

Investment Allocation and Technological Choice

Some Practical Considerations

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Whatever the conceptual difference between investment in capital formation and expenditure that does not create any fixed capital, the problem of choice between alternative means of spending a given amount of money is a perfectly valid one from the point of view of the planner. Treatment of this problem requires the consideration of a number of variables which are completely ignored in discussions on technological choice.

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WHATEVER the achievements of the second five year plan in terms of production of heavy machinery or yield of foodgrains, the amount of original thinking it has provoked among economists has not been by any means a negligible gain. The impact of all this thinking on the actual methods followed in planmaking, however, has not been appreciable. In fact it is to be doubted if in matters of techniques of planning, there has been much improvement. This is a pity, for a large part of this thinking has been directed precisely at making the methods that have been on the whole nothing more than rules of thumb somewhat more rational.

I shall illustrate my point with the help of two technical problems of planning about which there has been considerable fresh thinking in India, namely the problems of technological choice and investment allocation.

These two problems are such that they have to be faced and solved at every step in planning. Whether it is long period or only annual planning, whether it is planning at the Centre or planning in the States, whether it is planning with respect to all the sectors, or merely with respect to one branch of the economy, there is no field of planning where problems of investment allocation and technological choice do not occur. Planners, whether in the Planning Commission or in the Central Ministries or in the Departments in the States are making such decisions all the time. Can it, however, be said that their mode of decision making has undergone any significant change as a result of these theoretical discussions? There is little

doubt about the answer. But does that mean that the planners are too stupid to learn from the economists? Economists will probably hasten to reply that, they have no intention of taking such a superior air, it is just that there is always a distance between their thinking and the methods followed by those who have to take the decision. This is a platitude that may apply to theoretical economics in general, but it cannot be made to explain why theories about practical decision making do not help the practical decision maker.

Theoretical models have necessarily to abstract from reality — this is the very essence of scientific method in general — but how distant they will be from reality, will depend on the degree of approximation. The more complicated the model, the greater the degree of approximation to reality. But the difficulty with the theoretical discussions that have taken place about investment allocation and technological choice is not that the discussions relate to a world remote from the real world, but that they completely abstract from or assume away certain aspects of reality which appear to the practical planner to be the more important. So the planner does not know how to make use of the theory even to get certain broad results.

Allocation of Investment

Let us take up first the discussions on investment allocation that have centred on certain linear models involving capital output ratios, capital-labour ratios etc. Much of the discussion, it is to be regretted, has remained confined to the algebraic properties of the

models. Such models are helpful only in giving certain qualitative indications. In order to apply them in practice and to reduce them to quantitative terms, a minimum of additional complications have to be introduced into them.

One such complication to be introduced in the problem of allocation is the problem of technological choice itself. To assume constant coefficients relating employment and output to capital outlay is to assume that technological choice has already been made. Yet it is impossible to make the technological choice without regard to investment, allocation and vice versa. Go the relationship between outlay, employment, and output has to be considered, not in the rigid term; of constant coefficients, but in somewhat more flexible terms. Even such rigid relations may provide very near approximations to reality when one considers individual establishments of the factory type. But they are clearly inadmissible in the case, of agriculture or social services or small industries or even large scale factory type industries taken as a whole.

A Meaningless Ratio

Of course there will always be a ratio between the investment in any field during a certain period and increment in output or employment in the same field as observed at the end of the period, just as there will always be a ratio between any two numbers. Such ratios have no significance, however. The ratio for a given sector depends very much on the composition of the investment in that sector in terms of specific schemes. The schemes having themselves different technology

cal features and — what is so often ignored — different periods of gestation, the same volume of investment in the same sector but incorporating different proportions of schemes of different types will give rise to different values for the ratio.

A practical example will illustrate the point. Suppose that investment in a field, where the gestation period of the investment in different schemes varies from one year to seven years, be Rs 100 crores over a plan period of five years; and suppose that increment in value of production in the sector is Rs 45 crores over the same period. What significance can one attach to the ratio 0.45, if one knows that out of the Rs 100 crores only Rs 40 crores have been spent on schemes which were both begun and completed during the plan period; another Rs 40 crores on schemes that will be completed after the plan period is over; and the remaining Rs 20 crores on schemes that were begun before the commencement of the plan and were completed in the course of the plan period? It is obvious that the ratio between Rs 100 crores and Rs 45 crores cannot possibly have any significance, for the investment in question does not represent the cost of the schemes that give rise to the increment.

Technological Choice: Agriculture

Let us now consider the problem of technological choice. One minimum complication to be added is of course what we have already considered with respect to the problem of investment allocation: the two have to be treated simultaneously. Passing over this fundamental difficulty, a little examination will show that the terms in which the problem has been discussed limit the applicability of conclusions so narrowly as to rob the latter of all usefulness. The problem is usually posed in terms of four variables:

- fa) value of fixed capital;
- (b) quantity of output;
- (c) surplus produced; and
- (d) amount of employment generated.

The very variables indicate that the economic has a situation in mind in which the fixed capital installed is going to be the heart of a complex of economic activity that will (a) give rise to a steady stream of a fixed quantity of output per unit of time; (b) the product will

be saleable at a fixed price over successive units of time; (c) also give rise to a fixed quantity of employment; (d) the employees will be paid wages at a fixed rate by an employer (who may be a collective body like the state); and that (e) the employer would use the entire surplus realised for reinvestment. All these conditions are almost completely satisfied when the choice refers to an industrial unit to be set up in the private or in the public sector, but to be run on commercial lines. The greater part of planned investment in India, however, takes place in fields where these conditions do not hold. If there were not much scope for choice in these other fields, there would be nothing much to complain about. There is, however, no field where an investment may be made without there being a problem of technological choice.

Consider first agriculture. Investment here takes the form of dams and canals, reclamation work, soil improvement, use of better implements and modern machinery, seed farms etc. There may be different types of dams; canals may be dug in different patterns; and machines will of course have a large variety of technical features. But a dam or a canal or even an agricultural machine does not give rise to a fixed quantity of additional output in agriculture, nor does it give rise to a fixed amount of employment, either directly in its maintenance or indirectly in the cultivation of fields served by it. A certain variable amount of increased or decreased employment does probably result from all types of investment in agriculture taken together, but in any case, under Indian conditions, no wage payment is associated with the larger part of employment in agriculture, and therefore there is no question of profit being produced and reinvested. (Surplus, it is true, is extracted in the form of rent, interest etc, but most of it does not 'get reinvested.')

Applicability to Other Sectors

Take, again, a sector like transport. A very large part of investment in this sector takes the form of building of roads and bridges, harbours and airports. No fixed volumes of output or employment can be associated with the investment in them nor is it possible to speak in terms of surplus resulting from them.

We come across the variables treated in the theoretical discussion chiefly in the sector of industries and mining and to some extent also in the sector of transport. The establishment of a railway or bus service, if meant for commercial transport, satisfies almost all the conditions (though when railways or bus services are run by government, prices at which their services are valued and the prices at which capital goods used by them are valued, are to a large extent arbitrary).

Limitations in Application to Industry

While industries provide the largest field of application to the theoretical results, it should be remembered that even here the results cannot be applied indiscriminately. The scope of their application in small scale and cottage industries is very limited indeed. This may at first sound paradoxical, for a major part of the discussion in India on the question has centred on the Amber Charkha and the Handloom. But in both cases the fact that they necessitate subsidies has hidden the fact that employment in the small scale and cottage industries being predominantly of the "self-employment" type, there is very little possibility of surplus being realised in the form of profit; here, again, surplus is produced as rent, interest etc, out of which a very small part actually gets reinvested. The same observations hold with respect to unorganized small scale enterprises in transport, trade, animal husbandry, fishery etc.

Even for large scale factory industries, it should not be imagined that all the assumptions necessarily hold. As far as the private sector is concerned, all the conditions usually hold excepting that of reinvestment of profit; the last condition is often satisfied though not always; and there is no guarantee that the reinvestment would take place within the boundaries of the economy with reference to which the choice is to be effected. Thus the argument of surplus generation is quite pointless with reference to those foreign investments the profits of which are remitted abroad. Similarly, if there is a part of India in which, for one reason or other, the capitalists have a tendency to boycott, the argument of surplus again loses relevance in so far as that

part is concerned; for whatever the size of the surplus generated, it may not be reinvested in the same region,

On the other hand, for large factory establishments in the public sector whose products are sold only to other public concerns, the "selling price" cannot but be arbitrary; in any case the total volume of investible funds with the government cannot be augmented through profit making in such industries. Again, when the products of state enterprises are sold to the public, very often no profit is made at all, the selling price being equal to the cost of production. This case also falls outside the range of application of the theoretical results.

It will probably be said that all this does not amount to much. The theoretical problem (at least, in one of its versions) allows a choice between maximisation of output, that of employment and that of surplus for a given outlay in capital. If there are fields where surplus is not created or does not get reinvested, that would only mean that the problem has to be treated in terms of output, employment and outlay alone. If there are investments in fixed capital which do not give rise either to a fixed volume of employment or to a fixed volume of output. (e.g., setting up of a cattle breeding centre) in that case only outlay is to be considered as against the purpose to be served by the investment stated in qualitative terms. While not disagreeing with this position, one cannot ail the same help asking whether it has not been a little futile to have discussed the question of technological choice entirely in terms of a choice between maximisation of output (or employment) and maximisation of surplus, when the scope of such maximisation exists in so few cases? And particularly so, when several related questions, which are so very important for the practical planner, have been almost completely ignored?

Practical Problems of Choice

Choice regarding the technical nature of fixed capital is not the only problem of choice that the practical planner has to face. He has to face many more. For one thing, a large part of what he considers development expenditure is not even related to formation of fixed capital. An ex-

mination will show that a very large proportion of the "plan schemes" involve expenditure of various kinds most of which contribute to increase production. Thus in the sector agriculture (which in planning literature excludes irrigation), most of the schemes are for supplying manure and seeds to cultivators on credit or subsidy basis, and for propagation of better techniques of cultivation etc. Giving loans and aids is also the purpose of a large number of schemes.

Variables that Are Ignored

Whatever the conceptual difference between investment in capital formation and expenditure that does not create any fixed capital, the problem of choice between alternative means of spending a given amount of money is a perfectly valid one from the point of view of the planner. Treatment of this problem requires the consideration of a number of variables which are completely ignored in discussions on technological choice. Let us consider the following three alternative schemes in fishery: The first is the purchase of a trawler by the Fisheries Department and its use by employed workers; the second is to give subsidy to a cooperative of fishermen for building country boats; and the third is to sell mechanized small boats to fishermen on hire-purchase-cum-subsidy basis. There is a significant difference in the character of the outlay in the three projects. So the outlay without any qualifications cannot be the basis of comparison between them.

In the first case, the outlay being a part of government development budget, will be available for other purposes, if the scheme is not chosen. In the other two cases, capital formation by fishermen would not in all probability take place at all, if the aid given by government were to be withdrawn. Hence a comparison between outlay in the first scheme with that in the second or the third scheme would not take into account all the relevant facts. On the other hand, a comparison between the government expenditure alone would be certainly valid and interesting (though it cannot render unnecessary the comparison of total outlays). Differences in quality between different sorts of government expenditure will have also to be taken into account.

The first type of expenditure adds to fixed capital stock in the public sector; the second is an outflow of government's financial resources without any return; and the third will augment government's financial resources in the future, through the return of loan and interest payment

A Rational Method

If a rational method is to be worked out for the choice of different schemes (as opposed to the narrower concept of the choice of techniques), one will have to treat as distinct variables all the following factors in a scheme:

- (a) investment in fixed capital
 - (1) by the public sector,
 - (2) in the private sector made possible by the scheme;
- (b) investment in commercial working capital
 - (1) in public sector,
 - (2) in private sector made possible by the scheme;
- (c) public sector aid to private sector in the forms of grant of
 - (i) aid,
 - (in loan,
 - iiii» subsidies for purchasing
 - (d). capital goods, and for the production and sale of goods,
 - (ivi purchase of shares in private firm,
 - (v) diverse expenditure indirectly helping the private producer (e.g., research, propagation of technical knowledge);
- (d) employment
 - (1) during the course of implementation of the scheme,
 - (2) following upon the implementation of the scheme;
- (e) increment in production, if any, resulting from the implementation of the scheme;
- (f) specifications of fixed capital to be brought into existence when it is not to be directly productive;
- (g) additional investible resources to be available in the public sector in future years from profits resulting from implementation of the scheme;
- (h) additional profit in future years in the private sector resulting from implementation of the scheme; and
- (i) the part of such profit likely to be reinvested; etc.

It goes without saying that it will not be possible to devise a neat formula to (hand) over all this, which can be handed over to the planner and to be applied without any further

All the same, it should be in evolve, pragmatically, if -tially. ways of considering different variables to ' a decision about choice that would lead to better results than a completely arbitrary choice.

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ACC-Vicker Babcock Heavy Engineering Project

4 NEW company called the ACC -Vickers-Babcock Limited been formed for establishing a heavy engineering works in

including bolter-plant, cement-making and coal mining machinery.

The company has an authorised capital of Rs10 crores, of which Its 5,40 crore-s is expected to be issued by the time it goes into production. It is also to raise debenture capital to the extent of Rs 4 crore-s by private negotiation.

The share capital of the company will be :
 195 percent
 24.9 per cent.
 Ltd, London.
 Industries Ltd
 Dinshaw
 Tata Sons
 cent; and Mulraj
 (Private) Ltd 0.1 per cent,

The companys works will be pur in West Bengal have been com-

ted for acquiring land and other necessary facilities.

The AVB Project is one of the largest heavy engineering projects in the private sector to be started in the post-war period. AVB will manufacture machinery for cement-making,, general mining and coal-mining, as well as the well known "Babcock" water-tube boilers, pressure -vessels and ancillary items. ACC's own Engineering Workshops which have been manufacturing aient-making machinery for the i 15 years, will form an integral : of the new project inasmuch ble portion of the yed will be manufacture Workshops for AVB.

The construction of the AVB Works will commence immediately and it is expected they will be completed in 1961. When in full production, the project will provide additional employment to over a thousand workers.