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Imperfect Competition and the Fiscal Multiplier

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Abstract

The impact of fiscal policy in an economy with a monopolistic output market but perfectly competitive labour market is examined both in the short run (with a fixed number of firms), and in the long run with free entry. The main innovation of the paper is the generality of the assumptions about preferences and technology, which enable us to examine the robustness of the relationship between the degree of monopoly and the fiscal multiplier found by Startz (1989), Mankiw (1988) and Dixon (1987). The specific results of these papers are found to rest on two assumptions: constant returns and Cobb-Douglas preferences.

I. Introduction

The implications of imperfect competition for macroeconomics have been widely explored in the last decade; see Silvestre (1993) and Dixon and Rankin (1994) for surveys. One noteworthy issue is the attempt to link imperfect competition in the output market to the size of the fiscal multiplier. In particular, Mankiw (1988) and Startz (1989) have both argued that imperfect competition provides a microfoundation for the Keynesian multiplier: the multiplier will be larger the greater the degree of monopoly, at least in the short run. Dixon (1987) took a more circumspect view of the same result.[1] The basic story is very simple: with imperfect competition in the output market (the labour market is perfectly competitive), an increase in government expenditure increases profits, which in turn boosts consumption. This sets up a feedback which is stronger when there is a higher share of profits due to imperfect competition. In Startz (1989) it is argued that although this force may operate in the short run, if free entry is allowed for, all profits are dissipated in the long run, and there is no profits feedback.[2] Hence the short-run multiplier is larger than the long-

[1] It is interesting to note that for Dixon the multiplier was Walrasian, while for Mankiw and Startz it was Keynesian.
[2] For an earlier analysis of entry in an imperfectly competitive context, see Snower (1983).

run multiplier. The aim of this paper is to explore the generality of these arguments.

Despite some differences in their approaches, the papers by Startz, Mankiw and Dixon share two key assumptions which both turn out to be crucial for the results derived: (a) constant marginal expenditure shares,[3] and (b) a constant marginal product of labour.[4] We take these two assumptions together as defining the common Startz-Mankiw-Dixon approach (henceforth SMD). Three related conclusions arise from the SMD analysis:

(i) the short-run multiplier is larger the greater the degree of monopoly — Dixon (1987, p. 144, Proposition 3), Mankiw (1988, pp. 10–11, equations (15), (16) and (17)), Startz (1989, p. 744, equation (11));
(ii) the long-run multiplier is independent of the degree of monopoly (Startz pp. 748–9);
(iii) in the presence of monopoly power, the short-run fiscal multiplier exceeds the corresponding long-run multiplier (Startz, pp. 749–50).

In what follows, we examine the generality of these results using a model which is more general than the SMD framework, and which includes the latter as a special case. In particular, we focus on Startz's result (iii) comparing the long and short-run multipliers. We keep the basic SMD set-up, in that there is monopolistic competition in the output market and perfect competition in the labour market. However, we generalise the model in our assumptions about preferences and technology.[5] First, only limited restrictions are placed on the structure of household preferences. Second, as in Startz, a fixed set-up cost is assumed but this is combined with a specification of technology which is sufficiently general to encompass both declining and constant marginal productivity of labour. The former gives rise to *U*-shaped average cost curves with marginal cost increasing with output, the latter represents Startz's constant marginal cost technology. A useful feature of our technological assumptions is that they are perfectly consistent with both monopolistic and perfect competition. in

[3] In Dixon and Mankiw preferences are Cobb-Douglas, and in Startz Stone-Geary.

[4] In Dixon there are constant returns to labour; in Startz and Mankiw there are constant marginal product and fixed setup cost.

[5] We emphasise that our aim is not to extend the SMD approach in all potential directions, but rather to examine the implications of relaxing its most basic assumptions with regard to tastes and technology. Thus, like SMD, we do not explore e.g. the consequences of international trade or imperfect competition in the labour market. We note, however, that Dixon and Lawler (1993) incorporate money into the present model: such an extension changes none of the essential results discussed here.

contrast to Startz's framework which, with globally declining average cost, is incompatible with Walrasian equilibrium.

We employ our framework to examine the effects of fiscal policy in both the short and long runs. In so doing we find that here is no unambiguous relationship between the size of the fiscal multiplier (either short or long-run) and the degree of monopoly power. We are, nevertheless, able to identify sufficient conditions for the long-run multiplier to be independent of the degree of monopoly. However, our main results relate to the ranking of the short and long-run multipliers. Propositions 1 and 2 identify sufficient conditions for the short-run multiplier to exceed the corresponding long-run multiplier, highlighting the role played by the special assumptions of the SMD framework. We demonstrate, however, that Startz's ranking may be reversed. Proposition 3 shows that this is definitely the case for the Walrasian (i.e., perfectly competitive) case, while Proposition 4 extends this reversal to "sufficiently competitive" monopolistic economies. Finally, Proposition 5 indicates an unambiguous ranking of *employment* multipliers: in particular the long-run employment multiplier is always larger than the corresponding short-run multiplier, regardless of the degree of monopoly power.

The remainder of the paper is organised as follows. Section II outlines the model, our main results are derived in Section III, while the final section provides a brief summary and some concluding remarks.

II. The Model

The model describes a non-monetary economy in which three sets of agents, households, firms and government, interact in the markets for goods and labour. The labour market is taken to be perfectly competitive but the goods market is assumed to be populated by Dixit-Stiglitz monopolistic competitors whose output is purchased by both households and government.

Households

Households are taken to be identical and hence their behaviour can be encapsulated in the form of a single representative agent. Household preferences are defined over leisure (i.e., the household's time endowment, normalized to unity, less labour supply, L^S) and consumption of n differentiated products. Utility is described by a twice differentiable, strictly quasi-concave function, increasing in each of its arguments:

$$U = U(1-L^S, C) \quad \text{where} \quad C = n^{\mu/(\mu-1)}\left[\sum_{j=1}^{n} c_j^{(1-\mu)}\right]^{1/(1-\mu)} \tag{1}$$

C thus represents a CES subutility function defined over the n varieties of goods. The coefficient μ is the reciprocal of the own price elasticity of demand for each good and indicates the degree of market power held by the representative firm; for $\mu = 0$ goods are perfect substitutes and we have the Walrasian (i.e., perfectly competitive) case.

Let the price of firm j's product be p_j. We can then define the price index, P, as the cost-of-living index corresponding to C. We choose this to serve as the numeraire and normalise its value at unity, i.e.:

$$P = \left[\frac{1}{n}\sum_{j=1}^{n} p_j^{(\mu-1)/\mu}\right]^{\mu/(\mu-1)} = 1.$$

Equation (1) is maximised subject to:

$$C = WL^S + \Pi - T, \tag{2}$$

where W is the wage, Π aggregate profits and T lump-sum taxation, all in terms of the numeraire. The solution to the household's problem yields the standard Marshallian consumption demand and labour supply functions (3a) and (3b), and the demand for each variety of good (4):

$$C = C(W, \Pi - T); \qquad C_1 > 0, C_2 > 0 \tag{3a}$$

$$L^S = L^S(W, \Pi - T); \qquad L_2^S < 0 \tag{3b}$$

$$C_j = p_j^{-1/\mu}\frac{C}{n}. \tag{4}$$

The signs attached to the partial derivatives in (3a) and (3b) reflect the assumptions that each of the arguments of the utility function is a normal "good". It is further assumed that C and L^S are twice-continuously differentiable. As already noted, Dixon and Mankiw both take U to be Cobb-Douglas, $U = C^\alpha(1-L^S)^{1-\alpha}$, while Startz's Stone-Geary specification is equivalent for all relevant purposes.

Government

The government is assumed to formulate its expenditure plans in real terms, i.e., in terms of the numeraire. This expenditure, g, is then allocated across firms according to government preferences, taken to be identical to those of the household sector. The government is assumed to leave its potential monopsony power unexploited, and hence its optimisation process is entirely analogous to that of the household. In paticular the government chooses to purchase quantity g_j from firm j to maximise

$$U_g = n^{\mu/(\mu-1)}\left[\sum_{j=1}^{n} g_j^{(1-\mu)}\right]^{1/(1-\mu)},$$

subject to

$$\sum_{j=1}^{n} p_j g_j = g.$$

The finance of government spending is assumed to be entirely *via* lump-sum taxation, i.e., $T = g$.

Firms

Firm j employs l_j units of labour to produce y_j units of its own variety of output. All firms share a common production technology, described by:

$$y_j = f(l_j - \lambda); \quad f' > 0, \quad f'' \leq 0, \quad \lambda > 0, \tag{5}$$

where λ represents a fixed input requirement, such that $y_j = 0$ for $l_j \leq \lambda$. This formulation of the production function captures that adopted in the SMD framework as a special case for which $f'' = 0$. More generally, for $f'' < 0$ the declining marginal physical product of labour, combined with the fixed input requirement, gives rise to the familiar U-shaped average cost curve, the minimum point of which defines the "efficient" scale of production. Profits of firm j are $\pi_j = p_j y_j - Wl_j$. Profit maximisation requires (p_j, y_j, l_j) to be chosen such that marginal revenue equals marginal cost. With demand for product j described by (4), this implies that price is set as a fixed mark-up over marginal cost, i.e., $(p_j - W/f')/p_j = \mu$, or, defining firm j's own product real wage as $w_j \equiv W/p_j$:

$$w_j = (1-\mu)f'. \tag{6}$$

Hence the firm chooses (p_j, y_j, l_j) such that the real wage equals the marginal physical product of labour scaled down by $1-\mu$; for the limiting case of perfect competition ($\mu = 0$), the real wage and the marginal product of labour are equated.[6] Given that demand is symmetric across firms, each firm chooses the same price and employment level; thus $p_j = P = 1$ (implying $w_j = w = W$), $l_j = l$ and $y_j = y$. Aggregate employment and output are therefore $L = nl$ and $Y = ny$, respectively. With profits per firm given by $\pi = y - Wl$ and with all firms earning identical profits, aggregate profits are $\Pi = n(y - Wl)$.

[6] Setting $\mu = 0$ is equivalent in macroeconomic terms to treating μ as fixed and making all firms price-takers. In both cases the wage equations (see below) are the same in both the long and short run. The value of μ has no direct macroeconomic effect, and only matters through its effect on the pricing decision of the monopolistic firms.

III. Equilibrium and the Impact of Fisal Policy in the Long and Short Runs

Free Entry and the Firm in Long-run Equilibrium

In the long run, free entry (and exit) ensure that equilibrium is characterised by zero profits. With labour the only input, this requires equality between the wage and the average physical product of labour. It follows that long-run equilibrium is defined by:

$$W=(1-\mu)f'(l-\lambda)=f(l-\lambda)/l. \tag{7}$$

Equation (7) fully determines the long-run equilibrium values of the real wage and employment (hence output) per firm, for a given state of technology. Note, of course, that only in the limiting case of perfect competition are the marginal and average physical product of labour equated in the long run and hence only in this case is the long-run equilibrium characterised by production at the efficient scale.

Overall Equilibrium and the Impact of Fiscal Policy in the Long and Short Runs

With only two markets, overall equilibrium in the economy can be represented equivalently by either the goods market or the labour market equilibrium conditions:

$$Y=C(W,\Pi-T)+g \tag{8}$$

$$L=L^S(W,\Pi-T). \qquad (9)^7$$

By assumption $T=g$ and in the long run W takes the value defined by (7) and profits are zero. Imposing these restrictions and differentiating (8) with respect to g, the long-run effect of fiscal policy on aggregate output is:

$$\left.\frac{\mathrm{d}Y}{\mathrm{d}g}\right|_{LR}=1-C_2<1. \tag{10}$$

Thus the increase in government expenditure produces a rise in output, but one which is less than the increase in spending itself, i.e., the long-run

[7] The comparative static results which follow may be derived using either (8) or (9); to determine the effects of fiscal policy on *output* it is more convenient to use (8). However, following a referee's comment, we emphasise that this should not be taken to imply that output is simply demand determined. The impact of fiscal policy on the supply side is an important ingredient in determining its influence on the economy's equilibrium.

fiscal multiplier is less than unity. The crowding-out which occurs reflects, of course, the impact of the increase in lump-sum taxation on private sector consumption. At the same time, the fall in non-labour income associated with the rise in taxation prompts an increase in labour supply, which enables the expansion in output to occur:

$$\left.\frac{\mathrm{d}L}{\mathrm{d}g}\right|_{\mathrm{LR}} = -L_2^S. \tag{11}$$

An issue of interest is the relationship between the value of the long-run multiplier and the "degree of monopoly", μ. Noting from (10) that this relationship derives from the dependence of the long-run equilibrium real wage on μ, we differentiate (10) with respect to W and (7) with respect to μ, which together yield:

$$\mathrm{d}\left(\left.\frac{\mathrm{d}Y}{\mathrm{d}g}\right|_{\mathrm{LR}}\right)\Big/\mathrm{d}\mu = \mu C_{21}(f')^2/[\mu f' - (1-\mu)lf'']. \tag{12}$$

Since the denominator of the expression on the r.h.s. of (12) is unambiguously positive, it follows:

$$\mathrm{d}\left(\left.\frac{\mathrm{d}Y}{\mathrm{d}g}\right|_{\mathrm{LR}}\right)\Big/\mathrm{d}\mu \gtrless 0 \quad \text{as} \quad \mu C_{21} \gtrless 0. \tag{13}$$

The direction of this inequality can clearly go either way. However, it is clear from (12) that a small increase in μ from the Walrasian value of zero has no first-order effect on the long-run multiplier. This result derives from the fact that in the Walrasian equilibrium, each firm operates at the maximum point on its average product of labour curve. Consequently a small increase in μ from an initial value of zero and the associated fall in employment and output per firm have no effect on average productivity and the long-run equilibrium real wage.[8] In fact, the independence of the long-run multiplier from μ extends beyond the Walrasian case for certain preference structures; in particular $\mathrm{d}(\mathrm{d}Y/\mathrm{d}g|_{\mathrm{LR}})/\mathrm{d}\mu = 0$ for $C_{21} = 0$. Note that this is the case for Stone-Geary/Cobb-Douglas preferences and hence this result explains the independence of the long-run multiplier from μ

[8] A somewhat stronger result follows from this argument, that is a small displacement of μ from zero leaves the aggregate level of output (and employment) unchanged. This can be seen directly from (8) and the fact that $\mathrm{d}W/\mathrm{d}\mu|_{\mathrm{LR}} = 0$ for $\mu = 0$.

found by Startz (pp. 748–9) and extends it to a more general specification of both preferences and technology.

In the short run the number of firms is fixed. Taking the initial position of the economy to be one of long-run equilibrium, we differentiate (8) with respect to g, allowing W and Π to depart from their long-run values, to find first the short-run change in employment per firm:

$$\left.\frac{dl}{dg}\right|_{SR} = (1-C_2)/[n(1-\mu C_2)f' - (1-\mu)(C_1 - LC_2)f''] \tag{14}$$

with the increase in aggregate employment given by:

$$\left.\frac{dL}{dg}\right|_{SR} = (1-C_2) \bigg/ \left[(1-\mu C_2)f' - \frac{(1-\mu)}{n}(C_1 - LC_2)f''\right]. \tag{15}$$

The resulting change in aggregate output is:

$$\left.\frac{dY}{dg}\right|_{SR} = (1-C_2) \bigg/ \left[(1-\mu C_2) - \frac{(1-\mu)}{n}(C_1 - LC_2)\frac{f''}{f'}\right]. \tag{16}$$

The short-run multiplier, like the long-run multiplier, lies strictly between zero and one.[9] Inspection of (16) indicates that $dY/dg|_{SR}$ is related to μ in a highly complex fashion. In general the nature of this relationship will depend on the second-order derivatives C_{21}, C_{11} and the sign and magnitude of the third derivative of the production function. Hence, unlike in the SMD framework, there is no general presumption that the size of the short-run multiplier is increasing in μ.[10] Now comparing (10) and (16) we find:

$$\left.\frac{dY}{dg}\right|_{SR} \gtrless \left.\frac{dY}{dg}\right|_{LR} \quad \text{as} \quad \mu C_2 + \left(\frac{1-\mu}{n}\right)(C_1 - LC_2)\frac{f''}{f'} \gtrless 0 \tag{17}$$

and, in general, the direction of this inequality is indeterminate. However, despite this general ambiguity with regard to the relative rankings of the

[9] Note that $C_1 - LC_2 = \partial C/\partial W|_{U\text{ constant}}$. Thus $C_1 - LC_2$ represents the pure substitution effect on consumption of a rise in the real wage and hence is strictly positive. This ensures that the denominator of the expression in (16) is positive and exceeds the numerator in value.

[10] For Cobb-Douglas preferences and constant marginal product of labour technology, equation (16) becomes $dY/dg|_{SR} = (1-\alpha)/(1-\alpha\mu)$ from which the positive relationship between the magnitude of the short-run multiplier and μ in the SMD framework is readily apparent.

short and long-run output multipliers, we are able to formulate the following propositions:[11]

Proposition 1. *For* $f''=0$ *and with* $0<\mu<1$, *then* $\mathrm{d}Y/\mathrm{d}g|_{LR}<\mathrm{d}Y/\mathrm{d}g|_{SR}$.

Proposition 2. *Assume Cobb-Douglas preferences,* $U=(C)^{\alpha}(1-L^{S})^{1-\alpha}$, *and that* $-f''/f'$ *is continuous on* $l\in[\lambda, 1]$. *Then there exists* $\bar{\mu}<1$ *such that for* $\mu>\bar{\mu}$, $\mathrm{d}Y/\mathrm{d}g|_{SR}>\mathrm{d}Y/\mathrm{d}g|_{LR}$.

Proposition 3. *For the Walrasian case of* $\mu=0$ *and with* $f''<0$, *then* $\mathrm{d}Y/\mathrm{d}g|_{SR}<\mathrm{d}Y/\mathrm{d}g|_{LR}$.

Proposition 4. *Providing* f'', L, C_1 *and* C_2 *are continuous in the neighbourhood of the Walrasian equilibrium then, for* $f''<0$, *there exists* $\bar{\mu}>0$, *such that for* $0\le\mu<\bar{\mu}$ $\mathrm{d}Y/\mathrm{d}g|_{SR}<\mathrm{d}Y/\mathrm{d}g|_{LR}$.

Proposition 5. *For all* $0\le\mu<1$, $\mathrm{d}L/\mathrm{d}g|_{SR}<\mathrm{d}L/\mathrm{d}g|_{LR}$.

In fact two opposing forces act to modify the short-run impact of fiscal policy on output compared with its long-run effects. First, the expansion in output prompted by the rise in government spending leads, given the mark-up, to an increase in aggregate profits. The resulting increase in private sector disposable income produces a rise in private sector consumption. This first force is clearly stronger the larger μ is, since then the greater the positive feedback is from output to profits and thence to consumption. Second, however, as each individual firm expands, the accompanying decline in the marginal product of labour is reflected in a fall in the real wage which reduces aggregate consumption expenditure. While the first of these forces (the "profits effect") acts to offset the crowding-out associated with the increase in taxation, the second (the "real wage effect") serves to reinforce it. For constant marginal product of labour technology, only the first of these forces is present, hence Proposition 1 which replicates Startz's result, though for a more general specification of preferences. Proposition 2 extends Startz's ranking to a more general characterisation of technology. Given Cobb-Douglas preferences and for μ "sufficiently large", the profits effect must dominate the real wage effect. However, in the Walrasian case of $\mu=0$, the absence of a positive mark-up implies that the expansion of output to which the fiscal policy gives rise leaves, as a first-order effect, aggregate profits unchanged at zero. Thus only the second force identified above is operative, from which Proposition 3 follows. Finally, for μ not "too large", the second force

[11] See Appendix for proofs.

must dominate the first, which allows the generalisation of Proposition 3 to sufficiently competitive monopolistic economies as indicated by Proposition 4.

Although an unambiguous ranking of the short and long-run output multipliers is not possible, Proposition 5 indicates that the long-run *employment* multiplier is necessarily greater than the short-run employment multiplier. Both the increase in profits and the decline in the real wage which occur in the short run work to reduce the expansion in labour supply relative to its long-run increase. The fixed overhead labour requirement, which for $\mu > 0$ implies that the average product of labour falls as the number of firms increases, makes this larger long-run increase in employment compatible with the potentially smaller long-run expansion in output.[12]

We conclude this section by noting that our analysis, following Startz, has taken the mark-up to be constant and independent of the level of government spending. This assumption could be relaxed by (for example) allowing the government to have a different elasticity of demand. The elasticity of demand is then a weighted average of the household and government elasticities.[13] A more ambitious extension would be to have free entry into each "brand", with firms as Cournot competitors, and keep the number of brands fixed. This would mean that the mark-up would fall in each industry as more firms entered. In general we can decompose the total effect of an increase in government expenditure into two parts: one keeping μ fixed, the other the effect through μ:

$$\frac{dY}{dg} = \left.\frac{dY}{dg}\right|_{\mu} + \frac{dY}{d\mu}\frac{d\mu}{dg}.$$

Since $dY/d\mu < 0$ for $\mu > 0$, it follows that the effect of dg through the mark-up depends on the sign of $d\mu/dg$: if an increase in g reduces (increases) μ, it will tend to boost (dampen) the multiplier. If g influences μ via the elasticity effect, then it will operate on both the short-run and long-run multipliers. If, however, it occurs through entry, then it will only affect the long-run multiplier. Note that when $\mu = 0$, $dY/d\mu = 0$, so that the effect via

[12] The relationship between the short- and long-run effects of fiscal policy can be viewed from the perspective of the effects of entry on the economy's equilibrium. The short-run equilibrium following an increase in government spending is characterised by a positive level of profits, inducing the entry of new firms. New entry depresses aggregate profits and, by raising the marginal product of labour, increases the real wage. Thus entry has an ambiguous effect on consumption but necessarily increases labour supply.

[13] See Dixon and Rankin (1994, p. 189) for a discussion of this "elasticity effect".

μ is zero; the comparison of the long-run and short-run Walrasian multipliers is thus unaffected, and indeed Proposition 4 will still hold.

IV. Conclusions

We have provided a generalisation of existing models which seek to analyse fiscal policy within the context of an economy with monopolistic output markets and a Walrasian labour market. Our approach has allowed us to identify the specific assumptions on which the results found within the SMD framework rest: that is, constant marginal product of labour technology and constant marginal expenditure shares, either individually or in combination. Without these restrictions, the relationship between imperfect competition and the behaviour of the macroeconomy is clearly not as straightforward as the SMD framework would suggest.

Nonetheless our model does allow some significant general results to be identified:

(i) starting from the Walrasian limit, a small increase in the degree of monopoly has no effect on the long-run multiplier or, indeed, on the long-run equilibrium level of output;
(ii) if the economy is sufficiently competitive then the long-run output multiplier exceeds the corresponding short-run multiplier, with both lying between zero and unity;
(iii) whatever the degree of monopoly, including the Walrasian limit, the long-run employment multiplier is greater than that obtaining in the short run.

Thus, while our paper illustrates the potential dangers of attempting to draw too general conclusions from specific models, it indicates the possibility of moving beyond the confines of the assumptions which typify the macroeconomics of imperfect competition literature without losing the capacity to generate useful results.

Appendix. Proofs of Propositions 1–5

Proposition 1

Set $f'' = 0$ in (16) from which the proposition follows.

Proposition 2

For Cobb-Douglas preferences, $C_1 = C_2 = \alpha$ and with $-f''/f'$ continuous on $[\lambda, 1]$ there exists a finite upper bound $B > 0$. From (16) it follows:

$$\left.\frac{dY}{dg}\right|_{SR} > (1-\alpha)/[1-\alpha\mu+(1-\mu)\alpha(B/n)]$$

But if $\mu > B/(B+n)$, the r.h.s. denominator is less than unity, thus establishing the proposition.

Proposition 3

Set $\mu = 0$ in (16) which establishes the proposition.

Proposition 4

Continuity of the relevant derivatives ensures that the conditions necessary for the Implicit Function Theorem are satisfied. Thus both the short and long-run multipliers will be continuous in μ in the neighbourhood of $\mu = 0$. Proposition 4 then follows from Proposition 3.

Proposition 5

Comparing equations (11) and (15):

$$\left.\frac{dL}{dg}\right|_{LR} - \left.\frac{dL}{dg}\right|_{SR} = -L_2^S \frac{[\mu(1-C_2)f' - ((1-\mu)/n)(C_1 - LC_2)f'']}{[(1-\mu C_2)f' - ((1-\mu)/n)(C_1 - C_2)f'']} > 0$$

which confirms the proposition.

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