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Composition of Public Expenditure and Short Run Fiscal Multiplier

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Abstract Existing studies on the fiscal multiplier under imperfect competition assume a symmetric market structure with identical firms. This paper examines the fiscal policy implications of introducing a multisectoral economy where a composite commodity is offered in many varieties within a market of monopolistic competition while a homogeneous good is produced in a perfectly competitive environment. Within the context of this mixed industrial structure we show that the sign and the size of the short run multiplier crucially depends on the composition of public expenditure chosen by the government.

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1 Introduction

In recent years, several authors, following the seminal papers by Dixon (1987) and Mankiw (1988), have discussed the transmission mechanism of fiscal policy and the fiscal multiplier in macroeconomic models of imperfect competition. The analysis has been extended in various directions. The impact of a fiscal expansion and the multiplier have been evaluated both in the short run and in the long run (Startz (1989), Heijdra and van der Ploeg (1996), Dixon and Lawler (1996)) under alternative type of taxation (Molana and Moutos (1992), Heijdra et al (1998)). Additional effects of government expenditure have also been included when public consumption enters private utility (Heijdra et al (1998)) or government spending plays a productive role in private production (Chen et al (2005)). Moreover, policy-induced change in market structure may affect significantly the size of the multiplier in imperfectly competitive model with endogenous markup (Molana and Zhang (2001), Costa (2004)).

All these studies, however, adopt a representative sector approach and consider a symmetric equilibrium with identical monopolistically competitive firms. To our knowledge, the only exception is Molana and Montagna (2000) who relax the assumption of homogeneity and evaluate the fiscal multiplier within a macro-model where firms differ in their labour productivity. In this paper we introduce a different kind of asymmetry by assuming that the economy is characterized by a mixed industrial structure: some sectors are perfectly competitive while the others are monopolistically competitive. In New Keynesian literature this asymmetric setting has been used by Dixon and Hansen (1999) to explain money non-neutrality in the presence of menu costs, while here we aim at exploring its relevance for fiscal policy analysis. For this purpose, we slightly modify Dixon and Hansen (1999) model by assuming non separability of preferences, thus introducing wealth effect in labour supply, that represents the key transmission mechanism of fiscal policy in macroeconomic models under price flexibility. The very simplified structure of the model offers a clear picture of the implications of a mixed market structure and allows for a direct comparison with the standard results of the existing literature under symmetry. The asymmetric market structure introduces an additional dimension to the adjustment process following a fiscal policy change, since the multiplying process reflects also the reallocation of labour between sectors generated by the policy-induced change in the composition of aggregate demand. In particular, in this paper we show that the composition of public consumption affects both the sign and the size of the short run fiscal multiplier. Indeed, the expected impact of a demand oriented fiscal policy should be evaluated recognizing that it is the composition of consumption chosen by the government that ultimately determines the direction and the intensity of the economy response while the size of the fiscal change just modifies the scale of the adjustment.

The paper is organized as follows. Section 2 outlines the model and the basic properties of the mixed industrial structure equilibrium. In section 3 we introduce public spending and derive the short run balanced budget multipliers. Section 4 concludes the paper.

2 The mixed industrial structure economy

We consider an economy with three goods: leisure, a homogeneous consumption good supplied in a perfectly competitive environment and a composite commodity available in many varieties traded within a market of monopolistic competition. The representative household consumes and supplies labour services to firms. The model develops a version of the Dixon and Hansen (1999) mixed industrial structure setup with preferences allowing for wealth effects on labour supply. In this section we highlight the basic properties of the mixed industrial structure economy.

2.1 Consumers

A single representative consumer faces the following static maximization problem

$$\begin{aligned} \max U &= (C_Z^{1-\alpha} C_D^\alpha)^\beta (1-L)^{1-\beta} ; \\ C_D &= \left[\int_0^1 C_i^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}} ; \sigma > 1 \end{aligned} \quad (1)$$

subject to the budget constraint

$$I \equiv w + \Pi = P_Z C_Z + P_D C_D + w(1-L) \quad (2)$$

where Z is the homogeneous good and D the composite commodity, whose variety dimension has been normalized to one. Π is total profit income received from the monopolistic industry, while I defines full income. Total time endowment is set equal to one. The wage rate w is chosen as the numeraire, so that $(1-L)$ is the value of total consumption of leisure. Given [1], the corresponding price index for private consumption is the following

$$P = P_D^\alpha P_Z^{1-\alpha} \quad (3)$$

with

$$P_D = \left[\int_0^1 p_i^{1-\sigma} di \right]^{\frac{1}{1-\sigma}}$$

Maximization of [1] subject to [2] delivers the following demand functions

$$C_Z = (1 - \alpha)\beta \frac{I}{P_Z} \quad (4)$$

$$C_D = \alpha\beta \frac{I}{P_D} \quad (5)$$

$$C_i = \left(\frac{p_i}{P_D} \right)^{-\sigma} C_D \quad (6)$$

$$(1 - L) = (1 - \beta)I \quad (7)$$

2.2 Firms

We simplify technology, by assuming that all firms employ labour as the only factor of production, within a constant returns to scale technology with a common productivity parameter set equal to one. Given the symmetric specification of the composite commodity each producer i maximizes profits π_i , pricing a common constant mark-up over marginal cost

$$p = \frac{\sigma}{\sigma - 1} \quad (8)$$

$$\pi_i = \frac{1}{\sigma - 1} C_i \quad (9)$$

In the competitive sector equalizing price P_Z to marginal costs gives the following supply schedule

$$P_Z = 1 \quad (10)$$

2.3 Equilibrium

To solve the model we first derive the full income equilibrium level. Given the symmetric structure of the monopolistic sector, from [9], [8] and [6] we obtain the following aggregate profit function

$$\Pi = \frac{1}{\sigma} \alpha \beta I \quad (11)$$

Given [2] and [11], we get

$$I = \frac{\sigma}{\sigma - \alpha\beta} \quad (12)$$

From [7] we obtain the equilibrium employment

$$L = \frac{\beta(\sigma - \alpha)}{(\sigma - \alpha\beta)} \quad (13)$$

National income Y^N equals aggregate expenditures. [4], [5] and [12] imply

$$Y^N \equiv P_Z C_Z + P_D C_D = \frac{\beta \sigma}{\sigma - \alpha \beta} \quad (14)$$

Given [14] and [3] evaluated at the equilibrium ($P = \left(\frac{\sigma}{\sigma-1}\right)^\alpha$) we obtain the following measure of real national income

$$Y = \frac{Y^N}{P} = \left(\frac{\sigma}{\sigma-1}\right)^{-\alpha} \frac{\beta \sigma}{\sigma - \alpha \beta} \quad (15)$$

To highlight the properties of the mixed industrial structure economy, we compare the model equilibrium in [13], [14] and [15] with the equilibrium outcome generated by perfectly competitive markets. The competitive national income Y_C^N and aggregate employment L_C are derived from [14] and [13] for $\sigma \rightarrow \infty$

$$Y_C^N = L_C = \beta \quad (16)$$

Furthermore, the consumer price index P_C equals to one in the competitive economy. Thus, nominal and real national income coincide ($Y_C^N = Y_C$). Compared with the competitive setting, one unit of labour in the non competitive economy gives rise to higher levels of nominal spending. However, the price distortion in the monopolistic industry determines a lower purchasing capacity of income, resulting in a lower level of real output and employment. The inefficiency due to the presence of the monopolistic market works through two distinct channels. The first operates through an income effect. The presence of positive profits causes excessive consumption of leisure. The second stems from the asymmetric structure of the model, that causes a misallocation of labour across the two sectors. Let L_D and L_Z the labour employed in the D and Z market respectively. Compared with the competitive allocation, the employment ratio L_D/L_Z shows that, due to the monopolistic pricing behaviour, "too little" labour is employed in the monopolistic industry and "too much" in the competitive one

$$\frac{L_D}{L_Z} = \frac{\alpha}{1-\alpha} \frac{\sigma-1}{\sigma} < \frac{\alpha}{1-\alpha} = \left(\frac{L_D}{L_Z}\right)_C$$

3 Government and fiscal policy

Within the framework outlined above, we introduce the public sector. The government purchases discretionary amounts of both Z and D , financing consumption with lump sum taxation. Let $G^N = P_D G_D + P_Z G_Z$ the total public expenditure. A fraction τ of G^N is allocated to the composite commodity D , and the remaining $(1-\tau)$ to the homogeneous good Z according to the following demand functions

$$G_Z = \frac{(1-\tau)G^N}{P_Z}$$

$$G_D = \frac{\tau G^N}{P_D}$$

Moreover, we assume that the government perceives the composite commodity in the same manner as the private sector

$$G_D = \left[\int_0^1 G_i^{\frac{\sigma-1}{\sigma}} di \right]^{\frac{\sigma}{\sigma-1}}$$

This assumption implies the same demand function for the single variety as that of the representative household

$$G_i = \left(\frac{p_i}{P_D} \right)^{-\sigma} \frac{\tau G^N}{P_D}$$

Given the demand functions of private and public sectors we obtain the following total market demands

$$C_Z + G_Z \equiv Z = \frac{1}{P_Z} [(1-\alpha)\beta I + (1-\tau)G^N]$$

$$C_D + G_D \equiv D = \frac{1}{P_D} [\alpha\beta I + \tau G^N]$$

$$x_i = C_i + G_i = \left(\frac{p_i}{P_D} \right)^{-\sigma} \frac{[\alpha\beta I + \tau G^N]}{P_D}$$

where the definition of full income includes lump sum taxation ($I = 1 + \Pi - G^N$). Again, aggregate income equals aggregate demand or alternatively labour plus profit income

$$Y^N = P_Z Z + P_D D = L + \Pi = \beta I + G^N \quad (17)$$

where aggregate profits are now

$$\Pi = \frac{1}{\sigma} P_D D = \frac{1}{\sigma} [\alpha\beta I + \tau G^N] \quad (18)$$

We follow Heijdra (1998) by using as a measure of real aggregate output¹ the national income deflated by the consumer price index in [3]

$$Y = \frac{Y^N}{P} \quad (19)$$

¹See equation T1.6 in Heijdra (1998).

3.1 Balanced budget multipliers

In this section we analyze the effect of a fiscal policy change on aggregate output. Let G the level of public consumption in real terms ($G = G^N/P$). Solving the model along the steps outlined in the previous sections, it is immediate to obtain the following balanced budget income multiplier

$$\frac{dY}{dG} = \beta \frac{1}{P} \frac{\partial \Pi}{\partial G} + (1 - \beta) = \frac{\beta(\tau - \alpha\beta)}{\sigma - \alpha\beta} + (1 - \beta) \quad (20)$$

The initial effect of an additional unit of G is to depress private expenditure by β , resulting in a net expansion of output of $(1 - \beta)$. This represents the impulse that starts the multiplying process. A fraction τ of dG is devoted to the composite good, while the reduced disposable income by βdG crowds out the private consumption of D by a fraction α . If $(\tau > \alpha\beta)$ the monopolistic sector gains a net increase of demand, that leads to higher profits, and hence higher income. This starts the second round of the multiplying process. The intuition behind this result is that, in a mixed market structure economy, moving productive resources towards the monopolistic industry helps to compensate the distortion caused by prices set above marginal costs. In addition, the fiscal policy modifies the sectoral composition of aggregate output, according to the following multipliers²

$$\frac{dD}{PdG} = \frac{dL_D}{PdG} = \frac{(\sigma - 1)(\tau - \alpha\beta)}{(\sigma - \alpha\beta)} \begin{cases} \geq 0 & \text{if } (\tau - \alpha\beta) \geq 0 \\ \leq 0 & \text{if } (\tau - \alpha\beta) < 0 \end{cases} \quad (21)$$

$$\frac{dZ}{PdG} = \frac{dL_Z}{PdG} = \frac{\alpha\beta(\sigma - 1) + \sigma(1 - \beta) - \tau(\sigma - \beta)}{(\sigma - \alpha\beta)} \begin{cases} \geq 0 & \text{if } \tau \leq \tau^* \\ \leq 0 & \text{if } \tau > \tau^* \end{cases} \quad (22)$$

$$\tau^* = \frac{\sigma(1 - \beta + \alpha\beta) - \alpha\beta}{\sigma - \beta}$$

Unambiguously, if $(\tau - \alpha\beta) > 0$ an expansionary fiscal policy increases both the amount of labour employed in the monopolistic industry and the production of the composite commodity. On the other side, the effect of an increase in public spending in the competitive market crucially depends on τ being greater or lower than τ^* . If $\tau > \tau^*$, then the lower consumption of leisure does not suffice in providing the additional labour input demanded by the monopolistic sector. The excess demand of L_D crowds out the employment in the competitive market, implying a reallocation of production from the homogeneous good to the differentiated commodity.

These results are summarized in Figure 1. When the economy is characterized by a mixed industrial structure the effects of fiscal policy crucially depends on the composition of public consumption. If $(\tau - \alpha\beta) > 0$ a rise in public spending generates a positive income multiplier. In this case, two sectoral patterns can arise. Either employment expands in both sectors ($\alpha\beta < \tau < \tau^*$), or it increases in the monopolistic industry while decreasing in the competitive market

²Notice that, given our technology assumptions, labour and output sectoral multipliers coincide.

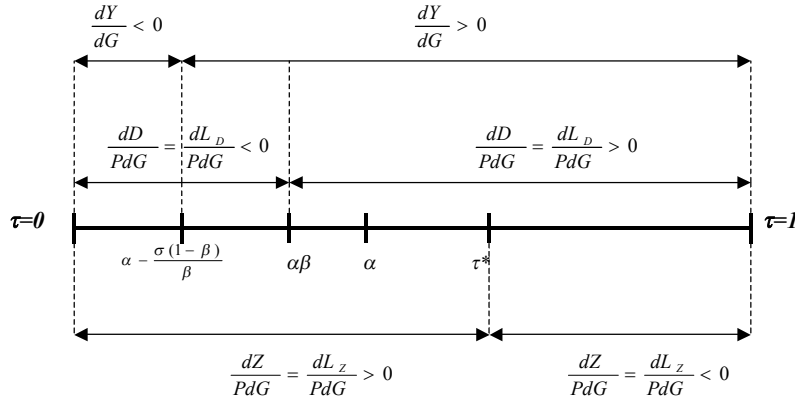


Figure 1: The sign of income and sectoral multipliers as a function of τ

($\tau^* < \tau \leq 1$). Conversely, if $(\tau - \alpha\beta) < 0$ the fiscal expansion reallocates labour from the monopolistic to the competitive sector. For $\alpha - \sigma(1 - \beta)/\beta < \tau < \alpha\beta$ the positive income effect on labour supply prevails over the crowding out in the monopolistic industry, resulting in an expansion of national income. On the contrary, for $0 \leq \tau < \alpha - \sigma(1 - \beta)/\beta$ an expansionary fiscal policy depresses national income.

Turning to aggregate employment, an increase in government expenditure unambiguously has positive effects

$$\frac{dL}{PdG} = (1 - \beta) \frac{\sigma - \tau}{\sigma - \alpha\beta} \quad (23)$$

The sign of the employment multiplier does not depend on the composition of public consumption. Actually, the value of τ chosen by the government does not influence the direction of the employment change, but it affects the size of the multiplier, by influencing the strength of the income effect on labour supply.

Clearly, the employment multiplier in [23] is zero with an inelastic labour supply ($\beta = 1$). However, it should be noticed that under this restriction, the national income multiplier in [20] does not vanish, since it still reflects the impact of dG on national income due to the reallocation of labour between sectors.

$$\frac{dY}{dG} = \frac{(\tau - \alpha)}{\sigma - \alpha} \quad (24)$$

Indeed, the employment in the competitive industry acts as a stored input, that can be employed by the monopolistic firms to adjust their production plans as demand increases. In other words, when $\tau > \alpha$ fiscal policy can partially dampen the misallocation of labour across sectors, by moving resources from the competitive to the monopolistic industry.

Notice that, when τ is sufficiently low ($\tau < \alpha - \sigma(1 - \beta)/\beta$) an increase in public spending depresses real national income while expanding aggregate

employment. This point deserves an explanation. With non distortionary taxation, the effect of a fiscal policy change on labour supply is uniquely determined by a pure income effect. On the other side, however, the impact on national income reflects not only the higher employment, but also the redistribution of labour between sectors. This latter effect depends on the fact that one unit of labour employed in the monopolistic industry contributes to national income by generating both wages and profits. Within the context of our model, however, this effect is magnified by the asymmetric industrial structure. When τ is low, the impact on real national income results from two opposite forces. On the one side, the lower leisure consumption increases employment and income. On the other side, however, the reallocation of labour towards the competitive market decreases national income for the share of missing profits. This latter effect dominates the former, resulting in higher employment accompanied by lower income³.

3.2 Asymmetric versus symmetric market structure

Traditionally, within the macroeconomics of imperfect competition, the analysis of the effects of fiscal policy has been carried out in models of symmetric monopolistic competition. Our setup allows a direct comparison between output multipliers obtained with symmetric and asymmetric market structure. Setting $\alpha = \tau = 1$ in [20] the model generates the standard multiplier as in Heijdra and van der Ploeg (2002, cap 13)

$$\left(\frac{dY}{dG}\right)_S = (1 - \beta) + \beta \frac{(1 - \beta)}{\sigma - \beta} = \frac{1 - \beta}{1 - \frac{\beta}{\sigma}} \quad (25)$$

The comparison between [25] and [20] shows that the initial impact of the fiscal policy change $(1 - \beta)$ is the same in the symmetric and asymmetric case. However, the multiplying process, working through profits, is generally different. Indeed, the asymmetric profit multiplier can be logically decomposed into two parts. The initial change in profits is proportional to the demand increase in the monopolistic market $(\tau - \alpha\beta)$. This can be lower or greater than the first demand impact in the symmetric case $(1 - \beta)$. Subsequently, however, in the asymmetric case the multiplying process is restrained by the demand leakage toward the competitive market, since a fraction $(1 - \alpha)$ of any income increase is devoted to the homogeneous good. As a result, the multiplier in [20] will be greater than [25] if the initial effect on profits is sufficiently strong. This is the case when the share of public consumption τ allocated to the differentiated good is sufficiently high. Formally, we have

³It should be stressed that, a similar feature appears in many other contributions concerning fiscal multipliers under imperfect competition. Notice that, for example in Mankiw (1988), Startz (1989) and Heijdra and van der Ploeg (1996), the output multiplier is a increasing function of the degree of monopoly power, while the employment multiplier is decreasing in it. This implies that, the higher is the degree of market competitiveness the higher is employment change and the lower the income change following a fiscal expansion.

$$\begin{aligned} \frac{dY}{dG} &\begin{cases} \geq \\ < \end{cases} \left(\frac{dY}{dG} \right)_s \quad \text{if } \tau \begin{cases} \geq \\ < \end{cases} \tau^* \\ \tau^* &= \frac{\sigma(1-\beta) + \alpha\beta(\sigma-1)}{\sigma-\beta} \end{aligned}$$

The multiplier [20] is greater than that obtained in the symmetric case if the rise in public spending crowds out employment in the competitive market (see [22].), thus shifting production from the competitive to the monopolistic market.

In conclusion, within a mixed industrial structure economy one can envisage a role for a double sided fiscal policy. On the one side, the government can decide the sign of a fiscal policy change and the global composition of the labour force by choosing a proper composition of its expenditure. On the other side, the size of a change in government spending just influences the magnitude of the output response.

4 Conclusions

In this paper we examine the effects of fiscal policy when the market structure is characterized by competitive and monopolistic sectors. The value of the short run fiscal multiplier can be positive or negative depending on the composition of government spending. The mechanism underlying this result is based on the capacity of public sector to modify the economy relative demand conditions. A fiscal expansion that reallocates resources towards the monopolistic sector can exert a positive effect on output reducing the misallocation of labour generated by the monopolistic pricing

We focus on short run analysis, but the role of public consumption composition deserves further investigation in a long run perspective as well. Standard models used in long run analysis, as in Startz (1989) and Heijdra and van der Ploeg (1996), do not probably represent the most suitable setting to highlight all the potential of the fiscal mechanism based on demand composition. Indeed, it is well known that in the long run the output effect of fiscal policy crucially depends on a particular specification of preferences: any long run effect of fiscal policy is determined by the value of the parameter regulating consumers' taste for variety. The latter would constrain in the same way the long run analysis of fiscal policy under a mixed industrial structure.

We think that more promising lines of research are offered by recent contributions based on more articulated representation of the monopolistic markets (e.g. Costa (2004)). In particular, more interesting results might arise when evaluating the long run effects of the composition of public spending in models where the mark up of price over marginal costs is not exogenously given, but reflects the size of the market. These issues will be left for future research.

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