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, 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 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. 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.

Such a dénouement can be prevented if there are exogenous countervailing factors. The two most common exogenous countervailing factors are: state expenditure,

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1 This was the argument of Josef Steindl (1951) who suggested that the level of investment in any period is 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 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.
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 \textit{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.

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,

\(^3\) 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.
but trade is always balanced and does not add to the level of aggregate demand of the economy⁴. 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 because of technological change. Denoting the output-equipment ratio by b, output by Q and the magnitude of investment in any period by I, we have

\[ Q(t) = b.\sum_{i=1}^{T} I(t-i) \]  

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

\[ E(t) = b.\sum_{i=1}^{T} \frac{I(t-i)}{z(t-i)} \]  

We also have the usual equation:

\[ w(t).E(t) + P(t) = Q(t) \]  

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 the larger the extent of autonomous surplus use, of which investment is the expression, the larger is the access to new goods and hence the larger is the consumption of the surplus earners. Taking capitalists’ consumption and investment together, the profits of the current period are given by

\[ P(t) = P(t-1).\left[1 + \left\{ \frac{I(t)}{I(t-1)} \right\}^2 - 1 \right] \]  

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

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.
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,

\[ w(t) = w^* \quad \ldots \quad (v) \]

The investment function is given simply by

\[ I(t+1) = I(t) \left[ 1 + a \cdot \frac{P(t)}{P(t-1)} - 1 \right] \quad \ldots \quad (vi), \]

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

\[ \frac{z(t)}{z(t-1)} - 1 = m \cdot \frac{I(t)}{I(t-1)} - 1 + n \cdot \left( \frac{I(t)}{I(t-1)} \right)^2 - 1 \quad \ldots \quad (vii) \]

where \( m \) and \( n \) are 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 r.h.s.

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

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

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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 our assumption about a lag between investment decisions and actual investment, which \( I(t) \) given to us by history.
\[ i(t+1) = 2a.i(t) + a.i(t)^2. \quad \text{(viii)} \]

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 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 where profits are rising at a constant rate higher than that of investment, and if the real wage rate \( \text{ex hypothesi} \) 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 which 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\( \ldots \)). But while I find the argument for “exhilarationism” unconvincing, because of the nature of the investment function assumed in that argument, 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.

\[ \text{II} \]

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

\( ^6 \) 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.
knife-edge property of Harrod’s celebrated “warranted rate of growth”. If the rate of 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. When these two are equal, then it is clear that the number jobs created on new equipment ceases to increase at all, and indeed in the subsequent periods it will start falling even though investment continues to accelerate. These two curves will intersect only once if \( n > a \), and \( m+2n < 2a \). If the second of these inequalities is reversed then there will be two intersections, but since one of them is likely to be before \( i^* \), the region of cumulative deceleration, we need not concern ourselves with that intersection. It follows then that as long as \( n > a \), the rate of growth of employment on new equipment will at some point come to zero even though the economy continues to experience accelerating growth. And after that point, the number of jobs created on new equipment added each year will start declining, even as the rate of growth of investment grows at an accelerating pace. To be sure, the decline in the number of jobs created on new equipment is not the same as a decline in the rate of growth in total employment, but clearly the possibility of employment increasing on old equipment, because of the demand-stimulating effect of the introduction of new goods, and that too to an extent sufficient to offset the stagnation/decline in the number of jobs created on new

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\(^7\) 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 \( t+1 \).
equipment, is too far-fetched to be considered. (Indeed the values of the parameters of the model should be such as to rule it out). If labour reserves have not fallen to the threshold level until that point in time when new jobs creation on new equipment ceases to increase, then they are unlikely ever to fall to the threshold level, in which case our assumption of a continuing subsistence wage rate would have been justified.

Two obvious conclusions follow from this simple formula. 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, beyond a point even an accelerating growth in investment may end up creating fewer and fewer jobs on new investment projects. 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 untenable.

Our result arises, of course, because of our assumption that the rate of growth of labour productivity 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 may increase even faster than the rate of growth of investment.

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 within 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 (Chandrasekhar 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 elasticity of employment with respect to output. The above model reckons with this possibility.
REFERENCES


