Comment on "Productive Public Expenditure and Imperfect Competition with Endogenous Price Markup"

Costa, Luís and Palma, Nuno

Costa: Department of Economics, ISEG, Technical University of Lisbon. Palma: Department of Economics, London School of Economics

16 October 2006

Comment on "Productive Public Expenditure with Endogenous Price Markup"*

Luís Costa† Nuno Palma‡

June 2007

Abstract

In this note we show that the claim from Chen et al (2005) that their model generates an endogenous markup is incorrect. This is not only a nomenclature issue: using the fixed markup which we show to be the only one consistent with the structure of the model implies the main conclusions in that paper do not hold. In particular, government expenditure in infrastructure cannot affect the business cycle in this model by deliberately changing the market structure of the economy.

JEL Classification: E10, E62, H54.

Keyword: Endogenous markup.

*Without implication, the authors would like to thank Huw Dixon for his comments on an earlier version. UECE (Research Unit on Complexity and Economics) is financially supported by FCT (Fundação para a Ciência e a Tecnologia), Portugal. This comment is part of the multi-annual Funding Project (POCTI/0436/2003).

†Corresponding author. ISEG (School of Economics and Management), Technical University of Lisbon (TULisbon), Rua do Quelhas 6, 1200-781 Lisboa, Portugal; and UECE (Research Unit on Complexity and Economics), Rua Miguel Lupi 20, 1249-078 Lisboa, Portugal; e-mail: lukosta@iseg.utl.pt

‡London School of Economics and Political Science, Houghton Street, London WC2A 2AE, United Kingdom, e-mail: n.p.palma@lse.ac.uk

1 Introduction

In a recent article in Oxford Economic Papers, Chen *et al.* (2005) analyze the role of government expenditure in an imperfectly competitive static model, following the Dixon (1987), Mankiw (1988), and Startz (1989) approach, but introducing a government-expenditure externality through the production function. The authors claim this gives rise to an endogenous " (...) 'markup,' which is used to measure the degree of monopoly"[1]. In this comment we show the above mentioned model does *not* contain an endogenous markup, but a fixed one, and the authors' claim is based upon an incorrect interpretation of what the marginal cost for the typical firm in the model.

Section 2 presents the markup definitions used in the literature and discusses the importance of this variable. Section 3 considers the microfoundations of the original paper and compares their markup measure with the standard ones. Section 4 concludes.

2 Markup Definitions and Usage

When firms have the power to set prices facing downward-sloping demand curves, monopoly (market) power can be measured by the wedge between the marginal cost of production (MC) and the price paid by the buyer (p), wedge that the seller can keep to him/herself.

In order to quantify it, there are two main measures of market power used in the literature:

- the Lerner index, more popular in the IO literature, that is defined as

$$\lambda = \frac{p - MC}{p} \ , \epsilon \ [0, 1] \tag{1}$$

- the price-cost wedge, used more often in the Macroeconomics literature, that is defined as

$$z = \frac{p}{MC} \ , \epsilon \ [1, +\infty] \tag{2}$$

Both measures are connected by the monotonic relationship $\lambda = 1 - 1/z$, and a larger value for either λ or z implies a higher degree of monopoly power.

The claim that one particular macro-model produces changes in the values of market power is crucial, as noticed by Barro and Tenreyro (2006):

> From the standpoint of generating fluctuations in aggregate economic activity, movements in markups – reflecting shifts in the extent of competition – work similarly to the technological disturbances usually stressed in real business cycles (RBC) models.

[1] Chen et al. (2005), p. 527.

For an excellent survey on the importance of endogenous markups in macroeconomics see Rotemberg and Woodford (1999).

However, markup fluctuations are not the only source of endogenous variability in the overall efficiency level in the economy available in the macroeconomic literature. Several types of externality also affect 'observed' total (private) factor productivity, as measured by the Solow residual, and they are not due to fluctuations in market power.

3 Micro-Foundations and Markup in Chen *et al.* (2005)

The original article here discussed presents a closed economy populated by n (a large number of) Dixit and Stiglitz (1977) monopolistic producers, each one using the following technology to generate a differentiated product variety:

$$y_i = f(L_i, G) \ , \ i = 1, 2, ...n \tag{3}$$

where y_i represents the output of firm i, L_i is its labor input, and G is government expenditure (on infrastructure). Here, firm i obtains its labor in a competitive market at a wage rate w, and G is a public good available to all firms at zero price. Furthermore, we know that $f_L > 0$, $f_{LL} < 0$, $f_G > 0$, $f_{GG} < 0$, and $f_{LG} \gtreqless 0$, where $f_u = \frac{\partial f}{\partial u}$and $f_{uv} = \frac{\partial^2 f}{\partial u \partial v}$ with $u, v = L, G$. Thus, government expenditure works as a positive externality in production as it is a non-rival non-excludable input for firms.

Here, 'labor demand' for firm i can be written as

$$L_i = \phi(Y_i, G) \ , \ i = 1, 2, ...n \tag{4}$$

where $\phi_1 = \frac{\partial \phi}{\partial y_i} = \frac{1}{f_L} > 0$ and $\phi_2 = \frac{\partial \phi}{\partial G_i} = \frac{1}{f_L} > 0 = -\frac{f_G}{f_L} < 0$.

In the model produced by Chen *et al.* (2005), neither of the two measures mentioned above (λ or z) is used. In fact, the authors use a price-wage ratio:[2]

$$\mu \equiv \frac{p_i}{w} = \frac{\sigma}{\sigma - 1}.\phi_i(y_i, G) > 1 \tag{5}$$

where σ is the price (p_i) elasticity of demand faced by producer i. This approach is incorrect, as the wage rate does not correspond to the marginal cost of the model (in which case the measure used would be the price-cost wedge, which we believe the authors were trying to calculate).

We will now discuss why the marginal cost is not equivalent to the wage rate in this model. In a model where labor is the only private input acquired by firms, as in this case, total cost is given by $TC_i = w.L_i = w.\phi(yi, G)$ and consequently the marginal cost is $MC_i = \frac{\partial TCi}{y_i} = \frac{w}{f_L} = w.\phi_1(y_i, G)$. Note that the marginal

[2] See equation (9) and the following line in page 527 of the original article.

cost would only be equal to the wage rate if and only if the production function was $y_i = 1.L_i$ (no externality and unit average labor productivity).

Some additional issues need clarification at this point. First, there is no mathematical reason why μ (the reciprocal of the real wage in a symmetric equilibrium) should be bounded below by 1, with the general production function chosen. The value of ϕ_1 is expressed in units of labor per unit of good i, thus its numerical value clearly depends on the choice of units which does not guarantee the expression is larger than one.

Second, and more importantly, using an appropriate markup measure we obtain $\lambda = \frac{1}{\sigma}$ and $z = \frac{\sigma}{\sigma - 1}$, a fixed markup. Despite the fact that labor is the only private input, and that labor demand is affected by fiscal policy, the monopoly power is not affected by fiscal policy. This should be clear when we observe the demand function faced by firm i in equation (3) of the original article, and the market structure assumed (Dixit-Stiglitz monopolistic competition): the price elasticity of demand faced by each producer is fixed and there is no way the market share of each producer can vary under a symmetric equilibrium.

It is important to remember that μ is nothing else than the reciprocal of the real wage. What the authors have in this paper is a fluctuating real wage: the real wage depends positively on government expenditure in infrastructure, and the markup remains fixed. What does vary with fiscal policy here is the marginal cost. However, this also happens (indirectly) in all general-equilibrium models, even in perfectly competitive ones. What is new in Chen *et al.* (2005) is the positive externality in production that may decrease the marginal cost instead of increasing it via equilibrium production and wages.

Finally, notice that μ still varies with G when $\sigma \to \infty$, i.e. when there is perfect competition. Obviously, it does not make any sense to have an endogenous markup under perfect competition. In fact, the results in Chen *et al.* (2005) have nothing to do with markup variation: they are driven by an externality that is closer to the effects of increasing returns to specialization as in Devereux et al. (1996) or love for variety in Heijdra and van der Ploeg (1996). For a model studying the effects of a really endogenous markup (entry in a Cournotian model) within the Dixon-Mankiw-Startz framework see Costa (2004).

4 Concluding Remark

The model in Chen *et al.* (2005) contains a fixed markup, due to an incorrect identification from the authors of the marginal cost for their typical firm. Therefore, the claim that government expenditure in infrastructure affects the markup in this model is incorrect. Changes in labor efficiency are solely due to the direct effect of government expenditure on the production function (a positive externality).

References

[1] Barro R., and S. Tenreyro (2006) "Closed and Open Economy Models of Business Cycles with Marked Up and Sticky Prices" *Economic Journal* **116**, 434-456.

[2] Chen J.-H., J.-Y. Shieh, C.-C. Lai, and J.-J. Chang (2005) "Productive Public Expenditure and Imperfect Competition with Endogenous Price Markup" *Oxford Economic Papers* **47**, 522-544.

[3] Costa L. (2004) "Endogenous Markups and Fiscal Policy" *Manchester School* **72**, 55-71.

[4] Devereux M., A. Head, and B. Lapham (1996) "Monopolistic Competition, Increasing Returns, and the Effects of Government Spending" *Journal of Money, Credit, and Banking* **28**, 233-254.

[5] Dixit A., and J. Stiglitz (1977) "Monopolistic Competition and Optimum Product Diversity" *American Economic Review* **67**, 297-308.

[6] Dixon H. (1987) "A Simple Model of Imperfect Competition with Walrasian Features" *Oxford Economic Papers* **39**, 134-160.

[7] Heijdra B., and F. van der Ploeg (1996) "Keynesian Multipliers and the Cost of Public Funds under Monopolistic Competition" *Economic Journal* **106**, 1284-1296.

[8] Mankiw N.G. (1988) "Imperfect Competition and the Keynesian Cross" *Economic Letters* **26**, 7-14.

[9] Rotemberg, J., and M. Woodford (1999) "The Cyclical Behavior of Prices and Costs" in *Handbook of Macroeconomics* by J. Taylor and M. Woodford, Eds., Amsterdam: Elsevier, 1051-1135.

[10] Startz R. (1989) "Monopolistic Competition as a Foundation for Keynesian Macroeconomic Models" *Quarterly Journal of Economics* **104**, 737-752.