1 Introduction

In recent years, both the real business cycle and the New Keynesian literature have devoted a great attention towards studying the effectiveness of fiscal policy in a flexible price environment.[1] While real business cycle theorists have concentrated upon the intertemporal substitution effects on labour supply - an increase in public expenditure raises the interest rate and makes current income more attractive than future income - New Keynesians have identified two transmission mechanisms in which the assumption of imperfect competition plays indeed the crucial role. The first mechanism relies on the multiplier effects of a balanced budget expansion generated by monopoly profits on the labour supply and consumption decisions (Dixon (1987), Dixon and Lawler (1996), Heijdra and van der Ploeg (1996)). The second works through the possibility that fiscal policy actually affect the firms' market power (Pagano (1990), Jacobsen and Schultz (1994)) - by changing the desired price-over-marginal-cost ratio, fiscal policy may induce an increase in the firms' desired level of employment at any real wage.

The aim of this paper is to investigate the technological and demand conditions under which this latter transmission mechanism is actually effective. It is a standard tenet of the literature in this field that an increase in public demand is expansionary when it is associated to a reduction in the desired mark-up, at any level of output. Indeed, under decreasing returns, an increase in the demand elasticity, which reduces the desired price-over-cost margin for any level of output, increases the desired amount of employment at any real wage. This amounts to saying that a downward sloping labour demand curve shifts outwards and the equilibrium employment increases[2] (Lindbeck and Snower (1994), Dixon and Rankin (1994)). This effectiveness result has been extended by D'Aspremont *et al.* (1995), who show that fiscal policy can be expansionary also under increasing returns, provided that it reinforces, rather than counteracts, the firms' market power - if the labour demand schedule is positively sloped, it is a decrease in demand elasticity, a widening of the price-cost margin, which is required to induce firms to expand employment at any real wage.

In this paper we develop a microfounded macroeconomic model with monopolistic competition, in which the firms' market power depends on the relative weight of the public and private components of aggregate demand - a situation which arises whenever firms face both a public and a private demand for their products, characterized by different price elasticities. Clearly, in this case a fiscal expansion causes an overall increase (decrease) in the demand elasticity at any level of output if public demand is more (less) elastic than private demand.

This simple framework allows us to extend the range of situations in which fiscal policy has a positive impact on employment and output, as compared with those identified in the existing literature. In particular, we show that there exists a range of technological conditions - from moderately decreasing to moderately increasing returns, including the constant case - in which fiscal policy is expansionary, independently of the sign of its impact effect on demand elasticity. The economic intuition behind this result is in the 'derived' nature of the

[1] For an assessment of the real business cycle approach to this issue, see Plosser (1989); the contributions in the New Keynesian perspective are reviewed in Silvestre (1993, 1995), Dixon and Rankin (1994) and Benassi et al. (1994).

[2] This result holds true when the labour supply is not inelastic.

labour demand (price-setting) schedule: since it is based on the equality between the marginal revenue product of labour and the real wage, its being positively or negatively sloped depends, under imperfect competition, not only on labour marginal productivity, but also on the behaviour of demand elasticity along the firms' product demand function. This latter effect may actually dominate the technological one, inducing an effect of 'slope reversal' (Gali, 1994b, p.749). In this framework, the same conditions on structural parameters, which guarantee that a fiscal expansion increases or decreases the elasticity of demand, may generate a reversal of the slope of the labour demand schedule, in the direction required for the policy to be expansionary

Our discussion is organized as follows. In section 2 we develop our basic model. Section 3 is devoted to the analysis of the effectiveness of fiscal policy through the transmission mechanism based on elasticity and the composition of demand. We provide also a quantitative and qualitative evaluation of the behaviour of the fiscal multiplier derived in this set-up. In section 4 some possible extensions of the analysis are considered, while brief remarks and conclusions are gathered in section 5.

2 The basic set-up

We consider a simple monetary economy where households, firms and the government interact in the goods, labour and money market. The labour market is assumed to be competitive, while firms are monopolistic competitors in the goods market. Output is a composite good, made of n varieties. Each variety is supplied by a single firm, by means of labour only. We adopt a short run perspective, by taking the number of firms (varieties) as given. Both households and the government demand output, though the public and private demands faced by any firm are characterized by different demand elasticities.

2.1 The Households' Behaviour

We assume that the economy is populated by a large number of identical households, so that their aggregate behaviour can be formalized in terms of a single representative competitive household. Its objective function U is defined over consumption of the composite good, C, real money balances, M/P, and labour supply, L. We shall refer to a convenient, explicit, formulation of this utility function, which satisfies the usual concavity and differentiability properties: in order to rule out any income effect on labour supply, we assume that U is additively separable with respect to labour, and homogeneous of degree one in consumption and real money balances. Moreover, we assume that utility is linear in labour and that aggregate consumption is a CES function of the consumption of n varieties of output, C_i , $i = 1, 2, ..., n$:

$$U\left(C, \frac{M}{P}, L\right) = C^{\beta}\left(\frac{M}{P}\right)^{1-\beta} - \theta L, \qquad 0 < \beta < 1 \tag{1}$$

$$C = n^{\frac{1}{1-\rho}}\left[\sum_{i=1}^{n} C_i^{\frac{\rho-1}{\rho}}\right]^{\frac{\rho}{\rho-1}}, \qquad \rho > 1 \tag{2}$$

where θ is the constant marginal disutility of labour, and ρ is the household's elasticity of substitution between any two varieties. The price P of the consumption bundle (output) is given, consistently with the structure of the household's preferences, by the following function of the prices of the n varieties:

$$P = \left[\frac{1}{n} \sum_{i=1}^{n} P_i^{(1-\rho)} \right]^{\frac{1}{1-\rho}}. \tag{3}$$

The household maximizes (1) subject to the budget constraint:

$$\sum_{i=1}^{n} P_i C_i + M = WL + \Pi - Z + \overline{M},$$

where WL is nominal labour income, Π denotes nominal profits, Z taxes in nominal terms and $\overline{M}$ the initial endowment of money.

Given the definitions (2) and (3), the solution to the household's maximization problem generates the following demand for variety i:

$$C_i = \left(\frac{P_i}{P} \right)^{-\rho} \frac{C}{n}, \tag{4}$$

and optimal values for C, M, and L, which satisfy:

$$PC = \beta \left(WL + \Pi - Z + \overline{M} \right), \tag{5}$$

$$M = (1-\beta) \left(WL + \Pi - Z + \overline{M} \right), \tag{6}$$

$$\frac{W}{P} = \frac{\theta}{\beta^{\beta} (1-\beta)^{(1-\beta)}} \equiv \nu, \qquad if \quad L < \overline{L} \tag{7}$$

$$L = \overline{L}, \qquad if \quad \frac{W}{P} > \frac{\theta}{\beta^{\beta} (1-\beta)^{(1-\beta)}}, \tag{7 bis}$$

where $\overline{L}$ is the total endowment of labour time. Notice that the labour supply function takes a reversed L shape, being horizontal at the reservation wage ν, for $L < \overline{L}$.

2.2 The Government

The n goods produced in the economy are demanded not only by the private sector, but also by the government, which entirely finances its expenditure with lump-sum taxation. In modelling the government behaviour, we follow Heijdra (1998) by assuming that the government sets public expenditure in real terms in order to generate an amount G of a public good, which is obtained by using all n varieties according to the following CES function:

$$G = n^{\frac{1}{1-\gamma}} \left[\sum_{i=1}^{n} G_i^{\frac{\gamma-1}{\gamma}} \right]^{\frac{\gamma}{\gamma-1}}, \qquad \gamma > 1 \tag{8}$$

where γ is the elasticity of substitution.The main additional assumption we introduce in this paper is that this elasticity of substitution is different from that of the private sector. Once a level of public expenditure G has been chosen, the government, which behaves competitively on the goods market, chooses the quantity of each good G_i to be purchased, in order to minimize nominal expenditure, i.e. the cost of production of the amount G of the public good. Therefore we have the following dual problem:

$$\text{Min } \sum_{i=1}^{n} P_{iG} G_i$$
$$\text{subject to } n^{\frac{1}{1-\gamma}} \left[\sum_{i=1}^{n} G_i^{\frac{\gamma-1}{\gamma}} \right]^{\frac{\gamma}{\gamma-1}} = G,$$

where P_{iG} is the price paid by the government for good i (which in principle might differ from that paid by the private sector). The solution for each G_i is the following demand function

$$G_i = \left(\frac{P_{iG}}{P_G} \right)^{-\gamma} \frac{G}{n}, \tag{9}$$

where P_G is the aggregate price index defined consistently with equation (8)[3]

$$P_G = \left[\frac{1}{n} \sum_{i=1}^{n} P_{iG}^{(1-\gamma)} \right]^{\frac{1}{1-\gamma}}.$$

2.3 The firms

On the production side, we assume that n monopolistically competitive firms produce, by means of labour only, the n goods that enter the private and public consumption bundles. Though each firm i produces a single good, Y_i, which is an imperfect substitute of all the others, we assume that the production function is identical for all goods and given by:

$$Y_i = L_i^{\alpha}, \qquad \alpha > 0 \tag{10}$$

where L_i is the amount of labour employed by firm i. We do not impose *a priori* any further restriction on the parameter α, which determines the prevailing returns to scale.[4]

On the basis of the optimal household's and government's decisions, we can write the following demand function faced by firm i:

$$Y_i^d = C_i + G_i = \left(\frac{P_i}{P} \right)^{-\rho} \frac{C}{n} + \left(\frac{P_{iG}}{P_G} \right)^{-\gamma} \frac{G}{n}. \tag{11}$$

[3] It can be checked that the solutions (9) and the price index P_G are such that by substituting them into the government objective function $\sum_{i=1}^{n} P_{iG} G_i$, we obtain $\sum_{i=1}^{n} P_{iG} G_i = P_G G$.

[4] In (10) increasing returns to scale are conceived of as increasing returns to labour. We adopt this simplifying assumption in order to evaluate the impact of technological conditions on the optimal behaviour of firms in the labour market through one single parameter. It is worth stressing right now that similar behavioural relations could be obtained by solving a more articulated model in which returns to scale are evaluated with respect to both labour and capital. See also Manning (1990, 1992).

Notice that two relative prices appear in (11), P_i/P and P_{iG}/P_G. However, we assume that firms are not able to discriminate between the private and the public sector, so that the price charged must be the same and $P_i = P_{iG}$, for all i. Since the market is characterized by monopolistic competition, each firm chooses this price in order to maximize nominal profits, given the demand function (11), the production function (10), and the aggregate price indices, P and P_G. The nominal wage is taken as given, under the assumption of perfect competition on the labour market. The restriction that both γ and ρ - which turn out to be also the elasticity of public and private demand for good i with respect to its relative price - be greater than one, guarantees that the firm's optimization problem is well-defined for any composition of demand.

Profit maximization entails the following first order condition:[5]

$$P_i\left(1-\frac{1}{\epsilon_i}\right)=\frac{W}{\alpha L_i^{(\alpha-1)}}, \tag{12}$$

where $\epsilon_i = \rho + (\gamma - \rho)\, G_i/Y_i^d$ is the price elasticity of firm i's demand. The latter is a weighted average of the elasticity of private and public demand, where the weights are the share of each component in total demand.[6] Notice that the definition of ϵ_i makes it clear that, though private and public demand are isoelastic, the elasticity of the overall demand schedule faced by firm i is not constant.

2.4 The symmetric macroeconomic equilibrium

Since all firms face identical demand functions and are subject to the same technological constraint, their optimal price must be the same. This also implies that under symmetry the two price indexes, P and P_G, coincide:

$$P_G = P. \tag{13}$$

Therefore, all firms face the same level of private consumption, the same level of public consumption, and *a fortiori* the same level and composition of demand. This implies that the elasticity of demand in the firm's symmetric equilibrium can be written as:

$$\epsilon_i = \epsilon = \rho + (\gamma - \rho)\,\frac{\widetilde{G}}{\widetilde{Y^d}}, \tag{14}$$

where we denote with $\widetilde{\ }$ the per capita value of the relevant variable, and $\widetilde{Y^d} = \widetilde{C} + \widetilde{G}$. Moreover, under symmetry each firm employs $1/n$ of total employment; therefore, by evaluating (12) in the symmetric equilibrium and by using (13) and (14) we obtain:

$$\frac{W}{P} = \alpha\widetilde{L}^{\alpha-1}\left(1-\frac{1}{\epsilon}\right) = \alpha\widetilde{L}^{\alpha-1}\left[1-\left(\rho+(\gamma-\rho)\,\frac{\widetilde{G}}{\widetilde{Y^d}}\right)^{-1}\right]. \tag{15}$$

[5] Since we have imposed no restrictions on technology, we specify the following requirement for the second order conditions to be satisfied at the optimal solution: $\frac{1}{\alpha} > 1 - \frac{1}{\epsilon_i}$.

[6] Gali (1994a) studies a model where the two components of aggregate demand characterized by different elasticity are private consumption and investment.

This equation is generally called the *price-setting* (PS) *schedule*. It shows the relation between the firms' desired level of employment and the real wage at the firms' symmetric optimum. To close our macro model we notice that under symmetry,

$$Y = n\widetilde{Y} = n\widetilde{L}^{\alpha}. \tag{10'}$$

By using (5), aggregate demand is

$$Y^d = C + G = \beta\left(Y - T + \frac{\overline{M}}{P}\right) + G, \tag{16}$$

where T denotes real taxes. Equations (7-7bis), (10'), (15) and (16) determine the equilibrium levels of L, Y, W/P, P, given the exogenous policy variables M, G and T. Notice that, were the relative price elasticity of public and private demand equal, $\gamma = \rho$, then the system would exhibit the standard dichotomy property associated with full wage and price flexibility: equations (7), (10') and (15) would determine L, Y, and W/P, independently of the demand variables M, G and T.[7] The essence of the elasticity transmission mechanism, however, is that if $\gamma \neq \rho$, then the real policy variable G actually enters the price-setting rule; it may therefore affect output and employment by changing the firms' desired mark-up.

3 The elasticity transmission mechanism and the properties of technology

It is clear from the above that the key equation of the model is the price-setting schedule (15). Provided an equilibrium exists at $L < \overline{L}$, an increase in employment might occur, if an increase in public expenditure induces the firms to employ a greater amount of labour at the reservation wage ν. Figure 1 shows that this requires an upward shift of the PS schedule through a reduction in the desired price-over-cost margin when the PS schedule is downward sloping, and a downward shift of the curve *via* an increase in the desired mark-up when the PS is upward sloping.

This suggests that preliminary to any study of the pro- or counter-cyclical impact of public expenditure on the desired mark-up, is the analysis of the slope of the PS schedule.

INSERT FIGURE 1 ABOUT HERE

3.1 The slope of the PS schedule

First, we notice that equation (14) con be written as:

$$\epsilon\left(\widetilde{G}, \widetilde{L}\right) = \rho + (\gamma - \rho)\frac{\widetilde{G}}{\widetilde{L}^{\alpha}},$$

[7] We recall that the structure of the household's preferences is such that any effect on the labour supply is ruled out.

where we stress the dependence of ϵ on $\widetilde{G}$ and $\widetilde{L}$, generated by the difference in the elasticities of public and private demands. We denote now with $r\left(\widetilde{G},\widetilde{L}\right)$ the firm's real marginal revenue under symmetry or, in other terms, the inverse of the equilibrium mark-up of price over marginal costs:[8]

$$r\left(\widetilde{G},\widetilde{L}\right)=\left(1-\frac{1}{\epsilon\left(\widetilde{G},\widetilde{L}\right)}\right).$$

This allows us to reformulate conveniently the PS schedule as:

$$\omega=\frac{W}{P}=\alpha\widetilde{L}^{\alpha-1}r\left(\widetilde{G},\widetilde{L}\right), \tag{17}$$

and the elasticity of ω with respect to $\widetilde{L}$ is

$$\frac{d\omega}{d\widetilde{L}}\frac{\widetilde{L}}{\omega}=(\alpha-1)+\eta_{r\widetilde{L}}\left(\widetilde{G},\widetilde{L}\right),$$

where $\eta_{r\widetilde{L}}\left(\widetilde{G},\widetilde{L}\right)=\left(-\alpha\left(\gamma-\rho\right)\widetilde{G}/\widetilde{L}^{\alpha}\right)/\epsilon\left(\epsilon-1\right)$ is the elasticity of the real marginal revenue with respect to labour.

Notice that the elasticity of the price-setting schedule is the sum of the elasticity of the marginal productivity of labour function and the elasticity of the real marginal revenue with respect to labour. Should r be constant (which is the case when $\gamma=\rho$), the latter would be zero, and the elasticity of the PS curve would depend on the returns to scale only. But in this set-up r is not a constant; rather, it depends on $\widetilde{G}$ and $\widetilde{L}$, the sign of these relations depending on the sign of $(\gamma-\rho)$. Therefore the quantitative and qualitative behaviour of the elasticity of the PS schedule for different values of $\widetilde{L}$ depends not only on the returns to scale, but also on $\widetilde{G}$ and the difference between the elasticity of public and private demand.

In particular, the PS schedule will be upward or downward sloping according to the sign of $(\alpha-1)+\eta_{r\widetilde{L}}\left(\widetilde{G},\widetilde{L}\right)$. As for the latter, $(\alpha-1)$ is obviously negative under decreasing returns to scale and positive under increasing returns; $\eta_{r\widetilde{L}}\left(\widetilde{G},\widetilde{L}\right)$ is negative if $\gamma>\rho$, i.e. if the elasticity of public demand is greater than the elasticity of private demand, and positive in the opposite case. Therefore the PS is unambiguously downward sloping if $\gamma>\rho$, and returns to scale are non-increasing; it is unambiguously upward sloping if $\gamma<\rho$, and returns to scale are non-decreasing.

However, the interaction between the technological and elasticity effect on the shape of the PS may be such that, for given $\widetilde{G}$, we may observe a downward sloping PS curve with (moderately) increasing returns, provided that public demand is more elastic than private demand to such an extent that the mark-up factor strongly decreases as $\widetilde{L}$ decreases, thus increasing $\widetilde{G}/\widetilde{L}^{\alpha}$. Similarly, we may observe an upward sloping PS curve with (moderately) decreasing returns, provided that public demand is less elastic than private demand to such an extent that the mark-up factor strongly increases as $\widetilde{L}$ decreases, thus increasing $\widetilde{G}/\widetilde{L}^{\alpha}$

[8] Notice that $(1-r)$ is the Lerner index of monopoly power.

We may conclude that, if the mark-up is very sensitive to the composition of demand, the sign of the firms' desired employment-real wage relation may depend on the properties of the demand side of the model. Needless to say, in the case of constant returns to scale, frequently referred to in the literature, the shape of the PS curve is entirely determined by the behaviour of the real marginal revenue.

3.2 The effects of fiscal policy

We now study the comparative statics of our macro-model, by concentrating upon changes in public demand. We notice that the sub-system (7-7bis) and (17) is sufficient to evaluate the effectiveness of G on employment. In particular, we now want to derive explicitly an employment multiplier, which the properties of the model make it more convenient to formulate in terms of elasticity.

Assume again that an equilibrium obtains at $L^* = n\widetilde{L^*} < \overline{L}$.[9] Clearly, at this equilibrium,

$$F\left(\widetilde{G}, \widetilde{L}^*\right) = \alpha \left(\widetilde{L}^*\right)^{\alpha-1} r\left(\widetilde{G}, \widetilde{L}^*\right) - \nu = 0,$$

implicit differentiation of which gives:

$$\frac{d\widetilde{L^*}}{d\widetilde{G}} = -\frac{\dfrac{\partial F}{d\widetilde{G}}}{\dfrac{\partial F}{\partial\widetilde{L^*}}} = -\frac{\dfrac{\omega}{\widetilde{G}}\eta_{r\widetilde{G}}}{\dfrac{\omega}{\widetilde{L^*}}\left[(\alpha-1)+\eta_{r\widetilde{L}}\right]}, \tag{18}$$

where $\eta_{r\widetilde{G}} = \left((\gamma-\rho)\widetilde{G}/\widetilde{L}^{\alpha}\right)/\epsilon(\epsilon-1)$

By using the definition of $\eta_{r\widetilde{L}}$, we can reformulate (18) in terms of elasticity:

$$\eta_{\widetilde{L}\widetilde{G}} = \frac{d\widetilde{L^*}}{d\widetilde{G}}\frac{\widetilde{G}}{\widetilde{L^*}} = -\frac{\eta_{r\widetilde{G}}}{(\alpha-1)-\alpha\eta_{r\widetilde{G}}} = \frac{\eta_{r\widetilde{G}}}{(1-\alpha)+\alpha\eta_{r\widetilde{G}}}. \tag{19}$$

Again, the sign of this expression depends on the interaction between the returns to scale and the mark-up behaviour. Indeed, equilibrium employment will react positively to an increase in $\widetilde{G}$, if the numerator and the denominator of (19) are either both positive, or both negative. This allows to establish the following propositions.

Proposition 1 *If the elasticity of public demand is greater than the elasticity of private demand, $\gamma > \rho$, then a fiscal expansion increases the equilibrium level of employment iff* $\eta_{r\widetilde{G}} > (\alpha-1)/\alpha$.

Indeed, if $\gamma > \rho$, the numerator of (19) is positive and a fiscal expansion shifts the PS schedule upwards in the $(\widetilde{L}, \omega)$ plane. For employment to increase following this shift, the PS schedule must be negatively sloped (the denominator of (19) must be positive). This is always verified for non-increasing returns, but can also be consistent with increasing returns, provided that the marginal revenue is sufficiently sensitive to the composition of demand and returns are not too increasing, $\eta_{r\widetilde{G}} > (\alpha-1)/\alpha$.

[9] Were the PS schedule non-monotone, multiple underemployment equilibria could arise.

Proposition 2 *If the elasticity of public demand is lower than the elasticity of private demand, $\gamma < \rho$, then a fiscal expansion increases the equilibrium level of employment iff $\eta_{r\widetilde{G}} < (\alpha - 1)/\alpha$.*

If $\gamma < \rho$, the numerator of (19) is negative and a fiscal expansion shifts the PS schedule downwards in the $(\widetilde{L}, \omega)$ plane. For employment to increase following this shift, the PS schedule must be positively sloped (the denominator of (19) must be negative). This is always verified for non-decreasing returns, but can also be consistent with decreasing returns, provided that the marginal revenue is sufficiently sensitive to the composition of demand and returns are not too decreasing, $\left|\eta_{r\widetilde{G}}\right| > |(\alpha - 1)/\alpha|$.

This result allows extending the range of situations in which expansionary fiscal policy actually increases employment and output, as compared with those previously established in the literature. According to the standard tenet (Silvestre 1995, p.326), under decreasing returns an increase in public expenditure is expansionary only if public demand is more elastic than private demand, hence reduces the desired mark-up at the initial equilibrium. Similarly, under increasing returns a fiscal expansion should reduce the overall elasticity of demand (public demand must be less elastic than private demand in our framework). Our basic point is that a decrease in the desired mark-up at the initial equilibrium is required when the PS is negatively sloped, but the latter situation may not coincide with decreasing returns. Similarly, an increase in the desired mark-up is not required under increasing returns, but when the PS schedule is positively sloped.[10]

In particular, when the elasticity effect works through the composition of demand, a positive difference in the elasticity of public and private demand, which shrinks the mark-up at the initial equilibrium following a fiscal expansion, bends downward the slope of the PS curve, and may generate a downward sloping PS curve even in the presence of increasing returns. The reverse is true when public consumption is less elastic than private consumption: the impact effect is an increase of the mark-up, and this turns out to be expansionary not only under increasing returns, but also under (moderately) decreasing ones, through the same 'reversal of the slope' phenomenon. Moreover, simple inspection of (19) shows that under constant returns fiscal policy is unambiguously expansionary, independently of its giving a pro- or counter-cyclical impulse to demand elasticity.

We can therefore establish that there exists a range of values, around one, of the technological parameter α - the extension of which depends on the share of public demand on aggregate demand - such that an increase in public expenditure is associated to an increase in employment and output, independently of the direction of change of the elasticity of demand.

Finally, it may be interesting to evaluate the size of the elasticity multiplier (19). Clearly, under constant returns, $\eta_{\widetilde{L}\widetilde{G}} = 1$: a percentage increase in public consumption implies an identical percentage increase in employment and output. As far as the other situations in which the multiplier is positive are concerned, we may establish the following proposition.

[10] In the Appendix we discuss the relevance of the 'reversal of the slope' phenomenon by identifying the ranges of technological and demand conditions which ensure that it actually occurs.

Proposition 3 *If $\eta_{\widetilde{L}\widetilde{G}} > 0$, and $\gamma > \rho$, then $\eta_{\widetilde{L}\widetilde{G}} < 1$ if $\alpha < 1$; $\eta_{\widetilde{L}\widetilde{G}} > 1$ if $\alpha > 1$. If $\eta_{\widetilde{L}\widetilde{G}} > 0$, and $\gamma < \rho$, then $\eta_{\widetilde{L}\widetilde{G}} < 1$ if $\alpha > 1$; $\eta_{\widetilde{L}\widetilde{G}} > 1$ if $\alpha < 1$.*

Proof. Assume $\eta_{\widetilde{L}\widetilde{G}} > 0$. The condition $\eta_{\widetilde{L}\widetilde{G}} > 1$ implies

$$\left|\eta_{r\widetilde{G}}\right| > \left|1 - \alpha + \alpha\eta_{r\widetilde{G}}\right|. \tag{20}$$

Consider first the case in which both $\eta_{r\widetilde{G}}$ and $1 - \alpha + \alpha\eta_{r\widetilde{G}}$ are positive, which occurs when $\gamma > \rho$. Notice that in this case $\eta_{r\widetilde{G}} = \dfrac{1}{\epsilon}\dfrac{(\gamma-\rho)\frac{\widetilde{G}}{\widetilde{L}^{\alpha}}}{(\gamma-\rho)\frac{\widetilde{G}}{\widetilde{L}^{\alpha}} + (\rho-1)} > 0$ implies $\eta_{r\widetilde{G}} < 1$. Therefore, condition (20), which collapses to $(1-\alpha)\,\eta_{r\widetilde{G}} > (1-\alpha)$, is verified only for $\alpha > 1$.

Consider now the case in which both $\eta_{r\widetilde{G}}$ and $1 - \alpha + \alpha\eta_{r\widetilde{G}}$ are negative, which occurs when $\gamma < \rho$. Condition (20) collapses to $(1-\alpha)\,\eta_{r\widetilde{G}} < (1-\alpha)$, which for $\eta_{r\widetilde{G}}$ negative is verified only for $\alpha < 1$. ■

The above proposition establishes that whenever a positive multiplier results from the 'slope reversal' of the PS schedule described above, the multiplier turns out to be greater than one. When a positive multiplier is obtained under the usual conditions (public demand more elastic and decreasing returns, or public demand less elastic under increasing returns), its value is lower than one.

The interesting implication of proposition 3 is that if the 'slope reversal' mechanism operates, the increase in employment and output is more than proportional to the increase in public expenditure. In this peculiar case, in the new equilibrium position the share of public demand on aggregate demand decreases - and though public demand is more (less) elastic than private demand, the new equilibrium mark-up increases (decreases). For example, in the presence of an increasing returns technology, the existence of a public component of demand more elastic than the private component (a) may bend downwards the PS schedule; (b) ensures that a fiscal expansion shift this downward sloping schedule outwards and generate a more than proportional increase in output: at the initial equilibrium the demand elasticity increases, stimulating the expansion, while at the final equilibrium the elasticity of demand actually decreases This qualitative difference between the direction of the change of the mark-up at the initial and final equilibrium positions is specific to the 'reversal of the slope' situations and does not show up in the other situations, in which the employment and output multiplier is positive.

4 Extensions

In the above discussion some simplifying hypotheses have been introduced, among which the most relevant are the absence of income effects of taxation on labour supply and the reversed-L shape of the labour supply schedule. As to the former, we believe that it is a convenient one, when the focus is on a transmission mechanism of fiscal policy based on product market competitiveness. It is conceptually easy to embody both the labour supply and the elasticity effects in more complicated models. As to the latter, it allowed us to concentrate the analysis on labour demand and to escape the problems of stability and multiplicity of underemployment equilibria, which could arise in the presence of two positively-sloped behavioural relations on the two sides of the labour market. However, the supply side of the labour market obviously contributes in defining quantitatively and qualitatively the macroeconomic effects of a change in the degree of monopoly power. In this section, we briefly take up this point by verifying the robustness of Propositions 1 and 2 to the introduction of both an upward sloping competitive labour supply, and a wage setting schedule which possibly describes non-competitive features of the labour market.

a) *Competitive labour supply*

The most straightforward way to reformulate the supply side of the labour market is to think of a constant elasticity upward sloping competitive supply function such as[11]

$$L = \left(\frac{\omega}{\theta}\right)^{\frac{1}{\sigma - 1}}, \qquad \sigma > 1$$

By applying the same procedure developed in section 3, the following employment multiplier can be obtained

$$\eta_{\widetilde{L}\widetilde{G}} = \frac{d\widetilde{L^*}}{d\widetilde{G}} \frac{\widetilde{G}}{\widetilde{L^*}} = -\frac{\eta_{r\widetilde{G}}}{(\alpha - 1) - \alpha\eta_{r\widetilde{G}} - (\sigma - 1)} \tag{21}$$

Simple inspection of equation (21) shows that Proposition 1 still holds.[12] As far as Proposition 2 is concerned, the new formulation of the multiplier shows that a downward shift of a positively sloped PS schedule is no more a sufficient condition for an increase in public expenditure to be expansionary. However, the additional condition $\left((\sigma - 1) < (\alpha - 1) - \alpha\eta_{r\widetilde{G}}\right)$, which ensures that with $\gamma < \rho$ the employment multiplier (21) is positive, is indeed the Walrasian local stability condition. In other words, Proposition 2 holds, provided that the equilibrium under consideration is locally stable.

b) *Non competitive wage setting schedule*

We describe the non competitive features of the labour market by coupling the PS schedule with the following wage setting (WS) schedule

$$\omega = \Omega(u, \epsilon), \qquad \Omega_u = \frac{\partial \Omega}{\partial u} < 0 \quad \Omega_\epsilon = \frac{\partial \Omega}{\partial \epsilon} < 0$$

where u is the unemployment rate and ϵ is again the product demand elasticity. Through this general formulation we capture some common features of unions and bargaining models, namely that wages are set as a mark-up over the

[11] This labour supply can be easily obtained by modifying the utility function (1) into $U\left(C, \frac{M}{P}, L\right) = C^\beta \left(\frac{M}{P}\right)^{1-\beta} - \frac{\theta}{\sigma} L^\sigma$.

[12] Indeed, if $\gamma > \rho$ a positive multiplier is now in principle consistent also with a positively sloped price setting schedule, but this case can be ruled out by stability considerations.

workers' outside opportunities, that the latter are inversely correlated to the rate of unemployment and, finally, that the mark-up over outside opportunities depends positively on the degree of market power on the product market. Notice that the reference to this non competitive framework opens the possibility that a transmission mechanism of fiscal policy, based on changes in product demand elasticity, operates not only directly, *via* shifts in the PS schedule, but also indirectly *via* induced shifts of the WS schedule.

In order to evaluate the effectiveness of fiscal policy on employment we follow the same procedure developed in section 3, and obtain the employment multiplier:

$$\eta_{\widetilde{L}\widetilde{G}} = -\frac{\eta_{r\widetilde{G}} - \dfrac{\widetilde{G}}{\omega}\dfrac{\partial\Omega}{\partial\widetilde{G}}}{(\alpha-1) - \alpha\eta_{r\widetilde{G}} - \dfrac{\widetilde{L^*}}{\omega}\dfrac{\partial\Omega}{\partial\widetilde{L}}}$$

To evaluate the sign of this multiplier, we again consider first the case in which the elasticity of public demand is higher than that of private demand. If $\gamma > \rho$, $\partial\Omega/\partial\widetilde{G} = \Omega_\epsilon \left(\partial\epsilon/\partial\widetilde{G}\right) < 0$ and $\partial\Omega/\partial\widetilde{L} = \Omega_u \left(\partial u/\partial\widetilde{L}\right) + \Omega_\epsilon \left(\partial\epsilon/\partial\widetilde{L}\right) > 0$. This allows us to establish that if the conditions for the PS schedule to be negatively sloped are verified, then an expansionary fiscal policy has a positive effect on employment. The PS curve shifts upwards and the overall effect is amplified by a downward shift of a positively sloped WS schedule.

If $\gamma < \rho$, $\partial\Omega/\partial\widetilde{G} > 0$ while $\partial\Omega/\partial\widetilde{L}$ is ambiguous in sign. If it is positive, so that the WS is positively sloped, and if the PS is upward sloping as well, then the above multiplier is positive, provided the WS intersects the PS from above (it is flatter at equilibrium). This configuration resambles that obtained above in a competitive framework. In this case, however, we cannot easily rely upon stability conditions. As noticed by Manning (1990), if both the labour and the goods markets are non competitive, no equilibria can be assessed to be stable or unstable, without *a priori* information on the degree of the nominal and real price and wage rigidities. Finally, we notice that if the WS schedule turns out to be negatively sloped, the multiplier is unambiguously positive.

5 Conclusions

In this paper we have highlighted the properties of a macroeconomic model with monopolistic competition, where the differentiated goods which enter the aggregate output basket are demanded and consumed by both the private and the public sector, with different demand elasticities. In this set-up, the level of public expenditure influences the overall demand elasticity and the labour demand schedule, through a direct 'demand composition' effect. In particular, we have proved that an increase in public expenditure may increase output, not only (as previously established) when public demand is more elastic than private demand and returns are decreasing, or when it is less elastic and returns are increasing. There is a set of technological conditions, from moderately increasing to moderately decreasing returns, in which fiscal policy is expansionary, independently of the way in which it alters the elasticity of demand at the initial equilibrium.

With these results we aim at contributing to the research program which views the degree of market power as a possible intermediate target for an employment-oriented fiscal policy (D'Aspremont *et al.* (1995)). Some authors have stressed the difficulties and risks involved in the actual implementation of such a policy intervention (Jacobsen and Schultz (1994)). However it is by now clear that the degree of market competitiveness plays a crucial role in the determination of the level of macroeconomic activity, and this suggests that a serious theoretical assessment of the market power effect of fiscal policy should be carried out.

In this wider perspective, one can draw no definite conclusions, be them theoretical or empirical, on the direction in which fiscal policy may influence the degree of market power. In some sectors, the presence of a public component of demand in addition to the private component may actually increase market competitiveness; to quote an example, the rules recently imposed in Italy on the government-financed purchases of pharmaceutical products may induce a more competitive price behaviour on the firms' side. On the other hand, public expenditure is somehow "rigidly" allocated - the setting of expenditure in real terms is often accompanied by a predetermination of its allocation between the different sectors - and this contributes to making demand more rigid. Both kinds of phenomena are consistent with our analysis.

6 Appendix

In this appendix we identify the range of technological and demand parameters for which an increase in public expenditure turns out to be expansionary.

As in the text, we start from the case in which public demand is more elastic than private demand ($\gamma > \rho$). Proposition 1 establishes that $\eta_{\widetilde{L}\widetilde{G}} > 0$ iff $\eta_{r\widetilde{G}} > (\alpha - 1)/\alpha$. This is always true in the presence of non increasing returns since $\eta_{r\widetilde{G}} > 0$. However, the above condition may also be verified under increasing returns provided that the reversal of the slope phenomenon occurs. In order to evaluate the relevance of the latter, we rewrite tha condition $\eta_{r\widetilde{G}} > (\alpha - 1)/\alpha$ with $\alpha > 1$ as

$$x^2 + \left(2\rho - 1 - \frac{\alpha}{\alpha - 1}\right) x + \rho(\rho - 1) < 0 \tag{A.1}$$

where $x = (\gamma - \rho) g$ and $g = \widetilde{G}/\widetilde{L}^{\alpha}$. Inequality (A.1) holds for $x \in]x_{\min}, x_{\max}[$, where $x_{\min}$ and $x_{\max}$ are the roots of the above second order polynomial. For these roots to be real, the following condition must be verified:

$$\left(2\rho - 1 - \frac{\alpha}{\alpha - 1}\right)^2 - 4\rho(\rho - 1) > 0$$

which implies

$$\rho < \frac{1}{4}\left[\frac{(2\alpha - 1)^2}{\alpha(\alpha - 1)}\right]. \tag{A.2}$$

Condition (A.2) imposes a constraint on the values of ρ and α, which is represented in Figure 2 for $1.01 < \alpha < 1.2$:

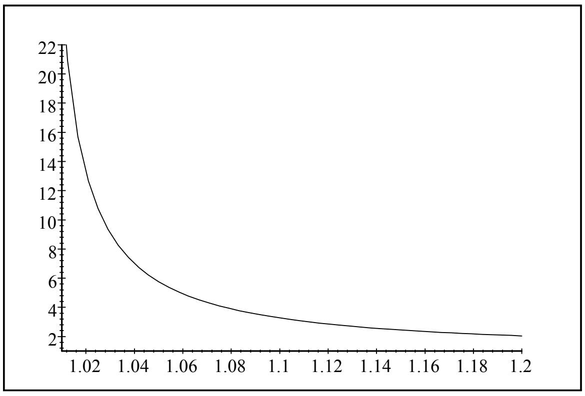

Figure 2

The higher the value of α, the smaller is the range of admissable values of ρ. For any couple of ρ and α satisfying (A.2), we may determine the corresponding interval $]x_{\min}, x_{\max}[$. For any x belonging to this interval, we obtain a relation between γ and g, consistent with the reversal of the slope:

$$\gamma = \frac{x}{g} + \rho.$$

For example, if $\alpha = 1.05$ and $\rho = 4$, $x_{\min} = 0.917$ and $x_{\max} = 13.083$. Choosing a value of $x = (\gamma - \rho)\, g$ close to $x_{\min}$, e.g. $x = 0.92$, we obtain the following relation between γ and g:

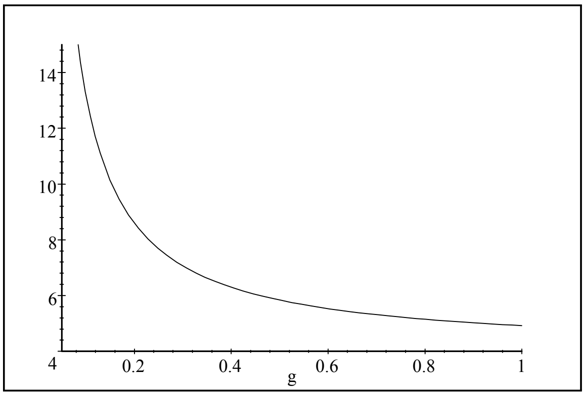

Figure 3

Figure 3 shows that a share of public expenditure on income equal to 20% requires an elasticity of public demand at least equal to 8.6, while $g = 0.3$ requires $\gamma \geq 7.07$. Had we chosen a lower value of ρ, e.g. $\rho = 3$, then $x_{\min} = 0.384$ and $x_{\max} = 15.616$. Then choosing $x = 0.39$, a value $g = 0.2$ requires $\gamma \geq 4.95$, while $g = 0.3$ requires $\gamma \geq 4.3$.

If returns are more increasing, say $\alpha = 1.1$ and, still consistently with (A.2), $\rho = 3$, $x_{\min} = 1.268$ and $x_{\max} = 4.732$. Choosing $x = 1.27$, we obtain that for $g = 0.2$ the elasticity γ must be greater than 9.35, while $g = 0.3$ requires $\gamma \geq 7.23$.

The discussion and the examples make it clear that once (A.2) is satisfied, the more increasing are returns for given ρ, the higher must be the value of γ for any given g. However, given returns, the lower the value of ρ, the lower the required value of γ.

Now we turn to the case of a public demand less elastic than private demand ($\gamma < \rho$). Proposition 2 states that in this case public expenditure is expansionary, $\eta_{\widetilde{L}\widetilde{G}} > 0$, iff $\eta_{r\widetilde{G}} < (\alpha - 1)/\alpha$. This is always verified for $\alpha \geq 1$, since now $\eta_{r\widetilde{G}} < 0$. However, Proposition 2 covers also situations of decreasing returns, provided that

$$z^2 - \left(2\rho - 1 - \frac{\alpha}{\alpha - 1}\right) z + \rho\,(\rho - 1) < 0 \tag{A.3}$$

where $z = (\rho - \gamma)\, g$. The roots of this second order polynomial are always real and they identify an interval $]z_{\min}, z_{\max}[$ within which inequality (A.3) holds and the reversal of the slope occurs. Obviously, the extreme values $z_{\min}$ and $z_{\max}$ depend on the technological and demand parameters α and ρ. Given ρ, we may therefore write $z_{\min} = z_{\min}(\alpha)$ and $z_{\max} = z_{\max}(\alpha)$.

Since γ must be greater than one, the following condition must hold:

$$z < (\rho - 1)\, g. \tag{A.4}$$

This implies that for any given ρ we cannot choose any $z \in \left]z_{\min}(\alpha), z_{\max}(\alpha)\right[$, but we are constrained to the values of z which satisfy both (A.3) and (A.4), with $g < 1$. For any α, let us choose one such value, $\underline{z}_{\min}(\alpha)$, arbitrarily close to $z_{\min}(\alpha)$. Then (A.4) allows us to identify a threshold value of g for any α:

$$g_{\min}(\alpha) = \frac{\underline{z}_{\min}(\alpha)}{(\rho - 1)}.$$

The function $g_{\min}(\alpha)$ is drawn in Figure 4, for $\rho = 4$ and $0.8 < \alpha < 1$

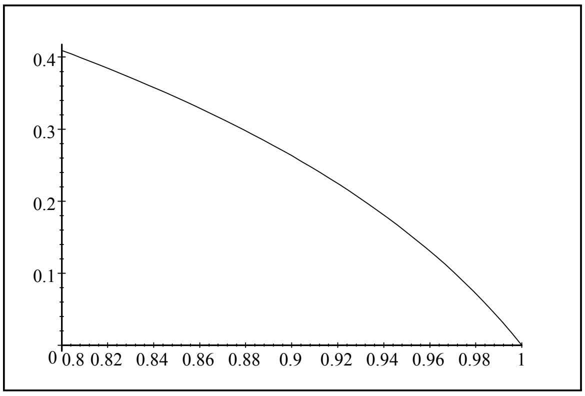

Figure 4

For all $1 > g \geq g_{\min}(\alpha)$, the reversal of the slope occurs, and the constraint on the demand elasticity parameters are verified. Therefore, for given ρ, and chosen $\underline{z}_{\min}(\alpha)$, we can use the definition of z and establish a relation between γ and $g \geq g_{\min}(\alpha)$, which ensures that public demand is expansionary:

$$\gamma = \rho - \frac{\underline{z}_{\min}(\alpha)}{g} \tag{A.5}$$

For example, if $\alpha = 0.95$ and $\rho = 4$, we have that $z_{\min} = 0.47$ and $z_{\max} = 25.53$. Therefore we may choose $\underline{z}_{\min} = 0.5$, so that $g_{\min} = 0.167$. The relation between γ and g is then represented in Figure 5:

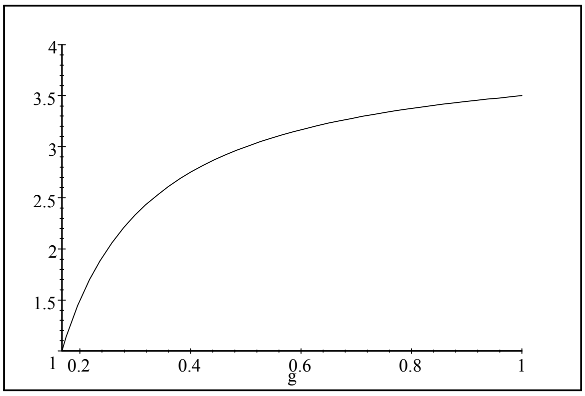

Figure 5

For all pairs (g, γ) lying below the curve, the reversal of the slope occurs. This implies that for $g = 0.2$, γ must be lower than 1.5. For $g = 0.3$, the maximum value of γ is 2.33. Had we chosen a higher value of ρ, e.g. $\rho = 5$, then $z_{\min} = 0.734$ and $z_{\max} = 27.266$. We may choose $\underline{z}_{\min} = 0.74$, so that $g_{\min} = 0.185$. Then for $g = 0.2$, γ must be lower than 1.3, while for $g = 0.3$, we have $\gamma \leq 2.54$.

If returns are more decreasing, e.g. $\alpha = 0.9$ and $\rho = 4$, the above procedure gives that $g_{\min} = 0.263$ Condition (A.5) implies $\gamma \leq 1.37$ for $g = 0.3$ and $\gamma \leq 2.03$ for $g = 0.4$.

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