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THE THEORY OF UNDERDEVELOPMENT AND AGRICULTURAL BACKWARDNESS[1]

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I. Introduction

1. The object of this essay is to work out a theory of agricultural backwardness. A number of reasons have been offered to explain the latter. One section holds the view that the backwardness is due to institutional deficiencies and that reorganisations in the methods of production and distribution would lead through better incentives to greater effort, and thus, to larger incomes. A second section attributes the low level of incomes in agriculture to a deficiency of capital which may be the result either of an overall scarcity of capital or of a lack of appropriate emphasis on agriculture in the investment programmes of the private and the public sectors. The solution suggested is either a higher rate of capital accumulation in the economy and/or in the agricultural sector. A third viewpoint draws attention to the evil of overpopulation, in this case, the malady of disguised unemployment being attributed to a superfluity of numbers. The obvious remedy is to check the rate of growth of population. A fourth view is that agricultural backwardness arises due to a lack of diversification of employment. Here, the cure is to step up the rate of industrialisation. Yet another explanation is sociological in nature and points to the low elasticity of response of agricultural population to new ideas and changes in the methods of resource utilisation. The way out here is through an increased emphasis upon innovation and the provision of appropriate leadership. Each of these explanations focuses attention on one feature of agricultural backwardness. Our contention is that there *is* an integrated explanation of the phenomenon of the low-income equilibrium that characterises agriculture in an economy like that of India and that any viewpoint which concentrates emphasis upon any single part of the problem might miss the essentials. The present essay seeks to arrive at a generalised explanation of the causes for the persistence of the underdevelopment or the low-income equilibrium in the agricultural sector. During the course of our discussion, we shall take the aid (with modification wherever necessary) of some of the new concepts which have been introduced in discussions of growth problems. But attention may be drawn to a vital difference in the methodology of our approach. The basic long-run trend in advanced countries is usually deemed as that of steady growth. Unemployment (industrial and agricultural), fluctuations in incomes, and maladjustments in capital structure are viewed at as problems arising in an *expanding* economy. The agricultural sector is relatively backward as compared to the other sectors even in advanced countries. But, our main contention is that the problems arising out of underdevelopment need to be viewed in the setting of a *contracting* economy. The long-run equilibrium trend in such an economy is one of steady decline. The agricultural sector is backward in these

1. This essay is part of an effort to evolve a theory of underdevelopment applicable to countries like India. *Vide* n. 9 for an account of some of the leading ideas arrived at so far in the course of above study.

economies absolutely as well as relatively. Several of the subsidiary problems which bewilder a student when he gets involved in a study of the different facets of agricultural poverty appear in a new light when they are viewed against the background of a retrogressing economy.

II. Clarification of the Concepts

2. It is necessary now to clarify the meaning of the concepts which we shall utilise in our discussion. Each capital asset embodies within itself a certain stream of output. Given the number of years of service life of the capital equipment and the rate at which the output can be theoretically expected to flow per unit of time, we can ascertain the output potential contained in the equipment. Similarly for the economy as a whole, we can get the output potential embodied in the stock of productive assets. By putting output potential in the denominator and capital in the numerator, we get the *capital fraction*.[2] The value of the capital fraction depends upon the level of output, its composition and the rate of interest. It also depends upon the nature of the conditions governing the supplies of factors of production. Thus, the value of the capital fraction will be high if out of a given total of output, the proportion produced under diminishing returns is high, and its value will be low if this proportion is less. When changes take place in the level of total output, the shape of the capital fraction will depend upon the conditions governing the elasticity of returns in respect of the different outputs which are included in the changing level of output. If the capital fraction has to continue to be constant in the face of a rising trend in output, the following conditions must be met : (*i*) The absolute amount of output produced under diminishing returns has to remain the same and in the case of other outputs taken together constant returns should operate. (*ii*) If the absolute amount of output coming under diminishing returns increases, then the rise in the capital fraction specific to these outputs has to be offset by a decline in the capital fraction in the case of other outputs. Or, (*iii*) Technological changes should take place so that the capital fraction in respect of all the outputs taken together remains dynamically constant.

It is obvious that if the proportion of output produced under diminishing returns is high, then changes in productive efficiency in the other outputs will not be of much help. So, if the outlay on agricultural commodities bears a high proportion to total outlay and the increment of outlay on these commodities as a result of an increment of income is also proportionately high, then the capital fraction will continue to rise. Now, the capital fraction can be prevented from rising if the methods of production that are adopted are such that the capital content in output is reduced. Given the rate of interest, the producers decide upon the extent to which they depend upon capital. If the interest rate is low, then the method adopted would be highly capital intensive. If it is high and the

2. If I is capital and Y is the output potential, then the capital fraction is equal to I/Y. If Rs. 100 worth of capital leads to Rs. 400 worth of output during the period of existence of the equipment then the capital fraction is $\frac{1}{4}$. The capital-output potential ratio is 1: 4. This is not the same as the capital-output ratio. If the equipment lasts for 10 years then the capital-output ratio is 100:40 and the capital coefficient is 2/5. Note that the concept of the capital fraction is a 'flow' concept whereas the capital-output ratio or the capital coefficient expresses a relationship between a stock and a flow. The capital coefficient may remain constant though there are increasing returns. In the above example suppose the equipment is such that it lasts for 5 years more and the output rate is the same. The capital coefficient is the same but the capital fraction has become different. The latter is now 1/6.

wage rates remain the same, then labour-intensive methods are adopted. If the interest rate is rising *and* the supply price of labour is falling, then most of the methods would be direct and 'uncapitalistic.' Thus, if we still find that the capital fraction has a tendency to rise, then we can conclude that diminishing returns have been a very powerful tendency.

3. The rise in the capital fraction is only one part of the picture. We have now to enquire about the *capital potential* (also called saving potential) *fraction.* Given the total output that can be expected to flow from a given stock of capital assets, we can expect that part of the output would tend to be available for utilisation in investment. If we put the output potential in the denominator and the capital potential in the numerator, the *capital potential fraction* is obtained.[3] The capital potential fraction will depend upon the level of output, the distribution of output among different income groups and the rate of interest as determined by productivity considerations. The capital potential fraction will be constant for different levels of output if (*i*) there are no changes in the pattern of income distribution or if the changes are such that they have a neutral effect on the proportion of income that is invested, and/or (*ii*) the total population remains the same, or if it has increased, the increase does not affect the saving capacity and habits, and/or (*iii*) there is no tendency to a rise in the living standards, and social and economic policy does not transfer control over the utilisation of factors in such a way that the saving potential is reduced. The capital potential fraction will decrease if the above influences work in a reverse direction. Increase in population, a rise in consumption standards, and egalitarian policies help to bring about a decline in the capital potential fraction. Thus, the capital potential fraction will be declining if income is not increasing but the other saving-depressant forces are at work or if the income is increasing but these forces operate with a greater vigour.

4. If the value of the capital fraction is equal to the capital potential fraction, and both remain constant, then the total equilibrium income would also be constant. If the capital potential fraction is higher than the capital fraction, then, income continues to grow. It is the difference between the two fractions and its variation with different amounts of output through time that matters from the point of view of economic development.

For the economy as a whole, if $\frac{I}{Y}$ is equal to $\frac{S}{Y}$

then the total investment outlay has become self-financing.

The above equation is fundamental to the understanding of the problems of under-

3. If Y is output-potential and S is the capital potential then the capital potential fraction (or the saving fraction) is equal to S/Y. If out of the output-potential of 400, the capital potential is 100, then the capital potential fraction is equal to ¼. *Vide* also note 2.

development.[4] If the capital fraction $\left(\frac{I}{Y}\right)$ is decreasing, given the capital potential fraction $\left(\frac{S}{Y}\right)$, a net surplus emerges in the economy. This enables the economy to step up the investment outlay which leads to a higher volume of output which in its turn leads to a higher absolute amount of investment outlay and so on. Thus, if the fraction of income that is saved continues to be constant, and the capital fraction continues to decrease, there is a cumulative process of growth. On the other hand, if the capital potential fraction is given but the capital fraction is rising with the process of expansion, then a time must soon come when the marginal capital fraction becomes larger than the marginal saving fraction. This means that the total investment outlay does not reimburse the costs of investment. This happens when the national output has reached that amount at which even marginal increases in output require investments which are not self-financing. In other words, there is a continuous process of diminishing returns with increases in investment. Equilibrium output is that amount of output at which the marginal capital fraction for an additional unit of investment is equal to the marginal capital potential fraction derived from the increase in income associated with the increment of investment.

Let us now look at the other side. If the saving fraction is continuously decreasing, given constancy in the capital fraction, then also the process of capital formation must come to a halt. The conclusion is that the rate of growth or the rate of decline is a resultant of the trends in the capital fraction and in the saving fraction. The point of equilibrium arising as a result of the intersection of the capital fraction and the capital potential fraction does not indicate that income will not increase after this point. It indicates only that any such increase in income beyond this point will tend to be less than self-financing. In the alternative the increases in income that take place beyond this point should dispense with the services of capital. In fact, what happens is that total income does increase even after the equilibrium point is reached. That is because the equilibrium from the point of view of the economy need not necessarily represent the equilibrium from the point of view of individual units. It is possible for the latter to reduce the outlay on replacements and to dis-save. In this way, the community can continue to increase the absolute amount of output by living on its capital. This will go on until gross savings become negligible or nil. In fact, it is a characteristic of a steadily contracting economy that in such an economy the total output goes

4. If the marginal capital fraction is higher than the marginal capital potential fraction and both remain constant then there is a limit to the total amount of income that can be generated as a result of some initial investment. If R indicates the marginal capital-output potential ratio of a given unit addition to investment and s is the marginal saving fraction and Δ I is the increase in investment the total increase in income that takes place is given by the formula :

$$\Delta Y = \left(\Delta I \times R \right) \times \frac{1}{1 - \left(s \times R \right)}$$

If Δ I is Rs. 1600 and R is 2 and s is 1/10, then the total increase in income is Rs. 4000. Note that the whole process of increase in income is non-self-financing. The formula may be of some use in indicating the limits to which deficit financing can step up the level of output, but if the real functions indicate that expansions in investment are not self-financing then the economy finds it difficult to maintain the new level of output constant.

on increasing but such increases are less than self-financing. Beyond a point, the community can expand its output only by methods of labour intensification.

5. It is analytically convenient to consider the supply of labour on lines similar to that of capital. Both capital equipments and labour are durable. The durability of labour is given by the average expectation of life. If the average expectation of life increases, labour becomes more durable. But, labour is productive only for a particular period of time. The expenditure incurred on the maintenance of labour earlier to the period from when it becomes productive is like expenditure incurred during the gestation period of capital equipments. If the average productive period in the life of a labourer is given, then depending upon the productivity, we can state whether or not the capital outlay has been self-financing. It follows that the lower the expectation of life, the more is the tendency for the supply of labour to be less then self-financing. If the durability of labour increases, but the productive efficiency of labour does not, it is possible that even an increase in durability may be a liability to the economy. Similarly, it may be possible that, given the productive period of labour, the average productivity of labour will be less than what it costs to maintain the labour in employment. In such a case, obviously, the entire capital outlay incurred during the period before labour becomes productive will be a waste to the economy. Just as in the case of capital, it may be possible to improve the productive efficiency of labour by increasing the capital content in labour, in other words, by a deepening of the labour supply. As the term itself implies, this is possible only when the supply of capital is adequate or is increasing. In the alternative, an increase in the demand for labour will tend to be met with by an increase in the widening of labour supply ; in other words, by adding to the number of labourers.

III. Diminishing Returns and the End of Accumulation

6. Let us now work out a model which would enable us to analyse the causes responsible for the emergence of the low-income equilibrium in agriculture. We shall assume that the rate of growth of population (and of labour supply) is just equal to the required amount ; that the economy is working at its optimal level of capacity ; that all savings are invested ; and that there is no decline in the productive efficiency of labour. If the capital potential fraction is larger than the capital fraction, then the economy goes on expanding. But if the process of expansion requires manufacture of outputs which are subject to diminishing returns, then the process must come to a halt unless the capital potential fraction starts rising. We know that the law of diminishing returns is a firm tendency in agriculture. Thus, unless the capital potential fraction rises, the advent of a stationary state where no net capital formation is possible, cannot be postponed. If the capital potential fraction is to be rising, then, both the willingness and the capacity to save on the part of the farmers must be undergoing a change. In the alternative, a substantial redistribution of assets must be taking place in the rural economy such that those who have a higher willingness and capacity to save are acquiring a greater extent of control over the ownership or distribution of wealth. In the second place, if the above is not happening, then there must be significant technological progress taking place which is in a position to lift up the productivity of capital. In other words, agriculture must not merely be not subject to diminishing returns, but it should be subject to the law of increasing returns. Note that it is not enough if technological progress is taking place. It

is necessary that the changes in technology should be absorbed in agriculture without any recourse being necessary to large-scale capital investment. If technological changes are such that they yield fruit only if large amounts of new capital are invested, then unless the saving fraction undergoes a change, technological progress will not fructify in agriculture.

7. It is easily seen that the concept of steady growth does not have much relevance to agriculture. If we give up this, then what else ? Do we get a better picture of the working of the agricultural economy both in its static and in its dynamic setting if we introduce the concept of a steadily declining rate of growth? Keeping in tact the assumptions stated earlier, what are the conditions necessary if the rate of growth of output should steadily decline ? Obviously, the capital potential fraction must be declining and/or the capital fraction must be rising. If both these forces are operating, the rate of growth of output would decline quite rapidly. We have assumed earlier that the rate of net labour supply is equal to the requirements. So, unless the consumption function of the agriculturists is secularly rising, net investments as a proportion of income will not be declining; but it is possible that changes in distribution of productive assets may be taking place such that there is a decline in the total volume of savings and of investment. There is nothing to warrant why this should not happen particularly if social policy is such as to place an increasing emphasis on equality in the distribution of productive assets. In the second place, the capital fraction, as is more probable, would be continuously rising. With total income being given, a rising tendency on the part of capital fraction will lead to a weakening in the rate of growth of output. In other words, if the law of diminishing returns is at all powerful, then it is bound to lead to a decline in the rate of growth of output. Thus, the reasons for the slackening in the rate of growth of the agricultural economy are to be sought in a study of the trends in agricultural productivity.

8. The above, however, does not explain as to when the rate of decline comes to a stop. It is here that we have to introduce the classical vision of dynamic equilibrium. So long as net investment which excludes replacement provision yields some surplus over costs, expansion will continue. Those investments which are self-financing in the sense that they yield a positive return to the investor will always tend to be undertaken. But, if the capital fraction is rising a stage must fast be reached wherein net investment just yields whatever is enough to meet the costs. Any further expansion would not be profitable inasmuch as it would lead to losses. Thus, the equilibrium point will be such that at this point the rate of profit which is expected from net investment will be less than the rate of interest necessary to induce the income receivers to provide the required volume of savings to be invested. In so far as net investment leads to increased incomes and it is possible out of the latter to reimburse the costs of investment, expansion will be taking place. The expansion process will tend to come to a halt when the net investment does not even yield the minimum receipts to the saver so as to meet the latter's minimum transfer earnings. The equilibrum in this case is reached because the demand for capital has become saturated, and at the ruling rate of interest as a supply price investment does not become self-financing. The way out obviously is to raise the productivity of agriculture. If the rate of interest can be brought down, then some expansion can take place but there is a limit below which the interest rate cannot be reduced. Hence, there is also a limit to accumulation in diminishing return industries.

An agricultural economy which starts on the process of expansion must sooner or later reach the above state of equilibrium. It may be that at this point the level of income would have already risen sufficiently high. But, it is also possible to visualise a situation in which the equilibrium point lands the economy into a state in which the levels of income are not at all satisfactory. Thus, there is an end to the process of expansion. When once the total output becomes constant, then no further expansion will take place, unless either there is an increased willingness to invest at a still lower rate of return or the net productivity of investments tends to rise.

It may be noted that the equilibrium state described above may be reached soon if the capital potential fraction declines. This indicates that there is a rise in the rate of interest, given the demand for capital, which is given by the conditions governing the productivity of net investments. The economy in this case arrives at an equilibrium point where the amount of output is less than in the former case. There can be an expansion in investment provided the volume of savings and the resources available for investment internally are supplemented by some other sources.

IV. Possibility of a Decline in Output

9. What happens if the capital potential fraction continues to decline even after the point at which the rate of output has ceased to grow ? Is there any guarantee that the autonomous forces will keep the total output at this level so that one can wait for improvements in agricultural productivity to sustain a further process of expansion ? Unfortunately, however, there is no room for this type of optimism, in so far as output has expanded upto the previous equilibrium level on account of additions to capital stock, which, however, require some provision for replacement and hence, depend upon some savings being effected in the economy. There is no valid reason to hope that total output will continue to be constant. If the capital potential fraction continues to decline and if the total volume of savings forthcoming in the economy falls below that necessary for replacing the capital stock, then, as capital equipments wear out, the total output also will start declining. It will further affect the proportion of savings, because income itself will have declined. The process of decline in total output cannot, however, go on indefinitely, because the economy is bound to have a number of assets which do not require any provision for replacement and several assets which wear out very slowly. Under these conditions, the rate of decline in output will come to a halt.

Thus, in our model, we have a ceiling upto which the equilibrium amount of total output can grow and a floor below which the total output will not decline. The ceiling is given by the equilibrium point at which the marginal productivity of capital is such that the rate of return resulting therefrom is less than the rate of interest necessary to get access to the required volume of savings. The floor is given by the point at which no further assets can wear out. In other words, the total output becomes independent of the volume of savings.

V. Emergence of Disguised Unemployment

10. We have so far proceeded under certain restrictive assumptions. We have also not taken into account the variations in total employment. Our first

assumption in the consideration of the above model relates to variations in the labour supply in response to variations in the demand for it. There is essentially an asymmetry here. Whereas it is possible to increase the supply of labour by creating a demand for it, it is not so easy to bring about a decline in its supply when the demand falls off. Later on, we shall enquire into the question whether the rate of growth of labour supply can at all be appropriate in relation to the rate of growth of demand for it. Suffice to note here that whereas the supply of labour and of population can continue to increase during the expansion phase, the rate of increase in labour supply will not come to a halt as soon as the expansion comes to a halt. In fact, even in the face of the decline in total output, labour supply will not automatically adjust itself. Thus, as soon as the rate of growth in output slackens and particularly when total output becomes constant or starts declining, the economy will find itself with a volume of labour force more than appropriate to the requirements. This is one possible reason why a certain volume of disguised unemployment can emerge in our model. When the demand for output falls off, a firm can curtail its output, at least after the lag of a certain period. Later on, it can reduce its outlay on replacement and thus need not replace the equipments. It is in this way that capital equipment disappears from the scene. The process is not so smooth and so painless in regard to labour. The only way by which the surplus labour can disappear from the scene is by ceasing to exist. This, however, is not easy and the surplus labour would generally employ itself in some way even though such employment does not in any way contribute to total output and the lack of such employment would in no way detract from total output. More often than not, the surplus labour becomes a drag on the earning population in the economy. If the surplus population does not add to output, but all the same consumes part of the output of the economy, there is bound to be some adverse effect on the total volume of savings. The well-to-do farmers would now find that they have to devote a part of their savings for the maintenance of their dependants. It is quite possible that the capital potential fraction would be adversely affected during the process, with a result that when once disguised unemployment starts emerging on the scene, the total output would tend to diminish, the rate of such dimunition being dependent upon the proportion of the disguised unemployment to the total population and the extent by which the former can force or induce the earners to part with part of their resources.

It can, however, be clearly stated that the phenomenon of disguised unemployment would be short-lived in economies in which there is no obligation on the part of the earners to subsidise the maintenance of their dependants and the State or such other institutions do not take upon themselves the responsibility of providing for the maintenance of the surplus population and the average expectation of life is low.

11. Is there any other way by which disguised unemployment can emerge ? Suppose some technological progress is taking place in the economy and the inventions are such that they reduce the labour content of output. It may be that such inventions are induced by a rise in wage rates. But, apart from the above, there is no reason why inventions and organisational changes which are profitable even from the point of view of the barest minimum wage rate that prevails in the economy should not emerge on the scene. It follows that those who can afford to utilise the invention would tend to do so, throwing out some labour in the pro-

cess. This type of technological unemployment is not a function of the relationship between wage rate and rate of interest. It might occur at any time and in so far as the community cannot control the progress of inventions, nothing can be done about it. The labour thrown out would tend to increase its dependence upon the earners.

Thus, we find that even under the most favourable conditions wherein the rate of growth in labour supply is equal to the rate of growth in the demand for it, disguised unemployment would emerge as soon as the growth of output has slackened or has touched the ceiling. Whether it is a continuing or a short-lived phenomenon depends upon institutional conditions and the type of social policy that is adopted. Both these, however, are conditioned by the extent to which those who have relatively high incomes can offer resistance to a decrease in their standards.

VI. Full Employment of Capacity and Hoarding

12. Before analysing what happens when the rate of growth in labour supply is more than what is required, let us study the implications of the relaxation of the other assumptions. We assumed that the economy would be working at its optimal level of capacity. This is quite a reasonable assumption, particularly when the economy wants to grow at the maximum rate that is consistent with the resources available. All that is necessary here is that all the available productive assets, land, labour, technical skill, capital, organisational ability, etc., should be deemed to work at their optimal level. Even if we relax this assumption, the economy would tend to reach its optimal level in so far as utilisation of capacity is concerned.

13. We have assumed that all savings are invested. This is questionable, particularly in an agricultural economy, where part of the income may be hoarded. In so far as the amount of income that is being hoarded is a constant proportion of total income throughout the process of growth and decline, there is no problem. But, during the process of growth, the proportion of hoarding would tend to decline and to that extent, it is possible that the saving potential fraction would be rising. This explains why given appropriate organisational arrangements, the rate of growth can be faster than what it is and wherever such organisational arrangements are available, the economy grows at a faster rate in the initial phase, particularly because an increasing proportion of hoards will tend to be invested.

VII. Productive Efficiency of Labourers

14. The assumption that productive efficiency of labour will not decline is doubtful. In so far as productive efficiency of labour is dependent upon the consumption of food and other subsistence requirements, there is no problem so long as output is growing, but when once the rate of output slackens and starts declining, disguised unemployment would emerge and part of the surplus labour force will tend to be maintained by transfers from the employed labour. This must cause some decline in productive efficiency. In the alternative, there will be a difference in the levels of food consumption on the part of the employed and the unemployed population. If the level of efficiency of the latter is to be raised to the level of the productive efficiency of the former, the supply of food to the

total economy must increase. In other words, the rate of output must rise. This is in fact one reason why the disguisedly unemployed are not automatically absorbed in new investments. Their employment would require a net addition to the supply of food, and this may not be possible because the economy has already reached the equilibrium point.

VIII. The Population Accelerator

15. There is, however, an essential aspect of the matter which we have now to take up. The assumption that the rate of growth in labour supply proceeds at an appropriate pace is seriously questionable. In fact, it is only when we relax this assumption that we are enabled to understand the extent to which the backwardness of agriculture can be stretched. Hence, we have to superimpose the implications of population growth on the above model.

There are two theories in regard to the determining factors in population growth theory. One theory emphasises the autonomous nature of population growth whereas another stresses dependence of population on income. We have to incorporate both these views. Some part of the population growth will be treated by us as arising on account of autonomous forces. Autonomous growth in population is that which is independent of the variations in the rate of income. This enables us to take into account the extremely significant role that is played by induced population growth in bringing about agricultural backwardness. Suppose there is an increase in the income of a producing unit.[5] This increase in income can be calculated in terms of its ability to maintain a unit of population at the standard of living which the producing unit treats as the conventionally accepted standard of living. The latter would differ according to the groups to whom the income accrues. Suppose the increase in income is enough to maintain one population unit ; then we say that income has increased by one population maintenance unit. If this leads to an increase in population by one unit, then the induced increase in the supply of population is equal to 1. The value of the population accelerator is equal to unity. This relationship between the increase in income in terms of population maintenance units and the induced increase in population can be analysed on the lines of the acceleration principle. The value of the population accelerator may be high or low depending upon the attitudes of the individuals whose income increases. Generally, if the increase in incomes accrues to individuals who desire a still higher standard of living for themselves and who are afraid that an expansion in the size of the family would ruin the chances of the above, then the value of the population accelerator may be low or it may be even nil. But, if the increase in incomes accrues to those earning units who do not object to a still further lowering of their living standards, then the value of the population accelerator would tend to be high. Thus, taking into account how the increase in incomes is being spread about and what the pattern of social attitudes that is prevalent in the economy is, we can calculate the value of the population accelerator for the economy. It is now necessary to note that if the value of the

5. Note that even transfers of income from those with high conventional living standards to those with low standards will have the same effect as absolute increases in the incomes of the latter will be having. That is why any process of transfer of labour from the rural areas will not be followed by an increase in the supply of food. Those who are enabled to retain higher incomes will now tend to increase the size of their families.

accelerator is more than one, then the very process of increase in initial income would tend to be defeated and the units which get the increases in income would find that their positions are worsened.

16. How is our model affected by the introduction of the concept of population accelerator ? In so far as the value of the population accelerator is equal to one, the incomes of earning units will generally tend to remain constant, but in so far as the value of the accelerator is more than one, their incomes would tend to go down. This is because the increase in population would tend to *reduce* the capital potential fraction.

17. But, the population accelerator exercises its full effect only after the lag of a particular period which may run into a decade or even more than that. If the value of the population accelerator is more than one during the period in which the rate of growth of output has started steadily increasing, forces will be brought about by which the population will tend to increase and naturally, the economy would find itself with continuously increasing quantities of surplus labour. Thus, the very pace of the rate of expansion in output leads to forces which tend to bring about a decline in it. If the rate of growth of output has been pretty rapid and if the value of the population accelerator has also been high, then after the rate of growth in output has slackened on account of forces described in the earlier model, the economy will find itself in possession of large quantities of surplus labour. As in the case of acceleration principle in regard to capital equipment, here also the principle works asymmetrically.

IX. The Process of Labour Intensification

18. The increase in population and the consequent increase in the volume of disguised unemployment will no doubt reduce the saving fraction, thus causing a rise in the interest rate. At the same time, the real wages will also be reduced. Let us assume that the economy has not yet reached the point when net capital accumulation is not profitable. What are the effects of the rise in the rate of interest and fall in the wage rate ? If the rate of interest rises, then the profitability of the more round-about methods of production is reduced. In the pattern of new capital structure that evolves as a result of investment outlay, most of the projects would be less round-about than if the size of the savings potential had been larger and the rate of interest low. This process is intensified because the wage rates are falling. Thus, the degree of capital intensity in the investment structure would steadily be reduced with the continued decline in net savings potential. Whereas the economy would have formerly thought in terms of grandiose irrigation dams, it would now reconcile to minor irrigation projects and if the process continues, it will spend on tanks and wells. From investments spread over a generation to those spread over a decade, from those spread over a decade to those spread over a year, and from those spread over a year to those which are spread over a day will be the feature of the economy. What happens is that with the decrease in the net capital potential, the economy tries to substitute short-term methods of production which require less capital per unit of output, though they are less productive than the longer period processes. This is how it tries to overcome difficulties arising out of shortage of capital. Here is a tendency which is exactly the reverse of what happens in steadily growing economies. The

normal feature in these countries is a change from less capitalistic methods of production to more capitalistic methods. Instead of the above trend, we witness an increase in the extent of variable capital in place of constant capital.[6] The ultimate limit to such a process is reached when most of the producers in the economy tend to dispense with the services of capital itself. In other words, a number of producers will tend to live from hand to mouth. This is the culmination of the process of *shallowing* which takes place in the capital structure. Such a process would affect in the first place the pattern of *new* investment projects. Gradually, if the net savings potential becomes negative, then, even in regard to those equipments which are replaced, the same process will operate. Those who are already equipped with capital-intensive methods will tend to gain quasi-rents. If such equipments are very durable, then their gains are akin to the rents accruing to those who own superior varieties of land.

19. The process of shifting to labour-intensive methods will go on in those methods in which such substitution is possible.[7] In the case of those methods in which capital happens to be a limiting factor no investment will at all take place if at the interest rate prevailing the investment does not become self-financing.

20. The above will be the trends if we assume that there is a continued decline in the net savings potential. In the above, we did not assume the possibility of diminishing returns. In the model described, the economy tries to maintain the total output constant in the face of a steadily declining trend in the net savings potential. The situation would be worse if the output which has to be maintained constant involves the utilisation of natural factors of production which are progressively inferior in quality. What happens here is that even if the optimal capital structure was chosen, the returns would be less than what they would have been if resort had not been had to progressively inferior factors of production. The process of increasing backwardness has to be viewed and visualised as arising out of the interaction of both the above forces. On the one hand, with the decline in savings potential, the capital structure will become more and more direct until the economy settles down to a mode of existence which does not depend upon capital. On the other, the operation of diminishing returns will tend to hasten the above process.[8]

21. The above model also helps us to understand the position which arises if there is a continuous outflow of capital from agriculture. The agricultural sector may be in a position to realise a large amount of net savings potential, but if for

6. Note that this is exactly opposite to the tendencies visualised by Marx for capitalistic economies. This is a pointer to those who argue that Marx and not Keynes holds the key to the puzzle of underdevelopment.

7. Let us assume that the supply of land (and capital equipment) is given and that there is a maximum limit to 'productive' employment that can be offered. If the supply of labour is in excess of the latter amount, then wage rates will be less than the value of the marginal productivity of labour. This explains the riddle why the lot of agricultural labourers is not improved much, even though there is some improvement in the well being of the land-owners. Thus, there is a sort of an 'involuntary' exploitation at work in the economy. This is not the same as Marxian exploitation.

8. We can now understand why the process of exploitation of primary producing economies by the industrial countries did not land the former into an equilibrium of high incomes. It would have been better for these economies if so much concentration had not been placed on the manufacture of outputs subject to diminishing returns. It might have been beneficial to these economies if the process of capital formation had not at all proceeded to such a high stage in these activities.

some reason or the other this flows out, the supply of capital to the agricultural sector becomes reduced. This, in its turn, leads to a progressive shortening of the process of production in agriculture. The supply of capital to the agricultural sector may be less than perfectly elastic because of many reasons (control over distribution of land, regulations pertaining to land transfers, restrictions on reorganisation measures, etc.). At the initial process of industrialisation, the agricultural sector does help in the generation of a large amount of savings potential, but in some countries, the capital which goes out, unlike the prodigal son might never return.

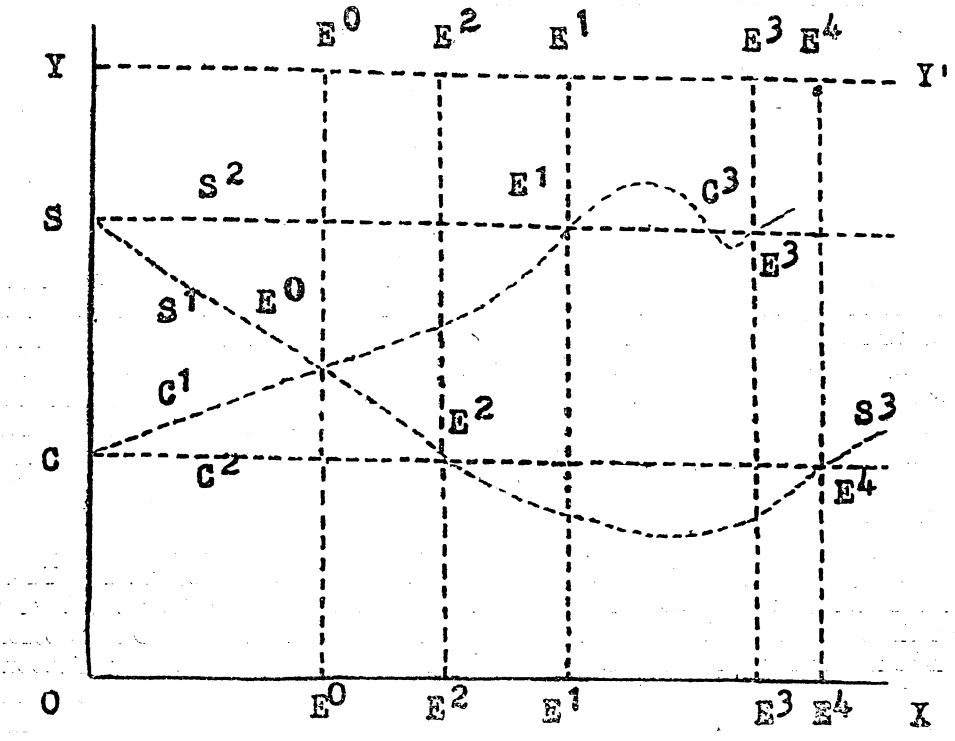
X. Limits to Growth of Industrial Sector

22. We have so far discussed the problem mainly as it affects the agricultural sector. Is it not possible for the agricultural sector to generate a high savings potential which might sustain a higher rate of progress in industry? Here also the same problems as bothered the agricultural sector will make themselves felt. The rate of growth of the industrial sector will depend upon the trends in the supply of wage-goods, particularly food. The production of the latter is subject to diminishing returns. Unless the supply of food is elastic in the short as well as in the long run, the progress of the industrial sector will be hampered. The industrial sector reacts to a situation of rising food prices by an increase in the extent of exploitation of labour and by resorting to more capitalistic and less labour requiring methods of production. Even if there is a rise in the rate of interest, this would not come in the way of such a process if wages are also rising or if wages do not fall below a limit. Thus, we have a paradoxical situation in that whereas one sector of the economy would be adopting methods of production which are more capitalistic, another sector would be adopting methods of production which are direct and 'primitive.' It is possible that the total amount of industrial output will go on increasing if the process of capital intensification proceeds quite far. But, even here, there is a limit. On the one hand, such a process cannot proceed far unless the market for industrial products widens. There can be a limit to the deepening of the market and a stage must be reached when markets have to *widen* if they have to sustain increased outputs. On the other, there is a limit to the process of intensification inasmuch as the supply of labour does become indispensable beyond a point. Apart from the above two limits, there is a more important check. The population accelerator will come into action with the increase in the real income of the producers of the industrial sector. If the latter is high, the efforts of the industrial sector to get over the difficulties arising from the imperfect elasticities of the supply of food by resorting to more capitalistic and labour-saving methods of production will tend to be defeated because the very increase in industrial output will increase the supply of population, as a result of which the net demand for food might even increase. Thus, the population accelerator snatches away whatever the gains that technology achieves. Once again, we get bogged down to the vital problem of how to augment agricultural productivity.

XI. A Diagramatic Statement

23. It may be appropriate to present our main conclusions in a diagramatic form. On the Y axis, we indicate the values of the capital fraction and the capital potential fraction. The different points on the X axis indicate the different

amounts of output at which equilibrium can be attained. The line YY′ is drawn parallel to the line OX and the different points on this line (YY′) indicate the absolute amounts of output. CC^1, CC^2, CC^3 are different lines depicting the value of the capital fraction at different levels of output. SS^1 and SS^2 indicate the value of the capital potential (or savings potential) fraction at different levels of output. For example, OC produces an output OY, out of which OS is saved. The surplus is given by SC. Let us assume that CC^1 and SS^1 are the relevant capital and capital potential fractions respectively. The economy now reaches an equilibrium at E°. Any expansion of output beyond YE° becomes less than self-financing.



DIAGRAM

Let us take a more favourable situation. The capital potential fraction is indicated by SS^2. The capital fraction continues to be CC^1. The economy reaches an equilibrium at E^1 (YE^1 being the of total output). Now, take a third alternative. The capital fraction is constant and is given by CC^2 and the capital potential fraction is SS^1. The economy now reaches an equilibrium at E^2 (YE^2 being the amount of total output).

Let us now visualise that it is possible through State policy to bring about *shifts* in the values of the fractions. In such a case, the lines CC^1 and SS^1 represent *less* than optimal values for these fractions. State policy can bring them to the optimum value. Here, it may be possible to attain a level of equilibrium at which the output is larger than what can be attained under autonomous circumstances. For example, treat CC^1 and SS^2 or CC^2 and SS^1 as the optimal values, which are

brought about by State policy. It is easy to note that the equilibrium may be attained at E^1 or E^2. It is also possible to visualise another alternative corresponding to Marshall's thesis about multiple equilibrium. In this case, let us assume that the capital fraction is given by $CC^1\ C^3$. The capital potential fraction is SS^2 and the equilibrium is attained at E^1. But, it may be that if total output increases by a substantial amount, the capital fraction might diminish and a new equilibrium might be attained at E^3. The same arguments apply also to the capital potential fraction ($SS^1\ S^3$). It may be that if the total absolute amount of output is very large, the capital potential fraction may start rising, and equilibrium may be attained at E^4. Note that the points indicating the equilibrium positions do not state that the economy contents itself with the output given at these points. In fact, the equilibrium position from the point of view of the economy will not be the equilibrium position from the point of view of firms and farms. What the E positions tell us is that, given the marginal values of the capital fraction and the capital potential fraction, expansion beyond these points will tend to be less than self-financing. Total output can continue to grow until gross savings become nil, *i.e.*, implying that the resources which were to be utilised for replacement will now be utilised for expansion. Here, the expansion path of output on the net is less than self-financing.

24. As suggested in the text, additions to the supply of labour can be treated methodologically as additions to capital equipments. The cost of additions to labour is the cost of the maintenance of increment to population. Thus, the economy can utilise labour alone for all activities.

The C lines indicate the rise in the labour fraction. For given increments of output the cost of labour rises. The cost of labour rises because the cost of production of food rises owing to diminishing returns. The S lines indicate the net productivity of labour (or the labour potential fraction). This is the difference between cost per unit of labour incurred during the gestation period of labour (*i.e.* before labour starts yielding some output) and the product per unit of labour throughout its production period. The inter-section of the net productivity curve and the labour fraction curve indicates the point at which labour becomes just self-financing. If the marginal labour fraction is higher than the marginal labour potential fraction the equilibrium is stable unless there is a shift in the curves.

XII. Conclusions and Implications

25. The foregoing essay has become somewhat abstract. It may, therefore, be appropriate to state the main conclusions.

(i) The problem of agricultural backwardness in an underdeveloped country should be viewed in the setting of a steadily contracting economy, *i.e.*, the total output grows at a slackening rate until it becomes constant and later on starts declining.

(ii) The main reasons for the decline in the rate of growth are to be sought in a study of the trends in the capital fraction and the capital potential fraction. Even if the growth in labour supply is just equal to the requirements, the continuous decline in the capital fraction or the operation of diminishing returns will land the economy into an equilibrium at which the marginal saving potential

contained in increases in income associated with increments of investment is less than the costs of such investment. This equilibrium is stable unless either the capital fraction or the capital potential fraction changes.

(iii) The capital fraction declines because there are limits to which productive efficiency can be stepped up in agriculture. If the interest and wage rates are low, then accumulation can be pushed up further, but the latter must come to a halt because there are limits below which both these rates cannot decline.

(iv) The capital potential fraction declines because the process of growth in income induces increases in the size of the population. The extent of such induced increase is given by the value of the population accelerator. If this is high, then the very forces which bring about an increase in incomes land the economy back into an equilibrium at which the level of incomes is still lower.

(v) The decline in the capital potential fraction leads to a rise in the interest rate. The population accelerator leads to a fall in the wage rate. The interaction of both these effects will bring about a pronounced shift in favour of direct and 'uncapitalistic' methods of production.

(vi) Disguised unemployment emerges even if the increase in labour supply induced by capital accumulation is just equal to the requirements, because of technical efficiency and the asymmetry in the working of the acceleration principle. If the population accelerator is vigorously at work, then the magnitude of disguised unemployment will be substantial.

(vii) The first reaction of an increase in capital in such an economy would be the adoption of capitalistic methods of production which in turn would intensify the problem of unemployment. But, if there are possibilities of further accumulation which are held up on account of capital shortage, expansion will go on until the mutual interaction of the law of diminishing returns and the working of the population accelerator will bring the economy again into an equilibrium of low incomes.

(viii) The industrial sector can expand only upto a limit depending upon the trends in the supply of wage goods and the terms at which they are available. The rise in the prices of wage goods leads to an intensification of the capitalistic methods of production in industry. If the industrial sector becomes a significant part of the economy, then the very process of increase in the real income of the industrial sector will lead to the working of the population accelerator, which in turn will raise the capital fraction and bring down the capital potential fraction. That is why in a closed economy it is not possible for the industrial sector to get rid of its dependence on the agricultural sector.

(ix) Under the above circumstances, an improvement in agricultural productivity alone will not solve the problem unless efforts are made to reduce the value of the population accelerator. Egalitarian policies under these conditions would only intensify the malady of agriculture.

(x) From the methodological point of view, neither the classical model nor the Marxian model provide a complete guide to an understanding of the problems of economic backwardness, though the classical model is by far the most satisfactory from the point of view of underdeveloped countries. It need not be

stressed that the Keynesian model is the least relevant in this context. The equilibrium of low incomes in agriculture—and in other sectors—tends to be dynamically stable. This is more so when there is a *substantial* divergence between the marginal capital fraction and marginal capital potential fraction. The worst state of underdevelopment is one wherein even though the interest rate, the wage rate and the population accelerator have reached the minimum values that can possibly be attained, there yet remains a substantial divergence between the capital fraction and the capital potential fraction. (Such an equilibrium is analogous to the Keynesian equilibrium wherein the marginal efficiency of capital happens to be less than the lowest possible level of rate of interest that can be attained). In the case of an underdeveloped country which has reached the state of equilibrium with the characteristics described above, unless there is a substantial decline in the absolute size of the population, there may be no way out.[9]

9. The above essay is part of a study conducted at the School of Economics under the inspiration and guidance of Prof. C. N. Vakil to evolve the framework of a general theory of underdevelopment. Attention may be drawn in this connection to some of the ideas developed in the earlier articles in connection with the above study. (1) An underdeveloped economy is characterised by a low elasticity of response to price, organisational and monetary stimuli, because of limitations in the supply of capital equipment, technical skill and entrepreneurial ability and on account of the lack of an integrated capital market, and the existence of institutional rigidities. (2) The small size of the domestic market is due to low incomes. (3) The cost of domestic products is high on account of the absence of external economies. (4) Inflation always hovers round the corner in an underdeveloped economy because any increase in investment is at the cost of some other investment. (5) Keynes' General Theory is not relevant in the context of the background conditions of a backward economy. ("Some Notes on the Development Problems of Backward Areas," the *Journal of the University to Bombay*, July, 1951). (6) The problem of development in a backward economy should be viewed as an aspect of the problem of an optimum allocation of resources. In this respect, the classical model offers a better guide to the problems of these countries than the Keynesian model which is relevant under conditions of actual or potential surplus capacity. (7) Increases in the volume of employment and in the level of real income tend to be conflicting aims in a backward economy. (8) The low rate of response to different stimuli is fundamentally due to low mobility of factors of production. (9) The Keynesian multiplier does not help to increase the level of incomes in a backward country because there is always a tendency to full utilisation of given capital. (10) An expansion in the rate of development is possible only provided there is an increase in the rate of savings. The mechanism of deficit financing does not offer a way out, because organisational changes have a limited scope in an underdeveloped country. ("The General Theory and the Problem of Development," *Ibid*, July, 1952). (11) A developing economy is characterised by a continuous operation of the forces of increasing returns. On account of the pressure of population on food supplies which are subject to diminishing returns, these forces do not operate in a backward economy. The basic background trend in a backward economy is one of steady decline. (12) Unless agricultural productivity is improved, it is not possible to expand the market for industrial goods. (13) The causes of continued underdevelopment have to be explained by an analysis of why supply lags behind demand. In backward countries, supply is another way of looking at demand. (14) Disguised unemployment is itself a cause of deficiency of supply of capital equipment and other factors. ("The Dynamics of Development and the Dynamics of Backwardness," the *Socio-Economist*, December 1952). (15) A valid theory of underdevelopment has to proceed on the basis of a generalisation of the Ricardian model. (*Vide* Chapter III, *Economics of Welfare Maximisation*, a thesis approved for the Ph. D. of the University of Bombay.) (16) A balanced development of different economic activities is not autonomously attained in an underdeveloped economy because the *laissez faire* forces do not bring about automatic compensatory adjustments. Hence, the industrial sector in a backward economy is in an involuntary infra—optimal situation. (*Vide* Chapter XIII, *Ibid*). (17) A reduction in unproductive consumption is a pre-condition of a higher rate of growth. (18) Capital accumulation is posterior to division of labour. ("The Classical Theory of Economic Policy," *Journal of the University of Bombay*, January, 1954). (19) Industrial unemployment in an underdeveloped economy is due to variations in terms at which wage goods are available. The industrial sector cannot progress fast unless diminishing returns are overcome in agriculture and the effects of population growth on the marketable surplus are

minimised. (20) Methodologically, it is possible to consider a situation wherein different rates of return for different activities can simultaneously exist in a condition of equilibrium. This is because of low mobility of factors in an underdeveloped economy. (21) Technological unemployment is due to the impact of disguised unemployment on the supply of wage goods. ("A Theory of Industrial Unemployment in an Underdeveloped Economy," *Indian Economic Journal*, April, 1954). (22) The interaction of a rising tendency on the part of the capital-output ratio and that of a decline on the part of income-saving ratio is the primary reason for the emergence of the equilibrium of retrogression. (23) The suggestion that disguised unemployment contains a concealed savings potential is not theoretically correct. This is because any process of transfer of labour, if it were feasible, would have been automatically brought about. The persistence of disguised unemployment is itself a reason why such transfers are not economically feasible. The process of transfer cannot be brought about through State policy because of a possible rise in the consumption standards in rural areas and of the repercussions on population growth. (24) A major problem of economic policy is to bring about an optimum allocation of given capital and other resources. In this respect, deficit financing will not work because the supply of wage goods is given and fixed. What deficit financing does is only a transfer of employment. ("Towards an Optimal Tax Policy in a Retrogressing Economy," *Journal of the University of Bombay*, July, 1954).

En passant, it may be pointed out that most of the above ideas were developed by the writer long before the recent leading works of some of the Western economists on problems of underdeveloped countries were published. It may be noted that several of these ideas have found an (independent) echo in these works.