}}{C_{SS}}$ is the ratio of public to private spending in the initial steady state. The steady-state values of *r, C, Y* and *M/P* coincide with the ones used by Obstfeld and Rogoff (1995, 1996) when $\theta = \eta$ and G_{SS} =0. Increases in θ and η, by reducing the degree of monopolistic distortion in the economy, raise the steady-state levels of output and consumption.

[7] Starting from a nonzero government spending steady-state value is also a desirable feature of the analysis in itself, not present in previous NOEM contributions, such as Obstfeld and Rogoff (1995, 1996) and Ganelli (2003). The fact that we start from a nonzero public spending steady state implies that the ratio of public to private spending in the initial steady state enters the log-linearized equations.

G. Log-linearization

The log-linearized version of the domestic economy is presented in Table 1. Log deviations in the period in which the shock hits (the short run) are denoted by lower cases with a tilde, for example: $\tilde{c} = \frac{dC}{C_{SS}} \simeq \frac{C - C_{SS}}{C_{SS}}$. Lower case with a hat denote long-run variables, i.e., log-deviations in the period after the one in which the shock hits, in which the economy is free to adjust to its new, flexible-price steady state. The variables $\tilde{p}(h)$ and $\tilde{p}(f)$ denote, respectively, the short-run log-deviations of the prices set by a representative domestic and foreign firm. The hypothesis of one period preset prices in the producers' currency means that we can set $\tilde{p}(h) = \tilde{p}(f) = 0$ in all the equations listed in Table 1 and in their analogous for the foreign economy. Since the initial steady state of net foreign assets is zero, $\hat{b}$ is defined as $\hat{b} = \frac{dB}{C_{SS}}$.[8]

Log-linearization around a symmetric initial steady state in which the law of one price holds implies that the log-linearized versions of the private and of the public price indexes are equivalent, as shown in equation (15). Equations (16) to (24) are respectively (log linearized versions of) the world demand function for the representative differentiated good, the Euler equation, short and long-run money demand equations, the labor-leisure trade off equation, short run and long run current account equations, the optimal pricing rule (equation 14) and the PPP equation. Because of the short-run price rigidity, equation (20) and (23) are only valid in the long run.

In table 1 ψ_1, ψ_2 and ψ_3 are composite parameters, which are functions of the other parameters defined as follows :

$$\psi_1 = \frac{\theta - 1}{\theta - 1 + \lambda(\eta - 1)} - \frac{\theta}{\theta + \lambda\eta}; \qquad \psi_2 = \frac{\lambda(\eta - 1)}{\theta - 1 + \lambda(\eta - 1)} - \frac{\lambda\eta}{\theta + \lambda\eta},$$

$$\psi_3 = \frac{\theta(\theta - 1)}{\theta - 1 + \lambda(\eta - 1)} - \frac{\lambda\eta(\eta - 1)}{\theta - 1 + \lambda(\eta - 1)} - \frac{\theta^2}{\theta + \lambda\eta} - \frac{\lambda\eta^2}{\theta + \lambda\eta}$$

Using the equations contained in Table 1 and the analogous expression for the foreign economy, we derived reduced forms for endogenous variables as functions of fiscal shocks and of the parameters of the model only. The reduced forms have been used to provide the numerical solutions reported in Section III. Given our focus on the effects of public competition policies in presence of asymmetric fiscal shocks, in our experiments we always set money shocks to zero.

---

[8] Notice that, as in Obstfeld and Rogoff (1995, 1996), the price adjustment that we are assuming implies that whatever value of net foreign assets arises at the end of the first period becomes the new steady-state level from the period after the shock onwards.

Table 1. The Log-linearized Domestic Economy

$\tilde{p} = \tilde{p}_G = n\tilde{p}(h) + (1-n)[\tilde{e} + \tilde{p}^*(f)]$	(15)
$\tilde{y} = \frac{\theta}{1+\lambda}\tilde{c}^w + \frac{\lambda}{1+\lambda}\tilde{g}^w + \frac{\theta}{1+\lambda}[\tilde{p} - \tilde{p}(h)] + \frac{\lambda}{1+\lambda}\eta[\tilde{p}_G - \tilde{p}(h)]$	(16)
$\hat{c} = \tilde{c} + \frac{\delta}{1+\delta}\tilde{r}$	(17)
$\tilde{m} - \tilde{p} = \tilde{c} - \frac{\tilde{r}}{1+\delta} - \frac{\hat{p} - \tilde{p}}{\delta}$	(18)
$\hat{m} - \hat{p} = \hat{c}$	(19)
$\hat{l} = \hat{y} = \hat{w} - \hat{c} - \hat{p}$	(20)
$\hat{b} = (1+\lambda)\tilde{y} - (1+\lambda)\tilde{p} - \tilde{c} - \lambda\tilde{g}$	(21)
$\hat{c} = \delta\hat{b} + (1+\lambda)\hat{y} + (1+\lambda)\hat{p}(h) - (1+\lambda)\hat{p} - \lambda\hat{g}$	(22)
$\hat{w} - \hat{p}(z) = \psi_1\hat{c}^w + \psi_2\hat{g}^w + \psi_3[\hat{p} - \hat{p}(h)]$	(23)
$\hat{e} = \tilde{p} - \tilde{p}^*$	(24)

Source: Author's calculations.

III. The Effects of Public Competition Policies

In this section we study how public competition policies affect the positive and normative results of the model in presence of asymmetric fiscal shocks. In order to do so, we provide some numerical results based on the reduced forms of the log-linearized model. Given the simple dynamics of the model, the economy reaches the new steady state in the period after the shock. In Section III(B) we show the response of domestic and foreign macroeconomic variables to an asymmetric fiscal shock, in which the log-deviation of domestic government spending is set to 1, and the one of foreign spending is set to 0. All shocks considered are permanent balanced-budget expansions. We compare the responses of the economy for different values of η.We interpret an increase in η as the implementation of global public competition policies.

A. Calibration of the Parameters

In our calibration, we follow Sutherland (1996) in setting β=1/1.05 and θ=6. The chosen value of β is consistent with a long-run real interest rate of about 5 percent.[9] We consider the case of symmetric countries, therefore *n=0.5.* The ratio of public to private consumption in the initial steady state is set at λ *=0.23*. In Section III(B) we report the responses of the

[9] Some sensitivity experiments showed that the qualitative responses of the variables are robust to changes in the value of β and of the other parameters.

main macroeconomic variables to an asymmetric fiscal shock for the above parameterization, for different values of η ranging from 1.1 to 100.[10] Since the long run is reached in the period after the shock, the graphs report the deviation from the initial steady state in the short run (when the shock hits) and in the following period, in which the economy reaches the new steady state.

B. Positive Effects

Figures 1 to 6 present the responses of domestic and foreign private consumption, domestic and foreign output, the exchange rate and net foreign assets held by domestic residents to an asymmetric domestic fiscal expansion, for different values of η. Comparing Figures 1 and 2, it is clear that our model preserves a standard NOEM result, even when the public and the private elasticities are allowed to differ: in the short run, the country that implements a balanced-budget fiscal expansion loses, in terms of relative private consumption, compared to the other country.[11] In the case of a domestic expansion, this happens through a fall in domestic consumption and an increase in foreign.

A novel result of our model is that an increase in the elasticity of substitution of government demand reduces the fall in relative private consumption. In the short run this happens through both a smaller fall of domestic consumption and a smaller increase in foreign. Foreign consumption is reduced by an increase in η both in the short and in the long run, with a more pronounced reduction in the flexible price periods. The response of domestic consumption is reduced in the long run, but becomes less negative in the short run, as a consequence of an increase in η. Although individual countries consumption profiles are tilted both by the fiscal shock and by changes in the government spending elasticity, these changes are consistent with the result of permanent effects on relative consumption, typical of NOEM models like the one we are using.[12]

Figure 1 and 2 show that an increase in the elasticity of public demand reduces the fall in relative consumption. The main mechanism at work behind this result is related to the increase in the degree of competition in the world economy brought about by an increase in η, as we explain in what follows. The standard reason for the fall in relative consumption in a NOEM model is that domestic residents are made poorer by the higher lump-sum taxes necessary to finance the increase in spending, while foreigners are better off because they get all the benefits of the policy, (i.e., the positive stimulation of demand), without having to bear extra tax costs. An increase in η reduces the degree of markup at all horizons, lowering firms' profit, that are redistributed to consumers as shares. This policy, therefore, also diminishes the benefits deriving from a fiscal expansion in terms of increased lifetime wealth

[10] A necessary condition for the government consumption index to be well defined is $\eta > 1$ (see equation 5).

[11] See Ganelli and Lane (2003).

[12] Formally, we have $\tilde{c} - \tilde{c}^* = \hat{c} - \hat{c}^*$, this can be proved using the domestic and foreign log-linearized Euler equations, that are not affected by changes in η.

deriving form higher redistributed profit shares. This effect contributes to reducing the asymmetry in benefits between domestic and foreign residents, generated by a domestic expansion. The reduction in this asymmetry explains why domestic relative consumption falls less as η increases. Although, as already stressed in Section II, prices are not set according to equation (14) in the short run due to nominal stickiness, the reduction in profits associated with a higher η in the flexible-price periods is also reflected in short-run decisions through the rational expectations mechanism.

Figures 3 and 4 illustrate the response of domestic and foreign output. In the case of output, unlike for consumption, short-run deviations from the initial steady state cannot be explained as consequences of wealth changes. This is due to the fact that, when prices are sticky, supply-side effects become irrelevant in the short run. The short-run changes in output are therefore mainly due to the expenditure switching effect that follows the exchange rate adjustment, that we now discuss in order to shed some light on the output effects. Using the Euler equations, the money demand equations and the purchasing power parity it is possible to show that the following relationship holds between short-run relative consumption and the exchange rate

$$\tilde{e} = -(\tilde{c} - \tilde{c}^*) \tag{25}$$

Equation (25) illustrates the following mechanism (already pointed out by Obstfeld and Rogoff 1995, 1996): when relative consumption decreases, so does the domestic money demand compared to the foreign and, in order to restore the equilibrium in the money market, the exchange rate has to depreciate ($\tilde{e}$ has to go up). Figure 5 shows this exchange rate response for our parameterization. By subtracting the long-run foreign demand equation from its domestic counterpart (equation 19) and using the PPP, with zero money shocks, we derive $(\hat{c} - \hat{c}^*) = -\hat{e}$. Combining the latter with equation (25) and with the result of permanent effects on relative consumption (see footnote 12), we can derive a no-overshooting result: the exchange rate jumps immediately to its more depreciated long-run value. While the latter result is standard in the NOEM framework, what matters most for our analysis are the effects of changes in η. Figure 5 illustrates how an increase in η, by reducing the fall in relative consumption, mitigates the nominal depreciation that follows a domestic fiscal shock.

The depreciation of the domestic currency and the subsequent expenditure switching effect can easily explain the results that the response of Home output is positive and the one of foreign output is negative in the short run. The result that an increase in η magnifies these effects (see Figures 3 and 4), however, seems at odds with the fact that increasing η also reduces the depreciation of the exchange rate. The contradiction between these two outcomes is, nonetheless, only apparent. The key to understanding how an increase in η can generate both a less depreciated exchange rate and a larger gap between domestic and foreign output is in noticing how the private and public elasticities (θ and η), enter as differentiated parameters in the demand equation (16) and in its analogous expression for the foreign country. This implies that, subtracting the foreign analogous from equation (16), and making

use of the PPP and of the one period price-rigidity assumption, we can derive the following short-run relationship between relative output and the exchange rate.

$$\tilde{y} - \tilde{y}^* = \frac{1}{1+\lambda}(\theta + \lambda\eta)\tilde{e} \tag{26}$$

As η increases worldwide, due to the higher competitive pressure imposed on firms by the domestic and foreign governments, the degree of substitutability between goods purchased by the governments also increases. In absence of home bias in government expenditure, this means that, with a higher η, the same exchange rate variation can sustain larger shifts in relative demand for goods, and therefore in output. The latter effect is formally expressed by the fact that an increase in η increases the response of $\tilde{y} - \tilde{y}^*$ to $\tilde{e}$ in equation (26). Intuitively, this mechanism reconciles the effects of an increase in η on the exchange rate (a reduced depreciation, i.e., a less pronounced increase in $\tilde{e}$) and on short-run domestic and foreign output (a bigger expenditure switching effect), highlighted in Figures 3, 4, and 5.

Since prices are flexible in the long run, long-run responses of output, unlike short-run ones, can be explained by supply-side factors. This means that the fall in domestic output and the increase in foreign output in the long run, showed in Figures 3 and 4, can be interpreted as deriving respectively from an increase and a fall in the demand for leisure by domestic and foreign residents. An increase in η magnifies those responses, pushing domestic agents to consume more leisure and foreigners to consume less. The decision to work less and enjoy more leisure is affected by the lifetime wealth of the individuals. It is therefore useful, in order to understand the above effects, to look at the response of net foreign assets, that links the short-run and long-run dynamics of the model.

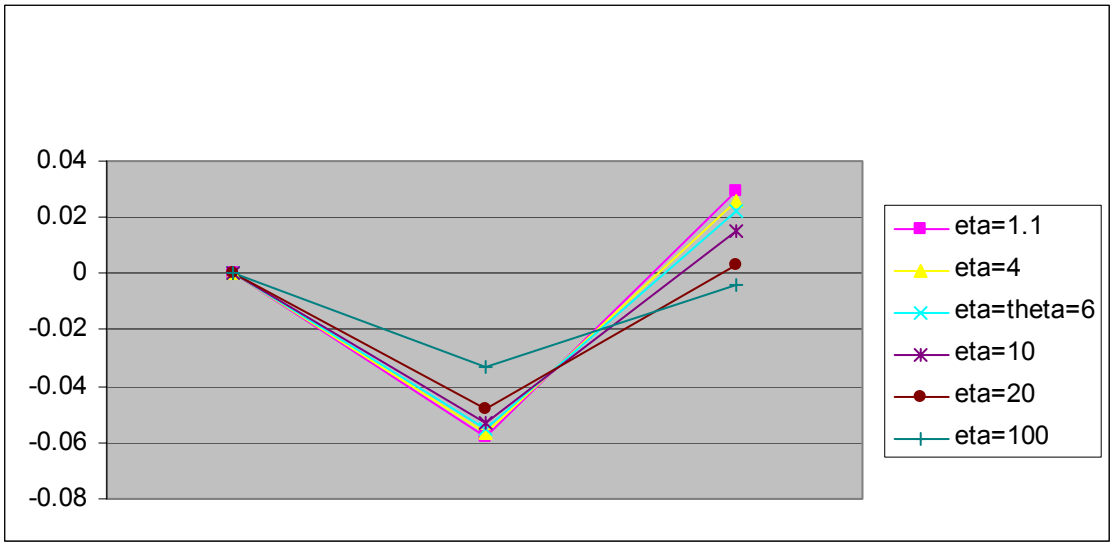
Figure 6 reports the response of net foreign assets held by domestic residents to an asymmetric fiscal shock. As already mentioned above (see footnote 11), the one-period price stickiness implies that the value of net foreign assets that arises at the end of the first period becomes the new steady-state level from the period after the shock onwards. The increase in net foreign assets is a consequence of the fact that relative consumption falls and relative output increases in the short run. The effect of a higher η in Figure 6 is to increase the amount of net foreign assets held by domestic residents. This is consistent with the short-run impact on relative output and consumption of a higher η, already stressed above. The Home country accumulates more assets and the Foreign country accumulates more liabilities as a consequence of the introduction of public competition policies, because domestic firms tend to increase their short-run output, in response to higher demand, as η increases.[13]

The asymmetric wealth accumulation that follows domestic fiscal shocks explains why domestic output falls and foreign output increases in the long run. The latter results should be

[13] This result is also reinforced, of course, by the opposite behavior of foreign firms.

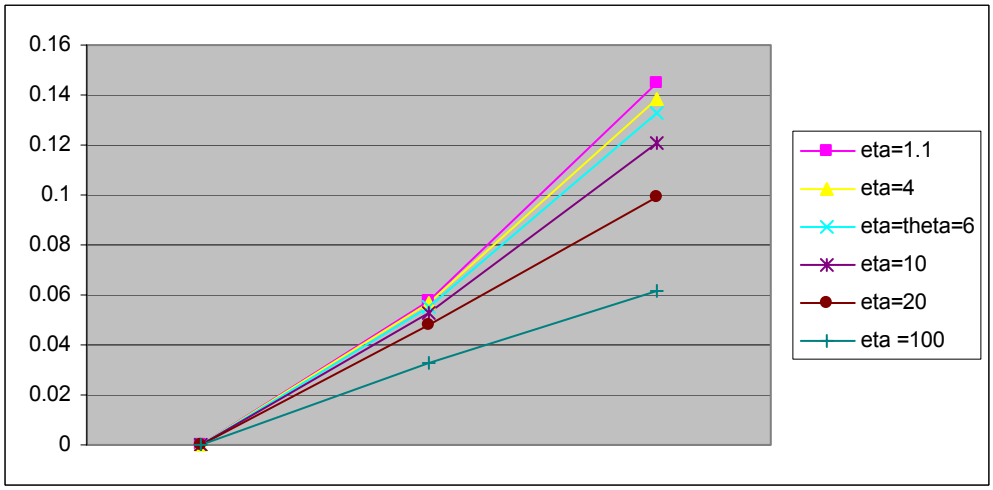
interpreted as increased consumption of leisure by domestic residents and reduced consumption of leisure by foreigners, stemming from changes in lifetime wealth. The effect of the increase in net foreign assets showed in Figure 6 is strong enough to counterbalance the negative wealth effects for domestic agents, deriving form the fact that, in the long run as well as in the short run, they will have to pay taxes to finance the fiscal expansion. The effects of changes in η on long-run output, showed in Figures 3 and 4, are consistent with the intuition that output moves mainly in response to the accumulation of net foreign assets in the periods in which prices are flexible: for domestic residents a higher η implies higher net foreign assets, and therefore a reduced labor supply in the long run (and vice versa for foreign residents).

Figure 1. Effect of a Domestic Fiscal Shock on Domestic Private Consumption



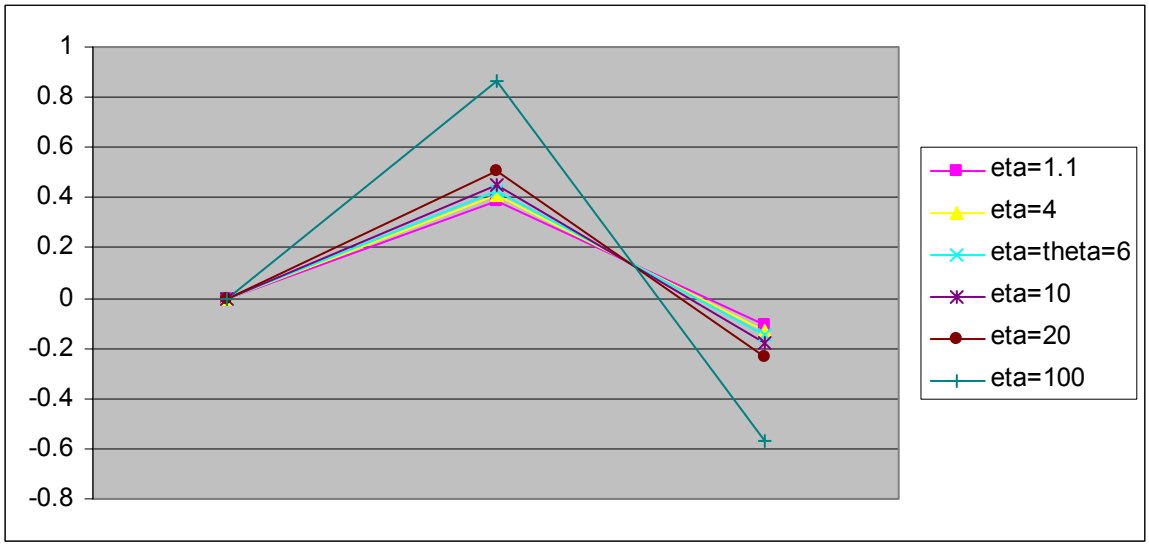
Source: Author's calculations.

Figure 2. Effect of a Domestic Fiscal Shock on Foreign Private Consumption



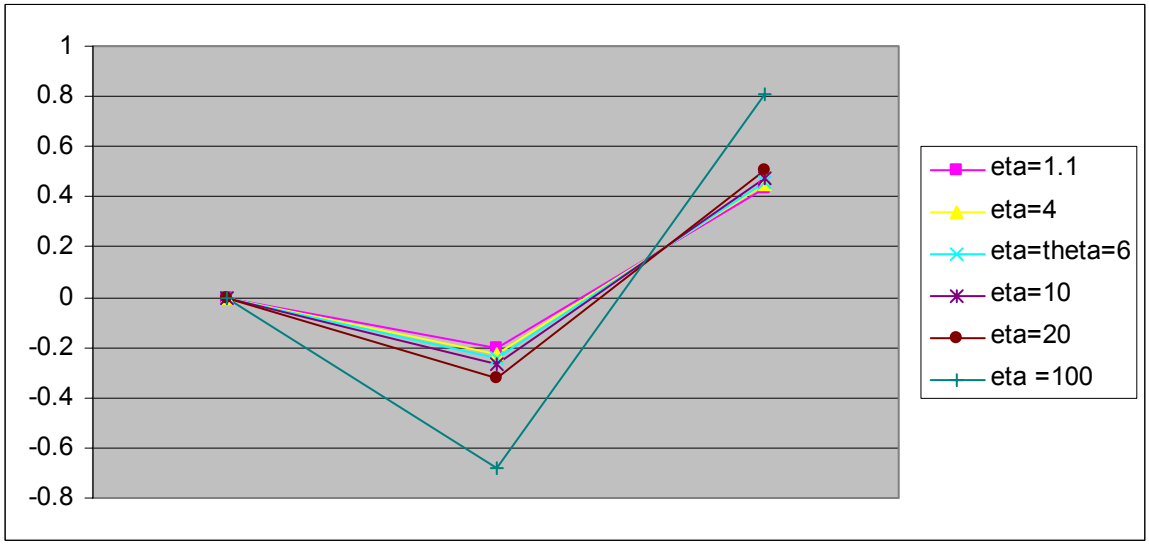
Source: Author's calculations.

Figure 3. Effect of a Domestic Fiscal Shock on Domestic Output



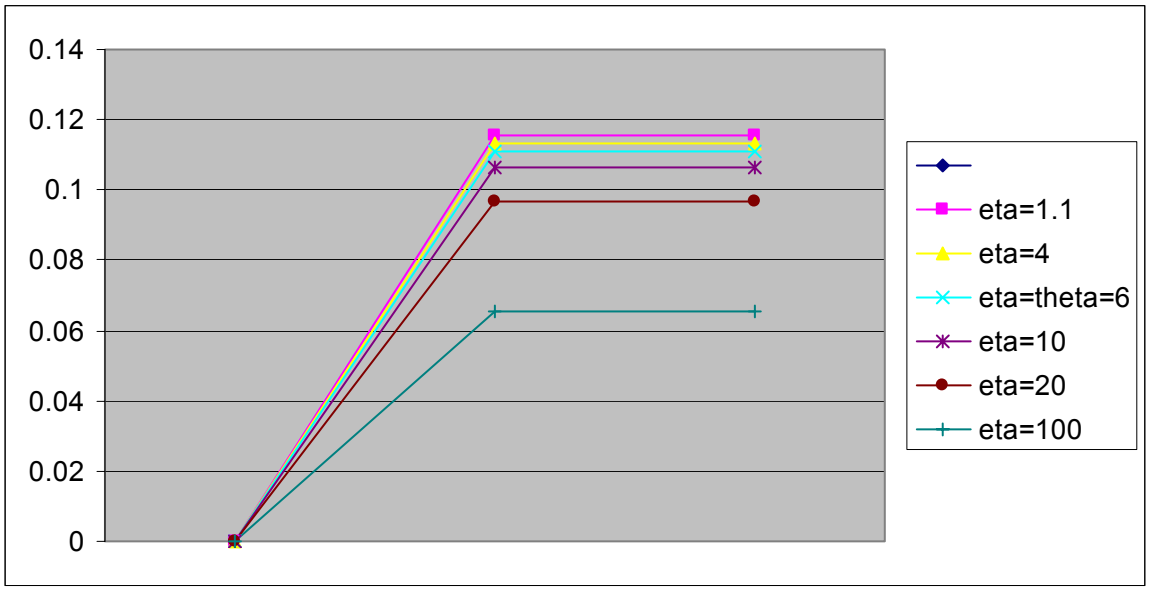
Source: Author's calculations.

Figure 4. Effect of a Domestic Fiscal Shock on Foreign Output



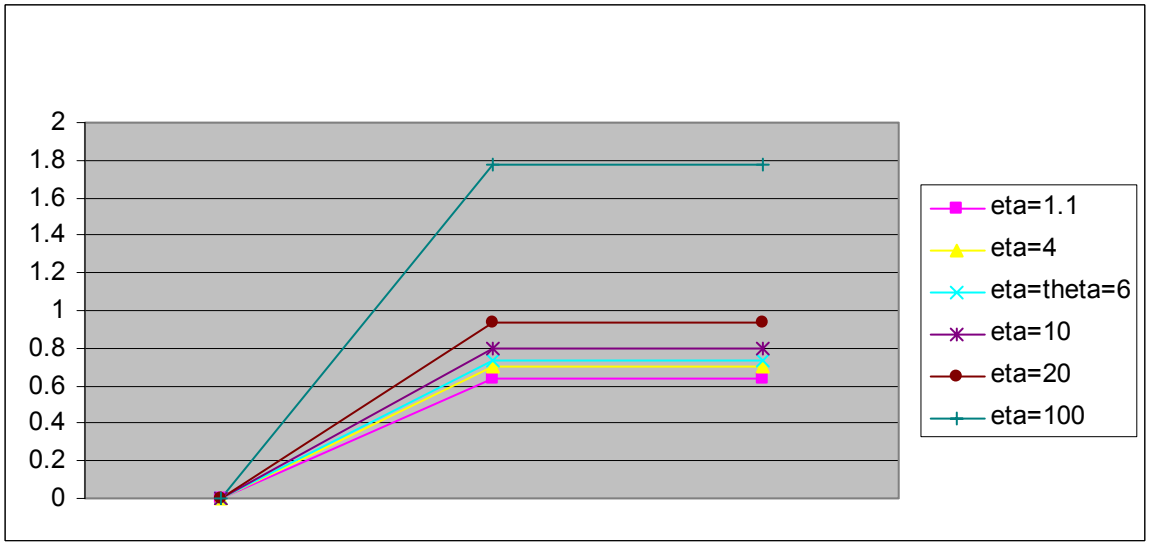
Source: Author's calculations.

Figure 5. Effect of a Domestic Fiscal Shock on the Exchange Rate



Source: Author's calculations.

Figure 6. Effect of a Domestic Fiscal Shock on Net Foreign Assets



Source: Author's calculations.

IV. Welfare Effects

Obstfeld and Rogoff (1995) have emphasized how taking output as an indicator of welfare can be misleading in an open economy, in which output and consumption movements are not

necessarily correlated. Furthermore, with an endogenous labor supply the welfare enhancing role of leisure time also needs to be taken in to account. One of the main advantages of using a microfounded framework is the possibility to carry out normative analysis based on a rigorous welfare metric.

This is particularly useful for our analysis, since the positive effects of fiscal policy shocks and of public competition policies (increases in η) discussed in the previous section have divergent welfare implications. The reduction in domestic private consumption relative to foreign and the increase in short-run relative output (i.e., reduction in relative leisure), for example, imply a reduction in domestic welfare compared to foreign welfare. In the long run, on the other hand, domestic output falls and foreign output increases following a domestic fiscal shock. The increase in leisure associate with these long-run output movements could counterbalance the negative effect deriving from the reduction in relative consumption. The implication of increasing η are also not clear if they are not added up together in a welfare metric. A higher η, for example, makes the response of domestic consumption less negative in the short run, but reduces the positive consumption response in the long run (see Figure 1), with contrasting effects on welfare.

In Table 2 we report the overall welfare changes both in the domestic and in the foreign countries following a domestic fiscal shock, for the different values of η considered in our experiments in Section III. As customary in this literature, we assume that the welfare effects of changes in real balances are negligible and we focus on changes in the real components of the utility function (1). The values reported in Table 2 are calculated as follows :

$$welfare = \frac{dU^R}{U^R_{SS}} \tag{27}$$

where U^R_{SS} is lifetime real utility calculated at the initial preshock steady state and dU^R is obtained by totally differentiating (1). Taking in to account that the new steady is reached in the period after the shock, we have :

$$dU^R = \tilde{c} - kY_{SS}{}^2 \tilde{y} + \frac{1}{\delta}(\hat{c} - kY_{SS}{}^2 \hat{y})$$

The welfare effects reported in Table 2 correspond to a parameterization equal to the one used in Section III, and a value of k=0.1.

Table 2. Welfare Effects of a Domestic Fiscal Shock

	Home	Foreign
$\eta = 1.1$	0.25	-0.59
$\eta = 4$	0.29	-0.65
$\eta = \theta = 6$	0.32	-0.70
$\eta = 10$	0.37	-0.77
$\eta = 20$	0.50	-0.93
$\eta = 100$	1.35	-1.84

Source: Author's calculations.

Table 2 shows that the overall welfare effect of a domestic fiscal shock is positive for the domestic country and negative for the foreign country. This numerical example suggests that the long run-gains in leisure enjoyed by the domestic country relative to the foreign can more than offset the decrease in relative consumption. Table 2 also shows that increasing η unambiguously magnifies the results, increasing the positive response of domestic welfare and the negative response of foreign welfare. The implementation of public competition policies has an overall positive effect on domestic utility because the reduced fall in short-run consumption and the increased leisure in the long run more than offset the negative utility deriving from such policies, like the fall in long-run consumption and the increase in short-run output. For the foreign country, the opposite is true.

The findings that overall home agents gain and foreigners lose when the domestic country expands contrasts with Obstfeld and Rogoff claim that "overall Foreign benefits and Home loses when Home's government spends more" (Obstfeld and Rogoff, 1996, p.706). While this is undoubtedly true if we only take in to account relative consumption movements, our analysis shows that Obstfeld and Rogoff's (1996) conclusion does not necessarily carries on to our model for realistic parameters values. Furthermore, increases in η are likely to widen the welfare differential between the two countries.

V. CONCLUSIONS

This paper focuses on the implications of structural reforms implemented by governments with the aim of improving the efficiency of public spending. We model such public competition policies as increases in the price elasticities of government consumption. Examples of such policies are measures which reduce the degree of monopolistic power enjoyed by private firms when dealing with the government, such as the introduction of competitive tenders for the provision of certain goods and services. Switching from volume to value planning of public spending (as in the United Kingdom in the late 1970s) can also be interpreted as an attempt to reduce the degree of monopolistic distortion in the economy.

The analysis of the implications of fiscal policy in the paper moves along two dimensions: the effects of fiscal expansions, and those of public spending efficiency-enhancing measures. In particular, we focus on how the implementation of public competition policies changes the cross-country interdependence pattern that follows a fiscal expansion in the domestic

country. In doing so, we illustrate how the main domestic and foreign variables respond to a balanced-budget increase in government spending, and how those responses change following the implementation of efficiency-enhancing measures.

Our results are consistent with the standard finding, in the NOEM literature, that in the short run, the country that implements a balanced-budget fiscal expansion loses, in terms of relative (domestic minus foreign) private consumption, compared to the other country. The basic intuition behind this result is that the wealth effects of this policy are asymmetric. When only the domestic country expands, domestic residents bear all the costs of the policy in terms of higher taxes, while foreigners get all the benefits of the policy (the positive stimulation of demand), without having to share the tax costs. A novel implication of our analysis is that the implementation of public competition policies reduces the fall in relative private consumption. This is explained by the fact that a reduction in the level of monopolistic distortion in the economy mitigates the asymmetric effects of domestic fiscal expansions.

Our analysis has also important implications for the response of the exchange rate and of relative output. An increase in the price elasticity of public consumption increases the degree of substitutability between goods purchased by the domestic and the foreign governments. This means that the same exchange rate variation can sustain larger shifts in relative demand for goods. The expenditure-switching effect is therefore magnified, implying a larger change in relative output.

The fact that we are using a microfounded model allows a rigorous welfare analysis. Since the representative agent utility function provides a rigorous welfare metric, we can add up the effects of changes in macroeconomic variables to see how they impact agents' welfare. We consider the possibility of going beyond movement in output, as indicators of welfare, as a key advantage of microfounded models when compared to their ad hoc predecessors. This is particularly true in an open economy, where output and consumption movements are not necessarily correlated. Furthermore, the endogenous labor supply approach also allows us to take into account the welfare enhancing role of leisure time.

In our normative analysis, we find that the short-run negative effects on domestic welfare are reversed in the long run. The overall effect of a domestic fiscal expansion is an increase in relative (domestic minus foreign) welfare. Furthermore, public competition policies tend to widen the gap between the country that expands and the other country. A way of interpreting our welfare results is that countries with a larger government sector should have an incentive to promote the implementation of structural reforms of public spending.

REFERENCES

Blanchard, O.J., and N. Kiyotaki, 1987, "Monopolistic Competition and the Effects of Aggregate Demand," *American Economic Review*, Vol. 77, pp. 647–66.

Dixon, H., and N. Rankin, 1995, *The New Macroeconomics: Imperfect Markets and Policy Effectiveness*, (Cambridge: Cambridge University Press).

Gali, J., 1994, "Monopolistic Competition, Business Cycles and the Composition of Aggregate Demand," *Journal of Economic Theory,* Vol. 63, pp. 73–96.

Ganelli, G., 2003, "Useful Government Spending, Direct Crowding-Out and Fiscal Policy Interdependence," *Journal of International Money and Finance*, Vol 22 (1), pp. 87–103.

———, 2004, "The New Open Economy Macroeconomics of Government Debt," forthcoming in the *Journal of International Economics.*

———, and P. R. Lane, 2003, *Dynamic General Equilibrium Analysis: The Open Economy Dimension*, S. Altug, S., Chadha, J., Nolan, C. (Eds.), Dynamic Macroeconomic Analysis, (Cambridge University Press).

Obstfeld, M., and K. Rogoff, 1995, "Exchange Rate Dynamics Redux," *Journal of Political Economy ,* Vol. 103, pp. 624–660.

———, 1996, *Foundations of International Macroeconomics*, Chapter 10, (Cambridge: MIT Press).

Rotemberg, J., and Woodford, M., 1992, "Oligopolistic Pricing and the Effects of Aggregate Demand on Economic Activity," *Journal of Political Economy*, Vol.100, pp. 1153–1207.

Sutherland A., 1996, "Financial Market Integration and Macroeconomic Volatility," *Scandinavian Journal of Economics* ,Vol. 98, pp. 521–39.