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PRICING PROBLEMS IN INDUSTRIAL PROJECT EVALUATION

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Introduction

There are two possible approaches to the problem of pricing in industrial project evaluation: one may be termed the computation approach, and the other the policy approach. The computation approach is predominantly concerned with the techniques of computing the value parameters needed for making the decisions on investment choice. The elaboration of such techniques means necessarily major pre-occupation with some kind of model-building. It is now commonly admitted that such value parameters as ought to be used for this purpose can best be arrived at by finding the solution for the dual problem in linear programming, the programme itself reflecting the aimed-at development of a given economy. This shows the main line of thinking contained in this particular approach: it is mainly concerned with techniques of optimization.

The policy approach, by contrast, may best be presented when starting with the assumption unrealistic as it is) of the existence of a perfect set of value parameters for the development of a given economy. Such a perfect set can be termed for brevity the set of shadow prices. This set of shadow prices is necessarily different from the set of market prices. This being so, it is clear that even on such assumption certain policy problems must arise for the government of the kind of how to make the individual decision-makers use the shadow prices instead of the market prices in their project evaluations.

In practice, however, it would be unrealistic to assume a perfect set of value parameters, i.e. such that would correspond to the optimum solution of the development programme. Such a perfect solution may be found in theory, but in practice it is beyond reach because of the lack of sufficient information.

This leads necessarily to the emergence of a second type of policy problems, i.e. such that arise from the non-existence of the perfect set of shadow prices or, in other words, from the imperfections of such set of value parameters as can be made available in reality. The available set shall be called for brevity the set of accounting prices as distinct from the set of shadow prices representing the perfect solution. The accounting prices represent better or worse approximations to shadow prices. Thus, the problem of how to make them better instead of worse seems to be one of the policy problems of the second type.

Another such problem can be seen in the need for an assessment of the consequences of the disparities between accounting and shadow prices, i.e. of the fact that such approximations as are being done must necessarily bear a [illegible] of error. The general result is clearly that the decisions arrived at by means of the accounting prices are not exactly what they ought to be to implement

the optimum development programme. This leads to one more policy problem: that of finding means to neutralize the effects of errors resulting from the disparities between accounting and shadow prices. This can be done either by the use of certain direct controls, or by successive adjustments in the set of accounting prices, or both.

Both of these approaches still require a good deal of work to be done before it will be possible to get satisfactory answers to the multitude of practical problems of development policy and investment decisions. It seems, however, that so far relatively more attention was paid to what we called the computation approach than to the policy approach. This observation was made when writing the present paper which was intended first to be a general survey and, perhaps, a summary of the existing lines of thinking and methods of approach to the problems of pricing in industrial project evaluation. It occurred that not very much can be said in this context about the policy approach to these problems.

But it is perhaps worth noting that, particularly because the computation approach leads at best to finding better or worse methods for making better or worse but as a rule rather crude, approximations, the policy approach becomes all the more important and may be it would deserve even more attention than the former one.

Part I. Project evaluation criteria, development programmes and shadow prices

Investment project evaluation is nowadays one of the crucial problems of economic theory and practice being a form in which appears the old question of how to make the best use of existing resources. If we imagine a developing economy with some kind of central body responsible for preparing a development plan, it is easy to see that for this central body the problem of the best allocation of resources, in any circumstances, means a multitude of decisions of what particular investment projects to choose for . This central body must, then, have a criterion for selecting projects. The meaning of the criterion is to indicate what is the relative benefit involved in each project. We may, then, think of the criterion in very general terms of a way to compare the benefits with the costs or, still more generally, with sacrifices . The general formula for such comparison may be written, after Tinbergen[1], in the following way:

$$r = \frac{\sum_i q^i dx^i - \sum_d p_j da_j}{\sum_j p_j da_j} \qquad (2)$$

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(1) J.Tinbergen, Project Criteria, in: Economic Planning, The Hague, 1963.

(2) This general formula can obviously be rewritten into any continous function of r (such as, e.g. r+1) which may be more convenient to use but means nothing more than a technical alteration.

We denote here by dx^i the addition to each of the conceivable aim or target variables x^i made by a project, while da_j stands for the quantities used of all the sacrifice (cost) items, or factors a_j. The total number of aim variables is indicated by I, the total number of factor variables by J.

Thus, in its general form, the problem of finding a criterion for project evaluation is a problem concerning a number of independent elements which have to be brought under a common denominator. Each industrial project can be characterized by these elements. In principle, these independent elements are all the aims and all the factors which appear in the development policy and its instruments.

In these general terms, the first thing to do is to compose a full list of these independent elements. To see the full complexity of the problem involved it is necessary to point out that each of these elements represents (both on the aim and on the sacrifice side) a magnitude variable over time. Thus, each specific target variable (such as, e.g., income, employment, etc.) for each particular year to come ought to be treated as a separate variable. The same applies to cost items. Thus, the number of independent elements increases with the number of time units considered.

Supposing that it is possible to draw such a full list, the next thing to do is to express in a common unit all benefits obtained from and all sacrifices made on behalf of a given project, the benefits being

$$\sum q^i dx^i = q^1 dx^1 + q^2 dx^2 + \ldots\ldots + q^I dx^I$$

and sacrifices being

$$\sum p_j da_j = p_1 dx_1 + p_2 da_2 + \ldots\ldots + p_J da_J$$

Finding these expressions is possible if, and only if, we can find equilibrium prices p_j for factors and q^1 for aims.

For any number of independent aim and cost variables the problem of pricing can find, at least theoretically, a solution. But it can be easily seen that for any practical purposes of project evaluation and selection, a certain choice must be made, first of all, as to the scope and meaning of all the x^i-s and a_j-s involved in the general formula. These must be somehow limited so as to embrace only some particular kinds of benefits and some particular kinds of sacrifices. Thus, some particular simplified form of the general criterion must be chosen.

It follows, then, that in operational terms the general problem of project evaluation can be looked at as embracing two distinct problems:

(i) that of finding a satisfactory form of the criterion, such as would take into account what is considered important elements on both the benefit and the cost side;

(ii) that of finding the equilibrium prices for all the benefit and cost items considered in the criterion, i.e. such prices that would equilibrate a given development programme.

The relationship between the accounting formula and prices

The problem under i may be termed for brevity as that of choosing a particular accounting formula.

The solution to it may be arrived at, on a macro-economic scale, only by means of a decision of the planning authorities. The decision is more or less of a political nature. Because of the very complexity of the general problem the authorities have no other choice but to adopt a simplified formula. On the other hand, they do have choice with respect to the particular simplified form of the accounting formula which they are to adopt. The latter choice must always be made. What may vary, is the extent to which the choice is motivated, as well as the degree of consciousness with regard to the full range of consequences of adopting a particular accounting formula.

We shall not be concerned in this paper with the problem of how to arrive at a satisfactory accounting formula. What is important to note here, is the fact that, whatever the particular decision looks like, it affects seriously the second problem that of pricing at least in so far that it determines the list of items to be priced.

Given the accounting formula, the set of prices enables us to obtain for each investment project a figure, representing its relative attractiveness. It is relative, because it is valid only on the ground of the adopted accounting formula and the adopted set of prices. It is the problem of how to arrive at a satisfactory set of prices with which we shall be concerned here. But it is now obvious that the set of prices itself is relative with respect to the accounting formula. Hence, the interconnection between the choice of the accounting formula and the problem of pricing needs closer examination.

But before entering into it one special aspect of this interconnection seems worth noting. As it is clear, in any project evaluation the result depends both on the adopted accounting formula and on the way the problem of pricing is solved. Owing to this, a kind of substitution emerges between the actual shape of the formula and the price relations. Starting from a given situation, we may

obtain the same result either by changing the formula, or by changing price relations. This fact shows its significance especially when we have to deal in practice with simplified formulas and approximated, quasi-equilibrium prices. We shall, accordingly, return to it when discussing the problem of the price of capital.

The meaning of shadow prices

Given a particular chosen shape of the accounting formula, it is necessary to decide what value parameters are to be used for project evaluation.

One obvious possibility would be to use for this purpose the set of market prices. But, considering the general shape of the accounting formula, we see at once that the set of market prices would not suffice even in the technical sense: for some of the independent variables (particularly on the benefit side) we could hardly find a market price at all (if, e.g., one of the benefit variables is improvement in health); other, representing some kind of future outlay or benefit, would have to be valued, at best, at some expected future market prices, for which the current set would give no information. But more than that can be said against the use of market prices. It is nowadays commonly admitted that they do not give the proper

indication of what are the actual social values of the relevant benefits and sacrifices, particularly so with regard to situations where we are confronted with the existence of substantial disproportions in the available amounts of various factors as related to aims. Current market prices serve different economic as well as social purposes. In this sense they fulfill several functions. As it has been mentioned they are certainly not equilibrium prices, at least from the long-term point of view. Yet, though they are faulty, they cannot be totally abolished or replaced for different reasons. It does not mean, however, that current market prices set could not possibly be replaced at least in

other

to some institutional conditions. Such splitting of the "natural" functions of prices forms a basis for pushing forward the idea of designing and using of a special set of prices for a precisely defined aim: to provide a stick of long-term evaluation of production factors allocation.

Theoretically, such indication of the actual social values can be found by means of programming techniques in the form of the so-called shadow prices. For clarity we shall be concerned here only with linear form of programmes. In terms of linear programming these prices represent

the set of parameters of the dual solution to a given over-all development programme. When using the previously introduced denotations, we may present an over-all development programme in the general form of:

$$\sum_i q^i x^i = \max$$

subject to the condition $\sum_j b_j^i x^i \leqslant a_j$

and $x^i \geqslant 0$

where b_j^i is the technical co-efficient showing the amount of the j-th factor needed to produce a unit of the i-th benefit item. The dual programme would then be:

$$\sum_j p_j a_j = \min$$

subject to the condition $\sum_i b_j^i p^i \geqslant q^i$

The solution of this dual programme gives the shadow prices of the factors p_j.

These shadow prices can now be used, in principle, for the purposes of project evaluation, by applying them in the criterion-formula as factor-values.

It will be noticed that in the foregoing procedure for pricing one set of value parameters - that for benefits - was treated as given and only the set of factor prices was obtained by solving the dual programme. The possibility

of treating both sets as unknown, although theoretically admissible [1], will be disregarded here because, so far, it has no practical significance.

Thus, from the point of view of a given development programme, the set of shadow prices represents the value parameters which ought to be assigned to all the "sacrifices" or simply factors, as the case may be in order to make this particular programme into its optimum solution. The shadow prices show the weight of each of the constraints of the given programme, and so they, in fact, show the social values attached to each sacrifice item or factor within the given programme.

When using these prices for evaluating a new investment project in a given accounting formula, what we really do is that we compare the project i.e. its benefits and sacrifices with the conditions of the overall development programme, out of which the shadow prices were obtained. If its net result per unit of sacrifice is greater than zero i.e. $r > 0$ in our general formula it shows that it would be worth while to readjust our programme in such a way as to include the project in question, instead of something that was previously in-

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(1) Cf. O.Lange, Optimal decisions, PWN Warsaw, 1964.

cluded. Thus, shadow prices, in showing the weights of the constraints, can also be interpreted in terms of showing the opportunity cost of each sacrifice or factor always given the development programme.

There is, then, a close link between the actual shape of the accounting formula used for project evaluation and the structure of the development programme which is used to find the shadow prices. Clearly, there would be no sense in evaluating the projects by taking into account other aims and other weights for them than those which appear in the goal function of the development programme. The shape of the accounting formula must, therefore, reflect the shape of the development programme. The adopted simplification of the formula ought to reflect the adopted simplification of the development programme.

Simplification with respect to aims

As was already stated, the technique of finding the shadow prices of a programme presupposes the value parameters of the goal function to be given[1]. With regard to the formula for project evaluation this can be interpreted in a twofold way.

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(1) However, the problem is open as to whether the shadow price derived in this way may affect themselves the subsequent process of aim evaluation.

Either this may mean that from the point of view of the planning body all conceivable aims of development are treated as directly and substitutable for each other which would be equivalent to saying that the general aim of development is to maximize one well-quantified magnitude such as, e.g., the value of the national product; in this case all new projects, irrespectively of the branch of activity which they represent, would be directly comparable with each other by means of the adopted value parameters for aims and shadow prices for factors.

Or, alternatively, it may mean that, because of the difficulty involved in treating all the aims as able, the planning body decides to resolve the general problem of optimum allocation into two groups of problems:

(i) how to choose properly the directions of investment, and

(ii) taking for granted certain directions of investment, how to choose properly the combinations of factors for future production set into motion by means of carrying out new investment projects.

It is the latter approach that seems nearer to the practical solutions in development planning.

When thinking of any strategy of development in terms of building a development programme, the normal situation will be that of having a number of degrees of freedom in choosing the directions of investment. Hence, the decisions concerning particular question must necessarily be arrived at, at least partly, by taking into account not only purely economic considerations. In the programme such decisions acquire the form of certain constraints of the general type of $X^i \geq A_i$ where X^i denotes the future net output of a given good, and A_i stands for the minimum amount to be produced. By treating such constraints as given we are making allowance for the existence of non-economic factors in shaping the strategy of development, and at the same time we get rid of the general problems involved in choosing the directions of investment.

Consequently, in our further reasoning we shall disregard entirely the question of choosing value parameters for aims and concentrate on the second category of problems - that of the value parameters for factors, needed to choose satisfactorily the factor combinations in deciding upon investment projects. This means that, in our general formula for project evaluation, we disregard entirely the problems involved in evaluating the

expression $\sum_i q^i dx^i$ and confine our attention to those of evaluating the expression $\sum_j p_j da_j$, more specifically, in finding the proper p_j-s_x for all the kinds of sacrifices involved.

Shadow prices and the type of the development programme.

There is no general rule about how a development programme ought to . All we know is that any programme must consist of a number of constraints and of a goal function to be either maximized or minimized. The goal function is not at all the same in all cases of development planning. It must be chosen by the planning body. But, depending on the type of the goal function chosen, the shadow prices will acquire various economic meaning.

There are many possible types of programmes that can be used, depending on the particular way of understanding the function of social welfare or, rather, on the particular simplified form of this function that is chosen for practical purposes . It seems that nowadays there are strong reasons to treat as the main form of a development programme that which uses maximization of the national product as the goal function. The reasons are different for different types of countries, but the maximization of national product is widely used as an approximation to the

maximization of social welfare, whatever meaning is ascribed to the latter concept.

However, this maximization of national product can be considered as a goal either in a direct or in an indirect way. [illegible] of certain difficulties involved in direct maximization of the national product, the goal function may sometimes take the form of minimizing social costs.

Thus, it seems that there are two main types of programmes and goal functions used in development planning. One is the programme serving to maximize the national product which will be referred to further on as the A-type programme. The other is the programme in which the desired value of output appears as one of the constraints, while the goal function is that of minimizing the input of a given factor; this will be denoted as the B-type programme.

Both types of programmes can be solved in such a way as to find the corresponding set of shadow prices. But in each case the shadow prices will have a different meaning.

Let us consider both possibilities with reference to an aggregated programme in which the factors will be represented only by two items, each of them homogeneous,

called labour (L) and capital (K).

The A-type of programme will then have for its goal function the national product as the sum total of outputs of various goods x^i to be maximized, subject to two constraints given by the available amounts of capital and labour. This can be written as follows:

$$Z = \sum_i q^i x^i = \max$$

Subject to

$$\sum_i b_K^i x^i \leqslant K$$

$$\sum_i b_L^i x^i \leqslant L$$

with $x^i \geqslant 0$

From this, by writing the dual programme and finding its optimum solution, we can determine the values for $\frac{dK}{dZ}$ and $\frac{dL}{dZ}$ or their reciprocals. These will represent the marginal productivities of, respectively, capital and labour in the optimum. At the same time, they can be interpreted as shadow prices of capital and labour for this type of programme.

The B-type of programme (or, rather, family of programmes) may be described as a programme where the goal function is either capital minimization or labour minimization, while the other factor and the value of output are the

constraints. It is easy to see that the shadow prices derived from this type of programme will represent the price of capital or labour, depending on which factor appears in the goal function in terms of its marginal rate of substitution to labour, or vice versa. Their general form will then be $\frac{dK}{dL}$ or the reverse of it.

Obviously, the terms "shadow price of capital" or "shadow price of labour" mean different things in each case. They acquire full meaning only when it is added to what type of programme they refer. Their similarity is only in that, in each case, they reflect the allocation of productive factors in a development plan. But, since in each case they reflect different objectives though the initial situation may be exactly the same in terms of constraints they necessarily differ in the kind of information they give:

(i) in the former case they inform about what prices ought to be charged to the factors in order to obtain a maximum national product, given the circumstances;

(ii) in the latter case they inform about the optimum rate of substitution between capital and labour to obtain a desired level of output, given the circumstances.

Since the two sets are conceptually quite different, they can be quantitatively correspondent to each other

only by chance. Still there remains the question when or under what conditions a set of shadow prices derived from one programme is equivalent to respective prices derived from another one. Given the same initial economic conditions and spectrum of techniques, the solution of the B-type programme would be equivalent to that of the A-type only provided that the value of output used as a constraint in the B-type would be equal to the maximum of the function arrived at in the A-type. But this can happen only by pure chance.

It may be taken for granted that in most cases the A-type of programme would be most suitable for the purposes of development programming. But then the question arises as to the desirable degree of aggregation with respect to factors [illegible]. The assumption of [illegible] of labour and capital obviously cannot be admitted for any purposes other than purely theoretical. Moreover, the assumption of a given structure of the product to be maximized creates its own difficulties for the practical approach. Thus, the [illegible] needed to build up and solve this type of programme is too great to make any possible use of it in practice.

Hence recourse is frequently taken to the B-type of programme which seems better suited for making justifiable

simplifications. In this sense the B-type of programme may serve as a substitute for the A-type, although its optimum may be treated only as an approximation to the A-cype optimum, if actually the maximization of national product is treated as the desired end in itself. It is only if we hit at a maximum of the national product in determining the condition for a B-type programme that the two solutions would be equivalent. But it would seem rather obvious that the procedure of arriving at a maximum of this kind in the B-type models would be very cumbersome.

It must, however, be noted that the B-type of programme may, in certain cases, be treated as desirable to use not as a substitute for the A-type, but for its own merits. In such a case the shadow prices of such a programme would preserve their full meaning, subject only to the simplifications of the programme itself and not having to be treated as a kind of substitute and approximation to those derived from the A-type programme.

<u>The aggregation of the programme and the use of shadow prices</u>.

Since the shadow prices which are to be used in the formula for project evaluation are entirely dependent in their economic meaning on the type of the programme

chosen for the purpose of finding the optimum solution, it follows that the degree of aggregation of the shadow prices is also dependent upon the degree of aggregation of the programme. If, e.g. we consider a highly aggregated programme of the A-type formulated in terms of maximizing the national product subject to the constraints of capital and labour, what we obtain as shadow prices are aggregated value parameters for capital and labour related to the national product. If, on the other hand, we consider an equally aggregated programme of the B-type, where, say, minimization of labour outlay is the goal function, we derive from it the price of capital in terms of saving the labour outlay, i.e. a rate of substitution of capital for labour. But if either of the programmes was to some extent disaggregated, e.g. if the capital constraint were presented in the form of several constraints, separately for various groups of capital goods, then we would be able to derive from the programme a set of shadow prices, a price for each of the groups of capital goods.

Let us concentrate on the example of the B-type programme and think of the shadow prices in terms of rates of substitution between labour and capital. Of course, it would seem perfectly sound to aim at getting individual rates of substitution (capital-labour) for every kind of investment goods. Thus, we would have instead of one uniform

rate p a set of rates p_j, j=1,..J.

Using one uniform rate would mean that, in the accounting formula for project evaluation, the expression representing total cost would take the form:

$$\sum_j p_j a_j = p_K \cdot K + p_L \cdot L$$

But, as p_K is derived from the B-type programme as the shadow price of capital in terms of labour, p_L would equal 1 and the whole expression would be simplified into

$p_K \cdot K + L$.

Similarly, with differentiated prices for various capital goods, the expression would take the form:

$$/ \sum_i p_K^i \cdot K^i / + L$$

where i = 1 ..... I represents the number of separately treated capital goods. It would certainly be desirable to have the set of prices p_K^i. However, to arrive at such a desirable state of affairs seems still nowadays practically impossible. On the other hand, there does exist a commonly cultivated and well-established practice of using in project evaluation a uniform price of capital in terms of labour, i.e. rate of substitution.

But, of course, in the expression $p_K \cdot K$ (where p_K stands for the uniform price of capital) the need remains

to price somehow the different capital goods included in K. Therefore, the formula used commonly in practice may be presented as:

$$p_K \cdot K = p_K \cdot \sum_i p_i \cdot k_i$$

where k_i represents the quantities of various capital goods, while p_i their prices "subordinated" to the general price of capital p_K. In this expression only p_K is a shadow price of capital derived from the given development programme, while the question of finding all the p_i remains open. The practical solution is often to use the market prices for the p_i.

A closer look at the practical formula informs us that the final result (the price of capital) is the product of a general price of capital and the prices of individual capital goods.

We may, then, arrive at the same price of capital in the two different ways:

(1) by using different prices p_i and a uniform p_K

(2) by using differentiated p_K rates.

The former way seems more practical: there exists always some set of prices reflecting better or worse the supply-demand conditions and the use of uniform rate is more operational.

But the very observation of the existence of the two ways means to underline the fact mentioned earlier in general terms that there exists substitution between the shape of the accounting formula used for project evaluation and the set of prices used in this formula. It may be even safely said that this rule of substitution dominates the field of pricing in project evaluation. This means that in determining the prices to be used the shape of the accounting formula should be clearly kept in mind, and vice versa. This is sometimes overlooked by those who are anxious to stress one-sidedly the role of the price structure in project evaluation.

Furthermore, this observation points out that to use a uniform, aggregated shadow price such as the p_K in the example given above can hardly mean a satisfactory solution of the problem of pricing in project evaluation. If this shadow price is used in combination with market prices, the ultimate effect is difficult to predict: it may happen that the use of market prices levels off the benefits of using the shadow prices derived from an aggregated programme.

The models of long-term growth usually assume an integrated network of competitive markets in a market economy or a high degree of centrally directed mobility

of production factors in a centrally planned economy which permit a high degree of aggregation, and so they are of limited relevance to the less developed countries with their

- fragmented economies,
- very imperfect markets,
- and badly based price relations.

Theoretically then shadow prices derived from such over-aggregated models are of limited value.

Part II. The accounting prices and some methods of their computation

The theoretical solution being known, the problem arises how far it is possible to use the shadow prices in actual prices.

Attempts observed all over the developing world to overcome existing there structural disequilibria and by the same taken to put a firm ground for future economic development lead necessarily to the elaboration of some kind of development plans. It is rather obvious that governments or special agencies in charge of planning aim at the elaboration of optimum programmes as close as possible.

But, so far, it must be impossible to build up a detailed programme, determined in every detail and, in a sense, infallible. This is so because of inadequate information or inability of processing the information which would be available. Therefore, in actual practice, the value parameters that are to reflect a certain development programme must be nothing more than approximations to the ideal shadow prices that would be derived from a perfect over-all programme. This is due to several reasons, some of which are the following:

(i) the programmes and, accordingly, the accounting formulas are simplified by disregarding some of the independent variables both on the benefit and the sacrifice side;

(ii) production factors are aggregated into broad groups and simplified assumptions as to the inter-factoral substitution are adopted;

(iii) the methods of computation are far from being precise.

In order to draw a distinction line between these approximated value parameters that can be arrived at in real practice from those that would be derived from an ideal model, we shall call the former ones accounting prices, while reserving the term "shadow prices" for the latter.

There seem to be two main features of the actual methods of computing the accounting prices as approximation to shadow prices. One is that they are derived from what may be called partial solutions. The other is that they represent aggregative value parameters and as such are subject to the qualifications made with respect to aggregative shadow prices above.

It must be noted, however, that there is something to say in defence of the aggregative value parameters, when they take the approximated form of accounting prices. Namely, if they were to be disaggregated according to types of factors and time periods, they would have to be currently adjusted. But the very procedure of current adjustment is rendered unnecessary when we have to do with approximations of a broadly aggregative nature.

It has been observed that "despite the greater potential efficiency of planning decisions made by the use of accounting prices, they have rarely been calculated" and used in planning [1]. The reasons for such a state of affairs are obviously manifold. It has been brought out

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(1) The Use of Accounting Prices in Planning by G.F.Papanek and Moeen A.Qureshi United Nations Conference on the Application of Science and Technology .... E/Conf. 39/H/81.

that inter alia, the concept of accounting prices is difficult to make plausible and acceptable to non-economists engaged in economic activities. It seems that this is linked with a still poor understanding by many of the role of a plan in a development process. Actual practising in planning should mean a great deal in this respect and seems to be quite promising. On the other hand, accounting prices are not easy to calculate:

- there are vivid disagreements on the approach and basis to be used for their calculations theoretical obstacles .
- there are inadequate data and acquiring them is costly and time-consuming bussiness information obstacles.

Finally, the application of accounting prices presupposes some requirements in practice not so easy to meet as regards the organization of an economy and its economic policy [1].

Notwithstanding these obstacles and in the absence of detailed informations that would be needed for setting up a comprehensive inter-industry programming framework various methods are suggested in which the rationale

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(1) For instance, a developing country can take advantage of accounting prices only under condition of the existence of sufficient supply of bankable industrial projects.

of the ideal analytical tool - a model of an optimal development programme - is attempted to be followed by approximation.

Generally speaking, the essence of all those simplifications boils down to the fact that they are all partial solutions. As an alternative to a solution derived from an over-all programme, partial solution means to determine the accounting price for each factor separately.

This opens a broad range of possibilities and dilemas before planners. First, they face the [illegible] which one of all the conceivable approaches to choose in a given situation and, second, how far to go in the refinement of a would-be-applied method.

As to the procedure, some rationalization - stemming from the practical experience - might be observed in the behaviour of relevant planning authorities as regards the computation of accounting prices.

[illegible] use accounting prices at all are anxious to compute the prices of these factors which are [illegible] in shortage. And so, there are countries which bother, above all, about how to estimate the right rate for foreign exchange, some other care first of all [illegible] the capital interest rate, and still other are primarily concerned about wage rate.

It is obvious that each of these approaches depends on the current economic situation and the way of viewing of the present and future development of the domestic economy. The latter express itself also in the choice of time horizon as a basis for computation of accounting prices. There does exist a close relationship between the institutional framework and "picking up of approximate accounting price. For instance, in a mixed economy as an accounting price of a given factor can be picked up some actual price out of few only checked against others. On the other hand a centralised economy by necessity due to the uniform prices rule requires deriving of accounting prices from some sort of an economic model.

Although accounting prices - as it was earlier mentioned - have rarely calculated and even more rarely applied in developing countries there exists a substantial and growing body of mostly methodological experience and suggestions as to their estimation.

It is beyond the scope of this paper to give a detailed and exhaustive survey of all the endeavours in the field of estimation and application of the accounting prices. However, it is possible to point out the main devices and approaches used in order to arrive at some applied in practice set of accounting prices. Motivated by the most general feature of all these calculations

partial solution-we order this outline, first of all, according to character of resources i.e. capital, labour and foreign exchange. Accounting prices of natural resources are not considered here since they are computed in practice only in very sporadic cases.

Accounting price of capital

commonly used ways of calculation of an accounting price of capital.

1 Approving one out of the existing "market" interest rates as a social rate of interest on capital. For instance, "In Pakistan the discount rate of the central bank has been around 3 - 4 percent, the interest rate charged by commercial banks ranges from 4 - 10 percent, and money-lenders may charge 25 - 40 percent or more. However, it appears that at times industrialists and businessmen obtain funds from each other at rates ranging from 10 - 15 percent". The last rate has been chosen on the ground of the following reasoning: "the central bank discount rate and the rates applied to government transactions are established with little regard to the productivity of capital and tend to be too low. On the other hand, interest rates outside the organized money market tend to be too high because of monopoly elements, high administrative costs and high risk premiums. It might be possible, how-

ever, to find market interests that are least affected by institutional factors" [1]. Thus the rate 10 - 15 percent has been regarded as that least affected by institutional factors and against can be checked interest rates obtained in some other way.

Another method is sometimes recommended which is indeed very similar to the one just outlined. It consists in deriving an average interest rate from multiple current rates.

2) "The marginal productivity of capital understood as an accounting interest rate can be derived by obtaining the rate of return (earnings minus costs for the marginal project in a field where cost-benefit calculations are feasible". In practice "The marginal productivity of capital ...can be approached by obtaining the rate of return on the proposed government industrial project with the lowest return among those included in the development program (ignoring any projects included largely for non-economic reasons). In those calculations the prevailing interest rate can be used in calculating investment costs and in discounting future cost and benefit streams. The result is a first approximation to a rate of interest which can then be used to recalculate the rate of return

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(1) G.F.Papanek and M.A.Qureshi, op.cit.

for a few industrial projects to find a new marginal rate of return. This more refined rate of return on capital employed in industry can then be checked by similar calculations for projects in other fields and for private industrial projects on which reasonably reliable information is available". It remains only to establish reasons for which government industrial projects are considered as suitable for calculating the marginal productivity of capital. The arguments for it are as follows: "Generally, information will be most readily available on proposed government investments ..." with less deliberate [illegible] "In addition, government projects are more likely to include some with returns that are marginal or close to it, since private enterprise will seek high profits while government will undertake some projects it considers desirable, though less profitable". Industrial projects are preferred for better availability and manageability of data, too. Calculations carried along these prescriptions in Pakistan for the First Five-Year Plan proposed government industrial projects revealed that: "The rate of return on the projects that could be included in the development plan ranged around 12 - 15 percent, including some important private investments" (1).

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(1) Ibid.

(3) The third way of an estimation of an accounting price of capital commonly used in a majority of Centrally Planned Economies CPE is marginal of"recoupment period." We placed this method as the last one on our list arranged in an ascending order of refinement of the most commonly used methods of computation of an accounting price of capital. It happened for two reasons: first, this method has been used in several countries for some time, secondly, it has been derived in some interpretions explicitly from two-factor model labour-capital.

The marginal "recoupment period" represents the accounting price of fixed capital valued in terms of labour; it is arrived at under certain simplifying assumptions, but is actually used for the purposes of investment choice.

Conceptually, the notion of the marginal "recoupment period" stems from the necessity of comparing, in deciding upon the choice of any particular investment project, the investment outlay with the current cost of running the plant which is to be constructed. It can be assumed that all the possible technical variants of constructing the plant can be arranged in the order of increasing investment outlay per unit of future product which at the same time will mean a decreasing order of

current cost of production per unit of the produot, all other technical solutions being disregarded as obviously effective or absolutely ineffeotive. If we assume that the current cost of produotion is meant in terms of labour only, and that there is perfect homogeneity both of labour as representing current costs of production and of capital as investment outlays then the problem is reduced to that of substitution of capital for labour or vice versa along the isoquant representing the desired future output. It is obvious that the chosen solution will depend upon the constraints and the goal function of the programme. Anyway, the arrived at solution will always be characterized by a certain rate of substitution between labour and capital. Given the constraints, the rate that can be adopted for the economy as a whole, when expressed in terms of the number of years necessary to repay the extra amount of capital by the annual saving in current cost, is the marginal period of recoupment.

The concept of the "recoupment period" used in socialist countries for investment project evaluation, is sometimes understood as the time needed to recuperate the capital invested assuming a given amount in terms of aims obtained annually

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1 See e.g. J.Tinbergen, Project Criteria, in: Economic Planning, The Hague, 1963.

This understanding would classify the "recoupment period" among different simplified versions of criteria for project [illegible] It is, however, based on a certain confusion, resulting from formal similarity to the general formula of the criterion. In actual fact, the "recoupment period" can best be interpreted as [illegible] reciprocal of the interest rate and thus not as a criterion for the choice of projects, but as the price assigned to the capital invested.

Indeed, let us recall the general criterion for project evaluation in the form suggested by Prof. Tinbergen:

$$r = \frac{b}{s} = \frac{\sum_i q^i \, dx^i - \sum_j p_j da_j}{\sum_j p_j da_j}$$

where b stands for the amount obtained in terms of aims from a given project, and s stands for the cost of carrying out the project, the dx^i representing increments in various aims valuated at q^i, while da_j denoting different cost items valuated at p_j. This formula can be simplified in various ways, one of them being such as to make b mean the annual increment in the value of (net) national product, while s would mean total annual cost both of capital and labour needed to produce this increment, best understood

on the assumption of homogeneity of each of these factors. With this in mind, let us write:

$$s = K.m + L$$

where K stands for the amount of capital outlay, m - for the interest rate, and L - for the annual cost of labour. Instead, we may also write:

$$s = \frac{K}{T} + L$$

where T would mean the "marginal period of recoupment" as used in the practice of socialist countries. It is obvious, then, that T is not per se a criterion for project evaluation, but a method of bringing capital outlay to common denominator with labour outlay, i.e. a way of expressing the price of capital.

What may be, however, misleading about it, is the very name attached to it. The reason for using it becomes clear when we take into account that, when comparing two variants of a project which, to simplify the reasoning, are both characterized by the same value of b (increment in aim), we may use either of the two methods:

(1) use a standard value of the "marginal period of recoupment" and find out the relation between the following two expressions:

$$\frac{K_1}{T} + L_1 \gtreqless \frac{K_2}{T} + L_2$$

which may also be written as:

$$K_1 m + L_1 \gtreqless K_2 m + L_2$$

where $m = \frac{1}{T}$ is a standard rate of interest; here we would tend to choose the variant with the minimum sum total of costs; or

(ii) use a direct way of comparing the two variants by finding the relation between the extra amount of capital needed to bring about a decrease in the labour cost, i.e.

$$\frac{K_1 - K_2}{E_2 - E_1}$$

The above ratio may be, for any pair of variants, interpreted as the number of years in which the extra amount of capital $K_1 - K_2$ is going to be recuperated by the reduction in the annual cost of labour $E_2 - E_1$. Hence, it may be called the "individual recoupment period" for project (1) as compared with project (2) and may be denoted here by T'.

It is easy to see that, for any pair of projects, the magnitude T' represents a rate of substitution between capital and labour. If we imagine that all the projects for a given economy are presented in an increasing order of this rate of substitution, then we necessarily arrive at a maximum acceptable rate which is determined by the

existing constraints with respect to the available amounts of both capital and labour. This maximum rate is nothing else but the "marginal period of recoupment" denoted earlier by T. Thus, to choose a variant, it becomes necessary to fulfil the condition T' T. It is in this sense, but only in this sense, that the "period of recoupment" may be interpreted to be a criterion for choosing investment projects.

It is of some interest to note that the capital interest rate as the reciprocal of the so called standard "recoupment period" commonly used in CPE varies within the range of 15 percent.

Accounting price of labour

It is well-known that "a major difficulty in calculating the accounting price of labour stems from the fact that labour is a much less homogeneous and mobile factor than capital, and institutional considerations are an even more important source of imperfection in labour than in the capital market" (1).

It is commonly admitted that because there are various categories of unskilled, semi-skilled and highly skilled labour and their supply varies in particular areas

(1) G.F.Papanek and M.A.Qureshi op.cit. p.3.

and at particular times of the year the only correct procedure would be to calculate the accounting price of labour separately for each set of circumstances. Evidently, this is not feasible nowadays. The pricing problem of labour in project evaluation is being solved in different ways in different countries.

(1) There are countries in which the current market prices of labour i.e. actual wage rates are used. Project evaluation men reason that although the labour market is undoubtedly imperfect, actual wages to a considerable extent reflect differing circumstances with respect to skill, seasonality of work and the cost of social overhead facilities. This approach "leaving as it is" may prove satisfactory in smaller countries with a relatively high mobility of labour. Unfortunately, the method "leaving as it is" is too often used in countries with obviously contrary conditions.

(2) There are countries in which planners busy with the industrial project evaluation are trying to estimate some sort of accounting price for labour. In practice, it takes the form of introducing a new set of wage rates or correction of actual wages.

The first approach is linked with the way of taking into account the problem of hemogensity of labour. Labour is usually broken down into two broad categories: unskilled and skilled labour.

It is considered that, as regards skilled and professional labour, the divergence between market wages and real social wages is in the opposite direction from unskilled labour: market wages tend to be below real social wages. However, since a it is too difficult to calculate accounting wages for these workers because there are too many disparate groups and, b most allocation decisions are in any case not very sensitive to accounting prices for very specialized and scarce manpower, it is sufficient to calculate accounting wage rates for unskilled and semi-skilled labour.

An estimation of an accounting price for unskilled labour involves usually in developing countries the estimatinn of its marginal productivity in agriculture. It is so because the bulk of labour employed in new industrial projects in those countries stems from agriculture. As it can be easily guessed the marginal productivity of labour in agriculture in developing countries may vary in a quite broad range. It may be a zero, somewhere above zero or, even in some special cases below zero. Technically, the process of its quantitative estimation is not a simple one.

Generally speaking, attempts to take into account an even geographical labour distribution in project evaluation can be met more often. The way of reflecting

the labour immobility in wage rates used in accounting formulae may be illustrated by means of wage correction methods applied in CPE.

There have been suggested two methods of taking into account social costs caused by the uneven labour distribution, especially in those countries where the latter phenomenon is very preminent.

(1) The differentiation of wage rates in an accounting formula regionally according to labour market situation.

(a) In regions of labour shortage current wage rates are to be multiplied by coefficient, say w, greater than 1.

(b) In regions of excess labour supply actual wage rates are to be multiplied by the coefficient lower than 1.

(2) The differentiation of the "recoupment period" in the accounting formula.

(a) In a region of the labour shortage the "recoupment period" in the accounting formula T' is to be lower than the standard "recoupment period" $T' < T$.

(b) In a region of labour excess T' is to be higher than T i.e. $T' > T$.

Both methods are giving the same results as it can be seen from the "basic" form of the accounting formula commonly used in some CPE.

$$\frac{I}{P} + K = \min.$$

where: I - investment outlays,

T - the standard "recoupment period",

K - production costs,

P - output.

The accounting prices of foreign exchange

The practical experience shows that the use of the accounting price for foreign exchange for both the cost and return side, substantially change the relative priority of some industrial projects.

There have been developed several approaches which, it is understood, can be applied in different situation in order to obtain the practically useful accounting price for foreign exchange. We confine ourselves in the [illegible] only to a few of the most important and interesting methods of its computation.

(1) "In an exchange system which relies exclusively upon multiple exchange rates to maintain balance of payments equilibrium, the weighted average effective rate should give an approximate indication of the accounting exchange rate. Similarly, in a system with a unitary exchange rate but with reliance upon tariffs and subsidies, the total amount of customs duties collected, plus subsidies paid out as a proportion of total imports plus exports, should indicate the

undervaluation of foreign exchange. In both cases, the assumption is made that there are no long-run gains or losses in exchange reserves. These approaches remain useful so long as direct controls are not an important means of achieving a balance in foreign accounts. The more important the direct controls, the more these calculations become a check on other methods rather than the primary method for calculating the accounting foreign exchange rate.

2) A second approach is based on the application of the purchasing power parity theory. This involves the calculation of the accounting exchange rate from a comparison of the variation in the country's prices, over some reasonable period of time, with that in some other country which has approximate equilibrium in its balance of payments and no reliance on restrictions. According to this approach, the relative variation in the price levels in the two countries should be proportional to the relative variations in their exchange rates. The main limitations of this approach are: (a) it is difficult to find a suitable period for purposes of comparison since one must start with a certain "normal" stage in the country's balance of payments; (b) price data are frequently neither adequately comprehensive nor sufficiently comparable; and (c) it takes no account of the fact that over a period of time, economic growth and

other changes can profoundly alter the structure of demand and of imports and exports of a country.

A variant of the above approach is to compare prices in the country and in the world market for the major domestically produced and consumed commodity or commodities and derive the exchange rate from their relationship. This is, if the country primarily produces and consumes rice, and the price of rice is 1,000 monetary units per ton while it is $ 200 per ton on the world market (c.i.f.) one would conclude that the accounting exchange rate should be five units to the dollar. A comparison of goods that are largely imported or exported is not of much use for this purpose since their international price and the official exchange rate are the main determinants of their domestic price. This method is therefore useful only when (a) the country produces and consumes itself one or a few commodities that make up a substantial part of the GNP; (b) these commodities are traded internationally but are not major imports or exports for the particular country; and (c) there are no serious problems in comparing quality. Even so, the method has substantial weaknesses since the prices of domestically produced and consumed commodities are often strongly influenced by institutional and other domestic factors which introduce price distortions"[1].

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(1) G.F.Papanek. op.cit.

(3) The extent of the necessary adjustment in the actual exchange rate can be obtained by looking at the profitability of exports and imports, especially the former. As an illustration of such an approach we shall quote extensively the method applied in Israel
This method rests upon inputing an accounting price to capital and labour and comparing projects on the basis of the implied cost per unit of foreign exchange.
"In practice, and in the absence of better information, labour is valued at its market price, and capital is imputed some rate of interest equal, say, to the real marginal cost of foreign borrowing 8 percent is the accepted government practice . In principle one should then compare the implied cost in domestic resources per unit of foreign exchange earned in case of exports or saved (in case of import substitutes with an accepted measure of the accounting exchange rate" . If the latter is unknown all one can do is to list projects by order of increasing "exchange cost" and follow the list in an upward direction till investment funds are exhausted. In illustrating this we shall confine ourselves

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(1) On Investment Allocation Criteria Under Disequilibrium Factor Pricing by Michael Bruno (Prepared for the E.C.E. Conference on Criteria for Investment Policies, Geneva, 1962).

(2) Clearly, if the accounting prices of the various factors were guessed correctly this method should give the same result as the previous "social profit" calculation.

to the case of exports.

Table 1.

BREAKDOWN OF PRIMARY INPUTS INTO REAL DOMESTIC AND IMPORTED COMPONENTS

(Auxiliary table for computations)

Total item	Domestic Component (C_L)	Foreign Exchange Component (C_s)	Remarks
1.	2.	3.	4.
Breakdown of capital stock			
K_1 - Imported equipment	-	K_1	
K_2 - Domestic equipment	+ 0.80 K_2	+ 0.20 K_2	Based on import component or equipment sect
K_3 - Structures	+ 0.86 K_3	+ 0.14 K_3	Import component of structure branch
K' - Inventories	+ 0.60 K'	+ 0.40 K'	Import component of change in inventory in 1958
$K_1+K_2+K_3+K'$ = Total Capital Stock	K_L	K_s	Definition: Sum total of above
Costs entering the profitability calculation			
0.08 $/K+K'/$ = Accounting profits	0.08 K_L	0.08 K_s	Based on the 8% profit assumption

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1.	2.	3.	4.
D - Depreciation	D_L	D_s	Arb. allocated according to capital
M - Imported raw materials	-	M	
W - Compensation of employees(b)	W	-	
$C_s + C_L$	$C_L=0.08K_L+$ $+D_L+W$	$C_s=0.08$ K_s+D_s+M	Total real social costs

(a) Clearly the depreciation rate of the two components of capital should not be the same, but the error involved in this simplifying assumption cannot be great.

b) We here assume that the market price of labour reflects the real social cost involved.

More specifically, suppose that the commodity in question has been broken down into its primary direct and indirect input components with all imported ($) cost items including raw materials, replacement and accounting interest on foreign equipment and all domestic (IL) components kept under separate headings, denote these by C_s and C_L respectively, all in terms of a commodity unit in domestic prices (1)

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(1) In the following calculation, based on a 1958 input-output table, C_s is expressed not in dollars but in Israeli pounds converted at the then existing official exchange rate of 1.80 IL./$. The latter was raised to 3.00 IL./$ in February 1962.

Table 1 sets out the ingredients of this calculation in schematic fashion which, we hope, is self-explanatory.

The ingredients of this calculation might be clarified by relating them to the usual exhaustive breakdown of a commodity unit into its primary direct and indirect cost elements: Imports M Compensation of Employees W Depreciation D Remuneration of Capital P and Taxes net of Subsidies (T-S) We have:

$$M + W + D + P + T - S = 1$$

Comparing this identity with total real social costs (domestic + foreign) as derived from the individual components in Table 1, we obtain:

$$C_L + C_S = 0.08(K+K') + M + D + W = 1 - (T-S) - (P-0.08(K+K'))$$

In other words, the difference between total real social costs, as here defined, and between total inputs resources as defined in the national accounts, say, lies in the subtraction of net indirect taxes which do not constitute costs to society and of the "excess remuneration of capital", where the latter is defined as the difference between the actual remuneration of capital and the imputed 8 percent. i.e. we regard any such "surplus profit" as a transfer payment and not as a real cost item.

All we need now is an estimate of what the unit of commodity in question would fetch on the foreign market.

Denote this by R_s, which again was, in this case, evaluated in IL. at the existing official exchange rate 1.80 IL/$. The cost per unit of foreign exchange earned in that commodity is then defined as:

$$r_x = \frac{L}{R_s - C_s} \quad 1.80 \text{ IL/\$}$$

For illustrative purposes this measure was here worked out for a 42 branch breakdown of the economy in 1958, based on an input-output table of the same order of detail. For planning purposes much greater detail would be required".

4) Still another method of computation of the accounting price of foreign exchange was suggested in Poland by M.Kalecki and S.Polaczek[1]. The exchange rate is obtained by comparing, when starting from any initial situation, the value of a possible extra amount of foreign exchange to be earned (or saved) with the corresponding increase in home market supply needed because of the rise in total wage fund caused by the effort to earn (or save) this extra ammount. The increase in the home market supply involves a certain loss of foreign exchange which corresponds to its content of raw materials (either in the form of extra imports or of

(1) Gospodarka Planowa 1957 No.4. In the course of a subsequent discussion several refinements were suggested, also by the present authors. The main approach remained, however, unchanged. It is presented here in a generalized way.

a fall in exports of raw materials). The latter foreign exchange input to the home market supply is directly comparable to the extra amount earned or saved provided that the input per unit of market supply is independently estimated. The rate of exchange obtained in this way depends both on the initial and the aimed-at situation. If the initial situation is that of equilibrated balance of payments, and we aim at preserving this equilibrium, then the result is obtained by assuming that the amount of foreign exchange earned or saved must be equal to the additional input of foreign exchange needed to raise the home market supply appropriately. This method of computation seems to be particularly suitable for situations in which foreign trade is administrated mainly by means of direct controls, with the state monopoly of foreign trade as the extreme case.

Part III.

Impact of the institutional set-up on the use of accounting prices in project evaluation

Having overcome all the difficulties involved in arriving at some [illegible] set of accounting prices, the governmental body in charge of designing and implementing a development policy faces two serious problems concerning

the application of accounting prices. The first relates to their immediate use for project, especially industrial project evaluation. The really economy-wide application of accounting prices requires creation of a suitable information and inducement mechanism which would be able to bring in line all the investment decisions of various levels. We can expect that this mechanism depends largely upon the institutional set-up.

On the other hand the arrived-at set of accounting prices might be used as one of the very important guidelines for an [illegible] improvement of the market prices structure. This aspect of the use of accounting prices must be emphasized since it is frequently neglected. The use of accounting prices as such guidelines would embody the fact that it is possible to come closer to an ideal price set only by a process of trial and error. The use of accounting prices [illegible] for a price reform can be of particular importance in countries, where in certain time periods occurs a high concentration of major investment decisions which are bound to determine the future course of economic growth, and also where individual investment decisions are more susceptible to price fluctuations.

Investment decision models

In any institutional set-up project evaluation constitutes an important element of investment acitivities. The difference between different set-ups is that of ... and procedures of evaluation.

To begin with, two extreme investment decision models may be distinguished: that of a market economy and that of a centrally planned economy. Let us call here by a market economy an economy in which all the investment decisions are made ... by individual decision-makers (IDM), no centrally made strategy for development being existent at all. In this case the IDM's have no alternative but to make their decisions on the basis of: a current market pri..., b expectations as to future price changes. The outcome of their decisions is a certain development path of the economy which brings about a definite set of prices after a certain period. Thus, in such a model, one has to do, for any period of development under consideration, with at least three sets of prices:

(i) the initial set of current market prices,

(ii) the expected set of market prices (which, of course, may not be uniform because of different price expectations of the IDM-s),

(iii) the real future set of market prices.

It is the divergence between (ii) and (iii) which leads to the emergence of undesirable maladjustments which possibly may prove some investment decisions to be false. It is unnecessary to enter into this point here.

The other extreme may be conceived of as a fully centralized economy in which no use at all is made of price calculation in its practical investment decisions.

All investment decisions are made by a central board (CB) which forms both its entire strategy of development and its judgments about different investment projects solely on the basis of physical balancing. Clearly, certain price sets can be deduced from these decisions, but they are not made an actual instrument of decisions. This decision model offers no practical possibility of optimization and, beyond that, it may be thought of as workable only in very specific circumstances.

Against the background of these two extremes it may be said that neither of them fits nowadays to any kind of reality. The real case (or, rather, all real cases) lies somewhere in between: it embraces both the CB and the IDM-s. The CB is the body responsible for making an over-all development plan; the IDM-s are the bodies responsible for particular investment decisions. The difference between different particular cases consists

in the different endowment of the CB in the instruments to influence the decisions of the IDM-s so as to make them conform with the overall strategy.

It may be safely assumed that in any type of economy the reason for preparing a development plan is to try to carry it out; but this proves to be more or less difficult because of more or less unsatisfactory degree of manageability of the economy, which in turn results from different reasons. The non-manageability of the economy means that the decisions of the IDM-s are not easily influenced in the desired way by the measures available to the CB. Thus, in any type of the economy, provided only that the CB does exist and does elaborate a certain strategy of development, it must strive to affect efficiently the decisions of the IDM-s through:

(a) giving them enough information as to what they ought to choose in order to make their decisions consistent with the overall strategy,

(b) making them willing to use this information in their investment decisions in the socially desirable way.

For the sake of brevity, let us call the task (a) of the CB - "information", and the task (b) - "inducement".

The actually existing types of investment decision models differ in the (i) available, (ii) necessary, iii employed measures and instruments of performing these two tasks by the CB[1].

Since, by definition, we mean by a "market economy" an economy without CB, we may exclude it from further consideration. It may, however, be worth while to show that even in this type of economy these two tasks are performed: the IDM gets both his information and his inducement from the "invisible hand" of the market. This information is imperfect because the invisible hand does not prepare any development plan, and so it rests within the range of impossibility to make the information perfect

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(1) Some of the developing countries have been subject to repeated sharp bursts of price inflation. Such inflationary processes may mean a serious impediment to the efficacy of performing those two tasks. Thus, inflation might strongly influence two groups of problems connected with project evaluation:

- it decreases the degree of accuracy as regards predictions of future price trends which preserve their importance when aggregative (and relatively stable) accounting prices are used; this may lead to unsallocations in investment;
- it can badly lower the efficacy of the price system as an essential part of the inducement mechanism.

In both cases inflation means an increased degree of uncertainty of project and programme evaluation.

with regard to price expectations.

What remains to be discussed is a planned economy in which investment decisions are to some extent decentralized, and a mixed economy. The difference between them is in the existence or non-existence of the private sector. In other words, the IDM-s may be either public or private enterprises or both. But this does not bring about any great difference to the main economic problem of the CB: how to provide the optimum information to the IDM-s. It only affects the techniques of inducement.

The problem of how to prepare the necessary information was treated at some length while discussing the methods of computation of both shadow and accounting prices. But, evidently, the best information is not enough. In other words, the problem of how to arrange adequate inducement must necessarily arise even if we have to do with a perfect set of shadow prices (such as can be imagined only in theory).

Let us stress that in an economy designed by the CB, the accounting prices are to play the same role in investment project evaluation as that played by the expected set of market prices in a market economy. This is, then, the direction in which the inducement mechanism ought to work. It is its efficiency in this particular

respect that depends on the institutional set-up of the economy.

Influence of specific investment decision models on the role of accounting prices

Assuming a given system of information transmitting the strategic ideas of the CB to all the IDM-s, the actual system of inducement which is necessary to make the IDM-s use this information in the proper way, depends on certain features of the institutional set-up of the economy. It seems helpful to distinguish two broad cases: the case of the submissive IDM and the case of the resistant IDM.

By a submissive IDM we mean such a low-level projecting unit which has no reasons of its own to be unwilling to act accordingly to the information obtained from CB. In other words, having no individual goal functions of its own, it is willing to act accordingly to any information received from the CB. It will be understood that such a situation of the IDM vis à vis the CB can hardly be imagined in practice in its pure form. We can, however, think of real cases which are relatively near to it. This happens when the individual interests of the IDM can have only minor influence on the nature of its projecting work and choices.

By contrast, the resistant IDM is the projecting unit which has strong reasons to act according to its own goal functions instead of submitting to the information received from the CB. It has its own understanding of the current economic situation, its own expectations and its own methods of calculation. An obvious example of the resistant IDM would be the private form in a mixed economy. This, however, is by no means the only possible example. The situation is very similar in a planned economy based on public investment, if the investment decisions are to

some extent decentralized. The public IDM may then have its own goal function, although differing from that of the private IDM, but making him resistant enough to the information coming from the CB.

Let us consider first the case of the submissive IDM. This occurs when, due to the institutional set-up adopted for the purpose of management of the public sector, investment projects are prepared by such special units ("projecting agencies") as would be made entirely uninterested in the future performance of the new plant built according to their projects. This split between the projecting work and the future economi erformance makes the project-maker submissive to any information coming from the CB. He is entirely uninterested in what particular set of prices he uses in his projecting work, and what particular method of comparing the effectiveness of different projects of project evaluation he is instructed to use. The decision upon the set of prices and the criteria for evaluation belongs to the CB, while the IDM is supposed to set in the assumption that whatever are the prices and the fomula chosen by the CB, they reflect adequately the overall strategy of development and there would be no ground for using any other data (such as, e.g., current market prices). It is obvious that, because of the very submissiveness of the IDM-s, such institutional system requires high efficiency in preparing the necessary information by the CB. The set of prices given by the CB to the IDM-s must indeed reflect very adequately the strategy of development, since otherwise the investment choice made throughout the economy would necessarily become more or less blind.

Thus, in the case of the submissive project-maker, the accounting prices as the instrument of information acquire an absolute meaning in the sense that any

set of accounting prices prepared by the CB has the same kind of influence on the actions of the IDM-s.

It should, perhaps, be noted that a strive to create an institutional system of submissive project-makers was characteristic of the centrally planned economies with respect to all major investment decisions. On the other hand, minor investment decisions were, at the same time, decentralized in the sense of leaving them to individual enterprises, which made them subject to the ideas of the "resistant IDM-s". Thus, a certain combination of the two cases is, in fact, typical of the actual practice of a centrally planned economy.

Coming now to the case of the resistant IDM, we may simplify the picture by reducing it to the problem of disparity between the accounting and the market prices. Let us suppose that the information coming from above to the individual IDM-s consists in a set of accounting prices (or, alternatively, in a set of co-efficients to adjust market prices, which makes only a technical difference). The IDM-s, due to having goal functions of their own, are inclined to use for their choice-making the sets of current and expected market prices. The question then arises for the CB of what to do in order to induce the IDM-s to use accounting prices instead of market prices.

This question offers wide scope for discussion. The obvious, although crude, way of influencing the decisions of the IDM-s would be to use the tax-subsidy devices to account fully for the disparities between the two sets[1] What, however, seems important, is the necessity to understand this method in a more indirect way also.

For example, the subsidy meant to induce towards making greater use of unskilled labour (because of the accounting prices being much lower than the actual market price) must not be paid out directly to the firms. It can also take the form of such policies as would tend to bring down the actual market price of such labour e.g. through a conscious policy of low prices of food.

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(1) The possible use of the tax-subsidy devices raises the question, how far it is advisable to use the frequently suggested short-cut method of obtaining a kind of accounting prices by means of eliminating from the market prices the taxes and subsidies imposed on certain goods by the government as they have nothing to do with the cost structure.

Let us consider the simple case when the correction of the market prices is limited to the exclusion of taxes and subsidies. Suppose, e.g., that in a given country cement is taxed at the rate of 10%. By eliminating this tax, we want to pass to the IDM-s the information that from the social point of view it is advisable to use more cement in their investment projects (as compared with, say, steel or timber(than it would seem from the relations of market prices. Indeed, if we have to choose between a less and a more cement-consuming project (other things being equal) we shall choose the latter when using the accounting prices, but the former when using the market prices.

But what is the inducement that we are going to offer to the IDM in order that he actually chooses the more cement-consuming project? The answer is that we must use some form of subsidizing the use of cement, either directly or indirectly. Direct subsidizing will mean nothing else but repayment of the tax paid by the IDM on cement. Indirect subsidizing would mean, say, charging an extra tax on steel. But, then, we want the IDM to use also as much steel as would be indicated by its tax-free accounting price. In other words, we would have to repay the tax on steel in some form. This brings us to the conolusion that, in order to set at work all the necessary inducements for the IDM to shape his demand in a way reflecting the social cost structure,(approximated in the tax-free accounting prices, we would have actually either to remove all the taxes and subsidies, in which case the reasoning works the other way round) or, at least, to bring all the market prices, by our policy of taxes and subsidies, to exactly the same proportions with each other as those existing among the tax-free accounting prices. Thus, the use of accounting prices for the IDM-s involves a rather widespread and complex fiscal policy.

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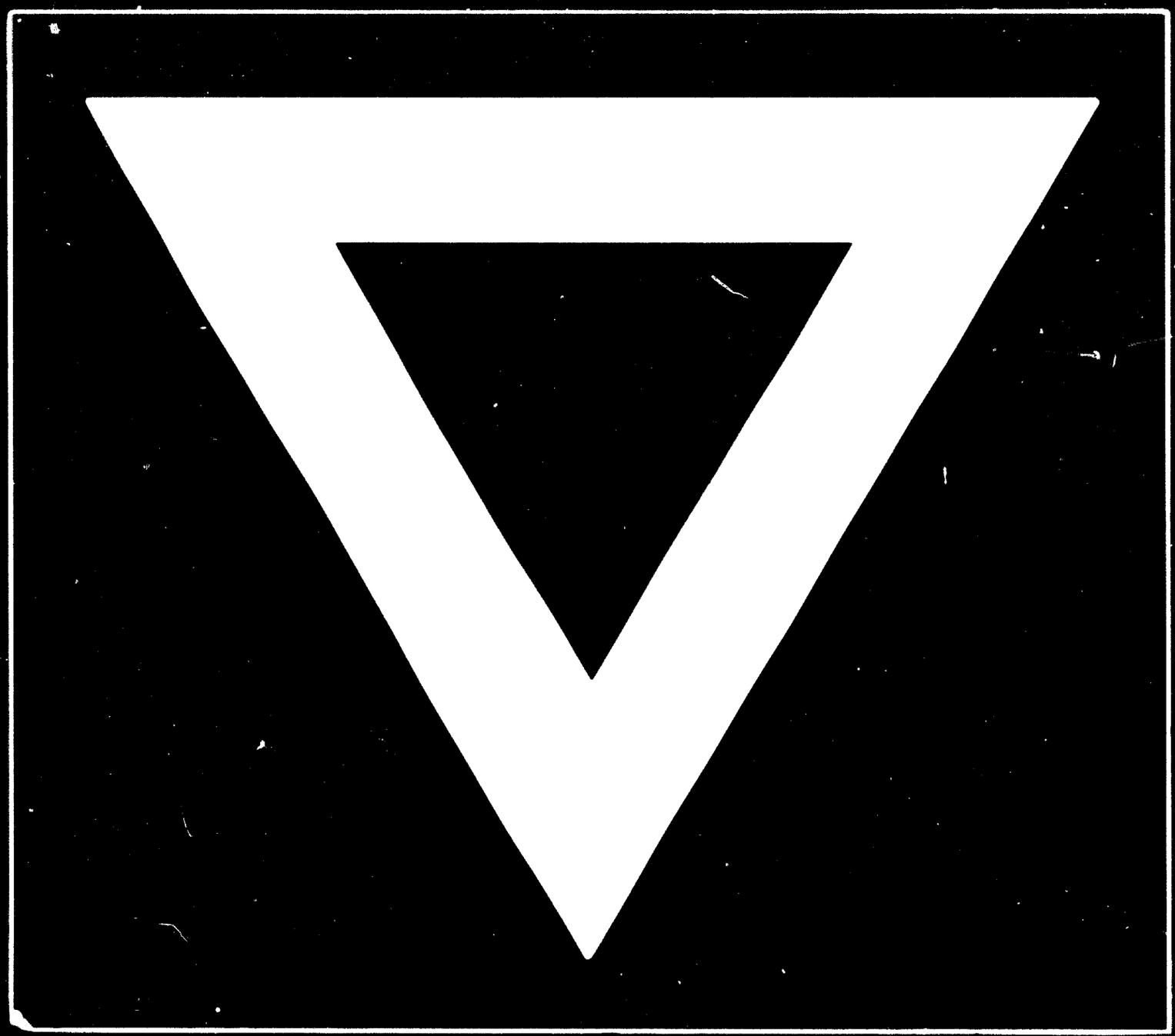

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