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An attempt at a reconciliation of the Sraffian and Kaleckian views on desired utilization

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This paper derives firms' desired rate of utilization from an explicit maximization of a conjectured rate of profit at the micro level. Invoking a strategic complementarity, desired utilization is thus an increasing function of not only the profit share but also the actual utilization. Drawing on recent empirical material and a straightforward functional specification, the model is subsequently numerically calibrated. In particular, this ensures a unique solution for a steady-state position in which the actual and the endogenous desired rates of utilization coincide. On the other hand, it turns out that the anticipated losses of firms by not producing at the desired level are rather small. Hence there may be only weak pressure on them to close a utilization gap in the ordinary way by suitable adjustments in fixed investment. It is indicated that this finding may serve Kaleckian economists as a more rigorous justification for viewing their equilibria as pertaining to the long run, even if they allow actual utilization to deviate persistently from desired utilization.

Keywords: *endogenous desired utilization, profit maximization, conjectured profits, strategic complementarities, calibration*

JEL codes: *C13, E12, E30*

1 INTRODUCTION

The Kaleckian modelling framework of distribution and growth has become an influential tool for macroeconomic analysis. This nevertheless does not mean that economists do not have quite different views about its specific design. A central issue that divides them into separate camps is the concept of the firms' desired, or normal, utilization of productive capacity. To begin with authors trained in a Sraffian, Marxist or classical tradition, in most models they conceive of desired utilization as a given and fixed magnitude determined in the end by some sort of profit maximization, although usually this principle is not made more precise.¹ While generally firms will not utilize their capital stock at the desired level and may under- as well as overutilize their equipment, for an equilibrium to make sense in a long-run perspective there ought to be some mechanism that adjusts the actual utilization rate to the desired rate. Otherwise the firms' rate of capital accumulation cannot remain constant and growth would systematically drift upward or downward, respectively.

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1. This will only be our concern later in the paper.

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Within the confines of current theoretical discussions, a typical implication of this approach is the problem of Harrodian instability, which is a dynamic process of cumulative causation in investment, output and expectation formation that inevitably drives the economy away from steady-state growth once it is disturbed from this path. This feature is a big challenge and various means have been proposed for how to cope with it. Thus either local stability is achieved or, alternatively, a stabilization of the system in the outer regions of the state space is achieved, so that the economy would persistently oscillate around the steady state. Many people can accept some of these solutions, at least for the time being and for a given limited purpose, whereas other economists remain unconvinced by any of them (Hein et al. 2012: 140). The latter, then, can be seen as forming a different camp on its own.

These unconvinced economists, who are often labelled Kaleckians or neo-Kaleckians, treat the rate of capacity utilization as an accommodating variable not only in the short run but also in the medium and long run. Specifically, this assumption allows them to maintain two paradoxes that seem particularly dear to them, the paradox of thrift and the paradox of costs. This means that a decrease in the propensity to save or an increase in real wages lead to an increase in output, utilization or growth rates. Consequently, the Kaleckians are also able to reject the famous dictum by Duménil/Lévy (1999) that we are Keynesian in the short term and classical in the long term.

Following the discussion in Hein et al. (2012), Kaleckian economists may in finer detail be subdivided into three groups, although they are not necessarily mutually exclusive. To begin with the second group in the article's ordering, its proponents argue that a normal rate of utilization may be only one of several targets that the firms seek to pursue. This means that, depending on their preferences, the firms trade off one target with another and so are willing to accept certain deviations even if they are persistent.²

The third group seems to have gained some particular attention lately. Its adherents abandon the concept of desired utilization as a rate that is exogenously fixed and determine it as an endogenous variable within their models. Most prominent is the drastic approach to reverse the causality of actual and desired utilization altogether. Viewing the desired rate as a moving target influenced by past values, it is the desired rate that adjusts to the actual rate and not the other way around.³ The approach has been criticized on conceptual grounds (for example, see Skott 2012). What makes it even more problematic is that it typically comes as a joint hypothesis. That is, the adjustments of desired utilization are combined with a few other dynamic mechanisms, however in such a way that, technically speaking, they give rise to collinearities in the difference or differential equations. The effect is that, instead of a unique equilibrium, such a system has a whole continuum of steady states, with a whole continuum of utilization rates. This feature is then praised as hysteresis or path dependence. On the other hand, to an outsider at least, these constructions appear somewhat artificial, built in just for the modeller's special purpose.⁴

2. Franke (2017b) makes the point that one may not be satisfied too early with such a situation. He brings into consideration the possibility that the agents in a concrete model may have been assumed to be too restrained in their behaviour. Accordingly, upon closer reflection, they would have more flexible or additional ways to react to some of the discrepancies they perceive. The gaps could thus disappear, or new discrepancies might emerge and open up new discussions.

3. The basic argument refers to behavioural economists who state that the managers of firms are satisficers rather than maximizers. Specifically, if goals are not met, a firm readjusts its aspiration level downwards. In this way desired utilization assumes a conventional character (and is better called normal utilization).

4. By introducing an additional feedback effect at some suitable place in such a model, the collinearities may disappear and the uniqueness of a steady state may be re-established.

The present paper may be mainly of interest to the first group of Kaleckian macro-economists: they skirt the problem of Harrodian instability by simply denying the firms any need in their investment decisions to react to a possible utilization gap.⁵ There are two kinds of justifications for this, which often are not clearly distinguished. One says (quoting Hein et al. 2012: 146) that ‘the notion of “normal” or “desired” utilisation should be defined more flexibly as a range of degrees rather than as a single value’. According to the other explanation, ‘firms may be quite content to run their production capacity at rates of utilization that are within an acceptable range of the normal rate of utilization’, where ‘under this interpretation, the normal rate of capacity utilization is more a conventional norm than a strict target’ (both formulations in Hein et al., in the same paragraph, suggesting that they are essentially considered to be equivalent).

It follows as a consequence that in comparing, say, two equilibria before and after a change in one of the parameters in a model, both can be interpreted as long-run equilibrium positions even though they may exhibit different degrees of utilization. This is legitimate as long as they fall within that ‘acceptable range’. The conclusion rests on the assumption of a kind of corridor of stability, from which Harrodian instability is being excluded. Missing in presentations of this approach are, however, discussions of how wide or narrow such a corridor is, and, more importantly, what criteria precisely determine the boundaries beyond which the original conclusions would no longer be valid.

In a first and short description to situate the paper in this literature, our analysis may be said to start out from a Sraffian or Marxist perspective that assumes the existence of a unique desired rate of utilization which is determined on the basis of a profit-maximization principle. One point is that the optimization problem will be made explicit, and that its solution will be state-dependent. On the other hand, we will also emphasize that this notion need not be in full contradiction to the Kaleckian point of view, according to which the firms are willing to accept a certain permanent gap between actual and desired utilization. While, in our framework, the latter is not a conventional and somewhat vague norm but a definite benchmark for the firms’ current rate of utilization, a second point is the question of whether or under what circumstances a possible gap could be regarded as fairly inessential in terms of forfeited profits.

The paper begins by widening the Sraffian perspective on desired utilization, for which it withdraws from the notion of an exogenously given and fixed magnitude. Desired utilization will, rather, be represented as a function of some macroeconomic variables. This relationship will not just be postulated but derived from a *hypothetical* profit-maximization problem which, it may be pointed out, may or may not play a role in the firms’ actual decisions about output, prices and investment.⁶ It is furthermore important in this concept that the objective function includes some expectational elements regarding imaginary variations of a firm’s utilization rate. In particular, these conjectured profits are also influenced by the current state of the economy. This assumption implies that not only the profit share but also the actual utilization will have a bearing on the level of desired utilization.⁷

5. Most often, however, investment is still assumed to react to the level of utilization, which may appear a somewhat mechanical if not contradictory specification.

6. That is, our concept of desired utilization will be compatible with a wide variety of macroeconomic modelling approaches.

7. A reference to expectational elements is necessary in any case. Otherwise, in the macroeconomic standard formulation of profit rates, it would not be clear why firms should not desire to produce at the highest technically and institutionally feasible level, which would then rule out any ‘overutilization’ in these models.

As a consequence, the Sraffian condition for a long-run equilibrium, which says that actual utilization must equal desired utilization, determines the steady-state rate in an endogenous way, namely as the solution of a fixed-point problem for a real function of the aggregate utilization rate. As it turns out in our specifications, this gives rise to a unique steady state which only changes if the profit share changes (which is here treated as an exogenous variable). On the other hand, changes of a saving propensity, for example, continue to have no long-run effects. So far, our approach to desired utilization remains close to the Sraffian conception, only lending more flexibility to it.

The significance of our analysis for the Kaleckian approach can be shown when it comes to numerical issues. It will be very helpful that we can make use of recent empirical estimates of the responsiveness of desired utilization to *ceteris paribus* changes in its determinants (Tavani/Petach 2018). They allow us to specify the form of our objective function of conjectured profits and calibrate the parameters for its expectational elements. In this way it is found that even larger variations of a firm's utilization rate would affect its profitability only marginally; the effects of other factors (such as the profit share) in the firm's decision on investment will actually be much more important. Hence, as mentioned above, deviations of actual from desired utilization may appear rather inessential to the firms and, therefore, may well persist even over longer periods of time, or vanish only extremely slowly. This result and the ideas from which it is derived are put forward as a proposal of how the Sraffian and Kaleckian view on desired utilization could be reconciled.⁸

The remainder of the paper is organized as follows. Section 2 is a prelude to the paper's main analysis. It first shows that too simple a profit-maximization approach to determine desired utilization will not work. Subsequently some treatments in the literature are mentioned that can later be compared to our results. Section 3 introduces the idea of a conjectured rate of profit, the maximization of which determines the desired rate of utilization. It begins with a general formulation of the framework and then proposes a convenient functional specification, which permits an explicit computation of the solution to the problem. Section 4 offers a numerical calibration of the concept and studies the effects of non-optimal utilization rates on the conjectured profits. This is first investigated at the level of a single firm and then for a comparison of macroeconomic steady-state positions. Section 5 contains a more detailed discussion of the methodological points that have just been sketched provisionally. Section 6 concludes.

2 PRELIMINARY OBSERVATIONS

2.1 A simple but futile attempt at desired utilization

Following a standard reference like Kurz (1986), underlying the concept of desired utilization is the principle of cost minimization or, complementarily, profit maximization. Regarding the heterodox macroeconomic literature it is, however, somewhat amazing that there does not seem to be any discussion about how this fits in with the standard formulation of the profit rate, which is linearly increasing without bounds in the output–capital ratio.

To introduce profit maximization in a formal way into macroeconomics, it is an immediate idea to abandon the linear specification. Assume instead that at sufficiently

8. Some of the ideas or their implications could perhaps be considered to contain some anti-Kaleckian flavour. The paper will not be interested in such labelling attempts. The term 'Kaleckian' will only apply to a non-zero utilization gap in a long-run equilibrium, which might now be justified by making reference to our analysis.

high levels of utilization the increments in the profit rate upon a further rise in utilization begin to decline and eventually also the level of the rate itself. Obvious reasons for this non-linearity are that overtime work or night shifts are more expensive for firms, and possibly the maintenance costs of the capital stock would then be higher, too. Accordingly, in a succinct manner, the profit rate may be conceived of as a concave function $r = r(u)$ of utilization u that first increases and then decreases. Desired utilization u^d can then be determined as the level of u that maximizes this function, which is characterized by a zero derivative $dr(u^d)/du = 0$.

The problem with this concept is its implication for an IS market-clearing equilibrium. Consider the familiar framework of a one-good economy without government and foreign trade where labour is in perfectly elastic supply. Firms pay out all profits to the rentier households, who save a fraction s of them. Workers do not save, so that total savings normalized by the capital stock are given by $g^s = s r(u)$. The firms' benchmark for fixed investment is an expected rate of growth g^e . They plan to increase their capital stock somewhat faster (more slowly) if their current utilization is above (below) their desired utilization. Hence investment is described by a function $g^i = g^e + \gamma(u - u^d)$, where γ is a positive reaction coefficient.

Suitable variations of utilization ensure a balancing of supply and demand, that is, excess demand vanishes, $ED := g^i - g^s = 0$. Focusing on a situation where IS utilization happens to coincide with desired utilization, let us ask how $u = u_{IS}$ changes in response to a rise in the expected growth rate. Using the Implicit Function Theorem, one calculates:

$$\frac{\partial u_{IS}}{\partial g^e} = \frac{-\partial ED / \partial g^e}{\partial ED / \partial u} = \frac{-1}{\gamma} < 0, \tag{1}$$

owing to the fact that $\partial g^s / \partial u = s dr(u^d) / du = 0$ from the tangency condition in the denominator. The result that more optimistic growth expectations cause economic activity to decline would certainly be hard to accept. In addition, $\partial g^s / \partial u = 0$ means that the Keynesian stability condition cannot possibly be fulfilled. Therefore, as simple and straightforward as this approach to desired utilization is, it just does not work and one has to consider the problem in finer detail.

2.2 Examples of endogenous desired utilization in the literature

Much of macroeconomic theory entertains the notion that firms strive to maintain a certain level of excess capacity. Two reasons to explain this objective stand out. First, firms operating in imperfect markets keep some capacity idle in order to respond rapidly to unanticipated surges in demand. The other argument is based on the assumption that the amount of excess capacity has a certain influence on the entry of new firms into an industry. The assumption can be justified by an extension of the limit-price argument: the probability of entry may be determined, not by the actual price, but by the price which would prevail if all existing capacity were fully utilized. Excess capacity can then deter entry because it demonstrates commitment to the particular line of business and signals the willingness of the firm to defend its position – should new entry take place – by expanding production and cutting prices (for this and the following, see Skott 1989: 53ff).

Usually this kind of reasoning is rather informal and quickly leads to the assumption of a given desired, or normal, rate of utilization, with no further hints as to what determines its specific level.⁹ In principle the rate may be subject to variations, but this is regarded as

9. A more substantial reasoning, some of which also includes formal arguments, may be found in the industrial economics literature.

an issue outside the model. The discussion by Skott (1989) is a certain exception. He supposes that desired utilization u^d is a decreasing function of expected rates of entry, which in turn are an increasing function of the ratio of pure profits to total revenue. The costs that are to be deducted from the revenue include the wage bill, capital depreciation and the cost of finance. In this way, u^d depends positively on the real wage or the wage share, for that matter (wages $\uparrow \Rightarrow$ profit ratio $\downarrow \Rightarrow$ expected entry rate $\downarrow \Rightarrow u^d \uparrow$). The depreciation rate and the rate of interest exert a positive influence, too. Interestingly, in the expression for the profit ratio the latter two are divided by the utilization rate of the individual firm. Hence, in addition to the effects just mentioned, desired utilization of the ‘representative firm’ (ibid.: 54) is a decreasing function of the average utilization in the economy. These statements may be later compared to the results implied by our own approach to the determination of desired utilization.¹⁰

3 THE CONCEPT OF ENDOGENOUS DESIRED UTILIZATION

3.1 The firm’s profit-maximization problem

Considering a single firm i , let y_i be its output–capital ratio and \bar{y} the maximum value of this ratio. The latter is the same for all firms and can conveniently be thought of as being technically given by operating the existing capital stock seven days a week for 24 hours.¹¹ The rate of capacity utilization is $u_i = y_i/\bar{y}$ (hence $u_i \leq 1$). Assuming a uniform rate of capital depreciation δ and a uniform profit share h , which we treat as exogenously given, the firm’s current rate of profit is

$$r_i = h\bar{y} u_i - \delta. \quad (2)$$

Evidently, this formulation is unsuitable for a maximization argument that seeks to establish a desired level of utilization from which the firms, as usual in macroeconomic theories, may deviate in both directions; with the linear influence of u_i there would only be the trivial corner solution $u_i = 1$. When this paper nevertheless aims at determining desired utilization as an interior solution $0 < u_i < 1$ to an explicit optimization problem, the underlying objective function has to be reconsidered more carefully.

As has already been indicated in Section 1, it should be emphasized at the beginning that such a problem and the utilization rate thus obtained are a hypothetical construct that can stand on its own. Therefore, it has no specific consequences for the modelling of the firms’ actual decisions about the variables they have under control. In particular, firms need not necessarily operate at a desired level. In the first instance, and in the absence of inventories and rationing, their production may, rather, be geared to the current

10. Referring to Skott (1989) and the deterrence mechanism, Palacio-Vera (2009: 179) introduces desired utilization directly as a decreasing function of the profit share. Franke (2018: 6f), because of his interest in the effects of monetary policy, focuses on another single component. Likewise referring to Skott, he specifies desired utilization as an increasing function of the (real) rate of interest. By contrast, as already mentioned in Section 1, Hein et al. (2012: 160, equation (23)) take a different perspective (a conflicting-claims model of inflation) and derive a negative dependence of u^d on the interest rate.

11. Of course, institutional constraints may play a role as well. The analysis accepts the limits of ordinary macroeconomics and neglects different degrees of intensity and also the problem of how to treat different vintages of the capital stock, where dated or ‘obsolete’ equipment will remain shut down most of the time but occasionally be freed from the dust to earn quasi-rents. Likewise, the meaning of ‘full capacity’ for different sectors of a service economy is not discussed, either.

demand of their customers, which they take as given in the short period (the widely employed framework of IS market clearing). Nor is it implied that firms maximize an objective function to determine their prices or investment.

The theoretical status of our concept of desired capacity utilization will actually be similar to that of an exogenously given desired (or normal) rate of utilization in so much of the macroeconomic literature, which is also said to be optimal in some sense. The difference is that the latter is told as an informal background story, whereas the present paper proposes an explicit criterion. A strong additional point is that this approach will allow a quantitative assessment of how serious possible deviations of production from its optimal level may be.

Starting our discussion of a meaningful profit function, it may be realized that in an environment of imperfect competition (which we presume), a firm i cannot simply assume that it would be able to sell whatever it produces, at least not at the conditions presently prevailing. So, when considering its future revenues under imaginary variations of its utilization u_i , it cannot expect the profit rate to obey the simple relationship (2), not even in the absence of bottlenecks or disproportional cost effects. If, for instance, the firm considers increasing its production, it may well have to reduce the price somewhat in order to sell the additional output. In fact, this elementary argument corresponds to the concept of a firm's conjectured demand curve that many partial models for a single industry work with. For various reasons the firm might also anticipate higher wages that it would have to pay. A complementary aspect is that higher sales may require higher marketing efforts for the firm or taking other measures to acquire additional customers, which would likewise affect the revenues. Conversely, lower production and thus lower supply could mean higher sales prices or lower unit costs of this kind.

Thinking about variations of its output or utilization rate, respectively, a firm will therefore not maximize an expression like (2) but will maximize profits that are based on expectations about these effects and their quantitative order of magnitude. A straightforward way to take them into account is a *conjectured* rate of profit r_i^c , in which these anticipated losses are subtracted from (2). This rate is concerned with the question of what, given the present capital equipment, would be the profits under hypothetical variations of a firm's utilization rate u_i . The question leads us to introduce into (2) a loss function $\ell = \ell(u_i)$ that is increasing in the firm's utilization rate.¹² As usual in cost arguments like this, let us furthermore suppose that the function is convex and twice differentiable, that is, $\ell'(u_i) > 0$ and $\ell''(u_i) > 0$ for all $u_i < 1$ (though the 'losses' themselves could also be negative for low utilization rates, as h or δ might already include normal marketing costs, etc.).

This is a fairly standard reasoning so far. It is, however, supplemented by including another type of firms' expectations about the future demand for their products. The basic idea and its specific treatment is stimulated by the recent paper by Tavani/Petach (2018). The authors' point is that in deciding on its optimal production, a firm will also take the activity levels of the other firms into account. To this end they refer to a firm's marginal user cost and argue that 'no firm wants to be the first to ramp up utilization while everyone else is not, or equivalently that there are strong incentives to wait for other firms to increase utilization first and then do the same' (ibid.: 4). The reason is that the anticipated relative user costs of a single firm are lower when other firms are doing the

12. Anticipated price and/or wage adjustments are also likely to affect a firm's profit share. In order to streamline the results, it will, however, be convenient to treat the profit share h as a predetermined variable, which is exogenously given in the following discussion, and assume that possible effects on the firm's product wages and labour productivity are all captured by the loss function.

same (ibid.: 14). On the basis of these considerations the authors postulate that the marginal user cost of an individual firm decreases with average utilization in the economy.

As this short explanation may remain somewhat vague and perhaps also debatable for someone not very familiar with the theoretical conception of user costs, we propose a slightly different and more direct story in this paper. Let us assume that firm i has expectations about the general state of aggregate demand in the near future. They are relevant for the individual firm since it expects that it will be able to profit from a general improvement, too. Accordingly, even if it does not change its utilization, the firm could moderate its marketing activities and/or sell its current flow of output at higher prices. Given the profit share in the expression for the firm's gross value added $h\bar{y}u_i$, the expectations in this case can be captured by multiplying this term by a 'benefit' factor larger than one. Our proposal for a parsimonious modelling of this aspect is (a) that the general state of expected demand is proxied by the *aggregate* utilization rate u , and (b) that for the firm's conjectured profit rate r_i^c the term $h\bar{y}u_i$ is multiplied by a function that increases in expected demand and thus in u . This function may be called the firm's benefit function and designated $b = b(u)$, with $b'(u) > 0$ for its derivative.¹³

According to the classical argument, on the other hand, firms may also fear new entries in times of generally higher economic activity, which could lure away a proportion of their customers from them. Similar to the reasoning before, a firm's attempt to protect its market share would mean higher costs or lower prices for it. In the present context this idea could be represented by postulating a negative slope for the function $b = b(u)$. Thus, an increasing function amounts to assuming that the threat of new entry is of secondary importance. In the end this is an empirical issue. Fortunately, we can quote evidence in favour of a positive derivative $b'(u) > 0$, which will be a subject in the next subsection.

On the whole, therefore, when a single firm i sets up a benchmark in order to reach an assessment of its current rate of utilization, whether the latter is particularly high or low, what it is supposed to maximize by a suitable choice of u_i is the following conjectured rate of profit r_i^c :

$$r_i^c = b(u)h\bar{y}u_i - \delta - \ell(u_i). \quad (3)$$

Assuming a sufficiently convex shape of the loss function $\ell = \ell(u_i)$, the profit rate r_i^c will be increasing for low values of u_i and eventually decreasing as u_i approaches unity. A maximum of r_i^c is obtained at a value of u_i where the marginal profit rate $\partial r_i^c / \partial u_i$ is zero. The negative second derivative $\partial^2 r_i^c / \partial u_i^2 = -\ell''(u_i) < 0$ ensures that it is also unique, so that the firm's desired utilization u_i^d is well defined. As it depends on aggregate utilization and the uniform profit share, this rate is the same for all firms. Hence we can drop the firm index i and write $u^d = u^d(u, h)$. This functional relationship is the paper's proposal for a rigorous and tractable theoretical concept of desired utilization based on profit maximization in a macroeconomic framework.

13. The reasoning behind the influence of u is similar to that for an influence of u in the usual macroeconomic investment functions, which likewise, in order to make sense, contain a little story about expectations that, for simplicity, are condensed in u . Besides, not much would change if the benefit function, instead of attaching it multiplicatively to the profit term $h\bar{y}u_i$, were inversely related to the loss function. Applying a side remark by Flaschel/Skott (2006: 318) to the present setting, the benefit function may also, or alternatively, be a function of the economy's current rate of growth. Certainly, in a more comprehensive modelling one could think of additional variables entering the formulation of conjectured profits.

The reactions of the desired utilization rate to changes in its arguments are easily obtained. Defining the auxiliary function $f = f(u_i, u, h) := \partial r_i^c / \partial u_i = b(u)h\bar{y} - \ell'(u_i)$, which is zero in $u_i = u^d$, an application of the Implicit Function Theorem yields:

$$\begin{aligned} \frac{\partial u^d}{\partial u} &= \frac{-\partial f / \partial u}{\partial f / \partial u_i} = \frac{h\bar{y} b'(u)}{\ell''(u_i)} > 0 \\ \frac{\partial u^d}{\partial h} &= \frac{-\partial f / \partial h}{\partial f / \partial u_i} = \frac{b(u)\bar{y}}{\ell''(u_i)} > 0. \end{aligned} \tag{4}$$

In particular, desired utilization increases (decreases) if actual utilization increases (decreases). However, in contrast to the dynamic adjustments of u^d as they are postulated by one of the groups of Kaleckians mentioned in Section 1, this rate is here directly linked to u and derived from an explicit maximization argument. The reason for the positive relation is the strategic complementarity established by the benefit function $b = b(u)$ with its positive slope. Accordingly, a rise in aggregate utilization raises the conjectured marginal profits $\partial r_i^c / \partial u_i$, and therefore, as the latter are decreasing in the firm's utilization, the value of u_i where this function cuts the zero line. The mechanism for $\partial u^d / \partial h > 0$ is analogous and has nothing to do with a profit-led versus wage-led regime. Note that the positive reactions of u^d in (4) are the opposite of what Skott (1989: 53–55) concludes from his assumption that firms use excess capacity as a strategic deterrence to new entry (cf. Section 2.2).

The notion of desired utilization should provide for the possibility that it coincides with actual utilization in a state of long-run equilibrium. That is, given the profit share h , the function should have a fixed-point u° satisfying $u^d(u^\circ, h) = u^\circ$, and preferably it should be unique. The latter would be implied if desired utilization increased less than one-to-one with actual utilization in an economically relevant range, which is a feature that one will expect to apply anyway. Rather than formulate some general properties for the benefit and loss functions $b = b(u)$ and $\ell = \ell(u_i)$, ensuring existence and uniqueness, we will propose a concrete and even numerical specification of them in the next subsection.

3.2 A functional specification of desired utilization

Tavani/Petach (2018) find it convenient to assume constant elasticities for their adjustment cost function, which serves to capture the paper's user cost of capital. Applying this obvious idea to the present setting, let us specify the loss and benefit functions as follows:

$$\begin{aligned} \ell(u_i) &= \theta_{\ell u} u_i^\lambda - \theta_{\ell o}, \quad \lambda > 1 \\ b(u) &= \theta_{bu} u^\beta, \quad \beta > 0, \end{aligned} \tag{5}$$

where of course $\theta_{\ell u}, \theta_{bu}$ are positive too. The formulation with the three coefficients $\theta_{\ell o}, \theta_{\ell u}, \theta_{bu}$, which presently might appear a bit clumsy, will later make it easier for us to set up a position where the output–capital ratio attains a reasonable value and the actual and conjectured profit rates coincide. Moreover, using (5) in the profit-maximization condition $\partial r_i^c / \partial u_i = 0$ gives rise to a meaningful closed-form solution for the desired utilization rate. Solving the equation for $u = u^d$ and computing the partial derivative with respect to actual utilization, we obtain:

$$u^d = u^d(u, h) = \mu h^{1/(\lambda-1)} u^{\beta/(\lambda-1)}, \quad \mu := \left[\frac{\bar{y} \theta_{bu}}{\lambda \theta_{\ell u}} \right]^{1/(\lambda-1)} > 0 \tag{6}$$

$$\frac{\partial u^d}{\partial u} = \text{const.} \cdot u^{\beta/(\lambda-1)-1} > 0. \quad (7)$$

Certainly, given u and h , a suitable choice of μ can ensure $0 < u^d < 1$. Desired utilization is a concave function of actual utilization if (and only if) the exponent in $\partial u^d / \partial u$ is negative. In order for the reactions of u^d to be not too strong, one feels (and this will be justified below) that this property should indeed prevail. This requires the exponent of the benefit function to be bounded relative to the exponent of the loss function, while it is still positive. Hence, in precise terms, preferably the following inequality should be additionally satisfied in (5):

$$0 < \beta < \lambda - 1. \quad (8)$$

Apart from the multiplicative factor μ , Tavani/Petach's (2018) so-called best-response function has the same form as (6): $u^d = h^\eta u^\alpha$ (maintaining our symbols). It is a great merit of their paper that they put this specification to empirical data on (annual) state-by-industry output and labour shares for the United States.¹⁴ After taking logarithms, the elasticities η and α can be estimated by simple linear regressions. The robustness of the results is checked by a number of variations in the construction of the data. The happy end of this endeavour is that the exponents come out highly significant, with the correct sign and the condition for concavity in u fulfilled, $\alpha < 1$.¹⁵

We make use of this work by choosing $\eta = 0.33$ and $\alpha = 0.70$ from somewhere in the middle of the range of estimates reported in the study. From this, our model's exponents β and λ result as $\beta = 2.10$ and $\lambda = 4.00$. With reference to the regression analysis in Tavani/Petach (2018) we can thus conclude that our approach to desired utilization and its specification by (6) has a certain empirical support, which also includes the validity of inequality (8).¹⁶

4 CALIBRATION OF THE LOSS AND BENEFIT FUNCTIONS

4.1 Setting a steady-state position

With the above estimate of the exponent of u in (6) and the resulting concavity of u^d , we are now sure that a salient condition for the existence of a long-run equilibrium value of utilization is satisfied. To be more precise, we think of a fully adjusted steady state, as it is often called, which here reads $u^d(u^\circ, h) = u^\circ$. In fact, the function $u \mapsto u^d(u, h)$ is defined

14. The sample they construct consists of 19 years of observations over 20 industries and 50 federal states. After dropping a few meaningless state-by-industry pairs, they obtain a sample of size $N = 18\,943$. To be precise, the estimations are on actual rather than 'desired' utilization, assuming that it is only idiosyncratic shocks that drive a wedge between the two. Apart from other estimation details to validate the results, general sceptical remarks may perhaps, to begin with, be countered with the question: why should one find a clear relationship for actual utilization on the left-hand side but reject it (if such data could be constructed) for desired utilization? And why should actual utilization exhibit such a regularity at all?

15. It is a remarkable detail of the estimations that even in non-tradable producing sectors, the demand for which is by definition only local, capacity utilization responds to changes in the level of average utilization (Tavani/Petach 2018: 15). Generally, this finding is validated by using the interactive fixed coefficients estimator to control for unobserved common trends (private communication with Daniele Tavani).

16. There is also quite some range of values η and α that would leave this inequality intact.

for all $u \geq 0$, with $u^d = 0$ for $u = 0$ and an infinite slope at this point. Given the profit share h , we have thus $u^d > u$ for low values of u . Since the slope steadily diminishes as u increases, it will eventually be less than one and subsequently so small that the function will cut the 45° line at some point $u = u^\circ$, which establishes the consistency condition $u^d(u^\circ, h) = u^\circ$. It has, however, also to be checked that this utilization rate is feasible and falls short of unity.¹⁷

For such a numerical analysis we reverse the chain of reasoning. That is, we start with a numerical value of u° that we would like to constitute a steady state. Quite arbitrarily, let us set it at $u^\circ = 0.30$. For the profit share we employ a rather familiar value of $h = 0.30$. The condition $u^d(u^\circ, h) = u^\circ = 0.30$ is then brought about by substituting these values and the exponents β and λ from above in (6) and solving the equation for the multiplicative constant μ .¹⁸ Table 1 summarizes our settings and the result. Demonstrating the uniqueness of this steady-state position (apart from the meaningless solution $u = 0$), Figure 1a plots the function $u \mapsto u^d(u, h)$ over a wide range of utilization rates (the dashed line is the 45° line).

Figure 1b depicts the graphs of the desired utilization function locally around $u = 0.30$ for two values of the profit share. In this detail the functions appear almost linear. The lower (solid) line has the original profit share $h = 0.30$ from panel (a) underlying, while the upper (dotted) line is based on a higher share $h = 0.32$. It is already known from (7) that this change shifts the function upward.

Table 1 Calibration of a steady-state position

u°	h	β	λ	\rightarrow	μ
0.300	0.300	2.100	4.000		1.041

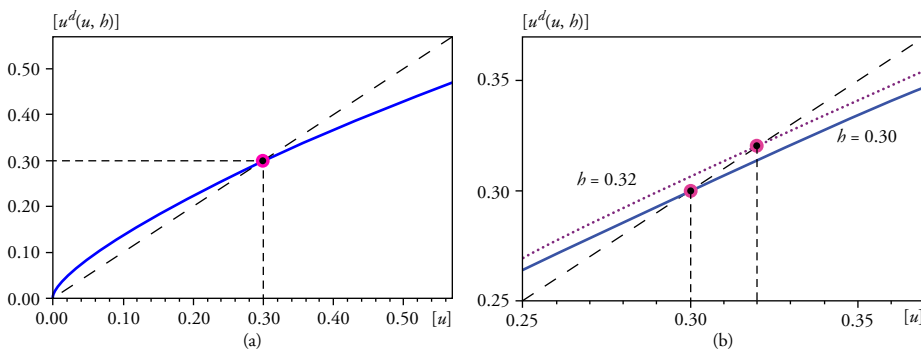


Figure 1 The calibrated function of desired utilization $u \mapsto u^d(u, h)$

17. Tavani/Petach (2018) view the condition as a decentralized Nash equilibrium for the firms' best-response functions. They contrast its utilization rate with the rate obtained from an optimal growth problem and its socially coordinated choice of utilization. Finding that the former is always less than the latter, it is this difference that they interpret as the economy's spare capacity.

18. Hence the only effect of another choice for u° is an opposite change in this coefficient.

is increasing in u and cuts the 45° line from above, its point of intersection with the latter shifts to the right.

It follows that, independently of whether aggregate demand is supposed to be wage-led or profit-led in some sense, an improvement for the workers in the income distribution conflict – that is, a lower profit share – causes utilization in a fully adjusted steady state not to increase, but to decrease. Though the conclusion might not necessarily be welcomed in general, it should come as no surprise. The reason for it is, of course, the profit maximization on which the notion of desired utilization is based; this principle not only applies to a given value of aggregate utilization u , that is, $u^d(u, h^1) > u^d(u, h^0)$ for $h^1 > h^0$, but also to a comparison of two endogenously determined long-run equilibrium positions, where $u^1 = u^d(u^1, h^1) > u^d(u^0, h^0) = u^0$.

Numerically it can also be seen from Figure 1b that a rise in the profit share from 30 per cent to 32 per cent increases the utilization rate from 0.30 to approximately 0.32. Given that over the business cycle the macroeconomic output–capital ratio fluctuates by less than ± 5 per cent around its trend (that is, u would fluctuate in a range 0.300 ± 0.015), the order of magnitude of this effect is certainly not negligible.

4.2 Implications for the conjectured rate of profit

The other coefficients θ_{bu} , $\theta_{\ell u}$, $\theta_{\ell o}$ in the loss and benefit functions in (5) can be determined once an anchor is provided for the latter. Quite naturally, let us to this end assume that the conjectured profits coincide with the realized profits in our fully adjusted steady state, that is, $\hat{b}(u^0) = 1$ and $\ell(u_i^0) = \ell(u^0) = 0$ (essentially this is just a matter of scale). The first equality can be directly solved for the value of θ_{bu} . Next, making use of the fixed-point equation $u^d(u, h) = u$, the auxiliary coefficient μ in (6) can be alternatively expressed as $\mu = u/[h^{1/(1-\lambda)} u^{\beta/(1-\lambda)}]$. Putting $u = u^0 = 0.30$ and equating this value to μ as it is specified in (6) allows us to determine $\theta_{\ell u}$. The maximum value \bar{y} of the output–capital ratio appearing in this equation is obtained from choosing a steady-state value of the ratio, designated y^0 , and then solving the relationship $u^0 = y^0/\bar{y}$ for \bar{y} . For y^0 itself we draw on Franke (2017a) and settle down on $y^0 = 1.09$. Lastly, $\ell(u^0) = 0$ can be solved for the remaining coefficient $\theta_{\ell o}$. The results are documented in Table 2.

For a numerical study of the conjectured rate of profit it remains to set the depreciation rate. Likewise from Franke (2017a), we infer a value of $\delta = 8$ per cent. The profit share, on the other hand, is fixed at its steady state value $h = 30$ per cent.

4.2.1 The individual firm

After these preparations we are first interested in the perceived losses of an individual firm i when it deviates from its optimal level of production while nothing changes in the rest of the economy. Accordingly, we freeze the average utilization of the other firms at the rate $u = u^0 = 0.30$ from above. Being in a short period setting, we ask how the firm's conjectured rate of profit $r_i^c = r_i^c(u_i; u^0, h)$ changes as its utilization u_i varies

Table 2 Remaining calibration of the loss and benefit function

y^0	→	\bar{y}	θ_{bu}	$\theta_{\ell u}$	$\theta_{\ell o}$
1.090		3.633	12.533	10.093	0.082

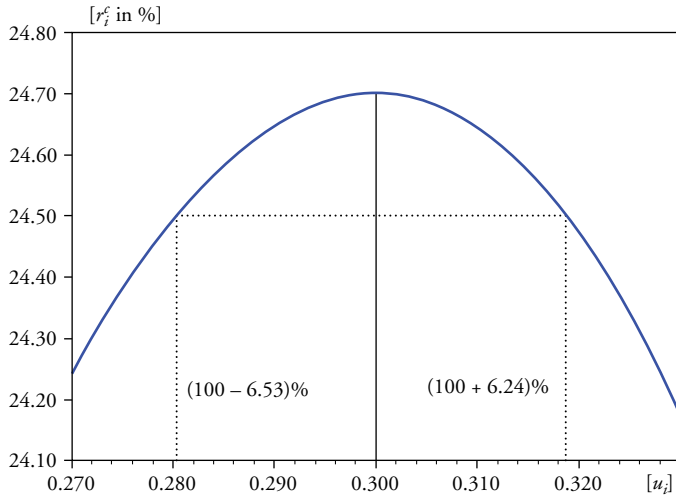


Figure 2 The conjectured rate of profit $u_i \mapsto r_i^c(u_i; u^\circ, h)$; $u^\circ = 0.30, h = 0.30, \delta = 0.08$.

between ± 10 per cent around the benchmark $u_i = u^\circ$. The outcome is shown in Figure 2. The profit rate is seen to be a smooth and well-behaved function, although it is not perfectly symmetric. Its maximal value, which by construction is attained at $u_i = u_i^\circ = 0.30$, is $r_i^c = 24.70$ per cent (this is indicated by the solid vertical line in the diagram).

Apart from the qualitative feature of the conjectured profits, we should have a look at the numerical details. The remarkable point to note is the range of u_i and r_i^c under study. Given that, as already mentioned, the aggregate output–capital ratio fluctuates by less than ± 5 per cent around its trend over the business cycle, the extent of the utilization rates shown in Figure 2 has to be regarded as rather wide. By contrast, the range of the resulting changes in the profit rate is extremely small. The diagram accentuates this by the two vertical dotted lines. If the firm considers utilizing its productive capacity at a rate within this interval, it expects a loss in its profit rate relative to its maximum of less than 0.20 percentage points; that is, r_i^c would still exceed 24.50 per cent. The boundaries of the utilization interval are, however, distinctly beyond the macroeconomic business-cycle variations of this variable. To the left, we have $u_i = u^\circ - 6.53$ per cent of u° , and to the right $u_i = u^\circ + 6.24$ per cent of u° . It can thus be affirmed that the forfeit in profits of a firm by not producing at its optimal level tends to be of a marginal order of magnitude.

4.2.2 The macro economy

The plot of the function $u_i \mapsto r_i^c(u_i; u^\circ, h)$ in Figure 2 gives us an impression of the typical numerical variability in the conjectured profits. However, it does not exactly capture what is relevant for much of Kaleckian macroeconomic modelling. We are thinking of theorists (the first group of Kaleckians mentioned in Section 1) who take a long-run perspective and study the changes in the equilibrium values of aggregate utilization in response to variations in some of the model’s parameters, where they maintain that the new utilization values, even if they happen to differ from desired utilization, will persist and do not induce any reactions on the part of the agents that would perturb these steady-state positions.

The theoretical argument is that over a certain range the firms would accept such a utilization gap because the corresponding losses would be rather small.

We are now in a position to provide a firm basis for this claim. Consider a model of Kaleckian origin that besides $\delta = 8$ per cent, $h = 30$ per cent yields the aggregate utilization rate $u^\circ = 0.30$ from Section 4.1 for its (unique) long-run equilibrium. Consider a *ceteris paribus* change in a parameter that brings about a new steady state with utilization $\tilde{u} \neq u^\circ$. As a consequence, and as admitted by the Kaleckian theorists, utilization will no longer be optimal in this state. Let us see how wide the ‘acceptable range’ of rates \tilde{u} would concretely be with which the firms may still feel comfortable.

For a proper comparison of two states with utilization u° and \tilde{u} we take into account that the firms’ conjectures about the profits they would earn under the hypothetical variations of their output may somewhat change when, in the transition from one state to the other, the general level of profits changes. In fact, to set the stage, let us suppose that the feature of the equality of conjectured and realized profits in a steady state is preserved. This means that the loss and benefit functions, for which $\ell(u^\circ) = 0$ and $b(u^\circ) = 1$ obtained, are modified in the new equilibrium such that $\ell(\tilde{u}) = \theta_{\ell u} \tilde{u}^\lambda - \theta_{\ell o} = 0$ and $b(\tilde{u}) = \theta_{bu} \tilde{u}^\beta = 1$. Accordingly, the loss function shifts by a suitable adjustment of the intercept $\theta_{\ell o}$, and the benefit function is rescaled by a suitable adjustment of the slope coefficient θ_{bu} . An immediate and convenient effect of this experimental design is that the desired rate of utilization remains constant, that is, $\tilde{u} \neq u^d(\tilde{u}, h) = u^d(u^\circ, h) = u^\circ$ for all meaningful values of \tilde{u} .¹⁹

Considering a number of equilibrium values of \tilde{u} between 0.30 and 0.25, Table 3 contrasts the realized profit rates $r = r_i^c(\tilde{u}; \tilde{u}, h)$ with those from an optimal utilization, which are given by $r_i^c[u^d(\tilde{u}, h); \tilde{u}, h]$. Certainly, both are equal for $\tilde{u} = u^\circ = 0.30$, and the difference increases as \tilde{u} moves further away from u° . The crucial point, however, is that the difference increases in an exponential manner; see the last column in Table 3.²⁰ As a consequence, the profit losses remain fairly small for deviations of \tilde{u} from its optimal value of up to 5 or even 10 per cent.²¹ It can thus be concluded that the ‘acceptable

Table 3 Macro positions \tilde{u} different from desired utilization

\tilde{u}	Dev. in %	→	$u^d(\tilde{u}, h)$	$r_i^c(u^d; \tilde{u}, h)$	$r_i(\tilde{u}; \tilde{u}, h)$	Diff.
0.30	0.00		0.30	24.70	24.70	0.00
0.29	3.33		0.30	23.66	23.61	0.05
0.28	6.67		0.30	22.73	22.52	0.21
0.27	10.00		0.30	21.89	21.43	0.46
0.26	13.33		0.30	21.14	20.34	0.80
0.25	16.67		0.30	20.47	19.25	1.22

19. This is readily seen by substituting $\theta_{bu} = 1/\tilde{u}^\beta$ in the coefficient μ that enters the determination of u^d in equation (6). It should also be added that, without the adjustments in the loss and benefit functions, desired utilization $u^d(\tilde{u}, h)$ would still be different from \tilde{u} , but the gap would be much smaller than in the present experiment. In fact, the difference between the corresponding two profit rates would hardly be worth mentioning.

20. This is not very surprising given that for suitable constants c_1, c_2, c_3 the rates $r_i^c(\tilde{u}; \tilde{u}, h)$ are of the form $c_1 \tilde{u}^{\beta+1} - c_2 \tilde{u}^\lambda - c_3$ and $4.00 = \lambda > \beta + 1 = 3.10$.

21. The differences between the two profit rates are slightly larger for positive deviations of \tilde{u} from u° .

range' of utilization rates to which the Kaleckian reasoning resorts is at least wider than the variations of utilization over a business cycle.

5 A SHORT METHODOLOGICAL DISCUSSION

As indicated before, many Kaleckian-oriented macroeconomic models hold the view that their positions of balanced growth are long-run equilibria, even though, perhaps after a change in one of the model's parameters, the firms' actual utilization may persistently deviate from a desired level. Sraffian or Marxist theorists, on the other hand, strongly refute this interpretation. They argue that there will be agents somewhere in the model who would attempt to close this gap and that the corresponding change in their behaviour would necessarily modify what so far constituted the alleged equilibrium. A typical reaction in such a case where $u \neq u^d$ is a change in fixed investment. That is, the firms would not increase their capital stock at the current or expected rate of growth but rather expand it at a higher (lower) speed if their capacities are overutilized (underutilized). With an explicit or implicit idea of conjectured profits, an economy could only be considered to be in a state of rest if firms have their conjectured profits maximized; in other words, a situation $u \neq u^d$ would violate the profit-maximization principle.

On the basis of the analysis in the previous section, Kaleckian economists need not necessarily oppose this view. They might rather formulate their disagreement at another level, where one asks for the practical relevance of the utilization derived from the hypothetical profit maximization. Reasonably, it may be supposed, the firms will react more strongly to a given utilization gap the stronger the pressure on them, which means the greater their losses for not doing so. Now, given the relatively small losses in the conjectured profit rates observed above, especially in the steady-state comparisons in Table 3, there is a considerable range of utilization rates over which the firms would only feel a weak pressure to react. Idiosyncratic shocks to the individual firms are quite likely to affect their profits more heavily than (direct or induced) changes in their utilization rates. Furthermore, in many models there will quite certainly be other variables which have a decidedly stronger impact on profits. The firms may pay greater attention to these variables, and investment may react much more strongly to their evolution. One example that was already hinted at in Figure 1b are changes in the profit share.

Recognizing that there are factors in the determination of the firm's investment that are considerably more important than the utilization gap, one could simplify things and even argue that the other factors in these decisions are so dominant that the utilization argument might be omitted altogether (in contrast to the observation made in footnote 5 in the introductory discussion). Therefore, if a utilization gap does not play a significant role elsewhere in a model, it would also make economic sense to ascribe explanatory power – even in a long-run context – to an equilibrium in which firms may not operate at their optimal level. Its features would be all the more informative if (explicitly or by way of a background story) this equilibrium is considered to be locally unstable and it only serves as a point of reference around which the economy fluctuates. After all, in a dynamic setting where either the macro economy converges to a state $u^\circ = u^d(u^\circ, b)$ but the firms are subjected to idiosyncratic shocks, or where this u° is approximately the time average of persistent cyclical behaviour, the single firms will hardly ever achieve an exact profit maximization anyway.

If the assumption that investment does not react at all to a utilization gap is held to be too radical, the reasoning may be a bit more differentiated. It may at that level of the argument be admitted that the firms do respond to a utilization gap, albeit relatively weakly, and that therefore a state exhibiting such a gap could not be regarded as a long-run

equilibrium in a strict sense. However, the analysis may not end with this assessment. Given the disproportionately weak investment reactions, it could be argued that a 'long-run' perspective within which any utilization gap would eventually be closed – persistently or approximately as a time average – may be considered to be too long as to ever become relevant. In the meantime several structural changes outside a given model's explanation will occur in the economy that may dominate the original effects in a comparison of two equilibria. Hence another state of the economy, one that does not demand the elimination of a possible utilization gap, may indeed be economically more significant as a point of reference. To assign an extra label to such a point of reference, it might be called a 'near long-run equilibrium'.

Whether the simpler or the methodologically more refined version, Kaleckian economists may use this kind of reasoning to justify their approach to the analysis of long-run equilibria, for which they do not particularly seem to care when actual utilization persistently deviates from desired utilization. In the author's view, the present notion of a conjectured rate of profit and its weak sensitivity in the firms' profit-maximization problem could offer the Kaleckians another and more concrete line of defence, a line that Sraffian economists would have to take more seriously than the rather informal statements in the literature about a practically irrelevant utilization gap.²²

6 CONCLUSION

The paper has advanced the notion of a conjectured rate of profit for the individual firms, proposing that its maximization determines the benchmark rate at which the firms would desire to utilize their capital stock. It has emphasized that this is a hypothetical optimization procedure with no specific implications for the modelling of the firms' actual decisions about output, prices and investment. Hence existing modelling strategies need not essentially be altered. In many cases a given exogenous desired, or normal, utilization may be simply replaced with the paper's rate of desired utilization, which is endogenous and may vary over time in a dynamic framework.

Since, for reasons of parsimony, the conjectured profits are also supposed to depend positively on the economic activity of the other firms, a feature that constitutes a strategic complementarity, desired utilization proves to be an increasing function of not only the profit share h , which is remarkable enough in itself, but also of the average utilization u prevailing in the economy; $u^d = u^d(u, h)$. It was very convenient that we could draw on the functional specifications and the regression estimates in Tavani/Petach (2018). This information made it possible to complement our analysis with a sensible numerical calibration of the model.

According to a Sraffian or Marxist point of view, a steady-state position requires actual utilization to be equal to desired utilization. Given the profit share, this amounts to a fixed-point equation in utilization, $u = u^d(u, h)$. The numerical treatment was able to ensure a unique positive solution $u = u^\circ$ to this problem. It was also seen that the profit share has a sizable impact on this equilibrium rate, although perhaps not every economist might be enthusiastic about the result that this effect is positive, $h \uparrow \Rightarrow u^\circ \uparrow$.

The economically most significant contribution of our theoretical approach is that the notion of a fully adjusted steady state need not be completely rejected by those Kaleckian

22. In an explicitly dynamic setting, for example, one might distinguish between a 'long-run' version of the model, where the utilization gap enters the investment function, and a 'near long-run' version, where this effect is omitted.

economists who treat the utilization rate as an accommodating variable in a short-run as well as long-run perspective. They may accept the present framework but argue in terms of practical relevance, where the argument they could put forward is the rather weak sensitivity of a conjectured rate of profit to changes in the firms' utilization. The point is that, to the author's knowledge, these economists have just claimed such an insensitivity but have not entered into a more serious discussion. The results from our numerical analysis both at the firm level and for alternative macroeconomic steady-state positions may now provide a concrete basis for such a reasoning. Specifically it may lend more credibility to the concept of a relatively wide range of utilization rates that the firms may feel comfortable with, even though they are not fully optimal.

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