TEXTO PARA DISCUSSÃO

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Changes in Capacity Utilization in
"Fully Adjusted Situations"*

Edward J. Amadeo**

PUC-Rio – Departamento de Economia
www.econ.puc-rio.br

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**Assistant professor of Economics at the Pontifical Catholic University of Rio de Janeiro.

1.   Introduction

In a recent article published in this journal, Vianello[1] presents a model in which capacity utilization is allowed to vary (and, indeed, to play the role of the adjustment variable) in the transition between "fully adjusted situations" as characterized by uniform rates of profit and normal degree of capacity utilization. By allowing utilization to adjust, Vianello provides an interesting and innovative discussion of the movements of proportions of labour and capital employed in the "corn" and "iron" industries between steady states given a change in data. As for the relation between the rates of profit and growth, on the one hand, and the real wage, on the other, his conclusions are quite in accordance with the Classical approach: higher rates of profit and accumulation are associated with lower real wage rates.

Vianello makes the "reasonable supposition" that the "productive capacity ... does not tend to remain either systematically under-utilized or systematically over-utilized" (p. 76); and that "under-utilization, as well as over-utilization, of productive capacity is by its very nature a temporary phenomenon" (p. 82). These suppositions constitute the only reason for the assumption that in fully adjusted situations the degree of capacity utilization corresponds to its normal degree. This assumption, in turn, lies behind the conventional results concerning the relation between the rates of profit and growth and the real wage.

Vianello argues that "steady state models, based on the hypothesis that productive capacity is *continuously* kept at its normal degree of utilization should be regarded as seriously misleading" (p. 72). It is the contention of this note that once we allow utilization to vary between steady states, we should be prepared to examine the possibility of utilization being different from its normal degree[2] even in fully adjusted situations. Our argument shall be that effective demand may have an effect on the degree of capacity utilization in the long period. Furthermore, it shall be argued that this possibility is not only theoretically plausible but that it tends to revert the Classical relation between growth and distribution.

Before we proceed, a word is in order to discuss the plausibility of different-from-normal utilization in fully adjusted situations. The problem, although difficult, must be faced and, from the start, we claim no definitive answer. What follows is no more than some preliminary reflections on the issue. It is important to begin by noticing that a central element in the 'endogeneization' of capacity utilization in growth models is the interaction of the behaviour of the individual firm with movements of aggregate demand. If the examination of this interaction can be made into an argument

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[1] F. Vianello, 1985. "The pace of accumulation", *Political Economy*, vol. 1, n. 1.

[2] For the purposes of this paper, it makes no difference if the 'normal' degree of utilization is the 'desired' degree as determined by firms' technological and strategic factors or 'full' utilization of capacity. For an interesting discussion of the notion of normal utilization, see Kurz (1985).

for firms being unable to achieve their utilization target, it seems save to argue that the supposition that utilization is always at its normal degree in steady states begs the (plausibility) question.

Two elements are involved in the endogeneization of capacity utilization. The first is the recognition that firms operating in oligopolized markets tend to avoid price movements as a competitive weapon[3]. Instead, they will make use of other strategies to increase their share of the market (such as, e.g., product differentiation) and adjust to changes in demand through movements in capacity utilization[4]. Second, since in highly concentrated and oligopolized industries, firms are able to control profit margins and, at least to a certain extent, the rate of profit, capacity utilization becomes the central signalling variable for short and long-term decisions. As for the latter, this only implies that investment decisions may be more sensitive to changes in utilization than in the (expected) rate of profit.

If we start from a fully adjusted situation in which each firm is operating at its utilization target, a reduction in aggregate expenditure will, in the first instance, lead to a reduction in capacity utilization. If firms react by reducing investment demand, there seems to be no endogenous mechanism that would bring them back to their normal degree of utilization. Quite the contrary, a cumulative process, leading to lower utilization would develop. Formally, a position of repose would only be achieved if the stability of the adjustment process is postulated.

It is worth noticing that this adjustment process does not deny the plausibility of the general principle that in the long period capacity adjusts to demand. It only means that if capacity utilization is not fixed *ex-hypothesis*, the interaction of an investment function based on the degree of utilization with the behaviour of firms trying to accommodate utilization to a new level of demand makes utilization move away (rather than towards) the normal degree.

In what follows, a simple one-sector model is presented to illustrate the role of endogenous capacity utilization in growth theory. It shall be argued that the Classical relation between the rate of profit and the real wage does not necessarily hold in a model in which utilization is endogenously determined. The model is also meant to be a contribution to the interaction between the "surplus approach" and Keynes's principle of effective demand.

2. A Simple Model

We start with the following equation of production:

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[3] See, e.g., Sweeze (1939) and Robinson (1933, preface to the second edition).
[4] Steindl (1952, ch. 5) makes this point by arguing that although in a competitive market (with many firms and a wide prime cost dispersion among firms) cut through competition via price reduction is a reasonable strategy for low cost firms, in a concentrated industry all firms would probably loose with a 'price war'. Firms tend to engage in tacit agreements and adjust to changes in demand through changes in capacity utilization.

$$p = \frac{w}{\pi} + p\frac{r}{x}$$

where p is the price of a unit of output, w is the wage rate, r is the gross rate of profit, $\pi = X/L$, where X is the level of aggregate output and L is the level of employment and $x = X/K$ is the degree of capacity utilization. From the equation of production, we can derive a profit rate equation given by:

$$r = \left[1 - \frac{\omega}{\pi}\right]x \tag{1}$$

where ω is the real wage and ω/π is the share of wages in output. When the actual degree of capacity utilization (x) is equal to the normal degree $(\underline{x})$, equation (1) describes the capacity distribution frontier depicted in figure 1.
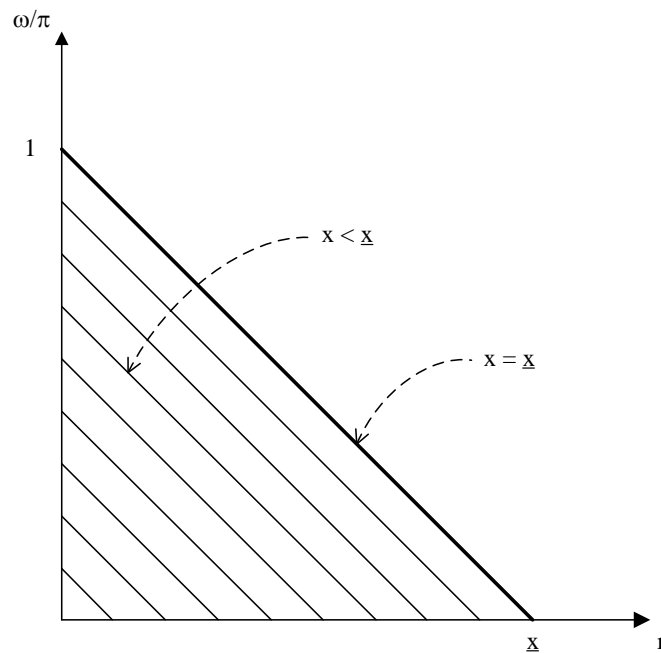

Figure 1

For $x < \underline{x}$ the frontier becomes the upper bound for the distributíon set represented by the shaded area on the graph. The following expenditure equation provides the second equation of the model:

$$pX = c_w wL + c_k[pX - wL] + pI$$

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where c_w and c_k are, respectively, workers' and capitalists' propensities to consume. Dividing this equation through by pK and assuming that workers do not save and capitalists do not consume, we get a simplified version of the Cambridge equation:

$$h^s = r \qquad (2)$$

where h^s is the rate of accumulation.

For a given real wage rate ($\omega = \underline{\omega}$) and assuming (as Vianello assumes) that capacity utilization is always at its normal degree ($x = \underline{x}$) in fully adjusted situations, the position of rest of the System will be characterized by:

$$h^* = r^* \left[1 - \frac{\omega}{\pi}\right] \underline{x}$$

The long period configuration is depicted in figure 2.
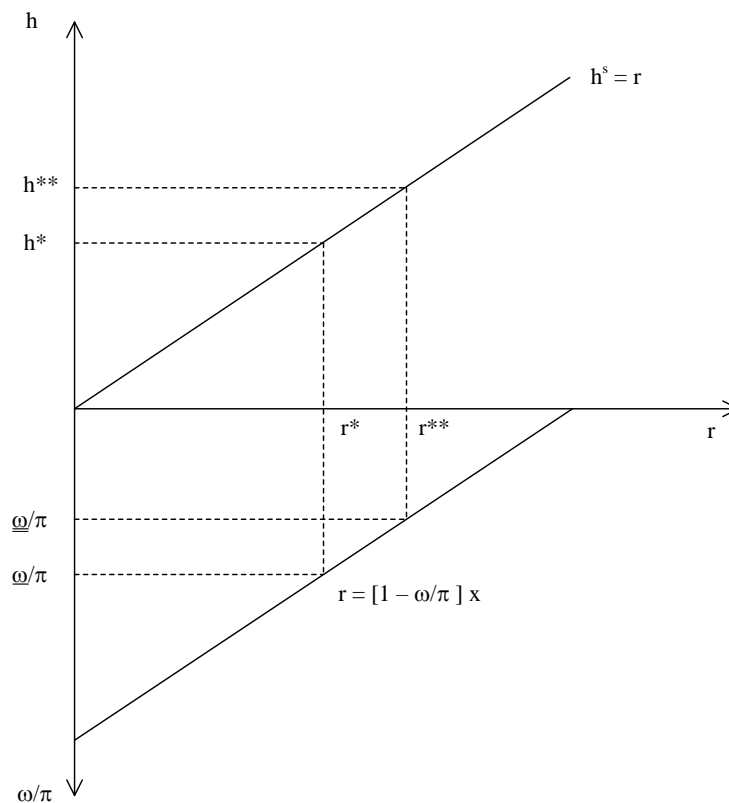

Figure 2

As in the exercise developed by Vianello (pp. 79-81), the Classical relation between growth and distribution obtains a lower wage rate is always associated with higher rates of profit and accumulation.

We may now introduce the alternative hypothesis, namely, that capacity utilization is endogenously determined. We assume an investment demand function according to which the demand for capital goods will increase whenever the actual degree of utilization is greater than the normal degree. This function can be written as follows:

$$h^i = \alpha + \beta(x - \underline{x}) \tag{3}$$

where α stands for "animal spirits" and β measures the speed of adjustment of investment to changes in capacity utilization. For a given wage rate, equations 1 - 3 yields the following long period configuration:[5]

$$x^* = \frac{\alpha - \beta \underline{x}}{\lambda}$$

and

$$h^* = r^* = \alpha + \beta \left[\frac{\alpha - \beta \underline{x}}{\lambda} - \underline{x} \right]$$

where

$$\lambda = 1 - \frac{\underline{\omega}}{\pi} - \beta$$

Figure 3 depicts the long period configuration. In quadrant II, the investment and accumulation functions together determine the rate of growth and degree of capacity utilization. For a given wage rate, the profit equation (equation 1) yields a linear relation between the degree of utilization and the profit rate, as depicted in quadrant I. This relation determines the rate of profit associated with the exogenous wage rate and the degree of capacity utilization as determined in quadrant II. Note that the $(\underline{\omega}/\pi, r^*)$ configuration lies inside the distribution set rather than on the distribution frontier.

In figure 4, we depict the effect of an increase in the wage rate; the effects on the rates of growth and profit and the degree of capacity utilization are given by:

$$\frac{\partial x^*}{\partial \omega} = \frac{\alpha - \beta \underline{x}}{\pi \lambda^2} > 0$$

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[5] The stability condition of this system is given by $\beta - (1 - \omega/\pi) < 0$ which means that the investment function must be less sensitive to changes in capacity utilization than the saving function.

$$\frac{\partial h^*}{\partial \omega} = \frac{\partial r^*}{\partial \omega} = \frac{\beta(\alpha - \beta \underline{x})}{\pi \lambda^2} > 0$$
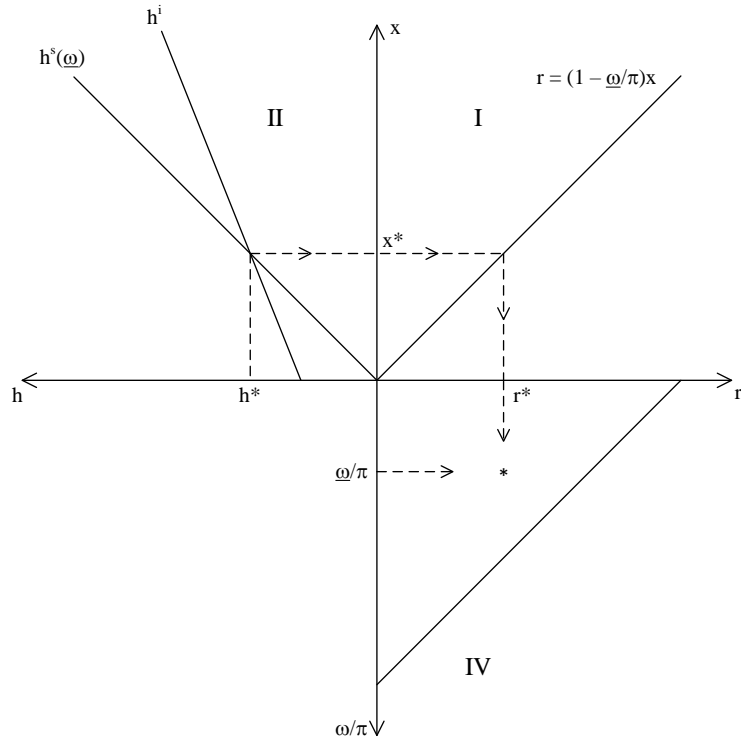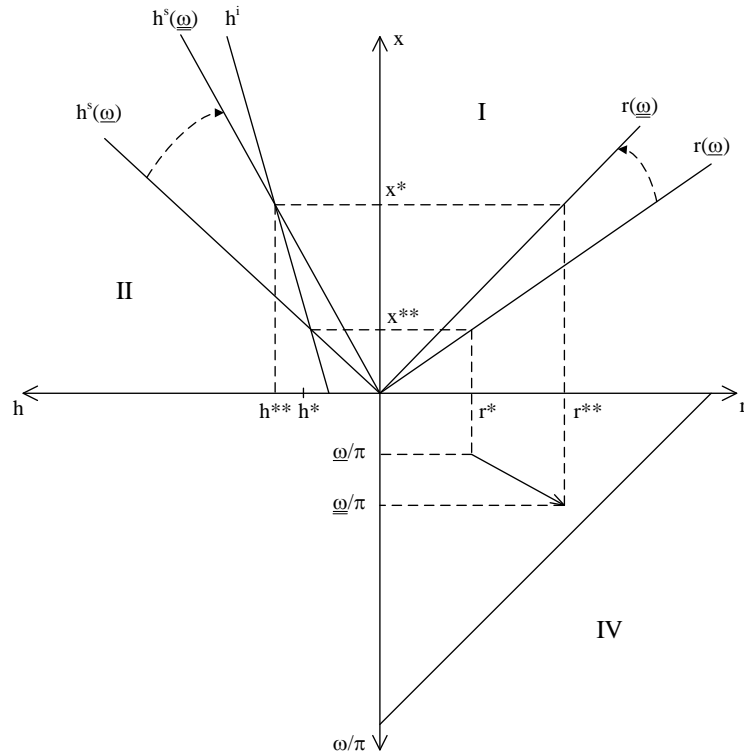
Figure 3

Figure 4

Given the assumption that workers' propensity to consume is greater than that of capitalists, a higher wage rate is associated with a higher degree of capacity utilization, which leads to a higher rate of growth given the relation between investment demand and utilization. These effects are the result of a shift in the accumulation function in quadrant II of figure 4. In quadrant I, the function relating utilization and the rate of profit also shifts inwards given the change in the wage rate. The new profit rate is greater than the original rate. The rather unconventional result of this exercise is that a higher wage rate is associated with higher rates of profit and growth. The Classical trade-off between the real wage and the rate of profit, on the one hand, and the rate of growth and consumption per worker, on the other hand, give way to a situation in which all of them can move in the same direction.

It will be noted that, according to this construction, both output (and capacity utilization) and capacity itself adjust to changes in data. The model contains the elements which Garegnani (1983, p. 75) believes "a satisfactory long-period theory of output" requires, namely, "(a) an analysis of how investment determines saving through changes in the level of *productive capacity* (and not only through changes in the level of *utilization* of productive capacity); (b) a study of the factors affecting the long-run levels of investment; (c) a study of the relation between consumption expenditure and aggregate income".

Equation 2 satisfies requirement; equation 3 provides a version of requirement (b). Finally, the adjustment to changes in data through changes in the rate of growth (h) and capacity utilization (x) is no more than the mechanism describing requirement (a). The model also provides a simple one-sector version of the interaction between the "surplus approach" and Keynes's principle of effective demand.

According to the construction proposed here, to higher wage rates there corresponds higher degrees of capacity utilization and rates of profit up to the point where the economy reaches a situation of full utilization of capacity (x_f). Refer to figure 5, where $x_0 < x_1 < \cdots < x_f$.

The inverse relation between the wage rate (or share of wages in income, ω/π, for that matter) and the rate of profit does not necessarily hold as long as capacity is less than fully employed. This conclusion has an interesting policy imp1ication: it implies that the notion of 'profit squeeze' according to which higher real wages lead to lower rates of profit and, thus, lower rates of growth, must be qualified. On the contrary, if the government can affect distribution (through changes in the tax structure for example) it is possible to implement a policy with no losers, one in which workers and capitalists can win as long as there is idle capacity.
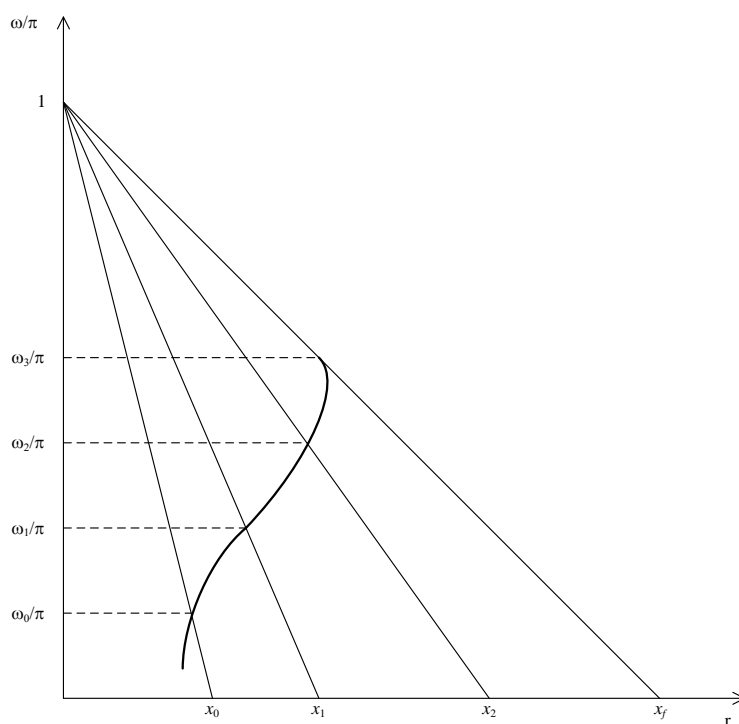
Figure 5

3. Concluding Remarks

The note started by arguing that once we introduce capacity utilization as an adjustment variable in models of growth and distribution, we must be prepared to examine the possibility of utilization being different from its normal degree in fully adjusted situations. We then argued for the plausibility of this outcome based on the assumptions that firms react to changes in aggregate demand by changing the degree of utilization, which, in turn, may have a negative effect on investment demand. The interaction of the two effects could prevent firms from achieving their utilization target or the normal degree of utilization. The notion of fully adjusted situation would have to be modified to allow for this possibility. We then reproduced Vianello's exercise showing that if utilization is assumed to be at its normal degree in fully adjusted situations, there would be an inverse relation between the rates of profit and growth, on the one hand, and the real wage, on the other. We finally developed a simple alternative model in which utilization is endogenous; in this model, the classical relations between growth and distribution do not necessarily obtain. We suggest that this simple model provides a starting point to for the combination of the "surplus approach" and Keynes's principle of effective demand.

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