A MODEL OF GROWTH OF THE CONTEMPORARY INDIAN ECONOMY

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The most remarkable feature of the contemporary Indian economy is that it has witnessed an increase in the rate of growth of GDP, even while the share of the economic surplus in output has been increasing. This is perfectly possible in a boom owing to growing excess demand pressures, unleashing a process of profit inflation. But while a tendency towards profit inflation is discernible over the last few months, virtually the whole of the post-liberalization era has been free of any such tendency; indeed the Indian economy during this entire period can be categorized as a demand-constrained system. Now, in a demand-constrained system, a rising share of surplus in output should give rise to a stagnationist tendency, and not to an increase in the growth rate. How then do we explain the contemporary Indian economy?

The reason why a rising share of surplus in output should cause a tendency towards stagnation in a demand-constrained economy, can be stated, following Michael Kalecki (1954), as follows. Investment in any period depends upon decisions taken earlier, and hence can be taken as fixed. This, with a balanced current account (for simplicity), must equal savings. Assuming, again for simplicity, that savings out of wages are negligible, investment must equal savings out of profits. With a given consumption propensity out of profits, the given level of investment fixes the level of profits in any period; and if the share of profits in output is given by a set of parameters that change only slowly (and together constitute what Kalecki called the "degree of monopoly"), then the level of output is determined by the given level of investment. Now, if for some reason the share of profits increases in output, i.e. the "degree of monopoly" increases, then, since investment is given during the period, output must *fall*. And if this fall in turn reduces investment for the next period, then the problem of aggregate demand will become even more acute and the growth rate of the economy will slow down[1]. Even if the short-period output fall has no effect on the next period's investment, even then a *rising share of profits in output* must, by causing a sequence of such falls, slow down growth, relative to the time-profile of output that would have prevailed in the absence of such a rising share of profits[2].

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[1] This was the argument of Josef Steindl (1951) who suggested that the level of investment in any period was dependent upon the *level of capacity utilization* of the previous period.

[2] This was Kalecki's argument. Since investment in any period depended according to him upon the *profits* of the previous period, and since these remained unchanged even when the "degree of monopoly" increased, the long-run rate of growth, i.e. the *slope of the line* showing the logarithm of output plotted against time did not change, but the

Such a *denouement* can be prevented if there are exogenous countervailing factors. The two most common exogenous countervailing factors are: state expenditure, and an export surplus of goods and services[3]. Neither of these however is of much significance in the Indian case. While state expenditure has increased somewhat as a proportion of GDP in the very recent period, the increase is still quite insignificant compared to the massive rise in the share of the economic surplus. And export surplus in India's case has not even been a persistent phenomenon, let alone a significant one. The rising share of economic surplus in output in other words has not created any serious realization problem, and hence any consequent stagnationist tendency, not because of any exogenous countervailing factors, but because it has been accompanied by greater consumption by the surplus earners themselves and also by greater investment that has been stimulated by such consumption, *contrary to what the underconsumptionist theories, inspired by the Kaleckian Revolution, would suggest.* How can we explain this?

The reason lies, in my view, in the fact that there has been a rapid rate of structural-cum-technological change in the Indian economy (I do not distinguish between the two, since the product emanating out of a new process is most appropriately seen as a new product). *The ability to introduce technological-cum-structural change(imitative of what prevails in the metropolis) is what has kept up the level of aggregate demand in the Indian economy even in the face of a rapidly increasing share of economic surplus in output.* It has given rise to a consumption splurge by those who live off the surplus, which in turn has also kept up the inducement to invest. The other side of this coin has been the fact that, notwithstanding high rates of economic growth, the rate of growth of employment in the economy has been very slow on account of the rapid increase in labour productivity, associated with the rapid technological-cum-structural change. The labour reserves, far from getting used up, have increased relative to the size of the labour force, which in turn has kept down the wage rate even in the face of fast-rising labour productivity, and hence contributed to a decline in the share of wages and the rise in the share of surplus.

The purpose of the present paper is to provide a simple model of this growth process, whose chief hallmark, to recapitulate, consists in the following: unless new products (and processes) are continuously and rapidly introduced, the economy plunges into a crisis of *ex ante* over-production; and if new products (and processes) are rapidly introduced, then, even while avoiding such a fate, it remains saddled with accentuating unemployment, increasing share of surplus in GDP, and a growing hiatus between the rich and the poor that perpetuates and exacerbates the dualism of the economy. Section I of the paper presents the basic model, and section II draws certain conclusions regarding the sustainability of this growth process.

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position of the line shifted down with a rise in the share of profits. With a *sequence* of such increases the actual growth rate will keep falling relative to the earlier trend.

[3] Innovations, even if they are considered an exogenous factor (which itself is questionable), do not constitute an exogenous *countervailing factor* against under-consumption: their pace can not be *increased* when under-consumption sets in.

I

I shall work in terms of a one-good model, which means not that there is physically only one good, but that the relative prices between goods is fixed. Trade is used to transform the produced bundle into the demanded bundle at these fixed prices, but trade is always balanced *and does not add to the level of aggregate demand of the economy*[4].. This assumption of balanced trade, meant to focus attention on the internal dynamics of the system, also happens to constitute one "stylized fact" (to use Kaldor's well-known expression) about the contemporary Indian economy. How trade gets balanced in every period is not a matter I discuss. But the availability of new goods, initially through trade, is what keeps up the level of consumption of the surplus earners, and hence investment in the economy with the objective of producing these goods domestically.

The "one good" assumption of course ignores the unevenness of sectoral growth which has been so marked a feature of the contemporary Indian economy. Instead of *sectors* however I shall consider different *vintages* of equipment, with which homogeneous labour acts to produce this "one good". Each of these equipments which itself represents congealed output of a particular period, produces the same amount of output, but with an amount of labour that is lower for later equipment, owing to increasing labour productivity associated with technological change. Denoting the output-equipment ratio by b, output by Q and the magnitude of investment by I, we have

$$Q(t) = b.[I(t-1) + I(t-2) + I(t-3) + \ldots\ldots I(t-T)]\ldots \qquad \text{(i)}$$

where investment in any period is supposed to add to capacity in the next, and I(t-T) is the earliest vintage in use in period t. Denoting labour productivity of workers engaged on equipment of vintage t by z(t), total employment is given by

$$E(t) = b.[I(t-1)/z(t-1) + I(t-2)/z(t-2) + \ldots\ldots\ldots I(t-T)/z(t-T)] \quad \text{(ii)}$$

We also have the usual equation:

$$w(t).E(t) + P(t) = Q(t)\ldots\ldots \qquad \text{(iii)}$$

where w denotes the real wage rate, and P the total profits. All wages are consumed. As for consumption out of surplus, I assume that there is no fixed consumption propensity out of profits; rather, this consumption propensity itself varies depending upon the degree of access to new goods. In an open third world economy of course, there is always *formal* access to all kinds of new goods that are available in the metropolis; but the *real* access depends upon the magnitude of surplus being generated. This is because for any surplus

[4] Neo-classical trade theory, which invariably assumes full employment believes that the sheer existence of trade possibilities is enough to assure full employment. This is not logically tenable, since the world economy as a whole is not characterized by the prevalence of full employment.

earner there is a minimum scale of expenditure required for accessing “new” goods which are available in the metropolis. Prior to this threshold, the marginal propensity to consume out of surplus will be close to zero for any particular surplus earner, since such a person will simply be consuming a certain autonomously determined magnitude of common and garden variety of goods, and what is left over after such consumption is too small to permit access to the “new goods” available in the metropolis. But when the surplus for such a person reaches a certain magnitude, then it will be spent to a very substantial extent on the “new goods” available in the metropolis. For the surplus earners as a whole, the marginal propensity to consume out of surplus therefore will be a weighted average of near-zero and a very high figure, the weights being the distribution of surplus among those below the threshold and those above. As the magnitude of overall surplus rises, the weights will shift in favour of the latter, which means that the overall marginal propensity to consume is a function of the magnitude of the surplus itself. If we ignore the autonomous consumption (for simplicity), then we can put the same point differently, namely that the propensity to save out of the surplus is a function of the surplus itself. Since the overall surplus is the sum of consumption out of surplus and investment, which is the autonomous element, it is more convenient to assume that the saving propensity out of surplus is a function of the magnitude of investment which is the autonomous element of surplus. We can therefore say that

$$P(t) = I(t)/\,s(I(t))$$

where s is the saving propensity out of profits and is itself a function of I, with $s'<0$. To make the system tractable while expressing the essential non-linearity inherent in the situation, I shall work with the following simple function:

$$s(I(t)) = A/I(t)$$

where A is a constant less than or equal to I, and where the system is assumed always to be lying within a range where absurd results do not follow from postulating this function. From the above two equations we can derive the following:

$$P(t) = P(t-1).[1+\{(I(t)/I(t-1))^2 -1\}] \quad \ldots \qquad \text{(iv)}$$

Implicit in (iv), it should be noted, is the assumptions of balanced trade and an ignoring of government expenditure (which is of no consequence for the purpose of the present argument).

Unless the relative size of the reserve army of labour in the total labour force drops below a certain level, the real wage rate is assumed to remain unchanged at some subsistence level. It is also assumed that the operation of the model, for reasons discussed later, remains within that zone where the relative size of the reserve army remains above this threshold level. Therefore,

$$w(t) = w^*\ldots \qquad \text{(v)}$$

The investment function is given simply by

$$I(t+1) = I(t) [1+ a.\{P(t)/P(t-1) - 1\}] \quad \ldots \quad (vi),$$

where a is a positive constant. This can be explained as follows. Investment decisions of period t which fructify as actual investment in period t+1 (and which start producing output in period t+2), relative to the investment decisions of the previous period, depend upon the relative magnitude of the profits of period t compared to those of period t-1. If profits register a positive growth, then this has an impact on the rate of growth of investment, which is a times the rate of growth of profits, $a<1$.

As regards, the rate of growth of labour productivity on new equipment, which captures the pace of technological change, I assume that it depends upon the rate of growth of investment. But unlike in the case of the Kaldor-Mirrlees (1962) technological progress function, I do not assume that there is some given stock of knowledge that gets progressively used up. Since my focus is on an India-type economy which has an immense possibility of imitating technology, I assume no such "diminishing returns". On the contrary a higher rate of accumulation makes possible a more rapid introduction of technological change, so that

$$[z(t)/z(t-1)-1] = m.[I(t)/I(t-1)-1] + n.[\{I(t)/I(t-1)\}^2 -1]\ldots \quad (vii)$$

where m and n are a positive constants.

This last point needs explaining. New technology generally requires a certain minimum scale of investment. If a lot of investment is being undertaken then there would be more investment projects where the minimum scale needed to employ new technology can be reached. The rate of labour productivity growth on new equipment therefore must *increase* relative to the rate of growth of investment when the latter itself is increasing. To catch this, I have introduced the squared term at the end of the rhs of (vii).

These seven equations, given past history, determine in any period the seven variables[5] Q(t), E(t), w(t), P(t), I(t+1), z(t), and T.

In view of (iii), (iv), and (vii), (vi) can be written as

$$i(t+1) = 2a.i(t) + a.i(t)^2 . \quad (viii)$$

where i(t) refers to the rate of growth of investment in period t.

This system admits of two solutions, each with a constant i, which are shown in the diagram. One is the zero growth solution or the stationary state. The other is denoted

[5] It may appear odd at first sight that I(t) is not one of the variables to be determined but I(t+1) is. But this is because of our assumption about a lag between investment decisions and actual investment, because of which I(t) is given to us by history.

by i^* where $i^* = (1-2a)/a$, *which however is not a steady state*[6]. The reason for its not being a steady state is simple. It is clear from (vi) that if the growth rate of investment stabilizes at i^*, then the growth rate of profits must be higher than i^*; it must be i^*/a. Now, it can be shown that in any situation of constant rate of growth of investment, if profits are rising at a constant rate higher than that of investment, and if the real wage rate *ex hypothesi* is an unchanging constant, then the share of profits in output must be rising over time. Hence at i^*, the share of profits must be increasing.

What happens when the economy remains at i^* is that while the profits bill increases at the rate i^*/a, the wage bill increases at a lower rate. The rate of increase of the wage-bill however is not a constant, since, even though the rate of growth of labour productivity is a constant on *new equipment*, the equipment-mix is not constant over time. The rate of growth of output is a weighted average of these two rates, namely the rate of growth of the profits-bill and the rate of growth of the wage-bill; and since the weights keep changing it too will keep changing over time. Interestingly however, since with the rising share of surplus in output, the weight of the wage bill keeps declining, the *rate of growth of output must eventually increase.* When this happens, we clearly have a counter-case to the underconsumptionist argument: as the share of surplus in output *increases*, the rate of growth of output also *increases* over time.

The proposition that a rise in the share of profit in output may be accompanied by an increase in the growth rate, and not by a decline as the Kaleckian tradition would suggest, has been advanced in the literature by the "exhilarationist" argument (Bhaduri and Marglin(1990)). But I find the argument for "exhilarationism" unconvincing, because of the nature of the investment function assumed in that argument, according to which investment can *increase* even when the profit *level* and the profit *rate* decline, simply because the profit *margin* has increased. One can understand capitalists being concerned with the *level* or the *rate* of profit, but one cannot understand why they should be concerned with the *margin* of profit *as such*, which at best is a mere instrument for raising the *level* or the *rate* of profit. In contrast, the view that under-consumptionism can be kept at bay, because of technological-cum-structural change, at least in a third world economy, appears to me far more persuasive. Not only is it compatible with a Kalecki-type investment function that is more plausible, but it is also based on the valid presumption that technological-cum-structural change stimulates capitalists' (more generally the elite's) consumption, and investment, in a third world economy: the elite's propensity here to imitate metropolitan life-styles is indubitable.

II

It is clear however that i^* is an unstable equilibrium. If $i > i^*$, then i keeps increasing, while if $i < i^*$, then i keeps decreasing. The point i^* in other words has the knife-edge property of Harrod's celebrated "warranted rate of growth". If the rate of

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[6] For i^* to be a meaningful solution, there must be restrictions on the value of a; for instance a must be less than 0.5. This however follows from the way the model has been set up, its sole function being for purposes of illustration.

growth of investment in the economy happens to be i*, then it will continue to be i*; but if it happens to be different from i*, then it will deviate further and further away from i* in the same direction where it happens to be. The case of $i < i^*$ which gives rise to stagnation, is quite obvious and need not detain us here. It is the other case, where $i > i^*$ that we shall be concerned with.. Here the economy will experience an accelerating rate of investment (and possibly output) growth, much the way that the Indian economy is currently experiencing.

But even when the economy is to the right of i*, and experiencing an accelerating rate of investment (and possibly output) growth, its capacity to use up labour reserves remains dubious. While we cannot track here the exact course of employment, we can nonetheless say something meaningful about employment.

The process of introduction of new goods plays a dual role: on the one hand it stimulates demand, as we have just seen. On the other hand it increases the rate of growth of labour productivity. Obviously not all innovation is necessarily labour-productivity augmenting. But we are talking here concretely of innovations within a third world context that are actually imitations from the capitalist metropolis. And since technological progress under capitalism, as Marx had argued long ago, amounts to a substitution of dead labour for living labour, the trajectory of technological progress we are talking about is necessarily labour productivity augmenting; and the degree to which it does so is given in equation (vii).

The demand stimulating effect of innovations in period t+1 is subsumed under the equation $i(t+1) = a.i(t)^2 + 2a.i(t)$, while the labour productivity augmenting effect of such innovations in period t+1 is subsumed under the equation (vii)[7] which can be rewritten as $g(t+1) = n.i(t)^2 + (m+2n).i(t)$ where g refers to the rate of growth of labour productivity on *the new vintage.* Now, depending upon the values of a, m, and n, we can have three different possibilities (see diagram). Let us discuss these *seriatim.*

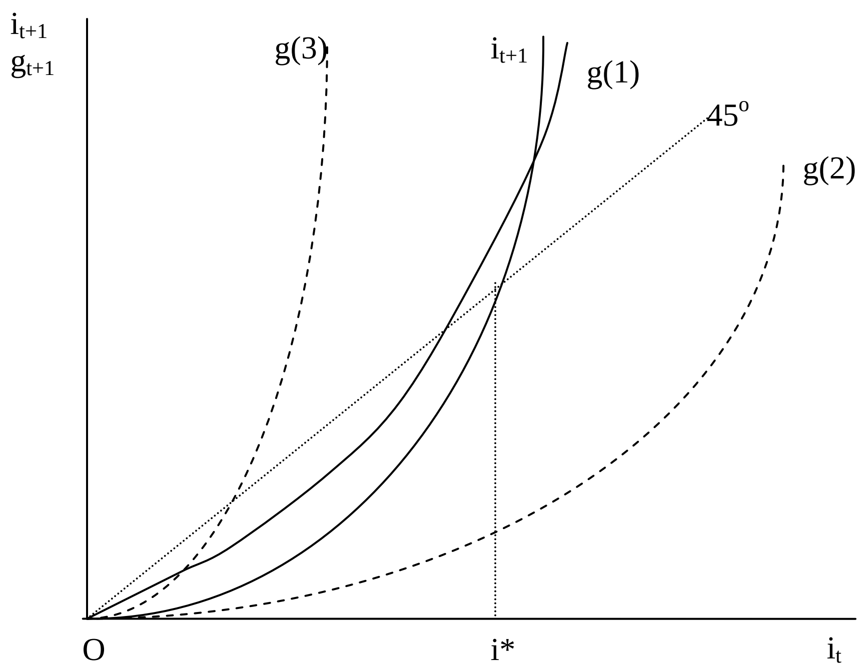
Case 1: $a > n$ but $2a < m+ 2n$. Here we shall have the i(t+1)-curve intersecting the g(t+1)-curve from below. Prior to the intersection, the rate of growth of labour productivity on new vintages will be higher than the rate of growth of investment; after the intersection the opposite will be the case. If this intersection occurs before i*, then this does not help overcome unemployment since i(t) itself will be moving down to stationary state. If the intersection occurs after i*, then the possibility of the using up of labour reserves arises as long as the acceleration in investment growth continues. In this case, in short, labour absorption may increase at high levels of growth.

Case 2: $a > n$ and $2a > m+ 2n$. In this case the g(t+1)-curve lies everywhere below the i (t+1)-curve. Prior to i*, since the economy collapses to a stationary state, the question of

[7] Since equation (vii) refers to z(t) which is the labour productivity on equipments produced in period t, it may appear puzzling why we refer to the rate of growth of labour productivity determined by the same variables as occurring in period t+1. *This is because equipment produced in period t is used in period t+1.*

overcoming unemployment does not arise. If the economy lies above i*, then the possibility of labour reserves being used up arises, again as long as the acceleration in investment growth continues.

Case 3: If n > a, then the g(t+1)-curve will lie everywhere above the i(t+1)-curve (since m being positive, n > a implies that m+2n > 2a). *In this case, no matter what the rate of growth of investment, the rate of growth of new jobs being created on new equipment will always be negative.* This reduces the likelihood of labour reserves declining at all, let alone getting used up.



Of course, the growth of employment depends not just upon the growth in the number of jobs on new equipment, but also upon the rate at which old equipment is being scrapped. To see what happens to old equipment, we can proceed as follows. Let us consider a situation where in period t+1, all the equipment that was used in period t is also used. Then the extra output in period t+1 compared to period t will be b.I(t). The extra profits will be b.I(t)(1- w/z(t)). But, from the demand side, extra profits in period t+1 compared to period t should be $[I(t+1)^2/A] – [I(t)^2/A]$ (see the discussion on equation (iv) above). All the equipment used in period t will also be used in period t+1 only if $b.I(t)(1-w/z(t)) \leq [I(t+1)^2/A] – [I(t)^2/A]$. Or putting it differently, if

$$[I(t+1)^2/A] – [I(t)^2/A] \leq bI(t)(1-w/z(t)) \qquad (C)$$

then no additional employment would be getting created through the use of equipment in t+1 that was not used in t. *So, if condition (C) is satisfied and also n>a, then we can say* *with certainty that even though the rate of growth of investment may be accelerating, the rate of growth of output must be slowing down*. Upon simplification, condition (C) becomes

$$s(t).b.\pi(t) \leq i(t+1)^2 + 2.i(t+1) \qquad (C')$$

where π is the share of profits on new equipment in period t+1. Condition (C') can be satisfied for a whole range of plausible values[8]. For instance if i(t+1)= .08, s(t) = .8, b = .33, and π(t) = .8, then (C') is satisfied. And over the entire range where (C') is satisfied, if n>a, then the rate of growth of employment must be slowing down. If the rate of growth of employment in the initial period was less than or equal to the rate of growth of the labour force, then notwithstanding accelerating investment growth, the magnitude of unemployment will keep increasing.

In all three cases above, the discussion has been confined to situations where the economy is above i*. But even when the economy is above i*, and is therefore experiencing accelerating growth of investment, if in any period there is some bottleneck that arises in the growth process which pushes *that particular period's investment growth rate below i**, then the economy will start moving towards a stationary state. The instability of the growth process *a la* Harrod also means that any apparently temporary set back to growth (as long as it pushes the economy below i*) will cease to be temporary, and will convert a situation of accelerating investment growth to one of decelerating investment growth, heading ultimately towards a stationary state.

Two obvious conclusions follow from the foregoing. First, notwithstanding the fact of high growth the economy may never succeed in overcoming its problem of unwanted labour reserves. Secondly, and more importantly, an increase in i does not necessarily constitute a solution to the problem. On the contrary, even an accelerating growth in investment may end up creating fewer and fewer jobs on new investment projects; it may even be accompanied by a slower and slower rate of growth of employment. The widely-held perception that if high growth does not have the effect of eradicating unemployment, then we need to have still higher growth, is not necessarily valid.

Our result arises, of course, because of our assumption that the rate of growth of labour productivity on new equipment does not just increase with the rate of growth of investment, but increases at an increasing rate (because of the squared term). But this assumption itself reflects a real life possibility, that the rate of growth of labour productivity on new equipment may increase even faster than the rate of growth of investment.

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[8] This condition states that the savings per unit of new equipment (calculated at the previous period's savings propensity out of profits) must be less than the growth rate of profits in any period.

This possibility paradoxically does not figure at all in the entire literature in economics. One of the most celebrated propositions in economics, namely Ricardo's proposition on the impact of the use of machinery on unemployment, discussed only a one-shot introduction of technical change rather than a continuous process of change. And later growth models which do discuss such continuous change either assume full employment (as neo-classical models do); or postulate a constant rate of unemployment through growth cycles (Goodwin 1967) which is made possible because of an exogenously given rate of growth of labour productivity; or assume a rate of growth of labour productivity that is necessarily lower than the rate of growth of output (Kaldor 1966). The fact that even an accelerating growth rate may leave the unemployment problem completely unresolved, or even accentuated, is never reckoned with in economic theory. It is time however that we did so, because as the cases of both India and China show, even extraordinarily high growth rates of output may be accompanied by rising unemployment (Chadrashekhar and Ghosh 2007).

But China's case points to something even more remarkable, namely that an acceleration in the growth rate of output is accompanied by a reduction in the observed elasticity of employment with respect to output. The above model reckons with this possibility.

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