The Choice of Technique

Joan Robinson

The dilemma of the choice of techniques is a real one and it is no good pretending that there is one obviously right answer to it. To weigh up the alternatives we need to know more, e.g.

How much greater, for a given investment, the output of consumer goods would be if small scale industry is fostered, or how much additional investible funds can be extracted (for planned investment) if capitalist firms are allotted to re-equip?

Whether different kinds of investible resources are required for the different techniques?

The technique with the larger wage bill may be scattered all over the country and may not require further overcrowding of city slums. On the other hand the more mechanised technique fosters modern engineering and the technologists outlook on life. Any one who has a prejudice for either side can find plenty of plausible arguments to support it.

IT is no wonder that the argument about small-scale industry and the choice of technique should be bewildering the readers of Economic Weekly, for the subject is one of very great complexity. There is no ready-made answer to it in the existing corpus of economic doctrine. The kind of theory, based on the rate of interest and marginal products, to which Mr M N Ghosh refers, has been worked out (and not very satisfactorily, one must admit) for situations in which there is already full employment. The Soviet debate (which again is far from satisfactory) also assumes full employment in the economy and is a whole and is concerned only with alternative schemes of investment for one particular bit of the whole national plan. Neither deals with the Indian case of which the essential feature is the existence of a large (and probably growing) mass of surplus labour which requires to be equipped to make it productive. Moreover, when the analysis is properly set out it does not provide a simple knock-clown answer, but leaves us in face of a political problem.

To seize the question we must go back to the beginning. The Indian economy is very lop-sided, and lacks the capacity to produce capital goods in sufficient quantity to provide the rate of accumulation that is considered desirable. To get the economy into balance is going to be a long job and will require heavy investment in the investment good sector. Foreign-exchange earnings may be regarded as contributing to the capital-good sector, since they can be used to import machinery and technical know-how, but export markets are limited and are vulnerable to the vagaries of world trade and to political pressure. India has therefore decided to build up a capital-good sector of her own. For inescapable technical reasons the capital-good sector requires investment in schemes with a long gestation period and a high capital-output ratio. Moreover, to carry out the grand programme, it is necessary to plough back into the investment sector a large part of its own product as it emerges. (The first output of the new steel mills, should go into building steel mills.) Thus for a very long time to come a large number of workers (including those engaged in earning foreign exchange) must be supported by the rest of the economy, without contributing anything to their own sustenance. But an immediate increase in total consumption is urgently needed. It is therefore necessary to allocate a part of the investible resources at present available to increasing the output of consumer goods by schemes with a quick yield. How the allocation is made is a larger question than that at present under discussion and for the moment must be taken as given.

The argument about the choice of technique is concerned with the best way of disposing of the ration of investible resources allocated to the consumption good sector. Dr Rudra is, of course, quite right in pointing out that nothing can be settled by an example drawn from a particular industry, but Dr Raj’s type of analysis can be applied if we take it to refer to the consumption-good sector as a whole, assuming that a well balanced mixture of schemes in arranged so that the flow of consumer goods emerging will be reasonably fitted to the demands of consumers.

A great deal of confusion has been imported into the discussion by calling techniques which require a higher ratio of capital to output “more advanced” instead of “more mechanised” or “more capital using”. (The confusion is partly only verbal. Dr Raj talks about technological change, which implies new inventions, when he means an increase in the stock of equipment of types already known. Dr Rudra defines his terms quite clearly but the overtones of “advanced” are misleading in the sense that he uses the word.) Let us distinguish “superior” from “more mechanised” techniques. Technique A is superior to technique B if it yields a higher return, in the form of a future flow of product, net of depreciation, both per unit of labour and per unit of investment. We have a certain sum of money to invest (taking wages and prices as given). If project A promises a higher rate of net output than project B, and at the same time will require less labour to operate when it has been installed, then so much the better for A. To prefer B on the ground that it will offer more employment would be extremely hard to justify. Some people, however, do prefer B. The extra workers left free if A were installed (as compared to the case where B is installed) would require either to be equipped for production, or to be supported by some kind of dole, or they would remain as a reproach. For the politicians therefore B may seem to provide an easier line than A. Some people also prefer technically inferior methods of production for aesthetic or religious reasons. It is against this sort of view that the economic pundits are (somewhat confusedly) protesting when they argue against labour-
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Rail transport is the blood stream of a nation’s commerce and industry. It keeps the flow of raw products moving continuously to production centres and of manufactured goods to consuming centres.

The Railways' short term measures for an increase of transport capacity, in the current busy season that is now at its height, by 10 to 20 per cent over last year have borne fruit.

The Railways are now planning for providing much increased transport facilities to meet the rapidly growing needs of the country's industries and commerce in the Second Five Year Plan.

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using techniques. And so long as they stick to favouring techniques which are properly speaking superior, they have a very strong case. But it is precisely the pundits, with their conception of "the production function" and "factor endowment" who should be most ready to accept the idea that "more mechanised" is not the same thing as "superior" and that different degrees of mechanisation are appropriate in different circumstances (In his reply to Y's chaff about the pundits, Dr Raj was putting on a trip that did not fit, for he does not fall into this confusion.)

The true problem, explored by Dr Raj and Dr Rudra, is to choose between a more mechanised technique, which requires a larger investment per unit of output with less labour to operate it, and a less mechanised technique which requires a smaller investment and more labour. In Dr Raj's example technique I (hand-looms) is inferior to II (semi-automatic looms), and I drops out of the argument. Technique III (fully automatic looms) offers a smaller output for a given investment than II, and requires very much less labour. How should we choose between them?

On pure capitalist principles of profit maximisation, the choice of technique depends upon the relation of wages to prices. Given the expected prices for the product, a higher level of money wages favours III (which requires less labour to operate) and a lower level favours II. At some level of wages they both promise an equal profit on the investment. In a high-wage country, H has long since been out of the question, but in India it still may be as good an investment as III.

What light the profit criterion throw on the question of which is the right choice for the nation? Dr Raj's main point is that there may be a bias in favour of III even if it is not more profitable than II. III is appropriate to be operated by capitalist firms (the assumed investment ration is put, say, into extension and modernisation of existing factories) while II is appropriate to scattered small scale concerns. III has organised interests to press for it, and plans already worked out, II requires help in marketing, finance, and organisation to be given to many small producers. It is the line of least resistance to give organised industry its lead. Moreover, within organised industry there is a bias in favour of mechanised techniques.

Machines are more docile than men. The future is uncertain, and wages are more likely to rise than to fall. There is a certain snob value in the "latest thing", and the latest thing, being drawn from high-wage capitalist countries is highly mechanised. All this means that a more mechanised technique is preferred even when it is somewhat less profitable.

But to rely on these arguments is to miss the real issue. Dr Raj has fixed his example so that technique II is the most profitable (though it would not be so if it was obliged to pay the rate of wages that obtains for III). Here there is a clear case for II, and nothing more need be said.

The interesting ease to discuss, and surely the most general, is the one in which the wage rate is such that technique III promises a higher rate of profit on investment. This is the situation which Dr Rudra presumably has in mind and his argument may be restated as follows:

If we put this year's ration of investment into III we shall have a smaller increment of output next year, but a larger increment of profit. This profit represents a surplus available for investment, so that next year's total investment can be greater. (Dr Rudra suggests that it can be used for labour-intensive land reclamation schemes, which are valuable in themselves and provide employment.)

The essence of the argument is that the smaller increment of output yields the larger increment of surplus. This is the central issue, though in actual cases it is always overlaid with confusing complications.

Now pause and consider what is

It can be seen in Dr Raj's example that the wage rate at which II and III are equally profitable is approximately Rs 1,380. At any higher wage, III is more profitable than II.

*The example can be re-arranged as follows:

<table>
<thead>
<tr>
<th>Technique</th>
<th>I</th>
<th>II</th>
<th>III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost per loom Rs.</td>
<td>50</td>
<td>200</td>
<td>10,000</td>
</tr>
<tr>
<td>No. of looms</td>
<td>3,200</td>
<td>800</td>
<td>16</td>
</tr>
<tr>
<td>No. of workers</td>
<td>3,200</td>
<td>800</td>
<td>1</td>
</tr>
<tr>
<td>Wage rate Rs.</td>
<td>300</td>
<td>900</td>
<td>1,500</td>
</tr>
<tr>
<td>Value of product Rs</td>
<td>960,000</td>
<td>1,200,000</td>
<td>96,000</td>
</tr>
<tr>
<td>Wages Bills Rs</td>
<td>960,000</td>
<td>720,000</td>
<td>1,500</td>
</tr>
<tr>
<td>Gross Profit Rs</td>
<td>0</td>
<td>480,000</td>
<td>91,500</td>
</tr>
</tbody>
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The investment is the initial cost of new looms, and to arrive at net profit on the investment it would be necessary to know the rate of amortisation of each type.
Dr Rudra ten us now much additional investible funds he expects to be extracted if capitalist firms are allowed to re-equip? It would be a great help to have even the sketchiest idea of the orders of magnitude involved.

Furthermore, it is relevant to know whether different kinds of investible resources are required for the different techniques. If III requires foreign exchange but II can be set up from local production, the initial investment ration might be more generous if II is chosen. (Even poor old I may score heavily on this point.) On the other hand investment in III may draw in foreign loans that would not otherwise be available.

Important but imponderable considerations also have to be remembered. The technique with the larger wages bill is fattening up more people and getting them into the swim of economic development, it may be scattered over the country and does not require further overcrowding of city slums. On the other hand the more mechanised technique strengthens the highly developed part of the economy and fosters modern engineering and the technologist’s outlook on life. Anyone who has a prejudice for either side can find plenty of plausible arguments to support it...

It is obvious enough where political considerations come in, and there does not seem to be much hope that pure economic argument will be able to make head against the passions that it arouses.