Effective Demand and Income Distribution under Increasing Returns Regime

Raghavendra. S[♣]

[♣] I am deeply indebted to Prof. Amit Bhaduri, guide and mentor. I am indeed grateful to Prof. Deepak Nayyar, Prof. Anjan Mukherjee of Centre For Economic Studies and Planning, JNU. My gratitude to Prof. Ram Ramasamy of JNU Physics Dept., for correcting an error in the model and setting me on the right track. My gratitude also to Dr. Sita Bruha Sinha, Prof. Sanjay Jain of IISC Bangalore, Dr. Sudheshana Sinha of Institute of Mathematical Sciences, Chennai and Prof. Balakrishnan of IIT, Chennai. I am also grateful to Prof. Vela Velupillai for giving a patient hearing of my case and gently telling me that this result, as well as many of the results in this vein, is not constructively effectivizable (meaning not dependable for policy!), which in fact has opened my blocked mind to the fertile and more challenging research area of Computational Complexity. Notwithstanding all these positive influences the remaining infelicities are mine.

Section I: Introduction

The aim of the paper is to examine the interrelation between class distribution of income and effective demand in a macroeconomic framework.[1] This question remains relatively unexplored in current mainstream theory, though addressed to an extent by two distinct, but separate, intellectual traditions originating in Classical economics on the one hand, and in Keynesian economics on the other. We argue that the question of how income distribution affects the level of effective demand and in turn how the formation of effective demand itself affects the distribution of income is not answered exclusively by either the theories of Classical economists like Ricardo, Malthus and Marx or the theories of Kalecki, Keynes and their successors, although the latter tradition succeeded in defining clearly the notion of effective demand.

Among the Classical economists, Malthus was perhaps the first to identify the connection between income distribution and effective demand. He failed, however, to work out the analytical connections satisfactorily since an adequate theory of effective demand was not available.[2] In contrast, Ricardo's main concern was to determine the laws, which regulate the distribution of income among the different classes. Ricardo corroborates the laws that govern the distribution of income in an economy where the composite input of labour and capital is applied in a fixed proportion to less and less fertile land as the margin of cultivation is extended in the process of accumulation. From our point of view, the central problem with his model lies in the dynamics of the wage fund vis-à-vis the process of accumulation. On the one hand, at a given real wage the size of the available wage fund determines both the amount of labour that can be employed and the margin of cultivation, which in turn determines the rent, and the wage bill, with profit as a residual. On the other hand, the change in size of the wage fund is governed entirely by the profit accruing to the capitalists, i.e. a part of profit (saving) is reinvested as the wage fund for

---

[1] Income distribution can be considered from various angles e.g., class or functional distribution into categories like wages, profits and rent or personal distribution e.g., by decile groups, and occupational distribution. The focus of this study is to discuss the link between class distribution i.e. profit and wage and effective demand in a macroeconomic context.

[2] In a communication to Ricardo, he explains this connection

" From the want of a proper distribution of the actual produce adequate motives are not furnished to continued production… the grand question is whether it (actual produce) is distributed in such a manner between the different parties concerned as to occasion the most effective demand for future produce" [Malthus, 1821] This is reprinted in Ricardo (1952), pp. 9-10 the next period. Hence the size of the wage fund and the margin of cultivation, which are simultaneously given in an exogenous manner, together specify the level of output (total surplus). Given the total surplus, its distribution between land rent, wages and profits can be determined on the basis of the marginal productivity theory and the postulate of subsistence wage. In other words, Ricardo's theory shows us how an exogenously given level of total surplus or total output is distributed among different social classes and the logic, which drives it towards the stationary state.[3] In essence it becomes a theory focused, not on the determination of the level of output but its distribution in so far as the pre-existing wage fund at each point determines both the margin of cultivation and output, while changes in the wage fund is governed by profits accruing to the capitalists. In this sense, the Ricardian framework is inadequate to deal with the interrelation between distribution of income and the determination of total output, particularly if investment is not governed entirely by saving out of profits, but has an independent role.[4]

Marx, on the other hand, seems to have come closer to analyzing specifically this problem of interrelation. And yet, his analysis does not appear to be sufficiently coherent on this issue. For Marx, surplus comes because capitalists pay workers not for their labour but for their labour-power as wage advance.[5] Thus the ratio of this surplus over the variable capital, namely relative surplus value per worker, is the crucial variable in his theory of distribution. However, as far as the aggregate surplus value is concerned, Marx discusses it in terms of the solution to the transformation problem. But the fundamental postulate involved in the transformation of values into prices is the assumption that total surplus equals total profits i.e. $\sum \text{Surplus} = \sum \text{Profit}$

[3] See Kaldor (1954-55), Pasinetti (1980). Also see Bhaduri and Harris (1987), where the authors argue against convergence to the stationary state by showing chaotic movements.

[4] See Robinson, J (1965, pp.64).

[5] Labour power- the capacity to do useful work, which adds value to commodities. The use value of labour power is its capacity to produce value. It is this labour power that workers sell to capitalists for a money wage. The category of labour power arises in the labour theory of value in the explanation of the source of Surplus value. The labour theory of value reveals that the source of surplus value in the system of capitalist production is unpaid labour of workers i.e., on average a worker in a day (or hour, or any unit of labour time) produces a certain money value, but the wage he receives is the equivalent of only a fraction of its value. Thus the worker is paid an equivalent for only a part (necessary to sustain labour power) of the working day, the value produced in the other, unpaid part, is the surplus value.

This suggests that Marx's theory is more concerned with the distribution of the total surplus[6], than its formation, which can be defined only when the 'scale' in terms of the number of workers is presumed. Marx spells out more clearly the conditions under which the relative surplus value per worker increases but he seems less clear in defining how the total surplus value is formed and the relation between the latter vis-à-vis the former. To put it differently, the surplus of value or product per worker is explained, but not the number of workers employed. Thus the theory of employment or the theory of the level of output is left unsettled in Marx.

To put it baldly, in both the models of Ricardo and Marx the scale of output, of which the total surplus forms a part, is not analysed adequately. This limitation in the classical literature stems from the fact that they had at best an unsatisfactory theory of the determination of total output.[7] If output is assumed to be determined by the exogenous wage fund (advanced as wage bill) as in Ricardo, it becomes a framework for analysis where the problem of determination of output is considered only from the supply side; if one approaches it through Marxian value theory, the question of what determines total value is again left unanswered, quite apart from the problem of transformation of value into price.

The notion of effective demand and the role it plays in the determination of income was an elusive concept for the Classical economists. Its analytical formulation was achieved after the publication of Keynes's General Theory, and Kalecki's parallel but independent

[6] To quote Marx, " The sum of the profits for all the different spheres of production must accordingly be equal to the sum of surplus values, and the sum of prices of production for the total social product must be equal to the sum of its values", Marx ([1867], 1981, p.273)

[7] See for instance, Sraffa (1960). The essence of his model may be distilled from the arguments in part I in which Sraffa deal with single-product industries and circulating capital. There Sraffa demonstrates that the approach to the analysis of Value and Distribution adopted by Ricardo and Marx is logically consistent. Taking the size and composition of output and the conditions of reproduction and the real wage as given, he shows that

> (i) In an economy that is capable of reproducing itself the relative prices are determined by the conditions of production.
>
> (ii) In an economy that is capable of producing surplus over and above the needs of reproduction, relative prices are determined by conditions of production of basic commodities and the manner in which the surplus is distributed.
>
> If in the latter case, the surplus is distributed as rate of profit, then the data i.e., the given level of output, determines relative prices and the rate of profit. In this sense Sraffa's model, as in the case of the Classical models, seems to be concerned with the distribution rather than the determination of the level of output or the interrelation.

work. This event led to a renewed interest into the question of interrelation between income distribution and effective demand in the immediate post-war years. In the following section we review the results of several analytical models that were presented by different authors, including Kalecki himself, Steindl and subsequently others, purporting to capture this interrelation.[8]

Section II:

In the previous section it was discussed how, the inadequate analytical understanding of the notion of effective demand and the role it might play in the determination of the level of income limited Classical theories from explaining satisfactorily the interrelation between the level and distribution of income. In this section we focus on models, which recognise the centrality of the notion of effective demand. It would be argued later in the chapter how these models suffer from the obverse problem of the classical theories, i.e. an ad hoc specification of how distribution is determined. It is simplest to start with models of income determination where the distribution of income is simply specified exogenously.

Section II.A: Models of Income Determination with Exogenous Distribution of Income

The origin and perhaps the clearest exposition of this class of models is to be found in Kalecki's writing. Kalecki in his theory of distribution of income postulates a precise relationship between the degree of monopoly and the level of output. The central idea of

[8] See Sweezy and Baran (1966), Cowling (1982), Sawyer (1982).

Kalecki's theory of income distribution is the mark-up price model, where the average (weighted) price $\bar{p}$ for an industry is calculated as mark-up (k) over the average (weighted) of unit prime cost ($\bar{u}$) in the industry.

i.e., $\bar{p} = k.\bar{u}$ (A.1)

Kalecki incorporates this mark-up price equation into his theory of distribution by noting that the ratio of aggregate proceeds of an industry to the aggregate prime costs of the industry is the mark-up k.

If Agg. Prime Costs = Agg. Wage Cost (W) + Agg. Material Cost (M)

then Agg. Proceeds = k $(W + M)$ (A.2)

subtracting (W+M) both sides, we have

Overheads + Profits = $(k-1)(W+M)$ (A.3)

The relative share of wages in value added is

$$w = \frac{1}{1+(k-1)(1+j)} \quad \text{(A.4)}$$

where $j = M/W$

Kalecki explains the effect of distribution on economic activity by postulating an increase in the degree of monopoly. From equation (A.4), an increase in the degree of monopoly will reduce the share of wages in the value added. Conversely, the relative share of profits must increase in response to the higher degree of monopoly. However, this need not imply that the total profits also increase because the level of investment and consumption expenditures determines the total profits.

To quote Kalecki

“ The level of income or product will decline to a point at which the higher relative share of profits yields the same absolute level of profits” (Kalecki, 1954, p.253).

Investment therefore determines the level of total profits, which in turn determines the level of total output to a proportion that depends upon the given degree of monopoly. This is the core of Kalecki’s theory of distribution. He does not have a theory of what determines the mark-up. As mentioned earlier, for him the degree of monopoly is determined by a set of institutional factors, and is given exogenously to the system.[9] An increase in the given degree of monopoly reduces output to the extent where this reduction offsets the rise in the share of profits leaving the level of total profits, which are determined by capitalists’ expenditures, unaltered. It is clear from the above analysis that an increase in the degree of monopoly does not alter the distribution of income among capitalists and workers. Kalecki’s theory is often misleadingly termed as the ‘Monopoly Theory of Distribution’. However, if one dwells deeper into his model one sees that the degree of monopoly does not influence the distribution of income in so far as total profit is unaltered for a given level of investment! Viewed this way, Kalecki’s theory poses exactly the opposite problem of the classical theories. For instance, Marx argued that at a given level of total surplus (or total income) changes in distribution of income occurs

[9] See Kalecki’s essay on “Class Struggle and the Distribution of National Income” in Kalecki, M (1971).

through changes in the rate of exploitation affecting relative surplus value. In Kalecki's model the problem is inverted, i.e. at a given degree of monopoly determining mark-up, which corresponds to the rate of surplus product rather than surplus value, changes in distribution occurs through changes in the level of output. The novelty of Kalecki's theory was to show that the level of output ultimately depends on the capitalist's expenditures. The problem, however, is the common intersection between Kalecki and Classical economists, i.e. both worked out in a somewhat one-sided manner the interrelation between income distribution and the level of output. The Classical economists viz., Ricardo and Marx fix the level of output in determining the distribution of income between classes (see Section.I). Kalecki, on the other hand, fixes the distribution more or less exogenously by taking the degree of monopoly as given, to determine the level of income.

The post-war period witnessed a spurt of models inspired by the Kaleckian formulation. They tried to solve the problem of interrelation between income distribution and the level of output. One set of authors tried to solve this problem by considering the mark-up as a function of elasticity of demand, trade union power, advertising etc. In other words they tried to solve the problem of interrelation by providing an additional theory of the determination of the mark-up.[10] In this class of models the adverse effect of distribution, due to higher profit share or mark-up, on the level of output is shown mainly through a reduction in the consumption demand. However the other component of aggregate

[10] See f.i. Eichner (1973), Kregal (1971) and Davidson (1981).

demand in a closed economy namely investment, plays no role in their analysis. In essence, it is under-consumptionist logic.[11]

Steindl (1952) provided a theory of investment, where the degree of utilisation of capacity plays a vital role in determining the level of investment. He tries to overcome the disadvantages of exclusive under-consumptionist logic in explaining the interrelation between the distribution of income and the level of output. However, in his argument, lower capacity utilization puts a drag on the level of investment primarily because of the structure of the manufacturing industry. In his model he considers two types of industries. One is competitive in nature where the profit margin is flexible and excess capacity is driven out by the competitive price-cutting by firms. The other industry is monopolistic in nature where cost differentials exist between firms, consequently the profit margin is less flexible than in the competitive industries.[12] On this industrial structure, Steindl builds up his case for stagnation in the economy as a whole by arguing that the structure of manufacturing, especially US manufacturing in the period under consideration, was evolving more and more towards a monopolistic form. So the fall in the level of output in his analysis is due to the presence of surplus capacity, brought about by the tendency towards concentration, which depresses investment at constant profit margin. In other words, since the profit margin is maintained by the evolving structure of industries, the

[11] In an economy without any economic activity by government and closed to foreign trade, private final expenditure on consumption and on investment are the two main components of aggregate demand. The under-consumptionist logic, for expanding the aggregate output, emphasises the importance of stimulating high private consumption through a policy of high (real) wages. See Domar, E.D (1947, pp.34-55).

[12] This notion of flexible/inflexible profit margin is very similar to Hick's idea of `fix price' and `flex price'. For Hicks, the existence of stocks (or surplus capacity in case of Steindl) has a great deal to do with the possibility of keeping prices fixed or inflexible profit margins. In case of excess demand it is the stock changes (quantity) substitute for price changes. See Hicks (1965, p.79). Also see Kalecki's essay on `Costs and Prices', in Kalecki (1971), where he defines two kinds of prices operating in the economy viz., cost determined (fix) and demand determined (flex) prices.

fall in output is not directly due to any adverse distributional effect.[13] Hence Steindl's model, getting out of the under-consumptionist mould by bringing investment into consideration and emphasising the evolving nature of the industrial structure as an essential feature of the analytical model, analyse partly the problem of interrelation between distribution of income and the level of output. However, Steindl's model is closely allied to Kalecki's, in so far as the industrial structure and its evolution, analogous to Kalecki's degree of monopoly, is largely extraneous to the macroeconomic analysis of aggregate demand. It affects aggregate demand through its impact on the level of investment, whereas in Kalecki's model it is the degree of monopoly determined exogenously that affects the level of aggregate demand through consumption.

Another set of models, which try to resolve this problem of interrelation between distribution of income and the level of output took their inspiration directly from Keynes's Treatise rather than the General Theory.[14] Among them, Kaldor's formulation is perhaps most well known. His formulation is interesting in so far as it relies explicitly on the principle of effective demand operating through the multiplier mechanism to derive a theory of distribution between profits and wages. At the same time his model is radically different from Kalecki's and other models worked out within the Kaleckian framework, Kaldor relies on a flexible price-wage mechanism to explain the distribution process, instead of relying on the exogenously determined degree of monopoly, which specifies an inflexible price-wage configuration. Kaldor's model deserves discussion in some detail as one of the most important contributions in the class of Keynesian models characterized by endogenous distribution.

---

[13] Steindl (1976) argues that the surplus capacity exits, in his model, due to insufficient aggregate demand.
[14] Starting from Kaldor's article on the theories of distribution, See Kaldor (1955-56).

Section II.B: Model with Endogenous Distribution with Exogenous Level of Income

Almost obverse to Kalecki's theory of distribution are Keynesian theories of distribution initiated by Kaldor (1955-56), and later extended by several economists of Keynesian persuasion. Kaldor referring to Keynes's Treatise on Money, calls his theory a Keynesian theory of distribution since, "it can be shown to be an application of specifically Keynesian apparatus of thought" (1956, p.94). In other words, it relies on the same theory of effective demand operating through the multiplier mechanism to derive a theory of distribution between profits and wages.[15] Although Kaldor works with Kalecki's concept of cost-determined prices rather than Keynes' approach to the problem in the General Theory,[16]

i.e., $p = m.b.w$ (B.1)

where m is the percentage mark-up.

he deviates from Kalecki's definition of the degree of monopoly being determined by institutional factors and assumes the mark-up to be a variable. Now instead of giving specific functional form for the profit mark-up, Kaldor closes the system by setting the level of output at the level of appropriate either to the capacity of existing plant and equipment or full-employment of available labour force i.e., $Y=Y_{f..}$ This returns Kaldor's model to the Classical separation between the level of output and distribution of income.

---

[15] Keynes in his Treatise envisages an economy to pass through three stages during the process of expansion. In Stage one, there is a rise in prices (of capital goods or of consumer goods) without any change in output or in employment. In Stage two, the real activity happens i.e., expansion of employment and output and in Stage three both prices and wages rise. But the peculiarity of the treatment in the Treatise is the extreme concentration on what is called as Stage one. In Hicks' words " it is stage one alone that is closely analysed and it is stage one alone to which the 'Fundamental equations' essentially refer" (Hicks, 1967,p.192). At the background of Kaldor's 1955 article lie these fundamental equations of Treatise.

[16] Keynes in the General Theory, with the assumption of diminishing returns and perfect competition, works with a price equation such as $p = w/f'(L)$ (marginal cost).

With $Y=Y_f$, the model boils down to the following set of equations:

$$pY_f = \pi + w.b.Y_f$$
$$p\bar{I} = s_\pi.\pi + s_w.w.p.Y_f$$
$$p = m.\bar{b}.w$$

Solving for mark-up, we have

$$m = \frac{(s_\pi - s_w)}{(s_\pi - \bar{I}/Y_f)} \qquad \text{(B.2)}$$

The share of profits then becomes, given $p = m.\bar{b}.w$

$$h = \frac{\pi/p}{Y_f} = \frac{[\bar{I}/Y_f - s_w]}{[s_\pi - s_w]} \qquad \text{(B.3)}$$

From (B.2) and (B.3) we see that as the level of investment increases with given output at full-employment level, the share of profits increases by the multiplier times. The multiplier in this case is the difference between the saving propensities out of profit and wage income respectively. This argument can be seen by rearranging equation (B.3) as

i.e., $\bar{I} = [(s_\pi - s_w).h + s_w].Y_f$ (B.4)

In Kaldor's model, as investment rises, mark-up rises depressing the real wage owing to the price equation (B.1). Since the level of output is at the full-employment level, the whole adjustment takes place in terms of redistribution of income from wages to profits (by lowering the real wage). This redistribution is captured by the saving propensities, which shows the additional saving per unit of income redistributed from wages to profits

$$[s_\pi - s_w] = (1 - s_w) - (1 - s_\pi)$$
$$= \mathrm{c_w} - c_\pi$$

where, c_π and c_w are per unit of consumption out of wages and profits respectively.

Rearranging (B.3) we can also see

$$S = [s_\pi . h + s_w (1 - h)].Y_f \qquad \text{(B.5)}$$

From equations (B.4) and (B.5) it is clear that an increase in the level of investment, at the full employment level, generates its matching level of saving through a redistribution of income between wages and profits, at the full-employment level. This is the reason why Kaldor's model and subsequent models have been labelled as Keynesian theories since savings is assumed to adjust passively to an increase in the level of investment. Nevertheless these models also differ fundamentally from the Keynesian scheme, in so far as changes in the distribution rather than level of income ensure the equality between saving and investment.

For attaining this equality between saving and investment in Kalecki's theory, a higher level of investment has to bring about its matching level of saving through a higher level of output at a given degree of monopoly. This can be seen from equation (B.4),

$$\bar{I} = [(s_\pi - s_w).\bar{h} + s_w].Y$$

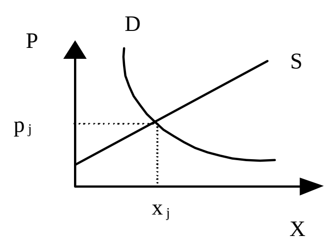
In Kalecki the profit share (h) is given and output (Y) varies to bring about the saving/investment equality. In short, in Kalecki's theory, changes in the level of income (output) at a given degree of monopoly ensure this equality. In contrast, this reappears in a different guise in Kaldor's model, i.e. changes in the distribution (h) through changes in the real wage, at a given level of output ($Y=Y_f$) ensures this equality.

This highlights our problematic: From the point of interrelation between distribution of income and its level both these intellectual traditions provide systems which are so to say, 'one equation short'. In other words, the level of total output is an exogenous variable to the system supply-determined by the 'initial condition' of the wage advanced in the case of classical theories, where as it is the distribution of income which becomes the exogenous variable in the case of the post-war models inspired by the theoretical approach of Kalecki and Keynes.

In what follows we shall analyze this interrelation in a model where distributive shares are endogenously determined by assuming labour productivity to vary with the level of output/capacity utilization due to economies of scale. And the aim is to show how effective demand might still operate as a constraint in a process where the distribution of income and the level of output influence each other in a self-reinforcing manner.[17]

[17] The possible limit to the process of self-reinforcing, cumulative interaction between distribution of income and its level being discussed here purely from the demand side. But models which assume demand to be a passive variable might be incompatible to work with under the assumption of increasing returns to scale. For instance, the laws of supply and demand of the Neo-classical theory state that in any competitive market, say for the jth commodity, there is a market clearing price, characterized by

$$D_j = S_j$$



Where D_j and S_j respectively are the maximum quantities that buyers are willing to buy or sellers to sell, at those prices. It is the assumption of diminishing returns, in the form of rising cost/supply curve, these laws give a unique market clearing price-output configuration. However the existence of increasing returns, translated in the form of falling cost/supply curve, would seriously undermine the stability of the neo-classical models. In other words, multiple equilibrium may emerge under increasing returns making at least some equilibrium constellations unstable depending on the exact specification of the out of equilibrium adjustment.

<u>Section III</u>: The Model

National Income in money terms is

$p.Y = \pi + W$ (III.1)

Here we divide total labour (L) in to two parts

$L = N + M$ (III.2)

where N – number of operatives who vary with the level of output i.e.,

$N=\beta Y$; Y – is the actual output.

M – number of non-operatives who vary with the level of potential output i.e., $M=\alpha Y^{*}$; Y^{*} - is the potential output.

With these definitions (III.2) becomes

$L = \beta Y + \alpha Y^{*}$

Dividing through Y we get,

$$\frac{L}{Y} = \beta + \alpha.\frac{Y^{*}}{Y}$$
$$= \beta + \alpha/z; \quad z = \frac{Y}{Y^{*}}$$
$$or$$
$$1/x = \beta + \alpha/z$$

$$\Rightarrow \quad x = z/\alpha + \beta z \qquad \text{(III.3)}$$

where x is the labour productivity.

In the light of our preceeding discussion, one way to model the interrelation is by assuming labour productivity as an increasing function of capacity utilization (z). Note here that the scale economies arise owing exclusively to fixed or overhead labour.

With price equation given by,

$$p = m.b.w \qquad \text{(III.4)}$$

where *m* is given mark-up, b is the labour-output coeffeicient and w is the money wage rate.

Hence with out assumption of labour productivity being an increasing function of capacity utilization the profit share (h) is no longer exogenously given but varies with the level of output/capacity utilization (z).

i.e., $$h = 1 - \frac{w}{p}.\frac{\alpha + \beta.z}{z}; \quad \frac{dh}{dz} > 0 \qquad \text{(III.5)}$$

Equation (III.5) can be written as

$$h = 1 - \frac{\left(w/p\right)}{x(z)}$$

Or

$$h = 1 - \frac{\left[w/x(z)\right]}{p} \qquad \text{(III.6)}$$

Thus, in this case of increasing returns due to fixed overhead wage bill of the non-operative labour, as capacity utilization (z) increases labour productivity increases to bring about a fall in the unit variable cost $\left(w/x(z)\right)$, which in turn would increase the share of profits (h). This result concurs with the widely observed empirical fact of procyclical behaviour of profit share emphasized by Okun.[18]

However note that unless we explicitly postulate how money wage rate (w) changes and its consequence for unit prime cost $\left(w / x(z) \right)$ and prices, the direction of change in profit share, under increasing returns regime remains ambiguous. Precisely this question would be examined in the following model. Thus, it will be shown in the following model that, postulating money wage as a function of the level of activity (capacity utilization) introduces new aspects, generating a richer and more complex dynamics in the study of interrelation between income distribution and its level, where not only labour productivity but also wage responds to changes in the level of economic activity.

Definitionally the change in profit share is brought about by money wage rate, labour productivity and price.
Or from (III.6) the share of wages is

$$1 - h = \frac{w}{p \,.\, x}$$

By log differentiation with respect to time

$$\dot{h} = (1 - h)\left[\dot{p}/p + \dot{x}/x - \dot{w}/w\ \right]$$

or (III.7)

$$(1 - h)\left[\dot{p}/p - \left(\dot{w}/w - \dot{x}/x\right)\right]$$

Here we assume that the money wage rate to be a function of capacity utilization because the bargaining power of the workers increase with the tightness of the labour market

[18] See Okun (1981) p. 16 and p.227. Also P. (15-18), for scale economies owing to overhead labour.

which in turn depends on the level of capacity utilization. This is postulated to be a simple linear relation,[19]

$$w = v + \theta z, \quad v, \theta > 0 \qquad \text{(III.8)}$$

Since labour productivity is also an increasing function of capacity utilization due to increasing returns as defined in equation (III.3),

i.e. $$x = z / \alpha + \beta z \qquad \text{(III.9)}$$

where α is the constant non-operative/overhead labour productivity coefficient and β is the constant labour productivity coefficient of operative/variable labour

The unit variable cost (UC) now becomes a more complex function of capacity utilization

i.e. $$UC = w(z) / x(z)$$

$$= \frac{(v + \theta z)(\alpha + \beta z)}{z} \qquad \text{(III.10)}$$

From the above equation (III.10), it can be seen that unit variable cost changes as capacity utilization changes according to,

$$\frac{d(UC)}{dz} = \frac{\theta.\beta.z^2 - v.\alpha}{z^2}$$

Therefore, $\frac{d(UC)}{dz} \gtrless 0$ depending upon whether $z \gtrless \sqrt{\frac{v.\alpha}{\theta.\beta}}$ (III.11)[20]

[19] Here we are defining a wage curve, which is similar but not identical in general with the Phillips curve in so far as it is not directly derivable by integration from the traditional Phillips curve. For instance $\dot{w}/w = H(u)$, (where u is the rate of unemployment) $H' < 0$ is the traditional Phillips curve. Suppose if u = f(z) with $f' < 0$ then $\dot{w}/w = F(z)$, $F' > 0$

Consider for example the case when unit variable cost is increasing i.e. $\frac{d\left(\dot{w}/w - \dot{x}/x\right)}{dz} > 0$ The increase in the unit variable cost beyond a certain level of capacity utilization given by z > $\sqrt{\frac{\nu.\alpha}{\theta.\beta}}$ represents the case of a sufficiently tight labour market, so that unit variable cost increases despite rising labour productivity (see eqn.III.9) with the consequence that, in a regime of cost determined prices, a rise in the unit variable cost would increase the price level. However with the assumption of constant proportional mark-up the condition for a consequent increase in profit share requires, from (III.1) that the percentage change in price $\left(\dot{p}/p\right)$ to be sufficiently high to satisfy

$$\left(\dot{p}/p\right) > \left(\dot{w}/w\right) - \left(\dot{x}/x\right) \qquad \text{(III.12)}$$

i.e. the rate of change in price is greater than the rate of change in unit variable cost.[21] However, when rising unit variable cost is not compensated by a corresponding rise in price (in percentage terms), i.e. the condition (III.12) is not satisfied, the profit share falls. Thus for

$$1 > h > 0, \quad \dot{h} < 0 \quad \text{if} \quad \left(\dot{p}/p\right) < \left(\dot{w}/w\right) - \left(\dot{x}/x\right)$$

For example, this could be the case where a more competitive market structure for products typically characterized by entry threat and oligopolistic rivalry rather than collusion restrains firms from raising prices. However, this has to be coupled with a monoposonistic labour market capable of rapid increase in money wages. Thus money wage would rise faster than price in percentage terms overcompensating the rise in labour

[20] Note 1 >z > o implies $1 > \frac{\nu.\alpha}{\theta.\beta} > 0$ i.e. $\theta.\beta > \nu.\alpha > 0$

[21] In this case, the extent of rise in unit variable cost is more than compensated by rising prices, presumably due to the greater monopoly power enjoyed by the price-setting firms.

productivity (*i.e.* $\dot{w}/w > \dot{p}/p + \dot{x}/x$, $\dot{x}/x > 0$). This is a case, which runs contrary Okun's "law", since profit share falls as capacity utilization (z) increases due to a more competitive product market coexisting with a monopsonistic labour market. Viewed this way, the two contrasting cases of rising and falling profit share in the course of expansion of economic activity can be seen as the interplay of the extent of monopoly power of the firms as price-setters and the extent of monoposony power of the trade unions of workers as wage-setters.

Both these cases might hold also when the unit variable cost falls[22] i.e. $\frac{d\left(\dot{w}/w - \dot{x}/x\right)}{dz} < 0$ below a certain level of capacity utilization given by $z < \sqrt{\frac{\nu.\alpha}{\theta.\beta}}$ from (III.11).

---

[22] In this model the concept of cost in question is average cost rather than marginal cost. However, in our formulation the condition for declining marginal cost i.e. MC < 0 is similar to that of average cost as given below.
The total cost is given by

C = w. L where w is the money wage rate and L is the number of labour

Which can be expressed as

$C = w.\frac{Y}{x}$ where Y is the total output (actual) and x is the Output-Labour ratio.

$= \frac{w}{x}.\frac{Y}{Y^*}.Y^*$ where Y^* is the potential output.

Normalizing with respect to Y^* we have,

$C = \frac{w}{x}.z$

Now $\frac{dC}{dz} = \frac{w}{x} + z.\left\{\frac{x.\frac{dw}{dz} - w.\frac{dx}{dz}}{x^2}\right\}$

$$= \frac{w}{x} + z.\left\{\frac{1}{x}.\frac{dw}{dx} - \frac{w}{x^2}.\frac{dx}{dz}\right\}$$

$$= \frac{w}{x} + z.\frac{w}{x}\left\{\frac{1}{w}.\frac{dw}{dz} - \frac{1}{x}.\frac{dx}{dz}\right\}$$

$$= \frac{w}{x} + \frac{w}{x}\left\{\frac{z}{w}.\frac{dw}{dz} - \frac{z}{x}.\frac{dx}{dz}\right\}$$

$$\frac{dC}{dz} = \frac{w}{x}\left\{1 - \left(e_{x,z} - e_{w,z}\right)\right\}$$

In this case productivity growth outweighs the sluggish change in money wage due to a slack labour market to effect a fall in the unit variable cost. Given that prices are cost determined and in this case of falling unit variable cost, the condition (III.12) would imply a falling share of profits i.e. $\left(\dot{p}/p\right) > \left(\dot{w}/w\right) - \left(\dot{x}/x\right)$. This is again the case that contradicts Okun's law where share of profits fall as capacity utilization increases. This may correspond to a more competitive product market, where the productivity gains are passed on to consumers and a slack labor market.

However in the same regime of falling unit variable cost violation of the condition (III.12) implies a rising profit share i.e. $1 > h > 0,\ \dot{h} > 0$ if $\left(\dot{p}/p\right) < \left(\dot{w}/w\right) - \left(\dot{x}/x\right)$. This situation represents non-competitive business behaviour in the product market where the benefits of productivity gain are not fully passed on to consumers.

It is in this analytical background we study the interrelation between distribution of income and its level especially in an Exhilarationist regime.[23] We show that the dynamics of the interrelations between the various variables in such a regime generates non-linear oscillations in terms of the possibility of limit cycles.

These models also highlight a point made by Steindl (1952) in terms of the effect of technological gains on prices under different types of Business Behaviour. The Business behaviour of firms in setting the mark-up depends upon the overall structure of the industry, in which they form a part. In this context Steindl discusses two types of market structures viz., competitive and non-competitive or monopolistically competitive market structures. In the non-competitive industry, where firms have considerable monopoly power, the gains or benefits of higher productivity (technological advances) would tend to be retained by firms through a higher mark-up thereby leaving price unchanged. In contrast, in a more competitive industrial structure, where there is a threat of entry, the benefits of higher productivity would be passed on to consumers in terms of lower level of prices through a policy of fixed markup. In some ways, it also resembles Hick's Fix-

---

$\therefore\ \frac{dC}{dz} < 0$ iff $\left(e_{x,z} - e_{w,z}\right) > 1$ Hence for $\frac{dC}{dz} < 0$ productivity must respond stronger than money wage for changes in capacity utilization.

[23] A regime where investment responds strongly than saving to changes in profit share. For a formal definition see Bhaduri and Marglin (1990).

price versus Flex price characterization.[24] Flex price case where a fall in the unit variable cost due to higher productivity results in the fall in prices corresponds to Steindl's competitive industry case with a tendency towards fixed mark-up.[25]

When mark-up tends to be fixed, it can be interpreted to mean that it is targeted at a certain level to achieve a target profit share. This can be seen formally from the following price adjustment equation

$$\dot{p} = \lambda\left[\mathrm{m}.\frac{\mathrm{w}(z)}{x(z)} - \mathrm{p}\right] \quad \lambda > 0 \tag{III.13}$$

Note that higher (lower) value of λ entails faster (slower) adjustment in price in response to unit variable cost.

Or from the definition of wage share (1-h),

$$\frac{\dot{p}}{p} = \lambda\left[\mathrm{m}.(1-\mathrm{h})-1\right]$$

$$= \lambda\left[\mathrm{m}-\mathrm{m.h}-1\right]$$

$$= \lambda\left[-(1-\mathrm{m})-\mathrm{m.h}\right]$$

$$= \mathrm{m}.\lambda\left[\frac{(\mathrm{m}-1)}{\mathrm{m}}-\mathrm{h}\right] \tag{III.14}$$

For any given level of mark-up (m) the first component in equation (III.14) gives us the intended profit share. The second component (h) is the actual profit share. Changes in this component (h) are brought about by adjustment in price in relation to unit variable cost, where the latter varies with capacity utilization as shown by (III.13). Hence the absolute change in price is defined in terms of deviations from the actual profit share from the

[24] See Hicks (1965)

[25] In Hick's Fix price case despite a fall in the unit variable cost there is no change in the price level implying higher or variable mark-up. This is similar to Steindl's non-competitive industry with flexible mark-up. This is the case that corresponds to our model in Chapter IV, where a fall in the unit cost due to higher productivity at given prices, directly affects the profit share through a higher level of mark-up (see eqn. IV.5, p.32). In that model profit share directly changes as a consequence of a change in the unit variable cost with price remaining constant.

targeted profit share, and $\frac{\dot{p}}{p} = 0$ means that the actual profit share (h) is equal to the targeted profit share (m-1)/m, which is targeted through the mark-up (m) in this case.

With these postulates we are now in a position to outline a formal model capturing the dynamic interrelation between the level and class distribution of income in the course of changing price and unit variable cost under increasing returns and wage bargain by organized labour in accordance with (III.8).

The realized profit share equation is given definitionally from (III.7) as,

$$\dot{h} = (1 - \mathrm{h}) \left[\dot{\mathrm{p}}/\mathrm{p} - \left(\dot{\mathrm{w}}/\mathrm{w} - \dot{\mathrm{x}}/\mathrm{x} \right) \right]$$

Using equation (III.8), (III.9), (III.13) and (III.14) we have

$$\dot{h} = \mathrm{c}.(1-h)\left[\lambda.\left(m.(1-h)-1\right)+\left(\frac{\alpha.\nu \text{ - } \beta.\theta.\mathrm{z}^2}{(\alpha+\beta.z)(\nu+\theta.z)}\right)\frac{1}{z}.\dot{z}\right] \qquad \text{(III.15)}$$

Let $g(z) = \left(\frac{\alpha.\nu \text{ - } \beta.\theta.\mathrm{z}^2}{(\alpha+\beta.\mathrm{z})(\nu+\theta.\mathrm{z})}\right)\frac{1}{z}$ in equation (III.15)

Now consider the rate of change in capacity utilization, which is governed by excess demand in the product market, i.e.

i.e. $\dot{z} = \mathrm{a}\left[\mathrm{I}(.) - \mathrm{S}(.)\right]$ (III.16)

Here I(.) is the investment function and is defined as I = I(h,z), where h is the profit share and z is the capacity utilization ratio.[26]

[26] See Bhaduri and Marglin (1990, p.105) for deriving this functional form.

Saving function is defined as

$S = s.\pi$, where s is the propensity to save out of profits (π) and $1 \geq s \geq 0$

This is further decomposed as

$S = \text{s}.\frac{\pi}{\text{Y}}.\frac{Y}{Y^*}.Y^*$, where Y is the actual output and Y^* is the potential output.

Normalizing with respect to Y^* we have

$$S = s.\ h.\ z \qquad \text{(III.17)}$$

Therefore equation (III.16) can be rewritten as

$$\dot{z} = \text{a}\left[\text{I(h, z)} - \text{s.h.z}\right] \qquad \text{(III.18)}$$

Equations (III.15) and (III.18) characterize our coupled dynamical system

$$\dot{h} = c\,(1-h)\left[\lambda.\left(m.(1-h)-1\right)+\left(\frac{\alpha.\nu\ \text{-}\ \beta.\theta.\text{z}^2}{(\alpha+\beta.z)(\nu+\theta.z)}\right)\frac{1}{z}.\dot{z}\right]$$

$\dot{z} = \text{a}\left[\text{I(h, z)} - \text{s.h.z}\right]$ a,c > 0 are speed of adjustment parameters.

0: In this system [I_s: (h = 1, z)] is an Invariant subspace, i.e. any orbit belongs to I_s remains in $I_{s.}$ And no trajectory can cross $I_{s.}$

1: There are two fixed points of the coupled dynamical system, an economically trivial one with zero wage share at h_1 = 1 and the other at $h_2 = 1 - 1/m$, where m>1 by definition. That is, (i) $\dot{z} = 0, \text{h} = 1$

(ii) $\dot{z} = 0, \text{h} = 1 - \frac{1}{\text{m}}$

** Condition for the existence of the trivial fixed point at $\left(h_1 = 1, z_1 = z_1^*\right)$

i.e., $\dot{h} = 0, \dot{z} = 0$ at $\left(h_1 = 1, z_1 = z_1^*\right)$ is $I(1, z_1^*) = s.z_1^*$

** Condition for the existence of fixed point at $\left(h_2 = (1 - \frac{1}{m}), z_2 = z_2^*\right)$ is :

at $h_2 = 1 - \frac{1}{m}$, for $\dot{z} = 0$ we need $I(z_2^*, 1 - \frac{1}{m}) = s.(1 - \frac{1}{m}).z_2^*$

If we assume $I = \text{i.h} + \text{j.z}$, here i and j are positive constants, then we have,

$$s.(1 - \tfrac{1}{m}).z_2^* = \text{i}.(1 - \tfrac{1}{m}) + j.z$$

$$\Rightarrow z_2^*\left[j - s.(1 - \tfrac{1}{m})\right] = \text{a}(\tfrac{1}{m} - 1)$$

Then for $z_2^* > 0$ the condition is $\text{j} < \text{s}.(1 - \tfrac{1}{\text{m}})$ ….. (III.19)

2: The Jacobian matrix of partial derivatives evaluated at trivial equilibrium, h=1 is given as,

$$J\Big|_{h_1=1,\, z=z_1^*} = \begin{bmatrix} a(I_z - s.h) & a(I_h - s.z) \\ 0 & \lambda.c \end{bmatrix}$$

Where Trace, $T : a(I_z - s.h.) + \lambda.c$ and

Deter min *ant*, $D = a.c.\lambda.(I_z - s.h)$

Here if we assume $(I_z - s.h) < 0$, the usual stability criteria for one variable Keynesian model, then for trace T to be negative we should have a >>c >0, which is plausible in many circumstances. But here the determinant D <0. We shall discuss the nature of instability of this fixed point when we formally state the properties of the system.

3: The Jacobian matrix of partial derivatives evaluated at the other equilibrium $h_2 = 1 - 1/m$ is given as,

$$J \,\Big|_{h_2 = 1 - \frac{1}{m},\, z_2 = z_2^*} = \begin{bmatrix} a(I_z - s.h) & a(I_h - s.z) \\ c(1-h).g(z).(I_z - s.h) & c(1-h)\left[-\lambda..m + g(z).(I_h - s.z)\right] \end{bmatrix}$$

$$T : a(I_z - s.h) - c.\lambda.\left[1 + \frac{h}{\lambda}.g(z).(I_h - s.z)\right] + c.g(z).(I_h - s.z) \qquad \text{(III.20)}$$

$$D : -a.c.\lambda.(I_z - s.h) \qquad \text{(III.21)}$$

Though we derive $(I_z - s.h) < 0$ assuming a linear investment function (see condition III.19), and would hold even if I(h,z) is a non-linear function. Nevertheless we still take this as an assumption for our subsequent analysis. This would imply D>0 (see III.21).

Here there are two possibilities exist depending on whether investment responds more or less strongly than saving with respect to changes in profit share.
Consider the case where investment responds relatively weakly compared to saving to changes in profit share. In this case, there is no ambiguity about the local stability of the system, because in this Stagnationist case (for explanation of this terminology, see fn.23) characterized by $(I_h \text{ - s.z}) < 0$, local stability conditions hold as the trace is negative (see condition III.20) and determinant is positive (condition III.21) and therefore the system is locally asymptotically stable.
But in the other case, where investment responds relatively more strongly than saving to changes in profit share i.e. $(I_h \text{ - s.z}) > 0$ the local stability analysis suggests wider possibilities with richer dynamics. The equilibrium will be locally asymptotically stable (unstable) when the trace is negative (positive). The negativity of the trace may be ensured here only if a is sufficiently greater than c, represented by a>>c>0. This implies that the speed of adjustment of the level of output or capacity utilization (z) is much faster than the speed of adjustment of profit share (h) or distribution of income, which is

plausible in many circumstances. On the contrary the condition for trace (T) to be positive can be derived from (III.20) as,

$$a(I_z - s.h) + \mathrm{c}\left[-\lambda + (1-\mathrm{h})\{\mathrm{g(z)}.(\mathrm{I_h} - s.z)\}\right] > 0$$

$$\text{or } -a\left|I_z - s.h\right| + \mathrm{c}\left[-\lambda + (1-\mathrm{h})\{\mathrm{g(z)}.(\mathrm{I_h} - s.z)\}\right] > 0$$

$$\Rightarrow \quad \mathrm{c}\left[-\lambda + (1-\mathrm{h})\{\mathrm{g(z)}.(\mathrm{I_h} - s.z)\}\right] > \mathrm{a}\left|\mathrm{I_z} - s.h\right|$$

$$\text{or} \quad \frac{c}{a} > \frac{\left|\mathrm{I_z} - s.h\right|}{\left[-\lambda + (1-\mathrm{h})\{\mathrm{g(z)}.(\mathrm{I_h} - s.z)\}\right]} \qquad \text{(III.22)}$$

The possibility of the trace (T) changing sign suggests, by "Bendixson's Negative Criterion" (Bendixson,I (1901) and also Cesari, L (1971)) that limit cycles may arise in the case of the Exhilarationist regime. To see this in economic terms, consider the special case of an exhilarationist regime with a sufficiently strong effect of profitability on investment, and fixed (or nearly fixed) prices. At low level of capacity utilization (zone I in fig.III.1) with $z < \sqrt{\frac{v.\alpha}{\theta.\beta}}$ (see III.11), as investment and capacity utilization increases, the profit share also increases because unit variable cost is falling, while prices remain more or less fixed. Thus, investment increases unambiguously, because both the arguments of the investment function I(h,z) are increasing to influence it positively. As a result the economy enters a situation of high capacity utilization i.e. $z > \sqrt{\frac{v.\alpha}{\theta.\beta}}$ in zone II, where profit share begins to fall as unit variable cost rises with fixed prices. Because the regime is exhilarationist by assumption, the negative impact of falling profit share on investment is stronger than that of the positive accelarationist impact of high capacity utilization leading to a fall in both profit share and capacity utilization. The significance of the relative speeds of adjustment in both profit share and capacity utilization can be seen more clearly now. In the expansionist phase (zone I) both capacity utilization and profit share rise in unison so that the speeds of adjustment are not crucial. But in the contractionist phase (zone II) the relative speed of adjustment is crucial for the cycle to turn the cycle to zone III i.e. profit share has to fall much faster than increase in capacity utilization i.e. c>>a to bring the expansion in Investment and output to an end, until capacity utilization is low enough (i.e. $z < \sqrt{\frac{v.\alpha}{\theta.\beta}}$) to repeat the above process of dynamic oscillation of the economy.

We are now in a position to formalize the preceding economic argument.

If the dynamical system

$$\dot{z} = \mathrm{a}\left[\mathrm{I(h,z) - s.h.z}\right]$$

$$\dot{h} = c\,(1-h)\left[\lambda.\left(m.(1-h)-1\right)+\left(\frac{\alpha.v - \beta.\theta.\mathrm{z}^2}{(\alpha+\beta.z)(v+\theta.z)}\right)\frac{1}{z}.\dot{z}\right] \qquad a\,,c > 0$$

has the following properties.

(i) I_s: (h=1,z) is an invariant subspace. Since any orbit which belongs to I_s remains in I_s and also no trajectory can cross I_s, it implies that h=1 line is a natural boundary of this system.

ii) I(.) and S(.) are continuously differentiable in the non–negative orthant R, with $I_h, I_z, S_h, S_z > 0$

ii) There exists two unstable fixed points (h_1^*, z_1^*) and (h_2^*, z_2^*) in the positive orthant such that, the conditions for instability are given by

* Fixed point, say A, at $\left(h_1 = 1, \mathrm{z}_1 = \mathrm{z}_1^*\right)$. From the Jacobian matrix of partial derivatives evaluated around this fixed point it is clear that $\frac{\partial \dot{z}}{\partial z} < 0$ (given the assumption $(\mathrm{I_z} - s.h) < 0$) and

$\frac{\partial \dot{h}}{\partial h} > 0$ (with both c and λ being positive)

This implies that this fixed point on the invariable subspace has one stable arm with respect to z-axis and a transverse unstable arm with respect to h-axis. (See fig. III.1)

* Fixed point, say B, at $\left(h_2 = (1 - \frac{1}{m}), z_2 = z_2^*\right)$

- c >>>a (sufficient condition)
- $\frac{c}{a} > \frac{\left|I_z - s.h\right|}{\left[-\lambda + (1-h)\left\{g(z).(I_h - s.z)\right\}\right]}$

(iii) There exists a finite $\bar{z}$, such that $\forall z \langle \bar{z}$, I (h,z) > S(h,z).[27] Furthermore $\dot{z}$ need not be monotonically increasing throughout in (h,z) space.

iv) The system is stable in an appropriately chosen compact subset in R. Since the area is bounded we conjuncture without proving, the possibility of finding a compact set in $F = \{h, z | [0,1] \times [0,1]\}$. If these conditions are satisfied, then every positive orbit starting in R approaches a limit cycle in R.

[27] The assumption underlying this functional form is that for low values of z, $\dot{z}$ is positive i.e. the response of investment is higher than the response of saving for unit changes in capacity utilization. This is exactly opposite to the one Kaldor (1940, p.85) assumed to prove the persistence of cycles in his model. However note that this is only one of the plausible functional forms. See Appendix B in Bhaduri and Marglin (1990), for further discussion.

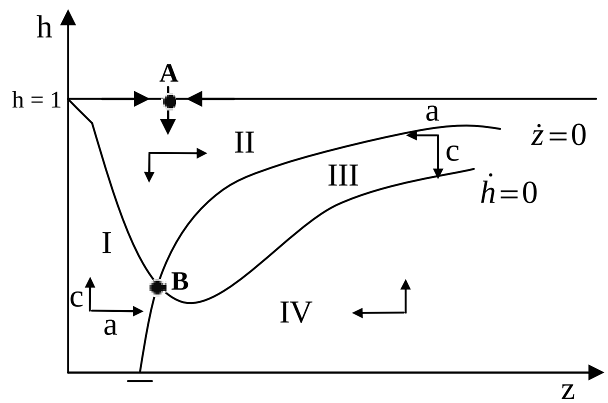


Fig. III.1

We may elaborate further the economic description of the cycle is along the lines discussed above, focusing now on the speed of price adjustment. At low level of capacity utilization, i.e. $z < \sqrt{\frac{\nu.\alpha}{\theta.\beta}}$ the unit variable cost $(\frac{\dot{w}}{w} - \frac{\dot{x}}{x})$ falls. With prices remain fixed the falling unit variable cost implies a rise in the share of profits. In an exhilarationist regime with a sufficiently strong effect of profitability on investment, i.e. investment responding more than saving to changes in profit share, $(I_h - s.z) > 0$, investment increases unambiguously as both profitability effect and accelerationist effect being positive. As a result output expands in zone I and drives the cycle towards to zone II. As capacity utilization increases and reaches the critical value i.e. $z > \sqrt{\frac{\nu.\alpha}{\theta.\beta}}$, the unit variable cost rises. Consequently, in zone II, profit share begins to fall as unit variable cost rises with fixed prices. Moreover, we can also see how profit share falls from the point of changes in price in response to changes in unit variable cost from condition (III.22).

For the right hand side in condition (III.22) to be positive, we require

$$\left[-\lambda + (1-h)\{g(z).(I_h - s.z)\}\right] > 0$$

which implies $\lambda < (1\text{-}\mathrm{h})\{\mathrm{g(z)}.(\mathrm{I_h} - s.z)\}$ (III.23)

where as explained earlier λ is the speed of adjustment of price in response to unit variable cost (see eqn. III.13). Since $\lambda < 1$ in (III.23), the adjustment in price is slower in response to adjustment in unit variable cost. In other words, in zone II, rising unit variable cost is not adequately compensated by a corresponding rise in price (percentage terms) implying a fall in the profit share. Because the regime is exhilarationist by assumption, the negative impact of falling profit share on investment is stronger than that of the positive effect of high capacity utilization. Hence in zone II at a peak of activity i.e. $z > \sqrt{\frac{v.\alpha}{\theta.\beta}}$, the negative impact of profitability on investment outweighs the positive acclerationist impact of capacity utilization to bring the expansion in investment to an end and consequently capacity utilization and output also fall. This is the economic intuition for the cycle to turn towards zone III. In terms of mechanics of the cycle it is the condition (III.22), which is critical for dragging the cycle towards zone III, i.e. the condition that the speed of adjustment of profit share (distribution of income) is faster than the speed of adjustment of capacity utilization (level of output) that leads the cycle towards zone III.[28] In zone III the falling share of profits feeds on to the output equation $(see\ \dot{z}\ \text{equation of the system})$ resulting a fall in the latter, which is due to a more than offsetting fall in investment over any rise in consumption. Hence both profit share and capacity utilization fall to lead the cycle to zone IV. Consequently the expansion in both investment and capacity utilization comes to an end, until capacity utilization is again low enough ($z < \sqrt{\frac{v.\alpha}{\theta.\beta}}$) to make profit share rise and repeat this process of dynamic oscillation of the economy. It is interesting to note that the coefficient g(z) (see equation

[28] At the peak of activity, higher λ (with in its bound as given in III.23) implies a larger ratio of the relative speeds of adjustment (see III.22).

III.15) acts as a ‘tuning’ parameter in terms of determining the direction and magnitude of direction of the cycle.

Conclusion:

In general, in this paper, the dynamics of interrelation between income distribution and the level of income is analyzed in a more complex model by assuming both money wage and productivity as increasing functions of capacity utilization. It is this explicit consideration of money wage and labour productivity as functions of capacity utilization that generates interesting dynamics capable of producing sustained non-linear oscillations in terms of limit cycles. Two points from the above analysis need to be stressed:

Firstly, the fall in investment demand is brought about by a fall in profit share at the peak of the cycle (activity), which is due to an upward pressure on unit variable cost from money wages. Falling profit share at the peak of activity in this regime stands somewhat in contrast to the widely observed empirical fact of pro-cyclical behaviour of profit share. In this sense, it is the anti-Okun’s case that we had already referred to in the last section. It requires the percentage rise money wage rate to be strong enough to outweigh the advantages of higher labour productivity at higher capacity utilization, beyond a point. The ‘anti-Okun’s’ case considered by us in theoretical terms may well correspond to the case of “wage explosion” not entirely unknown in economic experiences.

Secondly and more importantly it is clear from the above analysis that the fluctuations in the level of effective demand, due to the ambiguous effect of distribution of income on the components of aggregate demand, might still operate as a constraint in a productivity led expansion processes even when there is a strong impact of profitability on investment (exhilarationist regime). This underscores the importance interrelation between distribution of income and its level for broader policy discussions pertaining to economic expansion.