Department of Political Economy

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The Debate on Excess Capacity

Issues of Competition and Time

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STATEMENT ON ORIGINALITY

This work contains no material which has been accepted for the award of an other degree or diploma in any university, and to the best of my knowledge and belief, this thesis contains no material previously published or written by another person except where due references is made in the text of the thesis.

To my Mum,

I love you more than anything, and wish you were here to read this.

I hope I still make you proud.

Thank you for everything you did for me, thank you for everything you do for me, and thank you for everything you will do in time.

Nothing could make me prouder than to be your Son.

This is for you.

With all my heart,

Your Mathew.

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MATHEW ANDREW GILLILAND.

PREFACE

There has been a great deal of soul-searching in the economic community over the past few years. Economists of varying stripes have begun to question the academic and business paradigm which is the orthodox approach to economics. Questions of capital theory, of method, of normative philosophy are being reconsidered as the community questions the wisdom of the textbooks of Dornbusch and Bernanke, the truisms of Solow on growth and Friedman on financial markets, the intellectual sons of the marginalist revolution. The public and policymakers alike are also searching for alternatives, with proposals of a Tobin tax across Europe and occupations of Wall Street the most striking recent examples. Without doubt, the global financial crisis has done far more than simply cut the hair of the Samson of international finance, it has forced the jaws of orthodox economists to clamp down on Eve's apple and awaken, naked and impure, outside the ivory walls and locked gates of Eden. They now lie, castrate, amongst the intellectual barrenness and moral decrepitude which was neoclassical economics.

If they can open their eyes, they will see there are many rich traditions of heterodox thought which have persisted outside the bastions of economic Eden. These are not built from invisible hands, and they do not need to assume full employment or abstract from that which they do not understand to work. The theoretical underpinnings of these approaches are methodologically Babylonian, not Cartesian, and thus sustain themselves on more than just axioms (Dow, 1996). The insights of Keynes (1936), Robinson (1941), Steindl (1952), Sraffa (1960), Kalecki (1971), Marx (1971), Amadeo (1986a), White (1996), Missaglia (2007), Arestis and Sawyer (2009b), and Moudud (2010) are but a few authors whose contribution to understanding the phenomenon and implications of excess capacity cannot be understated.

It would be a travesty of morality and justice for the Department of Political Economy at this University to be closed, amalgamated out, or in any other way undermined, because if there is one thing which the past few years

of economic experience and this body work shares in common, it is that pluralism leads to a better, greater, and more fruitful understanding.

I pray the University makes the right decision.

INTRODUCTION

The degree of capacity utilisation in an economy features in the macro-models of many different schools of politico-economic thought. Generally understood as the level of output actually achieved given the capital stock versus the potential output of the same, the degree of capacity utilisation is commonly understood as an *ex post* equilibrium position uniting potential supply with actual demand. It is a point which traces equilibria between demand, supply, and capacity (cf. Moudud, 2010).

For some political economists, including the bulk of marginalist macroeconomists, the degree of capacity utilisation is important in determining supply-side constraints, often taken as given in the short period, but ignored or assumed flexible enough to be eliminable in the long period (e.g. Amadeo, 1986a; 1986b; Hein and Vogel, 2008; 2011). For Marxists and others of the classical theories of value and distribution, the degree of capacity utilisation is an indicator of tendency toward crisis, as output is always at full capacity due to free competition (Sardoni, 1987). For the Sraffians, the degree of capacity utilisation becomes crucial for explaining 'normal prices', and thus fundamental for linking the Sraffian model of value and distribution with a theory of prices and output. For Kalecki, a crucial observation in his theory of monopolistic competition is that output is produced at less than full capacity (Halevi and Kriesler, 1991), and the degree of utilisation features heavily in heterodox models of growth and long-period analysis (Kalecki, 1941; 1942; 1968; 1971).

An important and related concept to the degree of capacity utilisation is 'excess capacity'. If the degree of utilisation is less than unity—as is almost certainly always the case—then that capacity not utilised is 'excess'. As capacity is utilised according to fluctuations in supply and demand across

seasons and trade cycles, in non-adjusted situations, the degree of excess capacity may be expected to have a negative elasticity with respect to the level of effective demand in the economy.

The question remains, however, as to why *persistent* excess capacity exists. At least two forms of persistent excess capacity can be identified. Firstly, if the degree of capacity utilisation never approaches unity, even during periods of peak demand, then it would follow that selling off that excess capacity would, *ceteris paribus*, be the profit-maximising decision (cf. Chenery, 1952; Moudud, 2010). Excess capacity in this form is understood to be *undesired*, and is commonly assumed to be eliminated over the long period. This may not occur for structural or other reasons; for example, capacity-inducing capital may be difficult to sell off in an environment where demand is insufficient for it to be utilised, or the costs of disposal may be considered too great.

The second form, *desired* excess capacity, however, remains to have a robust theoretical explanation. Two general reasons are commonly proffered as to the purpose of desired excess capacity. In the first instance, markets approaching oligopoly or monopoly conditions may feature desired excess capacity in order to pose barriers to new entrants (Kalecki, 1971). The existence of excess capacity facilitates the ability of entrenched capital to flood the market with products at prices rendering negligible profits to the entrant, thus posing barriers of both psychology and infancy. In the second, capitalists may desire excess capacity in order to meet demand in peak periods, whether on a cyclical or seasonal basis (White, 1996; 1989). So long as the costs of retaining inventories between periods of trough and peak demand exceed the opportunity costs of retaining excess capacity, then a degree of excess capacity will be, *ceteris paribus*, desired.

These two explanations are common and are largely accepted by almost all (at the very least) heterodox economists. A third explanation of desired excess capacity may present itself, however, along the lines of path-dependency theory. In an environment of ergodic Keynesian uncertainty

(Kregel, 1976), the degree of capacity utilisation may be demand-determined (Hein et al., 2011). Capitalists may have a 'desired' level of capacity utilisation, determined according to a variety of parameters including animal spirits, average costs, and fiscal policy, but may choose to operate actual capacity to satisfy demand in the short period. As such, capitalists may adjust or re-assess the degree of capacity utilisation which they desire in the next short period. If this process continues, then desired level of excess capacity may be historically determined, with room for arguments such as hysteresis and expectation-outcome adjustments to be played out.

Although there are contested explanations of the *purpose* of desired excess capacity, they do not in and of themselves account for *how* it is determined. When a capitalist intends to retain a level of capacity beyond their current production needs, or undertakes capacity-increasing investment despite the presence of unutilised capacity, some set of factors must determine that desired level. Tied up in the determination of factors is determining the capitalist's purpose for the excess capacity: is it to significantly expand production in anticipation of a rise in effective demand or to increase monopoly influence? The two questions, how and why, are thus not distinct, and to answer one fully requires answering the other.

Despite the significance of the degree of capacity utilisation to many macro-models, the question of how the desired level of capacity utilisation is determined—and thus, effectively, what that level is—has tended to be ignored in the literature. Rather than examine the processes or consequences of determination, these issues tend to be abstracted from or ignored altogether. This is not to say that the desired degree of capacity utilisation itself is abstracted from; instead, the literature tends to assume that capitalists determine their desired level exogenously. For Sraffians, this is identified as 'normal capacity'; for post-Keynesians/neo-Kaleckians, the long-period, flexible prices degree of utilisation.

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At the heart of the debate between political and heterodox economists in the conception of the desired degree of capacity is, fundamentally, a debate on the theoretical conception of the role of time and relatedly, equilibrium. There is an enormous literature amongst heterodox scholars in this field, an overview of which will be taken up in Chapter I below. The discussion relates far beyond the simplistic view of the long period as one of flexible prices and mutable conditions against a restricted, fixed-price short period. It is one which contrasts Classical inspired schemas of long-run gravitational tendencies—of prices, the rate of profit, growth, and capacity—against a view of history formed in a series of short runs, a focus on actual events and prevailing conditions.

As regards the desired degree of capacity, this distinction is vitally important. Capacity utilisation is a crucial component of any model of growth which abandons the assumption of full employment (e.g. Arestis and Sawyer, 2009a). Analysis of growth clearly requires a purposive understanding of the nature of time; specifically as to whether an economy is to grow toward a gravitational centre (perhaps toward a steady-state) or as a result of net investment decisions in the preceding period. If the former, then the desired degree of capacity utilisation would be formed in the long period, with intermittent short periods adjusting actual utilisation toward the desired degree. If the latter, desired utilisation would be determined according to prevailing conditions according to specific criteria such as anticipated levels of demand and competition, and would be likely to adjust, or simply be different, in each (short) period.

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The intention of this work is to gain a better understanding of the debate on and significance of excess capacity. An important question which aims to be addressed in this work is whether or nor an analytically meaningful normal rate of capacity utilisation exists. In evaluating whether or not it is meaningful, the objective will be whether or not the theory purporting to conceptualise a normal rate of capacity utilisation has a mechanism by which capitalists may adjust toward it. If not, mechanisms from alternative theories

may be interrogated. It should be noted that the intention is not to locate a theory which assumes the existence of a steady state or the adjustment toward it.

This body is structured as follows. Chapter 1 presents an extended review of the literature on excess capacity, focusing on the approaches of the neoclassical school, the Marxian school, the Sraffian school, and the post-Keynesian school. The main models of each approach are presented, on their own terms, and are evaluated on the basis of how relevant and accurate the models are to actual experience. Furthermore, the level of abstraction in each approach is interrogated, including whether or not the theory of capacity utilisation is functional to the core theory.

Chapter 2 presents an evaluation of the concept of 'normal capacity utilisation'. The distinction between planned and unintended capacity is explored. Two major mechanisms of adjustment which arise in the literature, the organic adjustment of capacity utilisation to demand and the role of competition, are then assessed. The contribution of strategic competition by Moudud (2010) is found to provide a robust theoretical adjustment toward the normal degree of capacity utilisation.

Chapter 3 interrogates normal capacity on the basis of time. The conceptual foundations of time and equilibrium are explored. The theory of path dependency is conceptualised and is then applied to the concept of normal capacity. Finally, in the Conclusion, the last pieces of the puzzle are put into place, and a recommendation for further research in the field is made.

CHAPTER 1

LITERATURE REVIEW

The body of this work is intended to be an overarching discussion and evaluation of the development of the theory surrounding desired excess capacity. As such, in many ways, it is in its entirety a review of the literature, its development, and its findings. This section, however, is intended to briefly reveal the key arguments from across the spectrum of politico-economic thought.

Chapter 1 is structured as follows. The first section outlines the orthodox, or neoclassical, understanding and use of excess capacity. The second section deals with Marxian understandings. The third deals with capacity as understood by neo-Ricardians and Sraffians. The fourth examines the use of capacity utilisation more broadly in post-Keynesian and neo-Kaleckian growth models. A brief summation is presented at the end.

The reader will find that this literature review is quite extended. Its intention is not to cover every issue, to pose every question, or to solve them—the debate on excess capacity is far too extensive and complicated for such an approach. Instead, this literature review aims to present the main tenets of the debate as understood by the various expounders. Each school of thought understands capacity differently, with some commonality, some difference, and in keeping with the pluralist methodology of this work, it would seem both prudent and beneficial to at least outline in some detail each approach's particular emphases. The core issues of these contrasting conceptualisations will then be analysed and evaluated in Chapters 2 and 3 below.

THE NEOCLASSICAL APPROACH

The extent to which the neoclassical approach requires a theory of excess capacity is limited. A school of thought founded on the assumptions of full

employment achieved in general equilibrium leaves little place for the suboptimal utilisation of capacity. Thus there is no place for excess capacity in the neoclassical long run, where factor costs are flexible and, thus, the 'optimal' equilibria are achieved. Indeed, Kim (1999, p. 322) states that 'Since capacity utilization is fundamentally a short-run concept, the point of departure here is a short-run model of the firm's production and cost based on profit maximization'.

At its core, the neoclassical approach views excess capacity as inefficient and problematic (Kirkley, Morrison Paul, and Squires, 2002). Tied up in this vision is the notion that excess capacity is a feature of imperfect or oligopolistic markets and not a general condition (Kim, 1999). Analysis of excess capacity tends to be tied to examples of capital-intensive industries, such as natural gas distribution (Chenery, 1952), fisheries (Kirkley et al., 2002), and the telephone industry, oil distribution, highway construction, electricity generation, petroleum refining, and chemicals processing (Manne, 1961). Analysis of excess capacity in labour-intensive industry is less common. Kim (1999, p. 331) gives the example of US manufacturing between 1948 and 1981, but even then notes that the 'adjustment of capital is relatively slow, which implies that capital investment is lumpy and long-lived'.

The prevalence of realised excess capacity is thus problematic for the neoclassical approach, particularly with regard to long-run equilibrium positions. In most models, it is dealt with by having profits maximise in the short run whilst conforming to the long-run average cost position (cf. Kim, 1999). Thus, standard neoclassical rules may be applied. Kim's (1999, p. 323) model has marginal revenue (MR) equal short-run marginal cost ($SRMC$)—the typical profit maximisation rule—whilst adjusting short-run average costs ($SRAC$) to the long-run average cost position ($LRAC$), and thus having short-run marginal costs equal long-run marginal costs ($LRMC$). The optimal degree of capacity utilisation (CU) is thus given as follows:

$$CU = \frac{\hat{Y}}{Y^*} \tag{1}$$

where $\hat{Y}$ refers to the optimal level of output determined via profit maximisation ($MR = SRMC$) and Y^* refers to capacity output determined at the long-run average cost position ($SRMC = LRMC$). Figure 1 depicts such a scenario:

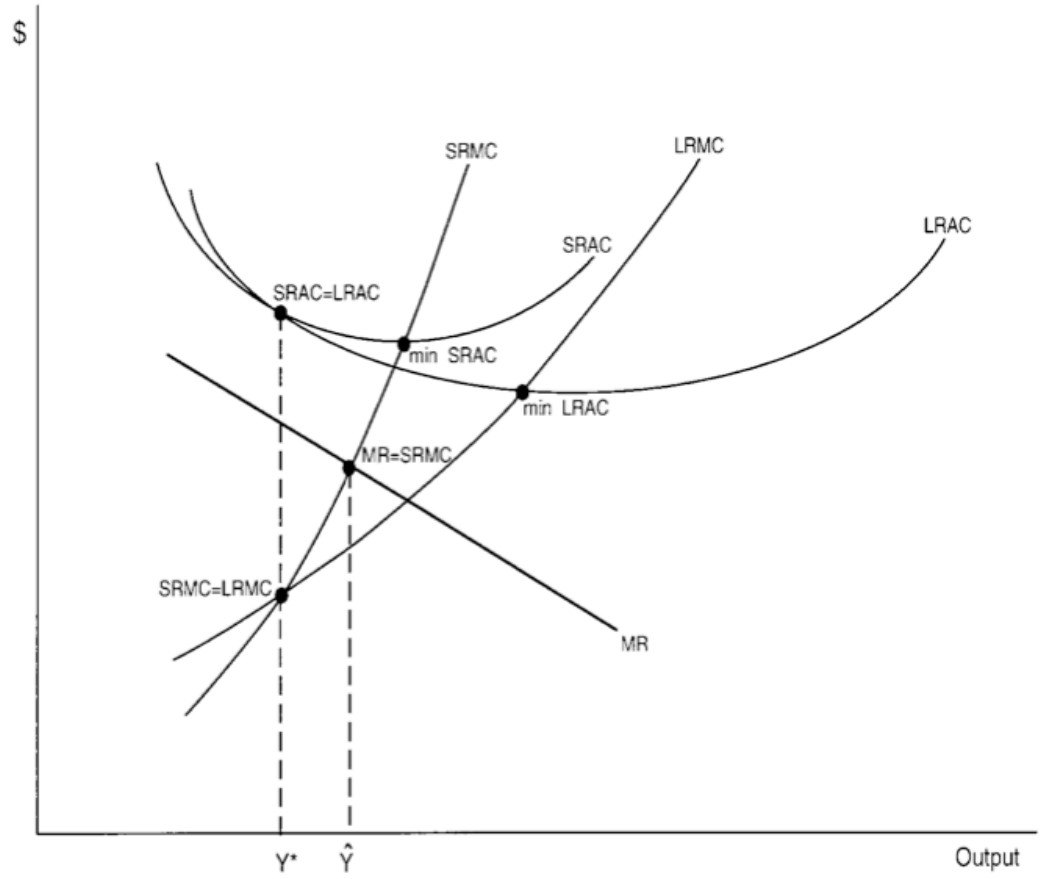

Fig. 1. *Optimal capacity utilisation as the ratio of optimal output to capacity output* (from Kim, 1999, p. 324)

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The major contribution to the neoclassical understanding of excess capacity comes from Chenery (1952) in 'Overcapacity and the Acceleration Principle' (Gerrard, 1996; Kim, 1999; Manne, 1961). Chenery (1952) assumes a given production function exhibiting economies of scale, the price of output, and a forecast of anticipated demand. So long as economies of scale exist, then it is held that there will always be excess capacity, even with perfect forecasting

(note that this result is due to the acceleration principle, which is not a typical feature of the neoclassical model; Chenery, 1952, p. 2). The 'optimum' degree of excess capacity is then a function of the production function, the planning period, and the discount rate. The model abstracts from concerns such as maintaining market share, determining the desired level of output, and risk (Chenery, 1952). As such, the model is limited to a cost minimisation problem.

Chenery's (1952, p. 3) formalisation is as follows:

$$\pi = R - \sum_{t=1}^{t=n} \frac{C_t(S, X)}{(1+r)^t} \tag{2}$$

where π refers to discounted net profit, R to discounted total revenue, t to time, n to the planning period, C to total costs, S to the 'index of the scale of plant', X to output, and r, the discount rate. The 'index of scale of plant' is catch-all for the 'size of equipment installed … the type of process chosen, relations among process, etc' (Chenery, 1952, p. 3). Assuming all parameters in equation (2) bar S are fixed, then the desired level of scale—and, hence, capacity—becomes a function of maximising profits, which occurs when $\frac{d\pi}{dS} = 0$:

$$\frac{d\pi}{dS} = \sum_{t=1}^{t=n} \left[\frac{-1}{(1+r)^t} \frac{dC_t}{dS} \right] = 0 \tag{3}$$

The reader will notice that equation (3) requires having a functional relationship between total costs and the index of scale. Chenery (1952, p. 6) gives the example of a long-run cost function for gas pipeline installation and operation which takes the following form:

$$C_L = bS^{\frac{1}{\psi}} \tag{4}$$

where C_L is long-run costs, b is a constant term (ensuring constant returns to scale), and ψ is an index of the economy of scale of production. Equation (4) is contingent on the use of a firm-specific production function. Figure 2 maps

this relationship with a variety of examples of short-run cost functions for given indexes of scale:

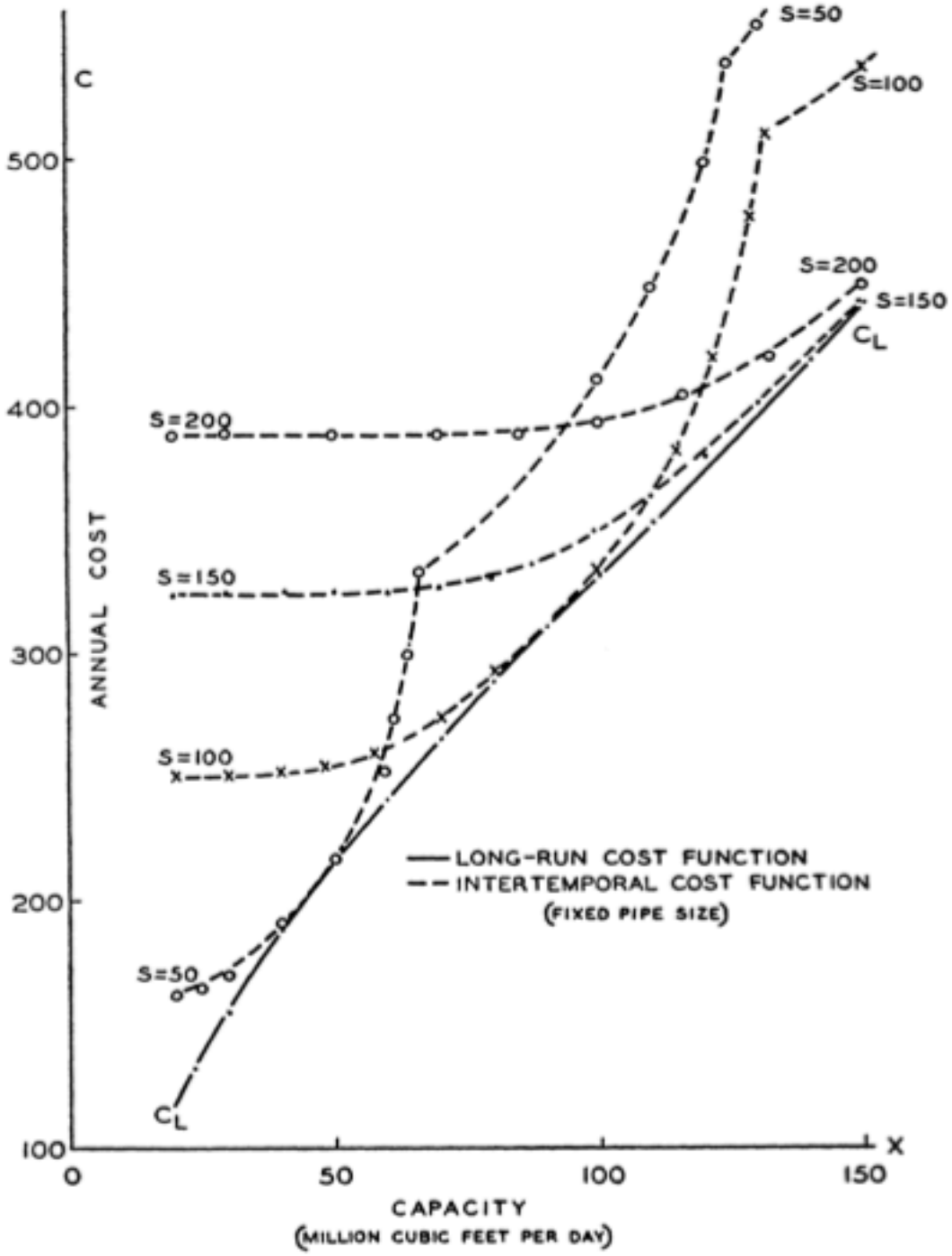

Fig. 2. *Intertemporal Cost Functions (Natural Gas Pipeline)* (from Chenery, 1952, p. 5)

Chenery (1952, pp. 9-10) notes that the 'principal result of this [analysis] is to show that with moderate economies of scale … and plausible

values for the discount rate and planning period, one would expect to find plants built to take care of demand a number of years ahead'. He now maps the adaptation of capacity to expected demand (Chenery, 1952, pp. 12-13):

$$I_t = \frac{\Delta \mathrm{K}}{\Delta t} = \beta \frac{\Delta X}{\Delta t} \tag{5}$$

$$\Delta K_{t+\theta} = K_{t+\theta} - K_{t+\theta-1} = b\beta(X_t - X_{t-1}) \tag{6}$$

$$\Delta K_{t+\theta} = b(\beta X_t - K_t) \tag{7}$$

where I_t is the rate of net investment, K represents the capital stock, β is the accelerator coefficient calculated as capital per unit of output (K/X), b is a reaction coefficient, and θ the lag period between changes to output and investment. Equation (5) is a fairly standard investment function making changes in the capital stock functional of the changing level of output through the accelerator coefficient. Equation (6) builds in lag and capitalists' responsiveness adjustments. Equation (7) allows analysis of this responsiveness. Assuming that the coefficient b is positive but less than unity (which would indicate a perfect adjustment), Chenery (1952, p. 13) thus allows capitalists to attempt to 'balance' capacity utilisation to changes in output in light of under- or over-capacity.

Chenery's (1952) model is thus an accelerationist one, and does differ from other neoclassical models. Indeed, Chenery is described by Gerrard (1996, p. 55) as an 'ISLM Keynesian' who builds a theory 'in which investment depends on changes in output'. Optimal capacity is thus determined in the short run, but is done so in light of achieving the long-run (average) cost position.

Manne (1961), however, builds in the possibility of 'backlogs' in demand to Chenery's (1952) model, thus allowing smoother transitions than available under the acceleration principle. Manne's (1961) contribution was fundamentally that, assuming the costs of incurring backlogs in demand are not infinite (or, at least, prohibitive), then capitalists will do so (i.e., incur

backlogs) before they invest in new capital. Figure 3 depicts the evolution of capacity over time:

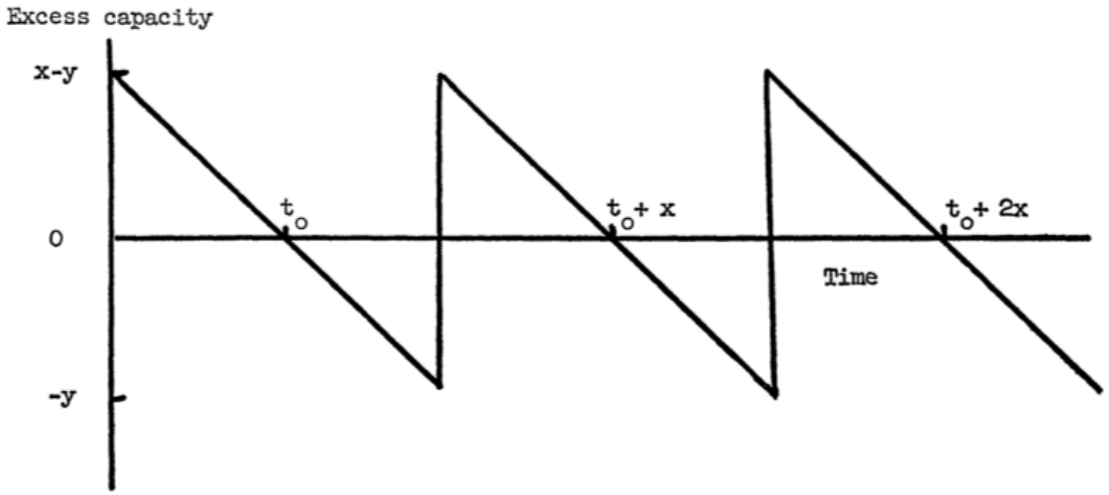

Fig. 3. *Evolution of Excess Capacity Over Time* (from Manne, 1961, p. 643)

where $x - y$ refers to a position of excess capacity (i.e. x is the output in the given period and where y is demand in that period), $-y$ to a backlog position (negative excess capacity), and t_0 the initial time period where there is no excess capacity. New capacity is built whenever backlogs reach – y equal to x, thus embedding cyclicity in the firm's individual production process.

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A range of criticisms may be levied against the neoclassical approach in general. Perhaps the most obvious is their use of orthodox production functions and their homogeneous treatment of capital. The reader will be familiar with the Garegnani (1970; 1966) critiques of the neoclassical production function and the homogeneous treatment of capital. In short, however, we may content ourselves with the proposition that, in a multi-commodity economy with many techniques of production, the homogenous use of capital and the use of the neoclassical production function (where the marginal return on capital is equal to its marginal product) is untenable.

Chenery (1952, p. 6), uses a continuous production function with which to calculate C_L in equation (4). For example, Kirkley et al. (2002, pp. 76-77, 83-84) calculates optimal capacity through the following relationship:

$$Y = Y(K, S, V, R) \tag{8}$$

$$CU = \frac{Y}{Y_C} \tag{9}$$

where K is a vector of stock inputs under control of the producer, S is a vector of non-discretionary stocks, V is a vector of variable inputs, R is a vector of control (temporal, spatial, technological, or environmental) conditions, and Y_C is the capacity level of output technologically and economically achievable.

In addition to its use of orthodox production functions, Kim's (1999) model is explicitly one constructed using an homogenous treatment of capital, even when the empirical model uses a variety of forms. The optimal size of the capital stock K^* is to be determined as a function of output, variable inputs W, the rental cost of capital R_K, and an index of the state of technology, T:

$$K^* = K^*(Y, W, R_K, T) \tag{10}$$

In log-linear form:

$$\ln K^* = \alpha_0 + \alpha_Y \ln Y + \sum \alpha_i \ln W_i + \alpha_K \ln R_K + \alpha_T \ln T \tag{11}$$

where α_0 is a constant term, and α_Y, α_i, α_K, and α_T measure elasticity of capital with respect to output, inputs (i), the price of capital, and technology respectively. Kim (1999, p. 329) states, however, that $\sum \alpha_i + \alpha_K = 0$ due to the homogeneity restriction on capital demand. The problem is furthered when, in constructing an empirical model of US manufacturing between 1948-81, he allows energy and labour to be substitutes for capital to maintain the capital homogeneity (Kim, 1999, p. 331, 336). Kirkley et al. similarly treat empirically observed capital as homogeneous:

> Representation of the production relationship should also take into account the existing state of technology, or other external conditions … [t]his is to some extent accommodated by expressing K as a

> vector of capital characteristics, which captures technology embedded in the capital stock. Kirkley et al. (2002, p. 86)

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Hence, the basic neoclassical conception of 'optimal' excess capacity is one which conceives simply of that capacity left unused following processes of simultaneous cost minimisation in both the short and long runs. It is micro-determined with firm- (or industry-) specific consequences—no place is described for a general, macroeconomic function of the degree of capacity utilisation (this will be contested by other approaches—see below).

All the standard neoclassical capacity utilisation models are constructed using deeply problematic assumptions, including homogenous capital and orthodox production functions. Further, significant concerns such as the maintenance of market share in an imperfectly competitive market (cf. Kalecki, 1941) and factors such as risk or uncertainty—i.e. animal spirits (cf. Keynes, 1936) on the forecast period are either abstracted from altogether (e.g. Chenery, 1952) or are only mentioned in passing (e.g. Manne, 1961, p. 642).

Perhaps the most significant observation of the neoclassical approach, however, is that the 'problem' of excess capacity is conceived of as almost entirely a short-run concern. Kim (1999, p. 326) states that 'capacity output Y^* is associated with the level of output for which [the] current capital stock coincides with the optimal long-run capital stock; hence there is no incentive for adjustment from that level'. As the desired level of excess capacity is determined via optimisation techniques in the short run, the standard neoclassical assumptions of factor-flexibility in the long run thus prevent meaningful analysis of persistent excess capacity. The treatment of excess capacity and full employment is thus in many ways analogous in the neoclassical approach—and therefore, deeply flawed.

THE MARXIAN APPROACH

The Marxian understanding of excess capacity is generally understood as the result of crisis, and is intrinsically linked with the underutilisation of labour and the overproduction of capital. Marx's (1971) general case, however, was for the full utilisation of capacity, as capitalists seek to expand accumulation as much as possible (cf. Sardoni, 1986). Robinson (1941, p. 237) also notes that Marx held that '[t]he capacity output of capital is given by technical conditions, and capital is used to capacity'.

Marx (1971) viewed excess capacity, the 'over-production of capital', as a natural consequence of capitalist accumulation, and a cause of the tendency for the rate of profit to fall and for increased intra-capitalist competition. He notes that (emphasis added) 'The rate of profit would not fall *under the effect of competition* due to over-production of capital … [i]t would rather be … the competitive struggle which would begin *because the fallen rate of profit and over-production of capital originate from the same conditions*' (Marx, 1971, p. 252). Over-accumulation in particular is the principal cause as, according to Marx (1971, p. 251), 'Over-production of capital … is therefore simply over-accumulation of capital … one need only assume it to be absolute'.

Sardoni (1986, p. 424) provides a neat formalisation of Marx's view of the tendency toward over-accumulation, and through it, that excess capacity is not desired:

$$r = \frac{(p - v)X - F}{K} \tag{12}$$

$$r^e = \frac{(p^e - v)X - F}{K} \tag{13}$$

where r is the rate of profit, p the unit price of output, v is the unit variable cost, X is the level of production, F is fixed costs, K is maximum capacity for the given capital, and e denotes an expectation. So long as $p > v$ (a requirement for positive profits and, therefore, production), then Sardoni (1986) notes r will be maximised when X is maximised. Thus, in shaping

profit expectations and production decisions, $r^e = r^e_{max}$ when $X^e = X^e_{max}$, to the point where it is still profitable to hire labour ($p > v$). Specifically, it will inevitably be the case that capitalists will seek to produce as much as possible, as doing so will best facilitate the accumulation of capital. The danger arises when the expansion of production leads to an absolute over-production of capital, which would thus cause undesired excess capacity:

> There would be absolute over-production of capital as soon as additional capital for purposes of capitalist production = 0. The purpose of capitalist production, however, is self-expansion of capital, i.e., appropriation of surplus-labour, production of surplus-value, of profit. As soon as capital would, therefore, have grown in such a ratio to the labouring population that neither the absolute working-time supplied by this population, nor the relative surplus working-time, could be expanded any further (this last would not be feasible at any rate in the case when the demand for labour were so strong that there were a tendency for wages to rise); at a point, therefore, when the increased capital produced just as much, or even less, surplus-value than it did before its increase, there would be absolute over-production of capital; i.e., the increased capital $C + \Delta C$ would produce no more, or even less, profit than capital C before its expansion by ΔC. …
>
> In reality, it would appear that a portion of the capital would lie completely or partially idle (because it would have to crowd out some of the active capital before it could expand its own value), and the other portion would produce values at a lower rate of profit, owing to the pressure of unemployed or but partly employed. It would be immaterial in this respect if a part of the additional capital were to take the place of the old capital, and the latter were to take its position in the additional capital. We should still always have the old sum of capital on one side, and the sum of additional capital on the other. The fall in the rate of profit would then be accompanied by an absolute decrease in the mass of profit, since the mass of employed labour-power could not be increased and the rate of surplus-value raised under the conditions we had assumed, so that

> the mass of surplus-value could not be increased either. And the reduced mass of profit would have to be calculated on an increased total capital. (Marx, 1971, pp. 251-52)

The situation attending excess capacity, as Marx (1971) conceives of it, therefore, is such that there is insufficient labour for capital to operate at full capacity. The consequence is thus 'excess' capital or the 'over-production' of capital, and a crisis of profit (both its level and rate) ensues. Marx's (1971) conception of excess capacity is thus limited to crisis, is a supply-side event (it is not caused by a lack of effective demand), and, perhaps most strikingly, is not a facet of the usual state of affairs of the capitalist mode of production. Furthermore, excess capacity is not desired.

As noted by Chenery (1952), Foss (1963), Winston (1974), Kim (1999), Shaikh and Moudud (2004), and Moudud (2010), however, excess industrial capacity *is* normal for a capitalist economy, and it would seem a long stretch to take the view that capitalists do not maintain excess capacity for the purposes of meeting unexpected demand, or to maintain hegemonic market shares. Both Kurz (1992) and Moudud (2010) note that Marx had a sense of systemic demand elasticity, however:

> So soon, however, as the factory system has gained a certain breadth of footing and a definite degree of maturity, and, especially, so soon as its technical basis, machinery, is itself produced by machinery … so soon, in short, as the general conditions requisite for production by the modern industrial system have been established, this mode of production acquires an elasticity, a capacity for sudden extension by leaps and bounds that finds no hindrance except in the supply of raw material and in the disposal of the produce. (Marx, 1954, p. 424)

This is quite clearly, however, a macroeconomic demand elasticity. It is quite distinct from the phenomenon of desired excess capacity which provides capitalists with the immediate physical potential to increase supply in the event of a stochastic increase in effective demand or other circumstance. Robinson (1941, p. 244) therefore rejects Marx's (1971)

conception of fully-utilised capacity, which appears the appropriate course of action.

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Perhaps the key insight Marx (1971) provides, however, is that when excess capacity does exist, it is attended by an outbreak in intra-capitalist competition. He notes that capitalists seek to ensure that any losses associated with the existence of undesired excess capacity are felt by other capitalists and not themselves, and the ensuing competition drives to a new equilibrium *sans* excess capacity:

> So long as things go well, competition effects an operating fraternity of the capitalist class, as we have seen in the case of the equalisation of the general rate of profit, so that each shares in the common loot in proportion to the size of his respective investment. But as soon as it no longer is a question of sharing profits, but of sharing losses, everyone tries to reduce his own share to a minimum and to shove it off upon another. … How much the individual capitalist must bear of the loss, i.e., to what extent he must share in it at all, is decided by strength and cunning, and competition then becomes a fight among hostile brothers. The antagonism between each individual capitalist's interests and those of the capitalist class as a whole, then comes to the surface, just as previously the identity of these interests operated in practice through competition.
>
> How is this conflict settled and the conditions restored which correspond to the 'sound' operation of capitalist production? The mode of settlement … implies the withdrawal and even the partial destruction of capital amounting to the full value of additional capital ΔC, or at least a part of it … the loss is by no means equally distributed among individual capitals, its distribution being rather decided through a competitive struggle in which the loss is distributed in very different proportions and forms, depending on special advantages or previously captured positions, so that one capital is left unused, another is destroyed, and a third suffers but a relative loss, or is just temporarily depreciated, etc.

> But the equilibrium would be restored under all circumstances through the withdrawal or even the destruction of more or less capital … [both] fixed and circulating capital, would not operate, not act as capital …. (Marx, 1971, pp. 253-54)

The theme of the role of competition in understanding excess capacity is picked up by Moudud (2010). His central thesis is that 'the pressure of competition forces each firm to its practicable optimal rate of capacity utilization, which could be consistent with considerable degrees of idle capacity and involuntary unemployment even though output would be at the target level of capacity' (Moudud, 2010, p. 137). Picking up on the work of the Oxford Economic Research Group ('OERG'—who included P.W.S. Andrews, Elizabeth Brunner, and Roy Harrod), Moudud (2010) argues that capitalists aim to maximise profits over the long-run, and thus adopt cost-minimisation strategies in order to be 'strategically competitive'.

Moudud's (2010) theory of strategic competition rejects what he conceives of as the post-Keynesian usage of monopolistic and oligopolistic, or imperfect, competition. Instead, strategic competition entails possessing a strict distinction between 'reserve' and 'excess' capacity, where excess capacity is eliminated over the long run through capitalists' investment decisions (Moudud, 2010). As such, the actual rate of capacity utilisation (u) can tend over time toward the planned, or 'normal', rate of capacity utilisation (u^*), which provides the long-run supply-capacity equilibria growth path, the warranted growth path (G_w). If $u > u^*$, there is an over-utilisation of capacity, and firms will expand investment; if $u < u^*$, there is an under-utilisation of capacity, and firms will decrease investment. He states that 'Put simply, in the Harrodian view the pressure of competition makes business investment vary endogenously to ensure that firms adjust capacity to bring it in line with output (demand), thereby producing the economy's long-run or warranted growth path' (Moudud, 2010, p. 5).

This conception of capacity decisions clearly suffers from Harrodian knife-edge instability. Over- (under-) utilisation would be due to excess (insufficient) demand given the capital stock. If capacity utilisation is thus

adjusted to equilibrate output demand in successive short periods, then the subsequent capital expansion (reduction) would compound the disequilibrium, leading to the well-known saying 'any deviation from the path leads further and further away from the path'. Moudud's (2010, p. 137) solution is for the state to adjust G_w through public investment and taxation policy to a long-run growth path consistent with a normal, or 'practical optimal' rate of capacity utilisation.

Moudud's (2010, p. 136) model is particularly appealing given, as he puts it, that 'the strategic competition perspective is … consistent with actual business practice and history', referring to its synthesis from the work of the OERG. More so, however, is the use of competition through long-run cost-minimisation strategies to eliminate supply-capacity disequilibria over the long run, deeply reflective of the contribution of Marx (1971). His formalisation draws upon Shaikh (1989) to provide a long-run capacity adjustment mechanism which he refers to as the 'slow adjustment process', where 'excess demand is approximately zero' (Moudud, 2010, p. 110):

$$\dot{a} = h(u - u^*) \tag{14}$$

$$\dot{u} = \frac{(s - a)u}{m(1 + v)} - \frac{au^2}{\kappa} \tag{15}$$

where $a = \frac{I}{Y}$ (investment divided by output), a dot above a variable indicates the first derivative with respect to time (i.e. a short-hand for rate of growth in the variable), h is an adjustment responsiveness index as capitalists attempt to bring capacity into line with output by adjusting the capital stock, u is the rate of capacity utilisation, u^* is the normal rate of capacity utilisation, s is the social savings rate adjusted for purchases of investment goods by the banking and government sectors, m is the circulating capital-output ratio, v is the fixed capital-output ratio, and κ is the fixed capital-capacity ratio. As Moudud (2010) seeks to eliminate excess capacity over the long run, he sets $u^* = 1$, so that the growth rate of capacity adjusts to eliminate any excess or insufficient capacity:

> This equation states that whenever there is excess capacity ($u < 1$) firms reduce fixed investment because they desire to decrease capacity; conversely they desire to increase fixed investment and capacity when $u > 1$ ... [reflecting] the Harrodian view that firms adjust fixed investment in response to demand so as to bring capacity into line with output. (Moudud, 2010, p. 110)

Clearly essential to this model is a conception of a long run which incorporates either a steady state or 'normal' rate of capacity utilisation (and growth; cf. Duménil and Lévy, 2011). Whilst there is no suggestion in Moudud (2010) that this long-run tendency will lead to full employment as per the neoclassical approach (he specifically rejects this, and offers up fiscal policy and public investment as means by which to raise G_w toward full employment), there is still the almost purposive criterion that excess capacity be eliminated over the long run. This is not to say that 'reserve capacity', as he describes it, does not persist, but the persistence of undesired excess capacity cannot continue into the long period. Duménil and Lévy (2011) make some concession, however, conceding that this process of excess capacity elimination is a 'sluggish' process.

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Hence, the Marxian approach conceives of excess capacity as a short run phenomenon which cannot persist in the long run. Although Marx (1971) himself did not conceive of excess capacity as a general, non-crisis condition, the real contribution of the Marxian approach to understanding excess capacity, therefore, is the role played by competition to eliminate it. Intra-capitalist competition is the mechanism by which equilibrium is regained as each seeks to minimise their exposure to losses. This is expanded on very neatly in Moudud (2010), where capitalists are conceived of as eliminating excess capacity over the long period through 'strategic competition'—where cost-minimisation is an act of competition itself.

There is, thus, somewhat of an analogous conception of relationship between the Marixan and neoclassical approaches, although each has a strikingly different purpose. The insights of Marx (1971), Moudud (2010),

and Duménil and Lévy (2011) all conceive of a long-run 'normal' utilisation of capacity, where excess capacity is eliminated. Substantially, this reflects the neoclassical conception, where capitalists also eliminate capacity inconsistent with the target rate of utilisation, given expectations. The real difference between the two approaches lies in the purpose, however. The neoclassical approach is fundamentally tied up in achieving long-run condition of full employment, whilst the Marxian approach is anchored in the desire for maximised capital accumulation—and has nothing to do with full employment.

The Sraffian Approach

The Sraffian (or neo-Ricardian) approach requires a robust theory of capacity utilisation in order to complete the transition from a Keynesian short run to a Classical long run in what has been described as the Sraffa-Keynes synthesis (White, 1996). The standard Sraffian exercise allows output to be determined via Keynes (1936), and value and distribution through Sraffa (1960), who himself drew inspiration from the Classics, particularly Ricardo (cf. White, 1989; White, 1996). Sraffa (1960) wrote of a uniform rate of profit across industries in the long period and a set of normal prices which gave effect to this. In order to establish a set of normal prices, if a Keynesian understanding of the principle of effective demand is used to determine the short-run goods market equilibrium, a tendency toward the utilisation of productive capacity at a normal degree becomes essential (Halevi and Kriesler, 1991). The 'general principle', as described by Amadeo (1986b, p. 149), is that 'in the long period capacity adjusts to demand' (cf. also Moudud, 2010).

The standard matrix of price equations for a k-commodity economy is as follows (Sraffa, 1960, pp. 4-11):

$$
\begin{aligned}
(A_a p_a + B_a p_b + \cdots + K_a p_k)(1+r) + L_a w &= A p_a \\
(A_b p_a + B_b p_b + \cdots + K_b p_k)(1+r) + L_b w &= B p_b \\
\cdots \quad \cdots \quad \cdots \quad \cdots \quad \cdots \quad \cdots \quad \cdots \quad \cdots \quad \cdots \quad \cdots \quad \cdots & \\
(A_k p_a + B_k p_b + \cdots + K_k p_k)(1+r) + L_k w &= K p_k
\end{aligned}
\tag{16}
$$

where $a, b, \ldots, k$ are commodities each produced by different industries; $A, B, \ldots, K$ are the quantities 'annually' (or however long the standard period is taken to be) produced of commodities $a, b, \ldots, k$; $A_a, B_a, \ldots, K_a$ the quantities of $a, b, \ldots, k$ required to produce A, $A_b, B_b, \ldots, K_b$ the quantities of $a, b, \ldots, k$ required to produce B, and so on; $p_a, p_b, \ldots, p_k$ are the unit values of commodities $a, b, \ldots, k$, 'which if adopted restored the initial position'; r is the rate of profit, taken to be uniform; L_a is the quantity of labour required to produce A, L_b is the quantity of labour required to produce B, and so on, so that $L_a + L_b + \cdots + L_k = 1$, the total annual labour in the society; and w is the unit wage cost which can be defined in terms of some commodity as numeraire. In order for the system to be self-replicating, $A_a + A_b + A_k \leq A$, $B_a + B_b + B_k \leq B$, and so on, so that 'the quantity produced of each commodity is *at least* equal to the quantity of it which is used up in all branches of production together' (Sraffa, 1960, pp. 6-7).

A theory of value and distribution based on Sraffa's (1960) price equations clearly requires (as he states himself) a uniformity of the rate of profit across industries (cf. Halevi and Kriesler, 1991). A uniform rate of profit is then associated with the gravitation of long-run market prices toward the relative prices of production (cf. Clifton, 1977; Clifton, 1983; Semmler, 1982; Semmler, 1985). To enable such a uniform profit rate to occur not simply due to a fluke, one criterion agreed to in the literature is the attainment of a normal degree of capacity utilisation in the long period (Clifton, 1977; Clifton, 1983; Semmler, 1982; Semmler, 1985; Amadeo, 1986a; Amadeo, 1986b; Ciccone, 1986; Vianello, 1986; White, 1989; White, 1996). Extensive debate has occurred in the Sraffian community as to the

particular role which normal capacity should take and as to how it is to be attained.[1] The present endeavour is thus to outline the main explanations.

Vianello (1986) considered capacity utilisation in light of 'fully adjusted situations'. These he defined as follows (emphasis is from the original):

> … 'fully adjusted situations' [are those] situations in which a uniform rate of profits prevails, and the productive capacity installed in each industry is exactly sufficient to produce the quantities that the market absorbs when commodities are sold at their natural prices. The fully adjusted situations are reached through the adjustment of demand to production and productive capacity, as far as the *level* of aggregate demand is concerned, and through the adjustment of production and productive capacity to demand, as far as its *composition* is concerned. (Vianello, 1986, p. 70)

Vianello's (1986) analysis may thus be understood as being conducted from the position of long-period equilibrium. His intention is to map a relationship between (net) investment and the rate of capital accumulation such that a normal rate of profits can be achieved. Vis-à-vis the degree of capacity utilisation, Vianello (1986, p. 72) rejects the (emphasis is from the original) 'hypothesis that productive capacity is *continuously* kept at its normal degree of utilisation'. Capitalists will, however, make investment decisions over time to eliminate excess capacity:

> … this indeterminateness in the degree of utilisation of productive capacity is bound to disappear as soon as we move from short-run to long-run analysis. For this necessarily involves a shift in attention from changes in the degree of utilisation to productive capacity to changes in productive capacity itself, *on the reasonable assumption that the latter [i.e. productive capacity] does not tend to remain either*

[1] Much of this debate took place in *Political Economy: Studies in the Surplus Approach* throughout the late 1980s. Very sadly, the journal ceased publication in 1991. Articles were partial to Sraffa, but the journal was well attended by post-Keynesian and neo-Marxist thought, also. Believing firmly that the calibre of the debate conducted over the years across the pages of *Political Economy: Studies in the Surplus Approach* was of such a level and of such contribution to heterodox economic understanding, I would emphatically support any attempt to revive it.

> *systematically under-utilised or systematically over-utilised*. It is on this ground that reference will be made in what follows to 'fully adjusted situations'. (Emphasis added; Vianello, 1986, p. 76)

Hence there is no place for persistent excess capacity in Vianello's (1986) analysis, and the mechanism for long-period transition to the normal degree of capacity utilisation is investment.

Amadeo (1986b, p. 148) notes that Vianello's (1986) use of 'fully adjusted situations' assumes away instability in the adjustment process, and thus his analysis 'is restricted, therefore, to temporary changes in capacity utilization, and does not consider the problems associated with the adjustment process between steady states'. His analysis of 'fully adjusted situations' thus eliminates any real consideration of the possibility of persistent excess capacity. Ciccone (1986), in contrast, notes that there is no reason why the actual and normal rates of capacity should correspond. Indeed, according to Amadeo (1986b):

> In the analysis, the actual degree of utilization does not maintain any relation with the determinants of the normal degree, that is, with the determinants of investment demand. It is only reasonable, therefore, that the two rates should differ, even in the long period. (Amadeo, 1986b, p. 158)

Instead, the only tendency toward normal capacity is in this approach is gross investment. Ciccone (1986, p. 26) states that 'equipment which constitutes or might constitute gross investment … would constitute an expression of the tendency … for capacity to adjust to demand'.

White (1989) emphasises the role of expectations in capacity adjustment. Building in particular on Ciccone (1986) and on his earlier work (1989), White (1996, pp. 288-89) provides a simple enough formalisation of the process of adapting capacity to demand:

$$S = \frac{\varepsilon D^*}{q} \tag{17}$$

$$q = \frac{\beta . K}{D^*} \tag{18}$$

$$\therefore S = \frac{\varepsilon \beta . K}{q^2} \tag{19}$$

where S is the quantity of stocks produced for one cycle, ε is a positive constant, D^* is expected peak demand, q is the ratio of output capacity to peak demand, and $\beta . K$ is output capacity. Thus, 'the larger the capacity as a proportion of peak demand, the smaller the quantity of stocks as a proportion of peak demand' (White, 1996, p. 289). As such, White (1996) provides a mechanism by which capitalists can seek to adjust capacity, over time, toward the normal degree.

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Given the swathe of criticism (particularly from post-Keynesians) on the relevance of normal capacity, some authors have attempted to distance the Sraffian focus on normal prices from a normal rate of capacity utilisation (cf. Palumbo and Trezzini, 2003). This is despite the literature's general acceptance that a normal rate of capacity utilisation is fundamental to a theory of normal prices, as in Sraffa (1960). Whilst Ciccone (1986) and White (1989; 1996) built in the ability for capitalists to make investment decisions toward a normal degree without it necessarily attaining one, Palumbo and Trezzini (2003, p. 121) outright deny the need in a normal prices system for capacity to be at a normal degree, as 'unlike the attainment of adjustment between demand and capacity, the process of price gravitation in no way requires the whole system to be in a state of adjustment of all its variables'.

Moudud (2010) notes that their rejection of a normal rate of capacity utilisation is due to their view that forces which push the actual rate toward a normal rate are extremely slow. As a result, says Moudud (2010), 'the system shows far greater elasticity' than normal capacity models imply. As such, the principle of effective demand (Keynes, 1936) is allowed to persist into the long run. This is reinforced when they note that capitalists

undertake capacity-expanding investment often for reasons not conforming to or even reflective of White's (1996) capacity-investment adjustment model in equations (17) to (19)—that which would see capacity adjust to demand in the long run:

> Competition can lead entrepreneurs to take investment decisions that are not induced and justified by the expected expansion in demand. ... In addition, however, competition is also the force that induces firms to change their methods of production and their products or to enter new sectors-in other words to innovate—in order to exploit new profit opportunities. And it is the force that obliges the non-innovative firms to react and take their own investment decisions if they are to survive. Firms can make innovative investment even when faced with stagnating demand. In point of fact, they could even be said to have a greater stimulus to undertake (at least some kinds of) innovative investment when the demand for the products of their sectors is growing slowly or in decline, since in this case the ability to take innovative action aimed at cutting costs may well make the difference between survival and failure. (2003, pp. 122-23)

As Moudud (2010, p. 36) notes, 'Quite simply then, competitive forces delink any relationship between demand and capacity'. This conception of competition is in striking contrast to that espoused in the Marxian approach, where competition forces capitalists to seek a minimum cost strategy—both in terms of achieving the highest rate of accumulation in Marx (1971) or as a strategy under Keynesian uncertainty (Moudud, 2010). This is highly criticised by Moudud (2010, p. 36) as 'the pressure of competition which Palumbo and Trezzini admit as being real cannot be consistent with arbitrary rates of capacity utilization'.

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For those otherwise in the Sraffian tradition, then, normal capacity utilisation still must play an important role in a long-run system attempting to reveal normal prices—a set of relative prices consistent with a uniform rate of

profit across sectors. There remains significant disagreement within the tradition, however, as to how to explain normal capacity. Whereas in both the Marxian and neoclassical approaches discussed earlier, the explanation of excess capacity is functional of central maxims (for the neoclassical approach, the tendency toward full employment in the long run; for the Marxian approach, the pursuit of capital accumulation as a driving force and the role of competition to effect this), the Sraffian approach makes the central maxim—normal prices—functional of normal capacity.

The extraordinary disagreement between Sraffian authors (Amadeo, 1986a; Amadeo, 1986b; Ciccone, 1986; Vianello, 1986; Palumbo and Trezzini, 2003) over the theory of capacity utilisation—and the continued lack of a resolved position on the issue—is testament to its importance in that approach. Whilst it is accepted in the short run, there remains uncertainty in the theory, however, as to whether excess capacity is a feature of the long-run capitalist economy, also.

The Post-Keynesian Approach

The post-Keynesian (or Kaleckian) approach is perhaps the most unique given those discussed previously. Post-Keynesians generally accept that excess capacity will persist into the long run, and indeed will likely be a typical feature of capitalist economies (cf. Kalecki, 1971; Halevi and Kriesler, 1991; Missaglia, 2007; Hein et al., 2011). This is intrinsically tied up in the post-Keynesian postulate that effective demand is important in the long run as well as the short run through the determination of the growth rate, the paradox of costs (that, despite micro intuition, higher wages may lead to higher growth) and the paradox of thrift (that a lower saving rate may lead to higher growth; Missaglia, 2007; Moudud, 2010). As such, because imperfect competition or oligopoly is assumed in the traditional post-Keynesian model, excess capacity in the long run will be a natural feature of the capitalist economy (cf. Kalecki, 1971; Harcourt and Kenyon, 1976; Harcourt, 2006; Hein et al., 2011).

The post-Keynesian conceptualisation of long-run excess capacity is, perhaps, best put by Kalecki (1971) himself:

> Even on average the degree of utilisation throughout the business cycle will be substantially below the maximum reached during the boom. Fluctuations in the utilisation of available labour parallel those in the utilisation of equipment. Not only is there mass unemployment in the slump, but average employment throughout the cycle is considerably below the peak reached in the boom. The reserve of capital equipment and the reserve army of unemployed are typical features of capitalist economy at least throughout a considerable part of the cycle. (Kalecki, 1971, p. 137)

Firstly, however, the short-run determination of excess capacity must be discussed. Arestis and Sawyer (2009a, pp. 27-28) provide the following formalisation:

$$\frac{S}{K} = \frac{smu}{v} \tag{20}$$

$$\frac{I}{K} = a + d + b(u - u^*) + cm \tag{21}$$

where S is saving, K is the capital stock, s is the propensity to save out of profits, m is the share of profits in the national income, u is the rate of capacity utilisation, v is the capital-capacity ratio, I is investment, a reflects a 'range of influences on investment including 'animal spirits' and the technological developments', d reflects 'net injections' such as the budget deficit and the 'net export position', b is a responsiveness coefficient, u^* is the target or 'desired' rate of capacity utilisation, and c is a responsiveness coefficient. Arestis and Sawyer (2009a) note that the model incorporates the rate of capacity utilisation and profitability into the investment decision—thus reflecting the current state of the economy—as well as allowing for bullishness, but with no requirement for rational expectations or perfect information.

The Kaleckian goods market equilibrium position requires $\frac{S}{K} = \frac{I}{K}$. As such, u will only equal u^* when $a + d = smu^* - cmv$. As such, the rate of utilisation, u, is demand-determined, and will only reach its normal or target rate by fluke. They note that:

> … firms are willing to undertake investment even when they have excess capacity, and excess capacity can be a feature of the long-run as well as the short-run and firms are willing to accept excess capacity (where here excess capacity means capacity utilisation below the 'desired' capacity utilisation, which may be influenced by average costs but also may allow for strategic factors, etc.). (Arestis and Sawyer, 2009a, p. 29)

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This persistence of excess capacity in the long run is discussed at length by many post-Keynesian authors. There is a diversity of views within the post-Keynesian tradition as to whether a normal, planned, or target degree of capacity utilisation exists at all. For example, Kalecki did refer to a 'trend degree of utilisation of equipment' (Kalecki, 1971, p. 181), and Steindl (1952) referred to a planned degree of capacity. Even Dutt (2006, p. 360), who rejects the analytical usefulness of a normal degree of capacity utilisation (cf. Dutt, 1990), acknowledges that one may exist in the theory. Authors such as Halevi and Kriesler (1991) and Hein et al. (2011) will tolerate analysis of a normal degree of capacity utilisation, if only to deconstruct or eliminate it. The united position of post-Keynesian economists, however, is a rejection of an independent, long-run normal rate of capacity utilisation to which the actual rate converges which is relevant to macroeconomic analysis (Hein et al., 2011).

It would be prudent to examine how post-Keynesians come to reject the normal rate of capacity utilisation. To this end, a useful formalisation is provided by Hein et al. (2011, p. 590), who construct a basic Kaleckian growth model similar to that provided by Arestis and Sawyer (2009a) to

interrogate the question of a normal degree of capacity utilisation through the following set of equations:

$$r = \frac{mu}{v} = \frac{r_n u}{u_n} \tag{22}$$

$$g^s = s_p r, \qquad s_p > 0 \tag{23}$$

$$g^i = \gamma + \gamma_u (u - u_n), \qquad \gamma, \gamma_u > 0 \tag{24}$$

where r is the realised net profit rate, m is the grows profit margin, u is the realised rate of capacity utilisation, v is the capital-to-capacity ratio, the subscript n indicates a 'normal' value, g^s is the saving function, s_p is saving out of profits, g^i is the investment function, and γ is a parameter 'which represents some assessment of the trend rate of growth of sales'. Equation (22) provides a basic pricing equation, (23) assumes wages are not saved, and (24) is constructed so that capitalists can correct for excess (insufficient) capacity through their planned investment decisions in each period toward a normal rate. Goods market equilibrium requires $g^s = g^i$, therefore providing the equilibrium capacity utilisation rate u^* when rearranged:

$$u^* = \frac{\gamma - \gamma_u u_n}{\frac{s_p m}{v} - \gamma_u} \tag{25}$$

For stability, the denominator in (25) must be positive, or else the rate of capacity utilisation will react explosively to increases in investment through knife-edge instability ($\frac{s_p m}{v}$ is the slope of g^s and γ_u of g^i). As such, when there is discrepancy between demand and supply, Hein et al. (2011) argue capitalists adjust capacity utilisation in the very short run (due to not having the time increase capacity proper through investment), which gives a utilisation responsiveness function, where μ is an index of responsiveness:

$$\Delta u = \mu\left(g^i - g^s\right), \qquad \mu > 0 \tag{26}$$

Hein et al. (2011) thus provide a (simple) capacity utilisation adjustment mechanism in equation (26), where utilisation adjusts according to output necessities (i.e. due to the role of effective demand). Importantly, however,

they note that there is no requirement that this goods market equilibrium position need conform to a normal utilisation of capacity.

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The question for post-Keynesians, however, is what leads (or, perhaps more insightfully, what *could* lead) u toward u_n? As with Arestis and Sawyer (2009a) above, Hein et al. (2008, p. 590) note that it would be a 'fluke' for concurrence to occur. In Halevi and Kriesler's (1991) two-sector model, it is shown that for a concurrence of the actual rate of capacity utilisation with a normal or target rate to occur, the target rate would have to be determined in the capital goods sector, achieved, and then also achieved in the consumption good sector. This is because in their model the rate of capacity utilisation in the capital goods sector enters into the profit rate equation of the consumption good sector also (Halevi and Kriesler, 1991).

There is also, however, no force or tendency in any of these models which requires successive short-run rates of capacity utilisation to converge on a normal rate. As investment responds to demand in equations (21) and (26) (and in post-Keynesian macro-models in general; e.g. cf. Lima, 2010) capitalists therefore expand (contract) production as necessary. Indeed equation (26) is constructed specifically in the ultra-short run, before which an act of investment can be taken. When the investment decision is made (i.e., equation (24)), it does take into account a target rate of utilisation, but as $\gamma, \gamma_u > 0$, there cannot be a perfect adjustment except by fluke.

Exploring the impact of successive short-run capacity positions on the long-run capacity position, Dutt (2009, p. 144) constructs a model of endogenous capacity utilisation. In his model, capitalists increase excess capacity (and thus reduce their desired rate of utilisation) strategically in order to be able to increase production to fight off potential competitors (Dutt, 2009). The target rate of capacity utilisation is then tied to the performance of the economy and expectations:

$$\frac{du_d}{dt} = -\lambda(x - g) \tag{27}$$

where u_d is the desired rate of utilisation, t is time, λ is an adjustment coefficient, x denotes the expected growth rate of the economy, and g is the rate of growth of the capital stock. Therefore, if a capitalist expects an increase in competition (which Dutt (2009) proxies through an expectation of increased growth in the whole economy) then the capitalist will lower the rate of utilisation (or, equivalently, will increase capacity). Figure 4 shows this process, where the objective is to have equation (27) equal zero. Horizontal and vertical lines reflect changes in u_d and x respectively:

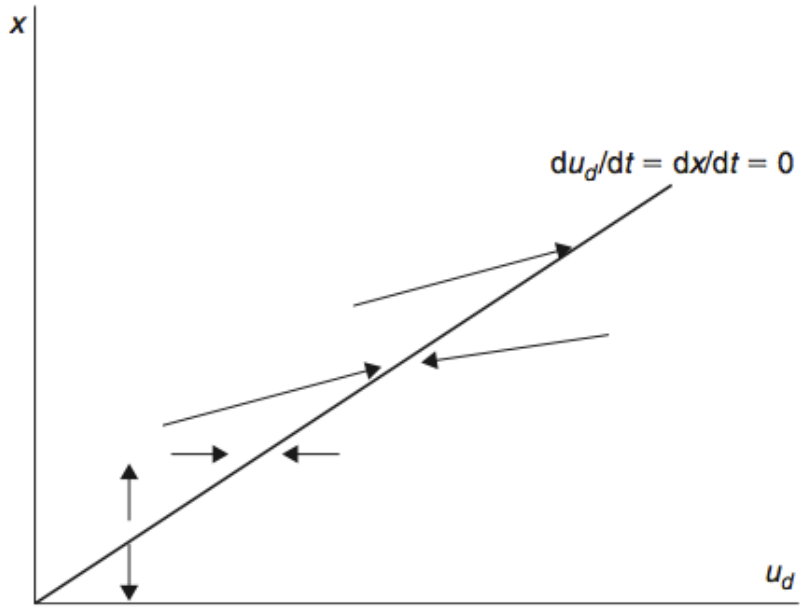

Fig. 4. *A growth model with endogenous desired capacity utilisation* (from Dutt, 2009, p. 145)

In this model, again, there is no reason why the actual rate of capacity utilisation should conform to the target rate. Furthermore, that the target rate is determined endogenously also rejects the notion of a long-run determined normal capacity utilisation rate.

Thus, critical to the post-Keynesian approach to conceptualisation of excess capacity is the role played by effective demand, and thus investment, in determining the short-run rate of capacity utilisation. This is significant due to the impact of path dependency theory in the post-Keynesian approach.

Path dependency theory seeks to provide historical explanations of economic phenomena (Arestis and Sawyer, 2009a). As such, it is a theory of the long period understood as the set of consequences of short-period actions: 'the long-run trend is but a slowly changing component of a chain of short-period situations; it has no independent entity' (Kalecki, 1971, p. 165). The relationship between the short run and the long run in path dependency analysis is spelled out by Setterfield (2009):

> Broadly speaking, a dynamical system displays path dependency if earlier states of the system affect later ones—including (but by no means limited to) anything than can be construed as a 'long run' or 'final' outcome of the system. In other words, path dependency is synonymous with the principle that 'history matters'. (Setterfield, 2009, p. 39)

Thus, it is clear that, vis-à-vis the long run, the post-Keynesian conception of time and history is crucial to their understanding of excess capacity. If excess capacity exists in the short run (and it would be a fluke for it not to), and the next period grows from the previous one, then (again bar a fluke), there is no reason to expect excess capacity to be eliminated (cf. Halevi and Kriesler, 1991; Hein et al., 2011). Furthermore, when factoring in that post-Keynesian investment (and growth) models, such as equations (21) and (26), are primarily resolved to respond to fluctuations in effective demand, there is little scope for capitalists to eliminate excess capacity toward a normal degree over time.

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Hence, post-Keynesian economists conceive of excess capacity as a normal feature of capitalist economies. Due to the responsiveness of capitalists to effective demand considerations in successive short periods (Arestis and Sawyer, 2009a; Lima, 2010; Hein et al., 2011), there is a general rejection of a long-period determined equilibrium degree of capacity (Halevi and Kriesler, 1991; Dutt, 2006). Fundamental to this approach is the conceptualisation of time as an historical process embodied in path dependency theory.

This distinguishes the post-Keynesian approach from those discussed previously. Each of the preceding approaches acknowledges at least temporary excess capacity, but eliminates it over the long run, either through optimal investment decisions (cf. Chenery, 1952), competition (cf. Moudud, 2010), or as the key to establishing normal prices (cf. White, 1996). In contrast, the post-Keynesian approach conceives of normal capacity occurring as a 'fluke', with no forces within the economy capable of attaining or maintaining such an occurrence.

CONCLUSION

Several main observations may be drawn from this review of the literature. There is clearly a vast debate on capacity utilisation, which extends from whether or not excess capacity exists purely in the short run, to the role which capacity utilisation plays in the broader theory. Particularly in the heterodox approaches, there is an acceptance that undesired excess capacity is a typical feature of a capitalist economy, at least in the short period. The Marxian and Sraffian approaches in particular have grown to accommodate excess capacity.

At this stage, it seems appropriate to reject the neoclassical conceptualisation almost entirely. Whilst the marginal revenue-marginal cost approach in an oligopolistic market found in Chenery (1952) and Kim (1999) is insightful, the use of neoclassical production functions and the assumption that excess capacity would otherwise be eliminated out of an inherent tendency of the economy toward full employment were it not for the presence of economies of scale are highly problematic. Further, the insights of the other approaches on the issues of competition and time in understanding excess capacity are ignored in the neoclassical approach.

The role of competition and the conceptualisation of time in explanations of the desired degree of capacity utilisation appear to be the major sticking points between the various approaches. On one hand, the Marxian and Sraffian approaches conceive of a normal capacity utilisation rate which capitalists attempt to achieve over the long run due to competitive

(minimum cost) motivations. On the other, post-Keynesians eschew the normal rate, in large part due to the path dependency theory rejection of an independent long run. Having been established in this Chapter, these are the issues—competition and time—which will be taken up in what follows.

CHAPTER 2

THE QUESTION OF NORMAL CAPACITY

The purpose of the extended literature review preceding the present section was to demonstrate that excess capacity is conceptualised differently and may have specific functions in the varying schools of politico-economic thought. It should at this stage be clear that the question of whether or not there is a desired level of excess capacity—and if so, what that level is—remains yet to be resolved.

Further insights can be gained, however, by exploring what is, deep down, the key debate in the literature: does a normal rate of capacity utilisation exists at all? If it does, what is its significance? This section aims to explore these questions.

Chapter 2 is structured as follows. Firstly, the purpose of desired excess capacity is examined—for capitalists, and for theory building. This will set up the next section's analysis on the nature of a normal degree of capacity utilisation. Two mechanisms by which the normal degree is attained are then discussed. The first is that capacity must inherently adjust to demand. The second interrogates the role played by competition in achieving a normal rate of capacity utilisation.

THE 'PURPOSE' OF DESIRED EXCESS CAPACITY

It is well established that capitalists may desire excess capacity. Along the lines of Winston (1974), Moudud (2010) provides an extremely compelling account of the differences between what is described as '*ex post*' (or unintended) and '*ex ante*' (or intended) excess capacity. Any number of factors can contribute to *ex post* excess capacity, including major macro constraints such as a lack of effective demand or an input supply shock. Equally, a surge in effective demand could lead to deficient capacity—negative excess capacity. More industry- or firm-specific considerations

include excess capacity occurring as a result of a lack of skilled labour or as a result of new competition, for example due to a new entrant in the industry.

What, though, are the factors which contribute to the existence of *ex ante* excess capacity, however? From Marx (1971) we know that capitalists seek to accumulate capital to the greatest extent possible, which would mean eliminating *ex ante* excess capacity altogether. This is reflected in the neoclassical approach also, where profit-maximising capitalists seek to minimise costs—again which involves eliminating excess capacity. That capitalists should seek to maintain spare capacity above and beyond the minimum needed to meet sales demand then appears, at least at first, puzzling.

The clearest reasons why capital is not used to absolute full capacity include labour market norms and the fact that the unit scale of plant may far exceed the demand for goods produced. Labour market norms include the payment of penalty rates for overtime or unsavoury hours of work or weekends which either increase the cost of labour or make labour scarce at certain times (cf. Moudud, 2010). As such, it may be more profitable to operate capacity during daylight shifts where penalty rates are not paid and when workers are prepared to avail themselves than at other times. The unit scale of plant reason refers to the fact that a piece of capital equipment may be physically capable of producing more than is demanded, but that piece cannot be substituted for a smaller piece of capital. As noted by Moudud (2010), this is the basis for Brunner's (1952) distinction between unexhausted economies of scale and achieving a practical optimum. For example, a machine may be physically capable of producing one thousand glass bottles per working day. If there is demand for only five hundred bottles, however, the capitalist must still use the machine capable of producing double that number if there is no machine designed to produce five hundred bottles available—it is not as if the machine could be cut in two and one half sold off.

These two reasons (labour market norms and the unit scale of plant consideration) reflect the difference between the technical frontier of productive capacity and the profitable frontier of productive capacity. Shaikh and Moudud (2004, p. 2) identify these concepts as 'engineering capacity' and 'economic capacity'. It would thus appear that the ideal (and presumably unlikely, unless Say's Law is to hold) static situation would be for engineering and economic capacity to conform, whereby absolutely maximum profitable production could be attained. I.e., a capitalist would be accumulating at the highest rate possible for a given stock of capital if there were sufficient demand to warrant running that capital full-time and with no extra costs associated with unsavoury hours, etc.

We may assume that the scope for a capitalist to shift the profitable frontier closer to the technical frontier is limited, although clearly still a goal of the capitalist. This could be achieved, for example, by requiring workers do shift work, thus increasing absolute surplus value, or eliminating penalty rates through whatever means, thus increasing relative surplus value (Marx, 1954). Otherwise, the reasons for the existence of *ex ante* excess engineering capacity are quite straightforward and not, at any rate, the intended subject of this discussion.

Conceptualising Normal Capacity

The main reasons for maintaining *ex ante* excess economic capacity—that is desiring a profitable frontier of productive capacity which is otherwise less than the technical frontier—are simple to understand. Many authors, from varying schools of thought, have written of maintaining excess capacity to enable expanded production during periods of peak demand (Manne, 1961; Ciccone, 1986; Halevi and Kriesler, 1991; White, 1996). Thus it may be profitable to maintain excess capacity in periods of trough demand which is 'eliminated' as demand grows. Or, equivalently, for capitalists facing a well-defined and known demand cycle, they could fix the level of capacity to average demand across the season or cycle and always produce up to capacity, building up inventories during trough demand and running them

down during peak demand. Clearly this latter approach requires factoring in inventory costs, etc.

These explanations are logical and convincing (at least through a pair of business lenses). Certainly, maintaining excess capacity for peak demand is a reality—it is well known, for example, that energy usage is higher during winter and summer than autumn and spring, but it is not as if energy companies construct and retire energy capacity in three-month intervals. For the maintenance of average capacity across the season or cycle, however, requires the use of expectations (cf. Halevi and Kriesler, 1991).[2]

Another reason typically presented for maintaining *ex ante* excess capacity is as a barrier to entry in oligopolistic, monopolistic, or imperfectly competitive markets (Steindl, 1952; Sylos-Labini, 1969). The ability of a capitalist to quickly increase production due to planned excess capacity in response to a threat of a new entrant is, at least, both a powerful economic and psychological barrier to potential competitors. This could be compounded if the capitalist were to lower the mark up temporarily, even to the point that they might operate at a loss, so as to fend off an infant firm.

The final explanation given for the maintenance of *ex ante* excess capacity comes from Lavoie (1996), who puts the case that capitalists keep reserve capital because the future is uncertain. He states:

> It is assumed that each segment of a plant is operated at its optimal level, as defined by the engineers, under the standard requirements of cost-minimization. Companies have several plants, but expect that in normal conditions some of the segments will not be running. One may wonder why firms would continue to upkeep such plants. The reasons have to do with the presence of uncertainty, as was pointed out by Steindl (1952). Firms hold on to excess capacities to face an uncertain future, just as agents hold on to cash balances for liquidity purposes. These reserves of capacity allow firms to respond quickly

[2] The purpose of this section is not to consider issues of expectation formation. The interested reader is, however, directed toward just some of the criticisms of the rational expectations approach, such as Wible (1984-1985), Dow (1996), and Dow and Hillard (2002).

> to changes in demand and in its structure, an in addition they are deterrent to entry by new firms. (Lavoie, 1996, p. 120)

Thus, given the potential for unexpected effective demand fluctuations, maintaining reserve capacity capable of exploiting any upswing would seem a prudent investment decision. Indeed, it is represented as part of the animal spirits value a in equation (21) and γ in equation (24), where capitalists expand capacity beyond just the balance of $u - u_n$.

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The above purposes for the maintenance of *ex ante* excess capacity are evidently decisions made in the short period (as all decisions inherently must be). This is not to say that there are not long-period consequences of, say, the investment decision to increase capacity (indeed, such a decision is made about the future), but the decision itself is made at a point in time. If investment decisions to incorporate desired excess capacity are then made in successive short periods, at what point can we conceive of a long-run rate of utilisation consistent with these successive short period decisions? This is the problematic political economists face in conceptualising normal capacity.

The literature is fairly clear that for capacity utilisation to be at the normal rate, excess capacity must be entirely desired (Vianello, 1986; Halevi and Kriesler, 1991; Moudud, 2010). This is because, as a long-run equilibrium position, any undesired capacity should be eliminated. Then if, for any reason, actual capacity utilisation happens not to be at the normal rate, then capitalists would be expected to attempt to structure investment decisions toward achieving the normal rate over time. Thus, the normal degree of capacity utilisation is inherently tied up in the notion of the 'steady state' (e.g. Vianello, 1986), which, as stated by Halevi and Kriesler (1991, p. 86), 'is of little analytical relevance in analysing accumulation'.

Few would argue that the normal degree of capacity utilisation is actually achieved perfectly. As such, the real concern for political economists who conceive of a normal rate of capacity becomes a question of the mechanism(s) by which the economy transitions to it (e.g. Ciccone, 1986;

Moudud, 2010). The questions then becomes what, if any, forces are pushing the economy toward the normal rate? Why is it a factor in the minds of capitalists? What obstacles exist which prevent the transition?

If the debates in the late 1980s and early 1990s amongst the Sraffians prove anything is the sheer difficultly involved in answering these questions. Two main mechanisms are offered in the literature, however, to facilitate the transition toward a normal utilisation of capacity. These are (i) streamlining investment decisions toward expected demand so that capacity adjusts to demand, and (ii) the role of competition in forcing down costs; each shall now be addressed.

The Adaptation of Capacity to Demand

That capacity adjusts to demand is a fairly standard observation in economics. As stated in the Introduction above, the rate of capacity utilisation maps an equilibrium point between supply, capacity, and demand. This is by definition an *ad hoc* equilibrium in mechanical time—in the event of the action of exchange, that which is supplied is what is demanded is what was produced at a given rate of capacity utilisation. This understanding of the equilibrium is clearly superficial, but the relationship it espouses between capacity and demand is important—demand affects the capacity utilisation decision.

There are two means by which this observation may present itself: in the decision as to the scale of capacity and in the decision as to the utilisation of that capacity. For example, in the case of a capitalist with one machine, if she perceives a rise in effective demand, she may decide simply to run her current machine harder or longer, thus raising the utilisation rate. She may instead decide to invest in a new machine with which to meet the demand, which will—unless the rise in demand is so great as to warrant supply doubling or more—lower the rate of utilisation. Alternatively, she may do a combination of both, which will have an indeterminate effect on utilisation. Below is a simple formalisation of these scenarios:

$$D \uparrow \quad \rightarrow \quad \frac{Y_1 (Y_1 > Y_0)}{K} \quad \rightarrow \quad u \uparrow \qquad \text{(a)}$$

$$D \uparrow \quad \rightarrow \quad \frac{Y_1 (Y_0 < Y_1 < 2Y_0)}{2K} \quad \rightarrow \quad u \downarrow \qquad \text{(b)}$$

$$D \uparrow \quad \rightarrow \quad \frac{Y_1 (Y_1 > Y_0)}{2K} \quad \rightarrow \quad u \, ? \qquad \text{(c)}$$

where D refers to the new quantity of demand as perceived by the capitalist, Y_1 is the new level of output to which the capitalist produces to meet that demand, Y_0 was supply produced to meet old demand, K refers to the capital stock, and u to the rate of utilisation. Which decision is chosen will depend on many things, including how accurately the capitalist perceives the rise in effective demand, whether or not a new technology can be made use of, whether or nor repairs need to be made, and perhaps most importantly, the state of animal spirits etc. (cf. Moudud, 2010). Options (b) or (c) in particular are especially possible if the current capital is in need of repairs or is approaching obsolescence.

Thus this simple micro-level example shows that the statement that 'capacity adjusts to demand' is quite complex, and potentially troubling. How can options (b) or (c) be reconciled with capacity necessarily adjusting to demand? White's (1996) formalisation in equations (17) to (19) demonstrates that the elasticity of the choice between investing in new capital and running current capital harder depends on the ratio of capacity to peak demand. At any rate, each of the three options may be the profit-maximising decision in various circumstances, and so the transition from one level of effective demand to the next need not be smooth. The question persists, however: if adjusting capacity to demand may *lower* the rate of capacity utilisation, what reason is there to assume a tendency toward a normal rate?

Amadeo (1986b) and Ciccone (1986), for example, acknowledge that the actual rate of utilisation may have no need to correspond to the normal rate, but still conceive of a normal rate as per the needs of a Sraffian system of normal prices. It may be said that at a macro level, where capacity does

not expand by orders of magnitude as in options (b) or (c), these effects may be smoothed. If we therefore consider in more detail option (a) specifically, we may use Hein et al.'s (2011) model of the very short-run capacity-demand adjustment in equation (26) a suitable formalisation as an investment decision: $\Delta u = \mu\left(g^i - g^s\right)$. Here, the rate of utilisation adjusts to meet a change in demand before it is possible to bring new capacity online. This adjustment, however, has nothing to do with the normal rate of capacity utilisation. It is simply acknowledging that there is an adjustment relationship between capacity utilisation and demand.

THE IMPETUS OF COMPETITION

Thus far, the *dictum* that capacity should adjust to demand has not shown that the rate of utilisation should tend toward a normal degree, just that it may certainly be profitable to increase utilisation in the face of an increase in effective demand. This is consistent with Marx's (1971) position insofar as capitalists seek to accumulate as much as possible and thus eliminate excess capacity as much as is possible—this being subject to effective demand.

The other mechanism offered by which the rate of utilisation tends toward a normal degree draws on Marx's (1971) other contribution in the field—the role of competition. Moudud's (2010) work in the area is extremely convincing: equations (14) and (15), driven by his theory of strategic competition, provide a sound mechanism by which capitalists act to adjust capacity toward the normal degree. The object of the present exercise is to examine this further.

At the outset, Moudud (2010) distances his own theory from the typically post-Keynesian or Kaleckian usage of imperfect competition. His contribution of the theory of 'strategic competition' relies on capitalists adopting cost-minimisation strategies to be prepared for an onslaught of competition in an uncertain world (Moudud, 2010). This he believes to be inconsistent with the theory of imperfect competition. He takes particular issue at the use of persistent barriers to entry—it is worth quoting at length:

> The existence of barriers to entry is the *sine qua non* of monopoly power since it allows incumbent firms to shielf themselves from potential entrants into the industry. The barriers to entry are said to arise from the fact that potential new entrants do not possess: absolute cost advantages, economies of scale from large-scale production, and the grater availability of finance. Following Bain, Sylos-Labini and Modigliani, incumbent firms set a price that deters the entry of potential new firms (Zamagni, 1987).
>
> Theoretical issues aside, the problem with the persistent-barriers-to-entry argument is that it flies in the face of historical evidence. Business history provides ample evidence regarding the evolution of technological learning within different industrial sectors which at some point has enabled firms to leapfrog into new sectors along the lines of Andrews. ...
>
> In fact practical analysts of real-world business behaviour are quite aware that incumbent firms even in sectors that are difficult to enter can sometimes be challenged quite successfully by highly competitive new entrants—although the ability to enter is not an inevitability it would be a stretch to assume that it is an impossibility. (Moudud, 2010, p. 31)

It should be noted that Harrod (1952) thought it quite possible for a state of imperfect competition to exist with free entry. Further, in many ways, Moudud's (2010) critique of imperfect competition in is a story of the exception which proves the rule. The literature on imperfect competition is extensive, both within and without the heterodox approaches (cf. Andrews, 1949; Andrews, 1950; Harcourt, 2006; Harrod, 1952; Kalecki, 1941; Kalecki, 1942; Kalecki, 1968; Kalecki, 1971; Sawyer, 1995; Sylos-Labini, 1969). It seems, therefore, that Moudud (2010) makes a sleight of hand in rejecting the theory of imperfect competition wholesale on the basis of a few examples where the imperfect competition mould has been broken. Indeed, Moudud (2010) seems to be conflating imperfect competition with oligopoly—likely due to their somewhat joint treatment by Kalecki (1942; 1968; 1941; 1971). Harrod (1952) makes the distinction between the two: although both set a

mark-up, oligopolists are price makers, whereas imperfect competitors remain price takers (just not to the extreme extent as would be found in a state of perfect competition).

At any rate, for Moudud's (2010) theory of strategic competition to operate, it need not junk the literature on imperfect competition—they can sit quite neatly together. Take, for example, Harrod's (1952) view:

> … field enquiry fully confirms the view that imperfect competition is widely prevalent, if not omnipresent, throughout the field of manufacturing industry, [and also confirms that there is] a lively fear of the possibility of the incursion of new entrants, should excessive prices be charged by those already producing a certain article, is very widespread. While there are many cases of fairly securely established monopolistic (or oligopolistic) positions, in the majority of cases it seems to be assumed that sustained high prices will attract new entrants. (Harrod, 1952, pp. 143-44)

As such, in an imperfectly competitive market, capitalists must adopt a pricing strategy which will not make it profitable for a rival to enter the market. Indeed, Harrod (1952) notes that the motivation for this is the maintenance of market share. Thus, rather than abandon the theory of imperfect competition wholesale, Moudud could easily have incorporated his theory within it.

Strategic competition essentially requires capitalists shed excess capacity over time so as to prevent exposure to damaging competition in an uncertain world:

> Since the future is fundamentally unknown, as emphasized by Keynes, price- and cost-minimization are part of every firm's defensive and offensive strategy, even though no final outcome is guaranteed, for example large-sized firms shielded behind entry barriers may face the ignominy of losing their market shares to smaller-sized new entrants. (Moudud, 2010, p. 6)

Moudud (2010) draws on Harrod (1952) for his theory of normal cost pricing, whereby capitalists adopt prices just low enough that she could not be profitably undercut. As a result, capitalists make investment decisions to push capacity utilisation to the normal degree over time. Equations (14) and (15), constructed as the 'slow adjustment process' toward zero excess demand, thus represent adequate formalisations toward achieving a normal rate of capacity utilisation.

CONCLUSION

The normal rate of capacity utilisation is conceived of as the long-period determined rate of capacity utilisation at which *ex post* excess capacity is eliminated. Although featuring in the models and theories of many authors, few seek to discuss the normal rate as one which is necessarily achieved, or as a steady state, but several attempt to explain why a tendency might exist to transition toward it.

The motivations to adjust excess capacity toward a normal degree are many. Whilst it may be profitable and wise, particularly in an uncertain future, to maintain reserve capacity, if a target rate is determined, investment actions can, subject to various forces, push the rate of capacity utilisation to the normal degree. For a normal degree of capacity utilisation to be a meaningful concept in political economy, there needs by a coherent mechanism by which this may be achieved.

In contrast to the fairly simplistic approach that capacity simply adjusts to demand over time, however, the effects of strategic competition on capitalists provides a sound mechanism by which this adjustment may occur. Building on Marx (1971) and Harrod (1952), Moudud (2010) articulates a model which informs the investment decision based on the tenets of normal cost pricing, the threat of competition, and Keynesian uncertainty. As such, the theory of strategic competition posits that capitalists seek to bring capacity into line with demand over the long run such that the rate of capacity utilisation is consistent with its normal degree.

CHAPTER 3

THE QUESTION OF TIME

Having covered the theoretical debate in Chapter 1, the purpose of Chapter 2 was to conceptualise the normal capacity problematic. In particular, the mechanisms by which the rate of capacity utilisation may conform to a target, or normal degree were interrogated. Moudud's (2010) contribution of the theory of strategic competition was found to provide an excellent adjustment mechanism for bringing the actual and normal rates into line.

The purpose of this section is now to interrogate the construct of normal capacity itself. Given that the pre-dominant alternative to a theory of normal capacity utilisation addressed in the literature review was one of a path-dependent rate of capacity utilisation, the domain of analysis in this section will be time. As the normal degree of capacity utilisation is accepted in the literature to be a distinctly long-run concept, this section aims to provide an understanding of the complexities involved in this use of time.

The Chapter is set out as follows. Firstly, the notion of normal capacity will be interrogated in a discussion of equilibrium along the lines of Dow (1996). Secondly, an overview of the theory of path dependency and the 'traverse' is presented. Finally, the path dependency critique of normal capacity will be proffered.

NORMAL CAPACITY AS AN EQUILIBRIUM CONCEPT

As Dow (1996) correctly notes, any discussion of equilibrium must involve discussion of time because, as the meaning of 'equilibrium' refers to a state of rest, whatever is resting must be doing so for some period of time. Relevant to our discussion, the literature identifies normal capacity either as a point of equilibrium or as a centre of gravity (cf. Hicks, 1965; Marx, 1971; Clifton, 1977; Clifton, 1983; Semmler, 1982; Semmler, 1985; Halevi and Kriesler,

1991; Dutt, 2006; Moudud, 2010). It thus appears prudent to interrogate the conceptualisation of time by those who conceive of, and by those who fail to conceive of, a normal degree of capacity.

To conceptualise equilibrium, a distinction must first be drawn between historical and mechanical time (Georgescu-Roegen, 1971; Robinson, 1978). Historical time refers to time where all events depend on those events preceding them. Dow (1996, p. 112) gives the example of an egg which, it can truthfully be said, cannot return to being uncracked once the cracking has begun. The equilibrium point which is the cracked egg depends entirely on what happened to the previous equilibrium point which was the uncracked egg. In contrast, mechanical time is reversible—that which occurs can freely be undone. Returning to the cracked egg example, if one knew that putting the egg in a particular place would lead it to being crushed, one could move it elsewhere to avoid it being crushed. As Dow (1996, p. 112) notes, historical time is thus far more the realistic approach of the two.

The neoclassical approach to capacity utilisation is certainly located in mechanical time (Dow, 1996). Kim's (1999) model reflects the use of mechanical time, in particular the formalisation of distinct time periods in Figure 1. Chenery's (1952) model also uses mechanical time, reflected in equations (2) to (4), where the long-run cost function (which is really a proxy for expected costs in the future) is run backwards to determine the scale of production. The aim in both models is to move to the optimal scale of capacity, defined along the lines of a target rate of capacity, and then remain at that equilibrium. Evidently, given neither approach adopts any usage of historical time, there is something left wonting in the neoclassical conceptualisation of time.

Vianello's (1986) use of 'fully adjusted situations' in normal capacity analysis hints at the use of mechanical time. If capacity will have adjusted to demand to a degree consistent with a uniform rate of profit (as required in equation (1) Sraffa's (1960) prices of production matrix), then that degree is the target, and the objective is to move to that fully adjusted situation. It is

on this basis that the charge of using steady-state analysis is levied on the Sraffian conception of normal capacity (cf. Halevi and Kriesler, 1991). That is, more specifically, if the pure framework for analysis is in returning a system found out of equilibrium, then it is likely that the system seeks a steady state. Such a scenario loses analytical relevance because of the implicit use of mechanical time in such an approach and because the model will inevitably be more concerned with its own stability than reality. There is thus a need to avoid the treatment of capacity utilisation as a steady state.

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That a system tends back toward an equilibrium point from disequilibrium does not in itself mean that it is a construct in mechanical time. Forces with the economy and institutions may play a significant role in help to achieve equilibrium with a grounding in historical time. For example, Dow (1996) notes that:

> … Marxians also adopt the historical-time concept of equilibrium, as a notional concept. An equilibrium thus refers to the outcome of historical tendencies. The meaning of equilibrium is a state of rest which results from a balancing of opposing forces, rather than the convergence of complementary forces. And indeed, most Marian theory is constructed within the basis of opposing forces: of class struggle, and of contradictions within the working of capitalism. …
>
> Nevertheless, it can be argued that the notion of equilibrium is used as a benchmark, against which this imbalance may be studied, and it is used within a range of time-periods. (Dow, 1996, pp. 126-27)

Competition in Marx (1971) and in Moudud (2010), for example, would be such a force or tendency. In Marx (1971), the fierce intra-capitalist competition which will break out during crises of the over-production of capital is a driving force which acts as a mechanism to overcome the crisis and to return to equilibrium. It is a process which must be undertaken by the system as a whole which need not have specific, mechanically determined results. In Moudud (2010), the explicit rejection of an ergodic future (one

whose probability can be calculated, for example, through a normal probability distribution) and the adoption of cost-minimisation policies as a defensive strategy against rivals is clearly historically specific. There is no reason why, for example, a rival capitalist might not gain a foothold in the market even despite the cost-minimisation policy; equally there is no reason why the normal rate of capacity utilisation might not actually be attained in reality. Strategic competition, as a theory, then, is constructed in historical time.

PATH DEPENDENCY AND THE 'TRAVERSE'

Dow (1996) notes that post-Keynesians tend to eschew equilibrium analysis altogether. The objection is typically due to the fact that equilibrium analysis tends to be divorced from history. The problem is well put by Setterfield (1997):

> … once we are in equilibrium history effectively ends; the future is predetermined by the time path corresponding to the equilibrium that has been achieved. The sequence of outcomes of which this time path is composed does not 'matter', because the absence of any endogenous tendency to change dictates that it cannot affect the subsequent outcomes of the system in any way that would cause deviation from the equilibrium time path. (Setterfield, 1997, p. 66)

Where they do analyse concepts of equilibrium, it is in historical or logical time. Logical time is a used to demonstrate causal sequences, such that if A happens then B must happen, etc. (cf. Termini, 1981). Drawing on Kregel (1976), Dow (1996) articulates three versions of equilibrium used in the post-Keynesian approach:

> (1) Static equilibrium, where long-period expectations are exogenous and short-period expectations are realized.
>
> (2) Stationary equilibrium, where short-period expectations may be disappointed, but this disappointment has no effect on long-period expectations.

(3) Shifting equilibrium, where disappointment of short-period expectations may encourage revision of long-period expectations. (Dow, 1996, pp. 122-23)

Stationary equilibrium is less abstracted and more realistic than static equilibrium, and shifting equilibrium is less abstracted and more realistic than stationary equilibrium.

It is in using shifting equilibria that Kalecki's (1971) conception of the long run as a chain of short runs arises. Each new short period may arrive at an equilibrium point which causes long-period expectations to be revised, and then revised again, and again. In other words, it is from this conception of time and equilibrium that path dependency theory arises.

As discussed in the review of the literature, the post-Keynesians conceive of capacity utilisation as path dependent. Investment functions such as in equations (21) and (26) reflect path dependency in that they seek to address changes in effective demand in the short period, without concern for the long period. Thus, in doing so, any expectation about what would constitute the long run may be wont to change, and thus create a 'new' expected long run each time:

> [Path dependency] is due to the fact that the movement of the system when it is out of equilibrium may change the data on which the static equations which define the equilibrium are based, so that these equations will change and determine a *different* equilibrium and so on and so forth. In other words, the (set of) equilibrium point(s) is *not* independent of the dynamic movement of the system, that is, this set is path-dependent. (Gandolfo, 1987, p. 461)

Tied up in path dependency theory is the question of the 'traverse'—in short, how does an economy move from one equilibrium position to another, and what causes the new equilibrium to be stable (cf. Hicks, 1965; Lowe, 1976; Halevi and Kriesler, 1991; Kriesler, 2003)? This is especially important for understanding the long run and normal positions. Halevi and Kriesler (1991) capture the insight of the traverse on capacity utilisation:

> … we accept [the path dependency approach] until some coherent dynamic adjustment process is specified which can describe the 'traverse' from one equilibrium position to another, without the traverse itself influencing the final equilibrium position, that is, without the equilibrium being path determined. (Halevi and Kriesler, 1991, p. 86)

That is, for an independent (and therefore meaningful) long run to exist, it must exist independently of the short-run events which occur alongside it (cf. Halevi and Kriesler, 1992). This is not to say that the long run does not exist altogether, but a long run which is dependent on short-run events may lead therefore to results inconsistent with the expected long-run results. In fact, there is little reason to suppose that this will occur for any reason other than a fluke.

The Path Dependency Critique

Despite whichever branch of the literature from which it comes, the concept of normal capacity is decidedly a long-run one. Whether capital accumulation forces capacity to adapt to demand in such a way as to move toward the normal degree of utilisation, or if strategic competition achieves the same result, both are long-run tendencies. Both require the existence of an independent and thus analytically meaningful long run.

If the post-Keynesian or path-dependent critique levied against the long run is successful, then it is also successful in terms of answering the question of the desired degree of capacity utilisation. Post-Keynesians have no requirement in their literature for the actual and normal rates of capacity utilisation to conform. Instead, capitalists respond to changes in effective demand in the first instance by adjusting the rate of capacity utilisation, and when time permits and confidence (or animal spirits) is sufficient to warrant it, by adjusting capacity proper. These are the insights of equations (21) and (26).

What are the consequences of the path dependency critique for those theorists positing a normal rate of capacity utilisation? It would be overly

simplistic to suggest that the theory of strategic competition put forward by Moudud (2010) is thus entirely invalidated. Strategic competition remains a convincing argument as to how capitalists operate and make investment decisions.

That a tendency exists for capitalists to adjust capacity over time toward a normal rate of utilisation, however, cannot be unquestioningly held. A target rate of utilisation may well exist in the short period, which, if it were achieved, may be analogous to a normal rate of utilisation (Halevi and Kriesler, 1991). Indeed, this target rate may well be heavily shaped by the forces of strategic competition in Moudud (2010).

For the forces of strategic competition to be the only determinants of the rate of utilisation, however, would require that short-run investment decisions and fluctuating effective demand considerations have an inconsequential impact on the long period. This seems very unlikely to be the case.

CONCLUSION

Normal capacity is a long-run concept. Whichever form it takes—be it the means by which the Sraffian relative price matrix in equation (16) is given life, or the end result of a slow adjustment process due to strategic competition in equations (14) and (15)—normal capacity is not determined in the short run. Furthermore it is an equilibrium position, which must therefore be constructed in historical time to have meaning.

Understanding time as historical, however, means that the relationship between successive short runs and the long run must be analysed. This raises the issue of the 'traverse' and questions the reasoning behind a long run which remains independent of its constituent short runs. In applying an analysis of the degree of capacity utilisation from the perspective of path dependency theory, we therefore find that the normal rate of capacity utilisation, as a long-run concept, need have no relation to the actual rate of capacity utilisation.

CONCLUSION

Using a pluralist methodology, the preceding Chapters have considered the neoclassical, Marxian, Sraffian, and post-Keynesian approaches to the issue of capacity utilisation. A core issue raised in each of the approaches is whether or not capacity adjusts to demand so as to have the rate of capacity utilisation conform to a 'normal' rate of utilisation. Mechanisms by which this transition to normal capacity may occur were examined, and the contribution of Moudud (2010) of strategic competition was praised as a likely contender. When considering, however, the role and conceptualisation of time, however, it was shown that if the criticism of an independent long run along the lines of path dependency theory is sustained, then the analytical relevance of a normal degree of capacity utilisation is seriously damaged.

The neoclassical approach was found early on to be far too abstractive to provide meaningful analysis of the rate of capacity utilisation. This was particularly troubling given that the very issue of excess capacity utilisation is problematic for neoclassical macro theory. Furthermore, the use of orthodox production functions in the models of both Kim (1999) and Chenery (1952), which have been thoroughly discredited (cf. Garegnani, 1966; 1970), as key features of their models warranted no further consideration of the neoclassical approach.

The Marxian approach was found to be highly insightful. Although Marx's (1971) own understanding of excess capacity was limited to periods of crisis of overproduction of capital, his analysis of the role payed by intra-capitalist competition in restoring equilibrium after crisis was revealing. This was then built upon by Moudud (2010), whose theory of strategic competition was examined in depth in Chapters 2 and 3.

The Sraffian approach was revealed to require a theory of the normal rate of capacity utilisation in order to sustain a uniform rate of profit across

industries (cf. Clifton, 1977; Clifton, 1983; Semmler, 1982; Semmler, 1985). This in turn was a crucial requirement of sustaining Sraffa's (1960) relative prices of production matrix, which forms the basis of the Sraffian understanding of value and distribution; the Sraffian approach was therefore revealed to be the only approach whose core theory was functional of the understanding of capacity utilisation. There was found to be intense debate amongst Sraffian authors as to whether or not the actual degree of capacity utilisation could ever be expected to conform to the normal degree (cf. Vianello, 1986; Amadeo, 1986a; Amadeo, 1986b; Ciccone, 1986).

The post-Keynesian understanding of capacity utilisation was found to be most different to the other approaches given its rejection of the usefulness of a normal degree of capacity (Halevi and Kriesler, 1991; Dutt, 2009; Arestis and Sawyer, 2009a). This was due to the importance of path dependency to the theory, which conceives of the long run as not independent of the chain of short runs which constitute it (Kalecki, 1971; Setterfield, 2009). Instead, capacity utilisation was found to be endogenous, responding instead to changes in effective demand (Arestis and Sawyer, 2009a; Dutt, 2009; Hein et al., 2011).

The second section sought to interrogate the question of excess capacity and the conceptualisation of the normal rate of capacity utilisation. Along the lines of Winston (1974), Moudud (2010), and Shaikh and Moudud (2004), a distinction was drawn between *ex post* and *ex ante* excess capacity, where the former is what is aimed to be eliminated over time and where the latter is retained for strategic purposes and forms normal excess capacity.

The adjustment toward the normal rate of utilisation was interrogated, with two mechanisms assessed. The first, the organic adaptation of capacity to demand, was found to be an observation rather than a mechanism as a result of capitalist investment behaviour (Amadeo, 1986b; Hein et al., 2011). The use of strategic competition by Moudud (2010), however, provided an excellent analytical tool which could tend the rate of capacity utilisation toward the normal rate, where cost-minimisation

forms a strategy in a non-ergodic future of Keynesian uncertainty. It was also shown that, in addition to drawing on Harrod (1952) for the strategy of cost-minimisation, Moudud (2010) did not need to reject the theory of imperfect competition; rather, Harrod's conceptualisation of imperfect competition could be suitably manipulated toward strategic competition.

The third section sought to test Moudud (2010) against the pre-dominant rival theory to appear in the review of the literature, that being from the post-Keynesian political economists. As the fundamental distinction between the two approaches lay in their respective conceptions of the relevance of the long run, this section sought to interrogate Moudud (2010) on the temporal foundations of his theory of strategic competition.

Firstly, an outline of equilibrium and time from Dow (1996) was provided. This revealed that there are two main conceptions of time, mechanical and historical. Mechanical time was understood to be highly abstracted as it allowed temporal actions to be reversed, and was also found to be the temporal foundation of steady states. In contrast, historical time was found to be unidirectional and realistic. On the basis of these conceptions, the neoclassical models and that of Vianello (1986) were rejected due to their reliance on steady state analysis.

Secondly, a more detailed discussion of path dependency and the associated 'traverse' between short-run equilibria was conducted. It was found that an independent long run cannot be conceived of in historical time if the realistic assumption is made that the transition between its constituent short runs may alter the long run (cf. Halevi and Kriesler, 1991; Halevi and Kriesler, 1992). As such, when this critique was applied to the theory of normal capacity, it was found that a normal rate of capacity utilisation is unlikely to have analytical relevance, as the actual rate of utilisation was more likely to be determined in the short run by effective demand considerations that the need to achieve the target rate of utilisation.

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Theories of capacity utilisation remains have been hotly contested within the heterodox literature for the best part of a century. Capacity utilisation remains integral to growth models of Kaleckian, Marxians, and Sraffians. It forms one of the basic building blocks of our understanding of the condition of the political economy, and it is considered relatively easy to measure (cf. Shaikh and Moudud, 2004)—and yet few can agree on its dynamics, its purpose, and particularly its historical condition.

The approach taken in this work was to investigate the debate—to put rival theories side by side, to evaluate them on their own terms and on the terms of their rivals. The eventual conclusion was to reject the conceptualisation of the normal degree of capacity due to the critique of path dependency theory. This was adopted due to its seemingly decisive integration of history into its dynamics.

This may be contested. It may be found that history is not just one damned thing after another, and this has economic consequences in the form of an independent long run. If this is found to be true and could be demonstrated somehow, then it might be the case that a normal degree of capacity utilisation was analytically relevant.

I would caution away from attempting to demonstrate the existence of a long run through historical data. This in itself would not overcome the path dependency argument, which is about the future. Trends will naturally exist in the past, and historical data will show this. The data will not show what impact the trend will have into the future, as today's and tomorrow's and the day following's actions will impact upon that trend, change it. Instead, more research into the nexus between historical and logical time—the combination of knowing what has happened as well as what must happen as a result—may lead to new conclusion.

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