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# THE ECONOMIC EVALUATION OF PRODUCTIVE INVESTMENTS IN HUNGARY

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The introduction of the new monetary unit, the "Forint" on the 1st of August 1946 was an important event in the history of post-war reconstruction in Hungary. The devaluation of the old currency, the "Pengő", had reached such an extent that banknotes bearing the denomination of billions and trillions had been printed and prices had become completely chaotic and confused. The price system introduced simultaneously with the new currency was a centrally developed one, which differed greatly from the previous price systems.

The other important event was the beginning of central planning and, in 1948 the nationalization of production plants. The first three-year plan was worked out for the years 1947 - 1949.

The principal objectives of the three-year-plan were directed in essence towards the elimination of war damages. The objective of investments in that period was the reconstruction of plants, the communication network, the public buildings and the dwellings. To choose among various technical solutions, various technologies and scales of production was the task of the technical planners. The planning engineers continued to use unchanged the costing methods learned under capitalism.

The elaboration of the five-year-plan for the years 1950 - 1954 had to be started in 1949. At that time the restoration of damages could no longer be applied as a general directive.

In connection with the planning of investments the economists had to face a number of new problems:

- What branches of industry should be developed and to what extent?

Within that:

- In respect of what products should the growing domestic demands be satisfied by increasing domestic production and in respect of what products by increasing imports?

- In order to secure the increasing demand for imports, in what branches of industry should exports be increased, and through the production of what products;

- Which of the various export possibilities should be considered more favourable?

- If, in respect of some products, we have decided that the expansion of production was necessary, what should the production capacity of the new plants be? What is the optimal size of plants?

- Where should the new establishments be located? Should the existing plants be expanded or should new plants be built at new sites?

- Which of the various technological processes, machines and equipment serving the production of a given product should be chosen. The one which requires bigger investment and secures a lower production cost, or the other way round?

- On what principle should we choose between the technological solutions, various materials and scales of production, all requiring a different volume of investment?

In the capitalist system, these questions had appeared primarily in connection with private investments, after the nationalization, however, they became the problems of the state planning bodies. The solution of these problems was of prime importance because the country was short of capital, and in many regions the employment of the population was not assured to a sufficient extent.

The situation was rather difficult due to the fact that the free market mechanism had ceased to function and thus the profits of the plants calculated at domestic prices no longer yielded information about the economic efficiency of production. Therefore, completely new and special methods had to be elaborated for the solution of the above problems.

In the first period, we obtained assistance in the solution of the problems connected with the economic evaluation of investments but from the economic literature of the Soviet Union and later of the people's democracies - primarily from the Polish one.

I shall attempt below to describe briefly the methods which we developed. I shall also summarize the principles and aspects concerning the development of industry which may be generalized and which may - in my opinion - deserve consideration also in other countries because they may prove to be useful.

I.

## Theoretical Questions of the Economic Efficiency of Productive Investments

Concepts of economic effectiveness of investments on the national scale and economic efficiency in the stricter sense.

Productive investment are means of primary importance for the development of production. The source of investments is accumulation which is always limited since it means the withdrawal of products from consumption.

The problem of investments is discussed in the following from the aspect of the entire national economy, irrespective of the fact whether the investments in question are state investments or private. Therefore, productive investments are always considered as social inputs carried out with the objective of developing production.

The new plants have to be built but once, hence, the investments are unique (non-recurring) inputs. On the other hand, the production set going is continous, its costs are recurring expenditures, thus, they are current inputs.

Now, if we want to calculate the total social expenditure needed for the expansion of production, both input elements have to be taken into consideration and added up. One of the most intricate problems of investment efficiency calculations is how to add up these two input elements of different dimensions, in conformity with the interests of the national economy.

The economic efficiency investigation of productive investments had to be started with the classification of the results (objectives) expected from investments.

The purpose of private investments is profit. On the other hand, from the point of view of the national economy as a whole, according to the nearly uniform opinion of Hungarian economists, the purpose of all productive investments combined is to increase the national income. Therefore, when the objectives of individual productive investments and those of industrial development are determined, the correct inner proportions of economic development must be observed.

The important requirements of proportionality that have to be met in the development of industry are as follows:

- Demands have to be satisfied to the largest possible extent not only at present, but the continually increasing demands have to be continuously satisfied in future, too. Therefore, when fixing of the objectives of investments, it is a special requirement that they should be correctly divided between investments assuring the satisfaction of the demands arising at present, in the near future and in the distant future,

- the territorial distribution of production forces is not even in any country. Therefore, production should not be developed evenly in the various districts, but according to weighted ratios considered to be correct from a national economic point of view;

- the various branches of production and plants are closely inter-connected in the process of production. These technological connections determine a definite proportion between the various areas of production; it is highly important to take them into consideration when setting the objectives of development. National economic balance sheets are of prime importance in the determination of production connections, and they have to be summed up in the balance of interindustry relations (input-output tables).

- Hungary is a relatively small country. For Hungary it is an objective necessity to participate in the international division of labour. The share of both imports and exports amounts to 25 - 30 per cent of the value of production and, therefore, favourable or unfavourable foreign trade has a large effect on the development of the entire production. Thus in fixing the investment objectives, the possibilities of foreign trade have to be given important consideration.

- In addition to the mainly economic aspects which have been enumerated, the various objectives, political, defence, social, cultural, health, etc. have also to be considered in the determination of development objectives and of the proportions of development.

In the development of production and in the determination of the investment objectives, quantitative targets have to be realized observing the above principles. It is not sufficient to increase the volume of national income, the assortment of products and

their use values have to develop in accordance with certain internal proportions. The proportions of development for a given period are determined by the national plans. In the following by development proportions the proportions determined by the national plans are meant and it may be stated that from the investments only those realizing objectives corresponding to the determined proportional development promote the satisfaction of demands. The requirements described above, will be called the proportionality requirements of investments.

Besides the requirements of proportionality, the other important requirement to be met by investments is the requirement of economic efficiency. The criterion of the economic efficiency of investments may be defined as the maximum promotion of the satisfaction of future needs with the minimum restriction of the satisfaction of present needs.

In brief, the economic efficiency of investments may be defined as the ratio (or the difference) of future results and present inputs.

The two principal requirements to be met by investments, form together the economic efficiency requirement of investments from the point of view of the national economy as a whole. Although economic efficiency and proportionality are inseparable aspects of the requirement of efficiency - -just as are value and use value as far as products are concerned -, their importance in various periods of planning and in various countries is different, depending on the stage of development of market relations.

In a free market economy, where prices elastically follow supply and demand,conclusions can be drawn from these on actual and future needs. In countries where prices are fixed and the development is determined by the national plans, economic efficiency in its narrower sense, i.e. the ratio of production result and inputs does not give satisfactory information about the directions of development and the requirements of proportionality to be met in the development of the production forces. Therefore, in countries with centrally planned economies, the requirement of proportionality has to be treated as a separate problem of planning. In its examination, special methods have to be applied,the description of which would go beyond the scope of the present study.

The Role of Economic Efficiency in the Planning of Investments.

As far as the complex problem of the economic efficiency of development and of investments is concerned, both proportionality and economic efficiency have, of course, to be kept in mind. The weight of these two main principles differs in the various stages of the process of investment planning.

The importance of economic efficiency in the narrower sense had often been underestimated in the past. But today, the view is generally accepted that efficiency in itself is usually decisive in choosing between "variants realizing the same objective". Let us examine what can be considered as "variants realizing the same objective" under conditions of socialist planned economy.

The variants realizing the same objective may be divided into two groups:

1/ Technical variants,

2/ Economic variants.

In the course of choosing from the technical variants, the following main planning problems have to be solved:

- The demand on or the load of the individual machines and equipment usually varies in time. The creation of a bigger capacity requires smaller per unit costs than that of a smaller capacity. What is the most favourable capacity from the point of view of efficiency calculated on the basis of useful life time of projects (e.g. in the determination of the size of a power station, long distance power lines, a transformer, a railway station water works)?

- Determination of the optimum size (capacity) of a plant. With how many plants and of what size should the capacity chosen be realized. E.g. should a storing capacity of 10.000 tons be realized with one project or several smaller units.

- Within certain districts, the problem of location, or the selection of the site within villages, the placing of a plant and machine units within the factories may become technical variants.

- The selection of the most advantageous machines, equipment, production processes and materials.

- The determination of the technological standards, the selection of the most economical degree of mechanization of the various work processes;

- Determination of the size of the various parts and elements in cases where the measurements influence the operation costs (e.g. the diametre of tubes and electric lines, the length and width of bridges etc.).

- The definition of the date when some projects should be realized or when some establishments should stop producing;

- The schedule of the general overhauling and scrapping of the various machines.

- The most economical completion time for the realization of investments can also be determined through the selection from technical variants.

The importance of correct selection from the technical variants is considerably increased by the fact that in the process of planning the variants form vertical chains. Therefore, the errors committed in the individual stages of evaluation will cumulate.

The other major type of the variants serving the same objective are the economic variants. In the case of these, it is the economic objective which is identical, and not only the various methods of production may vary but even the products themselves may differ. These include:

- Choice between products which may substitute each other. With technical progress, the importance of these is growing. Decisions on questions of such magnitude as choosing between sources of power (coal, oil, steam, gas) or choosing from the various applications of power (electrification or the use of Diesel engines) belong to this category.

- In a non-autarchic country like Hungary, variants aiming at the increase of exports or the replacement of imported goods by home products are very important. Developments directed towards the increase of exports or the saving of imports serve, in the final analysis, the same objective, namely, the acquisition or the saving of foreign exchange. There are industrial branches in Hungary, where 40 - 45% of the production is

being exported. In the development of these, the domestic demand plays but a subordinate role; the market conditions and the efficiency of production are decisive.

In non-autarchic countries with a socialist planned economy, therefore, not only the question of "how", but also the question of "what" has a decisive role in connection with the efficiency of investments.

Determination of the Economic Efficiency of Investments in Socialist Planned Economy

Even in countries with free market economies the question arises what indices, in addition to the profitability of the planned plant, should be taken into consideration in judging the development objectives. To what extent does the profitability of the enterprise express efficiency on the national scale? In Hungary this problem had to be faced even to a greater extent after the free movement of prices had been stopped.

The profits of the individual production plants therefore, cannot be used as economic indicators. In each case, the planning bodies have to examine the efficiency of investments from the point of view of the national economy. The efficiency of the investment from the point of view of the enterprise or of the industrial branch can only be considered as an auxiliary indicator supporting the analysis.

In the definition of the concept of efficiency we started with the classical definition, according to which:

$$\text{Efficiency} = \frac{\text{result}}{\text{input}}$$

From a practical point of view, this indicator of the result and the input is more convenient than result minus input as it indicates even formally that it is not the profit of the enterprise that is being considered.

In the practical evaluation of efficiency it is the quantitative valuation and comparison of the results and inputs of different dimensions that presented the problem.

## Determination of the Results of Investments and the Grouping of Investments

The first question in the examination of the result of the investment is whether the results of the productive investments can be measured with the same units of measurement or not?

Examining the investments from the point of view of their immediate aims, the following objectives arise:

- to leave the volume of production and the labour force unchanged in the existing production processes, and reduce working time,

- to leave the volume of production and working time unchanged, and reduce the labour force,

- to expand production.

The objective of any productive investment may be reduced to these immediate aims.

As the shortening of working hours and the reduction of the labour force may be expressed in the same units of measurement, (in hours or in the strength of the labour force,) investments may be divided into two main groups as far as the units of measurement of the immediate aims are concerned:

I. Labour saving investments,

II. Investments expanding production.

This grouping is not fictitous but corresponds to the immediate concrete aims of investments, the division into these two groups is not decided by the technical data of the investments, but exclusively by their purpose.

In practice there exist investments which expand production and, at the same time, release labour from the obsolete production processes. The efficiency of these may be solved as a special task on the basis of the efficiency of the two main groups.

In the capitalist economic system, the increase of the profit of the enterprise may be achieved through both ways. Profit may be increased while the volume of production

is unchanged if production costs are reduced; these investments correspond to the "investments releasing labour". (The reduction of production costs may be caused by a reduction of working hours within the plant or in proceeding phases of production; the latter may appear as a saving in materials.) The other well-known method of increasing profits is the expansion of production. The objective of increasing the profits of the enterprise includes and also hides the double character of the immediate aims of the investments. In a socialist planned economy, however, it is important and inevitable to apply the above grouping in calculating the efficiency of investments.

Hence, the two groups of investments are the following:

Group I. Investments releasing labour

The immediate aim of these is to release labour from the existing production processes while leaving, in general, the volume of production unchanged.

By labour releasing investments only those investments are meant which are carried out in existing production processes in order to reduce the input of live and of stored-up labour. This group is not identical with that of the investments aiming at the raising of productivity, because the rising of productivity may, in general, characterize investments expanding production and requiring new labour as well.

Group II. Investments expanding production

These form the majority of investments. Their immediate aim is the expansion of production and through this, the increase of the national income. In special cases, investments expanding production may occur which also release labour. These were considered as belonging to Group II.

A close connection is created between the above two groups of investments by the allocation of manpower. After a certain transitional period, the socialist countries reach a stage of development where unemployment ceases and the supply of labour to new projects expanding production presents a special task. It is the economic task of the investments of group I to secure new labour necessary for the investments of group II. As the immediate aims of the two groups of investments differ, the efficiency of the investments belonging to these two groups has to be calculated separately.

Before presenting these calculations, it should be clarified in what system of valuation the inputs should be calculated, i.e. what price system should be applied. The prices in force in Hungary (and in most people's democracies) are based on very different price principles, the accumulation contained in the prices of different products differs for various reasons and, therefore, the theoretical connections and deductions cannot be presented in the price system in force. We start therefore with a system of valuation proportionate to values (in the Marxian sense). In such a price system, the prices of products (more exactly the price centres) are proportionate to the wages paid for the socially necessary labour expended in their production. i.e. the accumulation is not distributed in proportion to the capital engaged in production, like in the producer-type price system, but in proportion to the wages paid. In the first stage of the calculations we completely disregard accumulation, and consider the prices of products as being equal to the wages expanded in their production. This price system is called a price system of "real costs".

The efficiency calculations will be presented in the different investment groups in two stages. In the first stage, the results and input connected with the investment are calculated on the plant level. In the second stage, the examinations will be extended to the level of the national economy.

The Effieiency of Labour Releasing Investments (Group I.) on Plant Level:

Let us examine the following scheme, in an existing plant a labour force of $L_1$ works for $M_1$ annual wages. Investments releasing labour are carried out in the plant to the amount of B. After the realization of the investment the labour force is reduced to $L_2$ and their annual wages to $M_2$. Consequently, as a result of the investment, $L_1 - L_2$ workers are released and $M_1 - M_2$ wages are saved. The material requirement does not change.

The indicator of investment efficiency of Group I will be as follows:

$$g = \frac{\text{result}}{\text{input}} = \frac{M_1 - M_2}{B}$$

where:

B = the amount invested (Forint)

$M_1$ = the annual wages before the investment (Forint/annum)

$M_2$ = the annual wages after the investment (Forint/annum)

$M_1 - M_2$ = the annual saving in wages (Forint/annum)

The Efficiency of Production Expanding Investments (Group II) on the Plant Level:

In order to be able to determine the efficiency of production expanding investments, i.e. their results and inputs, a case of production investment will be examined where the result may be considered entirely as achieved by the investment.

Let us examine the following scheme:

Objective: a production process is to be started in order to create a defined production value, and for which a labour force of L, with M Forint annual wages, materials to the annual value of A Forint and an investment of the amount of B Forint are needed. (By investment the entire advanced capital is meant i.e. the combined value of fixed and working capital.) If there is no free labour force, the releasing of labour from other areas of the economy through labour releasing investments is a pre-condition. The measures to be carried out are therefore the following:

1/ Investment B (the new plant) is to be realized.

2/ In a relatively obsolete plant production with equipment $T_1$, is to be abandoned, the equipment scrapped and a labour force of $L_1$ released.

3/ The scrapped equipment is to be replaced by new equipment of higher productivity, requiring an investment amounting to $B_g$, with which a substantially smaller labour force ($L_2$) may assure the volume of production in the old plant.

4/ From the old plant reconstructed as described above, a labour force of $L_1 - L_2 = L$ may be directed to the new plant, and so investment B may be set going.

In this scheme the new plant to be established was linked with an existing old plant to be reconstructed. Taking the two plants as a single unit, the following findings may be made:

The total number of workers originally employed has not changed, and so

the amount of annual wages has also remained constant. But part of the workers have been shifted from the old plant to the new one. The investments in the old and in the new plant together have made it possible to increase the productivity of the labour of all workers, and so to expand production without increasing the labour force. In this way, the current annual labour input necessary for the operation of the production expanding investments first appeares as a need for labour, and the assuring of the labour force becomes an investment task. In a wider sense, when securing the labour force for the new plant, not only the costs of releasing labour have to be taken into consideration, but the cost of its re-allocation and possibly of its re-training as well. The labour releasing investments form an "accessory (consequential) investment" of the production expanding investment.

The inputs connected with the measures carried out consist of the basic investment (B) and the accessory investment ($B_g$). As a result of the investments carried out in the two plants, the gross output has been increased by a value of T, against which have to be charged the costs of a material character (Cost of materials and power, transportation costs; symbol: "A"), by which T has to be reduced. The efficiency of the production expanding investments, on the plant level, may thus be expressed through the following formula:

$$G = \frac{\text{result}}{\text{input}} = \frac{T - A}{B + B_g}$$

where:

$T - A$ = value of annual net production (Forint/p.a.)

$B$ = amount of the basic investment (Forint)

$B_g$ = amount of the labour releasing investments (Forint)

In order to calculate efficiency, the value of the labour releasing investment, the key number showing the value of investments necessary for releasing one worker or for saving 1 Forint of annual wages has to be determined. This key number is the ratio of the results and input of all investments carried out in the national economy in a given period in order to release labour, i.e. the average efficiency of investments of group I. Let us apply the following symbols:

$\gamma$ = the average efficiency of the labour releasing investments in a certain period,

$b_g$ = the reciprocal value of $\gamma$, i.e. the investment amount needed for saving 1 Forint of annual wages,

$M_s$ = the labour force to be secured in the period under examination through labour releasing investments,

$B_s$ = the amount to be invested in order to release labour in the period under examination.

In accordance with formula on page 12 we may write down the following equations:

$$\gamma = \frac{M_s}{B_s}$$

$$b_g = \frac{B_s}{M_s} = \frac{1}{\gamma}$$

The determination of the above key numbers makes it possible to convert the annual productive labour input into investment input. Since $b_g$ Forint of investment is necessary for saving 1 Forint of wages, the saving of M Forint/year of wages can be solved by investing M. $b_g$ Forints. It follows that M Forint/year of wages are equivalent to M.$b_g$ investment.

Returning to the formula for the efficiency of production expanding investments, the amount of investments necessary for the accessory labour releasing investment may also be determined on the basis of the annual labour requirement of the new plant and the $b_g$ coefficient.

The amount of the accessory labour releasing investment:

$$B_g = M \cdot b_g$$

where:

M = the annual amount of wages necessary for operation.

The efficiency of investments expanding production (Group II) is thus characterized on the plant level by the following indicator:

$$g = \frac{T - A}{B + M \cdot b_g}$$

To sum up, the economic efficiency of the production expanding investments depends from five factors, of which four are contained in the data characteristic for the plant, and the fifth is the national economic coefficient $b_g$, which is not determined on the basis of the data of the plant under examination but on that of the average investment needed on the national level to release labour. The details of that will be examined later.

The Evaluation of Economic Efficiency on the National Economic Level.

It is not sufficient to examine the realization of a certain production goal on the level of the plant producing the end product, i.e. in the last production phase, but both the results and inputs have to be considered throughout the economy. The realization of some production goal cannot be considered as the result of a single plant, but as the end result of vertical and horizontal chains of production. These links are created by the demand of the production for material, power and transport. The indicators of efficiency obtained on the plant level have to be summarized along the linking production chains.

The economic efficiency of labour releasing investments on the national economic level:

The result of the investments of Group I is formed on the national economic level by summarizing the labour savings achieved in the plants belonging to the production chain. If the result of some investment reducing production costs is not the saving of live labour within the plant but of stored-up labour, i.e. the saving of material, this has two projections: one is that the live labour input stored up in the material, i.e. the cost of wages is saved. This wage cost does not arise in the plant producing the end product but in the plant where the material to be saved is being produced.

The other effect of the saving of material is that capacity is released in the plants producing the material.

The result of the investment of Group I on the national economic level is thus the sum of the live and stored-up labour inputs saved in the plants along the production chain.

Since, in the price system of "real costs" applied here, the production cost of a product equals the sum of wages expended in the plants of the production chain on the production of the product, the sum of wages saved is shown by the reduction of production cost:

$$\text{Result} = Ö_1 - Ö_2$$

where:

$Ö_1$ = the annual production cost before the investment (Forint/annum)

$Ö_2$ = the annual production cost after the investment (Forint/annum)

The other part of the result is represented by the capacity released in various domains of the economy through the material saved in the end product. These are in fact savings of investment. Obviously, if in the plant producing the end product the reduction of the production cost necessitates in connection with the saving of live labour an additional input of stored-up labour, i.e. the production requires more material we have to calculate not with material savings but with additional material. In such cases, the accessory investments through the material have to be taken into consideration as additional input. Whether the change in the quantity of material used is positive or negative, it changes the amount of capital engaged; therefore, it is accounted for among inputs.

The investment input of Group I is thus obtained as the sum of the basic investment (B) and the accessory investments on account of changes in material requirements.

The investments connected with the changes in material requirements have to be considered separately, because in the price system of "real costs" the prices are independent of the capital engaged in production (the prices are equal to wages). For this purpose the "average investment normatives" of the various materials have to be determined. These are marked "$b_{ik}$"; if several kinds of materials are needed, the average

capital requirement of the production of the materials is arrived at by summing up the capital requirement of the individual materials, i.e.:

$$B_k = \sum_{i=1}^{n} A_i \cdot b_{ik}$$

where:

$A_i$ = the annual value of the individual materials used (Forint/annum)

$b_{ik}$ = the average investment normative of the individual materials (Forint)

For the sake of simpler notation, instead of the above aggregative formula, the product formula of the average accessory investment requirements of the materials is used, i.e.

$$B_k = A \cdot b_k$$

where:

$A$ = the annual value of all materials uesed,

$b_k$ = the average accessory investment requirement of the materials (the average capital requirement of the products).

In accordance with the above principles, the following formula may be written down for the efficiency of Group I:

$$g = \frac{\text{result}}{\text{input}} = \frac{\ddot{O}_1 - \ddot{O}_2}{B \mp /A_1 - A_2/ \cdot b_k}$$

where:

$\ddot{O}_1 - \ddot{O}_2$ = the annual value of the reduction achieved in production costs (Forint/annum)

$A_1 - A_2$ = the reduction of the material requirement of production (Forint/annum)

If the material requirement increases, the second member of the denominator will have a positive sign.

The Economic Efficiency of Production Expanding Investments on the National Economic Level

On the plant level it was the net production value that we considered as the result of production expanding investments.

If we follow the production chain of all plants necessary for the production of a certain end product, and add up the results of these plants - the net production values-, we obtain the gross production value of the end product. This is considered as the result on the national level of the production expanding investments.

The calculation of input:

Since it is not sufficient, for the realization of the end product, to realize the last unit of the production chain - the basic investment -, but care has to be taken of the proportionate expansion of the preceding phases as well, in the calculation of inputs, too, we have to consider in addition to the basic investment the accessory investments necessary for the expansion of the production of materials needed for the operation of the basic investment. The amount of these may be determined on the basis of the average (normative) accessory investment requirement of materials, - $b_k$ - and of the material requirement of production. This will equal: $A \cdot b_k$

It is further necessary to secure the labour supply of the above accessory investments. These require additional labour releasing investments.

Since, in the price system of "real costs" the price of materials equals the wages, the volume of labour releasing investments may be determined through the application of the "$b_g$" normative as follows:

$$B_g = A \cdot b_g$$

To sum up: evaluated on the national economic level, the input connected with production expanding investments is composed of four items: the basic investment, the accessory labour releasing investment assuring a labour force for the basic investment, the accessory investments assuring the material requirements for operation, and the labour releasing investments assuring the labour supply of the latter. The complementa-

tion of the basic investment to an investment complex as above, makes it possible to calculate all inputs in one unit of measurement, the unit of measurement of investments, i.e. the capital input. This hypothesis is realistic in so far as it is possible, through the coordinated realization of investments with various objectives, to expand production without increasing the number and working hours of all those engaged in production.

On the national level, the indicator of efficiency of production expanding investments is the following:

$$g = \frac{\text{result}}{\text{input}} = \frac{T}{B + M \cdot b_g + A \cdot b_k + A \cdot b_g}$$

The economic content of the single members of the formula is the following:

$T$ = the production value showing the result

$B$ = the amount of the basic investment

$M \cdot b_g$ = the amount of investments necessary to assure the labour supply of the basic investment

$A \cdot b_k$ = the investment requirement of the plants producing the material needed for the operation of the basic investment

$A \cdot b_g$ = the amount of the labour releasing investments assuring the labour supply for the accessory investments securing the material requirements.

In the methodological solution of the efficiency of investments, it has been our first aim to clarify from among the various conditions of production the three most important ones: live labour, stored-up labour and the input to be advanced, i.e. the role of the capital input. Quite consciously, we have left unconsidered the other factors of the expansion of production, such as natural endowments and land; we consider the solution of these questions equally important, but as they are of a special character, we do not discuss them in this study. We shall continue to neglect their role.

The formula obtained for the expansion of production includes from among the data characteristic of the given plant the material costs, the wage costs of production and the cost of investment. The weighting in relation to each other of these inputs of various dimensions and character is solved by the two national economic "investment

requirement coefficients" $b_g$ and $h_k$.

The Importance of the National Economic Investment Requirement Coefficients

As we have seen, in the indicators serving the evaluation of the efficiency of investments there are, in addition to the data characteristic of the investment, two coefficients present whose values are of a national economic character, and quite independent from the investment under consideration. These are the per unit investment requirement coefficients $b_g$ and $h_k$.

The $b_g$ is the investment required to release one unit of labour, showing the volume of the investment input necessary for the continous saving of live labour. Its value has to be determined on the national economic level. Through the introduction of new technology, the release of labour becomes possible in the most diverse domains. If we apply the principle of efficiency in this area, too, we have to release labour first of all from those places where this requires the smallest investment per unit. It is, therefore, correct to implement the introduction of mechanization, of new techniques, from among the various possibilities, in the sequence of diminishing efficiency. The greater the labour requirement of the new plants, the greater the labour force which has to be found through the release of labour, and so, in addition to the best possibilities, worse possibilities may also have to be accepted. But the progress of technology offers again and again economical possibilities for the further release of labour. Consequently, the value of $b_g$ is the average value of the group of labour releasing investments carried out within a certain period, and since the objective is the realization of the best possibilities, the value of $b_g$ is of marginal character.

The other national economic indicator, $h_k$ is the accessory investment requirement of a material input worth 1 Forint. The content of this coefficient agrees in essence with that of "average fixed and working capital engaged per worker", which may also be called the indicator of "technological equipment" or the indicator of the "capital intensity of production". The average accessory investment requirement indicators of the various industrial branches and sectors are well known in economic literature. e.g. Oscar Lange, in his study entitled "Marxian re-production schemes and the input-output

method" marks with $b_{ij}$ the coefficient which denotes the quantity of the output of one sector to be invested in another sector in order to increase the output of the latter in the following period by one unit per time unit.

The indicator corresponding to $b_{ij}$ and expressed in "units of value" is called by the author the "investment cost coefficient".

The indicator used by us, and noted $b_k$ is the national economic average of the investment requirement indicators of the various sectors and industrial branches. Its value depends primarily on the technology planned and on the production costs of machines and buildings.

The determination of the average investment requirements of production took place in Hungary on the basis of relatively exact calculation. For this purpose, use has been made of the input-output table, as well as of the data of the planned investment programmes of recent years. At present, we have at our disposal not only the national economic average for the value of $b_k$, but the average investment requirement of the products of 95 industrial branches as well. These investment requirement indicators of the industrila branches show the amount of investments to be carried out in the whole of the economy in order to produce the end products of the industrial branch. The value of $b_k$ is formed as follows: the average total fixed investment requirement of the productive sectors is 3,5, the average working capital requirement is 0,4, the sum of the two, i.e. the value of $b_k$ is 3,9, which may be rounded to 4.

In the practical calculations, one has to take into consideration that investments are established for an average life of 20 - 30 years, and the coefficients applied in the calculations of efficiency have to be determined with a corresponding dynamics. The results of international research into the capital intensity of production are well known. According to these, the indicator of the capital intensity of production is - disregarding irregular fluctuations - roughly constant in the long range. We have, therefore, not found it necessary to make adjustments to the figure obtained for the value of $b_k$.

In the determination of the investment required to release a unit of labour it is not sufficient to reckon with the per unit cost of the labour releasing investments to be realized, but one has also to examine to what extent the labour supply of the new plants

can be obtained from the natural growth of population or from existing labour reserves (the unemployed). It has thus to be examined what possibilities there are for securing the labour required "free of charge", i.e. without investments. If part of the labour needed in a certain period may be secured "free", the value of $b_g$ has to be correspondingly reduced in investment efficiency calculations carried out on the national economic level and from the point of view of the national economy as a whole. Since investments are established for a life of 20 to 30 years, this has to be considered in the practical calculations, and the correction of the $b_g$ value has to be made not on the basis of the conditions prevailing at present but in view of the expected development.

In Hungary one has to count with the complete exhaustion of labour reserves within 5 to 10 years. In several areas of the country there is already a shortage of labour. Therefore, the labour situation cannot be judged on the basis of today's conditions but in a perspective of approximately 10 years, and in the determination of the value of $b_g$ one cannot count with "free" labour, and only the effect of the natural growth of population can be taken into consideration.

## The Average Investment Efficiency Coefficient

The importance of the two key figures of the national economy becomes even more obvious if we examine their combined economic content. For this purpose let us examine what has to be done in order to increase the productivity of labour to such an extent that it should result in an additional value of 1 Forint per annum.

For the expansion of production one has to find the labour and the means of production. In a price system proportionate to value - within which we have carried out our calculations so far - for the production of 1 Forint additional value, one has to release from the existing production processes, - without reducing production there - labour corresponding to 1 Forint annual wages, and this has to be shifted to the new production process. The saving of 1 Forint of annual wages requires an investment of the amount: $b_g$. The production of means of production necessary for the additional production value of 1 Forint requires - in addition to the investment necessary for the release of labour - on the average, an investment amounting to $b_k$. Altogether therefore, an investment of the value

of $b_g + b_k$ is necessary for raising the productivity of labour to the extent to achieve 1 Forint additional value annually. On this basis we may write the following equation:

$$(b_g + b_k) \text{ Forint} = 1 \text{ Forint/annum}$$

i.e. an ivestment of the value of $(b_g + b_k)$ makes it possible to raise the national income by 1 Forint. The investment amounting to $(b_g + b_k)$ may be considered as the equivalent of 1 Forint additional annual value.

Dividing both sides of the equation by $(b_g + b_k)$:

$$1 \text{ Forint} = \frac{1}{b_g + b_k} \text{ Forint/annum} = \beta \text{ Forint/annum} \quad \text{i.e.}$$

1 Forint investment is equivalent in the national economic average to $\frac{1}{b_g + b_k}$ Forint annual additional value.

$\beta$ is a key figure which shows the average effect of investments on the expansion of production. In economic literature, this key figure is called the coefficient of investment efficiency.

The value of the coefficient of investment efficiency is influenced by many circumstances. The more important ones of these are the following:

- natural conditions and technical conditions already existing,

- the international progress of technology and its achievements,

- the organization of production and factors affecting the utilization of the established production capacity,

- objectives of the national economic plan (the total volume of investments, the ratio of productive to non-productive investments, the proportion between the various production branches within the productive investments, the development ratios of the various regions, etc.),

- the quality of the economic and technical planning of the individual investment projects, the application of the principle of economic efficiency in technological planning,

- the extent of general employment,

- the rate of the natural growth of population.

In the capitalist economies, the average rate of profit, the rent on capital, and the interest rate have developed over a relatively longer period. These serve as directives for the capitalists in judging the rentability of investments, and serve for the technological planners as normatives for the comparison of investment costs and operation costs. As the investments have the effect of making the expansion of production possible without raising the continuous (current) labour input, there exists also in the socialist economy an average figure referring to the production processes and their expansion over a longer period, showing the efficiency of investments.

In the capitalist economy, the average rate of profits and the interest develop spontaneously. In the countries with a centrally planned economy, the efficiency normative of investments has to be determined consciously on the basis of analysing production and the expansion of production. This coefficient plays a very important role in the planned economy countries and meets an urgent need. It makes a proper consider - ation of the various investment and operation costs and a correct choice between variants possible in the planning of investments, the expansion of production, the development of technology, the substitution and replacement of obsolete means of production.

II.

## Practical Calculations of Investment Efficiency

### The Proper Evaluation of Input in Various Price Systems

We have deduced the formula of total inputs connected with the realization and operation of investments in the so called "real cost" price system. We have presented the method of summing up three kinds of inputs; the non-recurring investment of capital, the annual wage input, and the annual material input, with the assistance of the national economic coefficients. In practice, however, the real production cost price system is not applied, and thus the proper evaluation of input has to be solved within the existing price systems. The price systems functioning in the free market economy countries are close to the so called "producer type price" systems; we shall, therefore, present the calculation of the inputs in the pure producer type price system, and in the current Hungarian price system. In these calculations we shall set out from the basic formula introduced in the real cost price system, according to which the total input equalled:

$$R = B + M \cdot b_g + A \cdot b_k + A \cdot b_g$$

contracted:

$$R = B + M \cdot b_g + A (b_g + b_k)$$

### Evaluation of Input in the Pure Producer-Type Price System

In the pure producer type price system, accumulation is collected entirely in proportion to the quantity of fixed and working capital engaged in production, and prices equal the total input; such a price system assures most, in my opinion, a proper orientation and the realization of efficiency.

From now on, we shall denote the values calculated at real costs with an apostrophe: the wage content of the material prices with A', the wage content of the amount of investments with B'.

The formula of input at real costs will be the following:

$$R' = B' + M \cdot b_g + A' (b_g + b_k);$$

The coefficients $b_g$ and $(b_g + b_k)$ show how the wages and material inputs should be weighted.

Thus, the value of 1 Forint wages will be: $1 \cdot b_g = b_g$

The value of material containing 1 Forint wages will be:

$1 \cdot (b_g + b_k) = (b_g + b_k)$

The valuation ratio of materials containing 1 Forint wages to 1 Forint wages is expressed by the following fraction:

$$\frac{b_g + b_k}{b_g}$$

It follows that the material with A' Forint wage-content has to be valued at $A' \frac{b_g + b_k}{b_g}$ forints, i.e. it costs as much in a producer type price system.

The total price of materials we denote with A:

$$A = A' \frac{b_g + b_k}{b_g}$$

from which: $A' = A \frac{b_g}{b_g + b_k}$

Similarly, the price of an investment with B' wage-content will be:

$$B = B' \frac{b_g + b_k}{b_g}$$

from which: $B' = B \frac{b_g}{b_g + b_k}$

We may convert the formula of total input from the unit of measurement of investment to the unit of measurement of annual wages by multiplying it with $\frac{1}{b_g}$ :

$$R' = \left[ B' + M \cdot b_g + A' \cdot /b_g + b_k/ \right] \cdot \frac{1}{b_g} \cdot /\frac{1}{\text{annum}}/$$

$$B' \text{ (Forint/annum)} = B' \frac{1}{b_g} + M + A' \frac{b_g + b_k}{b_g} \text{ (Forint/annum)}$$

Let us substitute the prices of the producer type price system.

The total price of R will be:

$$R = B \cdot \frac{b_g}{b_g + b_k} \cdot \frac{1}{b_g} + M + A \frac{b_g}{b_g + b_k} \cdot \frac{b_g + b_k}{b_g}$$

$$R = B \cdot \frac{1}{b_g + b_k} + M + A = B \cdot \beta + M + A$$

where

$$\beta = \frac{1}{b_g + b_k}$$

Since the cost of wages and the costs of a material character (which include depreciation as well) give together the production costs, the indicator showing the magnitude of the total social input may be contracted as follows:

$$R = B \cdot \beta + \ddot{O}$$

This proves that in a producer type price system the formula obtained for the total input agrees with the indicator applied at present in the technological planning practice of capitalist countries. The category of annual production cost is the same in both systems. The function of the interest rate applied in capitalist conditions is fulfilled in our system by the coefficient of investment efficiency, whose value may be determined on the basis of the per unit investment requirement of releasing labour and the per unit investment requirement of production. But the value of $\beta$ may differ and does substantially differ from the magnitude of the average capitalist rate of interest.

What is the economic content under socialist conditions of the product of the multiplication: $B \cdot \beta$ appearing in the indicator of total input? As has been pointed out, through investments we may raise the productivity of labour. An investment input

amounting to B makes possible an increase in the national income amounting, on an average to B . $\beta$ . If we reduce the amount of investments of average efficiency by an amount of B, the national income will be less by B . $\beta$ . When we engage an investment input amounting to B for the realization of a certain production objective, we not only make possible the realization of the said objective, but additionally and simultaneously we cause a loss amounting to B . $\beta$ in the national income. This is a fictitious loss, but the real absence of an increase in the national income which could have been realized; it is a result of the engagement of fixed and working capital and it has to be taken into consideration in the calculation of the input of production processes. We call this in Hungary "lack of increase in national income on account of engagement of means " or, in brief, "capital charge".

Determination of Total Input in the Actual Hungarian Price System

In Hungary, and in the majority of the countries building socialism, the price systems used in practice are not of a pure type. This is manifest from the fact that the accumulation content of the prices of individual products cannot be determined through the application of any general rule.

Since in the calculation of the efficiency of investments it is not the evaluation of one material or product that has to be carried out, but the evaluation of a large number of materials necessary for the realization and operation of investments, the accuracy of practical calculations is met if we compute the accumulation content of products with the average key figures for industrial branches. Through the application of the input-output table this may be determined relatively exactly. The calculations carried out supply for the products of 95 industrial branches the ratios showing the accumulation and national economic wage content of the products. Through these indices the following relations may be written down:

$$A'_1 = m_1 \cdot A_1 \qquad A'_2 = m_2 \cdot A_2 \ldots A'_n = m_n \cdot A_n$$

$$B' = m_b \cdot B, \quad \text{where:}$$

$A'_n$ = the wage content of the product of a total price of $A_n$

$B'$ = the wage content of the investment of a total price of B

From $m_1$ to $m_n$ and $m_b$ = the wage ratio indicators

m = the average wage ratio indicator of the annual material requirement.

The group of products may be narrowed down at will. E.g. special key figures may be formulated within the investment according to the material technological composition. With wage ratio indicators determined for a narrower group, more exact calculations may be carried out.

Let us start with the formula of the total input expressed in real production cost:

$$R' = B' \frac{1}{b_g} + M + A' \frac{b_g + b_k}{b_g}$$

if we substitute the prices:

$$R = B \cdot m_b \cdot \frac{1}{b_g} + M + A \cdot m \cdot \frac{b_g + b_k}{b_g} = B \cdot \beta + M + A \cdot \alpha$$

From this, the efficiency coefficient of investments:

$$\beta = \frac{m_b}{b_g}$$

In order to have correct efficiency calculations, the wage and material inputs have to be weighted correctly, therefore, the concrete Hungarian price system has to be adjusted as far as the evaluation of materials is concerned. The value for the key figure for price correction is:

$$\alpha = \frac{b_g + b_k}{b_g} \cdot m$$

The correct relationship of the material prices to the wage cost can be assured through the application of the key figures for price adjustment. In Hungarian

planning practice, this adjustment is being taken into consideration as the capital charge for the accessory investments of the materials.

The formulae worked out for the evaluation of the total input on the national economic level make it possible to determine in any price system the investment effectiveness coefficient ( $\beta$ ) and the coefficient of price adjustment of material input ($\alpha$) to be applied in the concrete calculations. The values of the above adjusting coefficients may be determined, in the function of the importance of the calculation, either as national economic averages, or the price adjustment coefficients may be determined by industrial branches as well.

## The Determination of the Values for the Investment Efficiency Coefficient and the Factors of Material Price Adjustment in Hungary

I shall now attempt to present the determination of the efficiency coefficient and the average material price adjustment coefficient to be applied in Hungary in the case of various price systems. For this purpose, we have to know the values of the coefficients $b_g$ and $b_k$ and of the wage content indicators.

In Hungary, according to calculations made on the basis of the input-output table for 1959, the value of the "capital requirement indicator of production", the $b_k$, is the following: the average total fixed investment requirement of the productive sectors is 3,5; the average working capital requirement is 0,4. Consequently, the total fixed- and working capital engagement corresponding to the value of $b_k$ is, in round figures, 4,0.

On the basis of the input-output table for 1959, the coefficient m expressing the average wage content of materials is 0,6; the coefficient expressing the wage content of investment input, $m_b = 0,53$.

We determined the investment requirement of releasing labour primarily through the examination of the mechanization of agriculture. Since there has been practically no unemployed labour in Hungary in recent years, the labour force necessary for the development of industry had to be assured through the releasing of workers employed in agriculture and their re-direction into industry. As 38% of the total labour

force work in agriculture, this will be the principal way to obtain industrial labour for another 10 to 15 years.

The calculations show that through the mechanization of work processes in agriculture it will be possible to release workers and re-direct them into industry for another 8 to 10 years, at a cost of 90.000 Forint per worker. Counting with a coefficient of 0,53, the wage content of the 90.000 Forint investment is 48.000 forints. The average annual wage of 1 worker is 19.000 forints. Consequently:

$$b_g = \frac{48.000\ Ft}{19.000\ Ft} = 2,52, \text{ or in round figures } 2,5.$$

Summarizing the basic data:

$$b_k = 4 \qquad b_g = 2,5 \qquad m = 0,60 \qquad m_b = 0,53$$

Let us now carry out the calculations in accordance with the price system in use at present in Hungary:

The investment efficiency coefficient is:

$$\beta = \frac{m_b}{b_g} = \frac{0,53}{2,5} = 0,21$$

The value of the average price correction factor of material prices will be:

$$\alpha = \frac{b_g + b_k}{b_g} \quad m = \frac{2,5 + 4}{2,5} \cdot 0,60 = 1,56$$

In more exact calculations the price adjustment of the material (the $\alpha_i$) should be calculated by industrial branches by using the wage content indicator characteristic of the industrial branch in question ($m_i$).

$$\alpha_i = \frac{6,5}{2,5} \cdot m_i = 2,6\ m_i$$

The indicator of total input at current prices will be the following:

$$R = \beta \cdot B + M + \alpha \cdot A = 0,21\ B + M + 1,56\ A$$

In the Case of Applying the Pure Producer Type Price System

In the opinion of numerous Hungarian economists it would be advantageous, in order to support more correct economic orientation, to transform the Hungarian price system into a pure producer type price system. (The initial steps in this direction were taken when, on the 1st January 1964, a 5% capital charge payable after the fixed assets was introduced in the bulk of state-owned enterprises.)

In such a price system, the calculations become simpler and the Hungarian price structure will approach the export-import market prices. The coefficients under investigation will be as follows:

Value of the investment efficiency coefficient:

$$\beta = \frac{1}{b_g + b_k} = \frac{1}{2,5 + 4} = \frac{1}{6,5} = 0,154$$

In such a price system the prices of materials correctly reflect the valuation ratio of live and stored-up labour, and it is, therefore, unnecessary to apply the adjustment of material prices in efficency calculations. Consequently:

$$\alpha = 1.00$$

The formula of total input will be the following:

$$R = \beta \cdot B + M + A$$

$$R = 0.15 \cdot B + Ö$$

The Economic Structure of Investments

There are several authors in economic literature who treat the question of raising productivity as one of the effects of raising the technological level and, at the same time, argue what are the other effects of raising the technological level, and what role these effects play besides raising productivity. In my opinion, it is indisputable that the raising of productivity of social labour should be the main characteristic of the raising of the technological level.

It goes without saying, that the raising of the technical level cannot be exhausted by the increase of productivity, it must simultaneously meet, to an increasing extent,the requirements of labour safety, quality, hygiene, social welfare, etc. But all these requirements can only be secondary to raising the productivity of labour.

The technological planning of investments has a considerable influence on the technical level of the new industrial establishment, and even determines it. It is, therefore, a very important economic task to determine the extent of raising productivity to be achieved with the new production equipment. Still, this is a question about which the technical planners get the least concrete directives from economists. If, among the various technologies, equipment, and sizes the choice is to be made between such variants of which the one with the lowest production cost also requires the smallest investment - the decision presents no problem. But in general, the equipment assuring a higher technological standard, i.e. lower production cost, requires a higher investment, and so the planner is repeatedly confronted with the problem of having to weigh up the pros and cons of additional investment and the more favourable production cost that can be achieved with it.

There are many technologies for the achievement of every objective. In the course of development, further solutions become possible for the same equipment. These, however, differ from each other as far as investment costs and operational production costs are concerned.

For example, to produce annually 100 million pieces of bricks, the transport of material can be solved through different technological variants, from pushcarts through horse-drawn bogies to Diesel traction. The transportation objective can be realized through either of the three variants. Consequently, the choice among these variants becomes entirely an economic problem.

The planner sets out from the fact that one of the three variants has to be realized, therefore the investment cost of the cheapest variant will have to be used up in any case. The more expensive solutions assure a more advantageous production cost. Consequently, only one part of the amount of the production expanding investment is inevitably necessary for the realization of the given production expansion, the other part

has no effect on the volume of production, the aim of latter is to determine the requirement of labour i.e. to assure a satisfactory level of productivity and technology. The necessary part of the investment has to be treated sparately from the possible second part. The latter is called the supplementary investment part, or supplementary investment.

The definition of the production task determines only the necessary part of the investment. The production task itself. has no effect on the establishment or size of the supplementary investments. The correct solution of this problem from the economic point of view on the national level, is supplied by the study of the relationship between the effectiveness of the labour releasing investments and the supplementary investments.

There is a close economic relationship between the labour releasing investments and the supplementary part of the production expanding investments. The goal of the labour releasing investments is the supply of labour to the production expanding investments. The magnitude of the new labour requirements is determined by the supplementary part of the production expanding investments. If e.g. we are in a position to achieve in some domains of the national economy, through the mechanization of production, with the investment of 1 Forint an annual reduction of 40 Filléres in cost, and know that this possibility will continue to exist for another 10 years, are we then justified to choose the amount of supplementary investment in planning any new establishment in such a way that the reduction of cost so achieved should only amount to 20 Filléres annually (per Forint) instead? Or to put the question another way: is it right to carry out, when establishing a new plant, 180.000 forint supplementary investment in order to save 1 worker, when, through the raising of the technical standard of an existing production process, and maintaining the level of production, it is possible to release 1 worker and to re-direct him to where he is needed with an investment of 90.000 forints? The answer to both questions is obviously negative.

The releasing of labour from existing production processes and the reduction of the labour requirement of new production processes are, namely, two economic variants which may be substituted for each other. From the national economic point of view, we choose the optimum solution if we determine the size of supplementary invest-

ments in production expanding investments in a way that their unit costs per worker saved should not exceed the per unit investment costs of releasing labour. This means that within economic regions where the free flow of labour is not impeded, the economically most advantanous method of raising productivity and through that the technological standard, is to determine the economic structure of the production expanding investments - thc ratio of necessary part to supplementary part within the investment - in harmony with averagc effectiveness of labour releasing investments.

The Economic Efficiency Indicators of Investments as Applied in Practical Calculations

In the foregoing the three kinds of input elements i.e. live work, embodied work and the advanced, productivity increasing work (the investment) as well as the problems of valuation of the total input needed for the expansion of production, were discussed in detail. Relying upon the results obtained we now proceed to determine the indicators of economic efficiency defined as the quotient of results and inputs in case different price systems are applied.

Economic efficiency indicators of labour force releasing investments in case different price system are applied. The following indicator was obtained for the efficiency of investment of Group I. at real production cost:

$$g = \frac{\text{result}}{\text{input}} = \frac{\ddot{O}_1 - \ddot{O}_2}{B \pm (A_1 - A_2)\, b_k}$$

The required degree, i.e. the normative, for establishing the economic efficiency of labour force releasing investments in individual periods is expressed by indicator

$$\gamma = \frac{1}{b_k}$$

In Hungary: $b_k = 2,5$ hence $\gamma = 0,40$

That labour force releasing investment whose economic efficiency does not reach the level of 0,40 is, from the aspect of the national economy, not worth while to be implemented, since there is a wide range of possibilities of greater effectiveness.

Now let us examine the formation of the efficiency indicator in the pure producer type price system:

In the efficiency formula of Group I. calculated at real production cost, the term $(A_1 - A_2) \cdot b_k$ showed the value of the productive capacity released together with savings of material. This effect can also be taken into account as the price adjustment of materials. This means that the formula can be modified as follows:

$$g = \frac{(M_1 - M_2) + (A_1 - A_2)}{B \pm (A_1 - A_2)\, b_k} = \frac{(M_1 - M_2) + (A_1 - A_2)}{B}$$

The price adjustments coefficient $\alpha = \frac{b_g + b_k}{b_g}$, and accordingly:

$$g = \frac{M_1 - M_2 + (A_1 - A_2)\,\frac{b_g + b_k}{b_g}}{B} \geq \gamma = \frac{1}{b_g}$$

Henceforth, the material calculated at real production cost (A) and investment costs (B) will be denoted by A' and B', respectively. By A and B the price sums in the producer type price system will be denoted:

Now let us repeat the previous formula with the new notation:

$$g = \frac{(M_1 - M_2) + (A'_1 - A'_2)\,\frac{b_g + b_k}{b_g}}{B'}$$

The material prices in the pure producer type price system will become modified in the following way (according to the connections expounded on page 28.):

$$A' = A - \frac{b_g}{b_g + b_k} \qquad B' = B\,\frac{b_g}{b_g + b_k}$$

By substituion we obtain the following formula:

$$g = \frac{(M_1 - M_2) + (A_1 - A_2)\,\frac{b_g + b_k}{b_g} \cdot \frac{b_g}{b_g + b_k}}{B - \frac{b_g}{b_g + b_k}} \geq \frac{1}{b_g}$$

Reduced:

$$g = \frac{(M_1 - M_2) + (A_1 - A_2)}{B} \geq \frac{1}{b_g} \cdot \frac{b_g}{b_g + b_k}$$

$$g = \frac{Ö_1 - Ö_2}{B} \geq \frac{1}{b_g + b_k} = \beta$$

Thus, the formula expressing the economic efficiency of labour force releasing investments in the producer type price system becomes simplified to the formula well-known in capitalist planning techniques. The normative also changes from $-\frac{1}{b_g}-$ to $\frac{1}{b_g + b_k}$ to the value of the economic efficiency coefficient of investments.

Omitting the detailed deduction, we now present the economic efficiency formula for the investments of Group I. in the price system functioning at present in Hungary:

$$g = \frac{(M_1 - M_2) + (A_1 - A_2)\,m}{B} \geq \frac{m_b}{b_g} = \beta$$

This formula can be applied in any price system constructed if the wage content of the materials was determined on the average or by industrial branches.

The economic efficiency indicators of production expanding investments in different price systems.

The valuation of "results" and "input" needed for economic efficiency calculations, concerning the investments of Group II., meant a particular problem in the

practice of planning in Hungary.

For the evaluation of inputs, which was previously discussed in detail, the functioning price system serves, in practice, to measure value. The input of each investment consists, generally, of a variety of elements. (Different kinds of materials, machines, equipments, fuel, energy, etc.). In this way, the distortions of the price system become levelled up to a certain degree and by applying average rates of adjustment or such of industrial branches, approximately correct values can be obtained.

The situation is , however, a different one for the evaluation of the "result" which is made up by the gross production value of the plant established due to the investment. The output consists of a few products (cement, coal, energy) or some groups of products (canned food, shoes, incandescent lamps) only. In such cases the highly deviating rate of accumulation incorporated in the domestic prices renders the economic efficiency calculations completely uncertain. Therefore, since 1958, in Hungary, in the economic calculations of production expanding investments prepared from the aspect of the national economy the products are, generally, not evaluated at domestic prices but at foreign trade (world market) prices, in Dollars or Rubels.

This measure is justified by the fact that Hungary is a relatively small country which has, however, highly developed foreign trade relations. This is made necessary by the country's natural endowments and the pattern of production. Therefore, exports and imports play a considerable role in both production and consumption (20 to 25 per cent of the total production). For the majority of products, imports are an alternative to domestic production, and in the development of production a choice can be made between the export of different products.

Thus, it is indispensable to follow with attention world-marketing possibilities, when it comes to the development of production.

For the granting of investments an "investment programme" is drawn up which contains the economic efficiency calculations. The state-owned foreign trade companies are requested to supply the necessary information about world-market prices for the preparation of these calculations. The foreign trade enterprises collect and systematize the actual sales and purchase prices and assess the effects of price changes to be

expected on the market. In case of larger projects, comprehensive price estimates are made by taking into consideration the effect of measures for the increase of the production and the prospective formation of consumption, the quality of the product and the probable production time of goods to be exported.

However, even these measures do not provide sufficient protection against the unexpected surprises of the market. But no methodology whatever could eliminate the uncertainties inherent in the production for export. In spite of that, world market prices are used for evaluating the economic efficiency of investments.

There are, of course, some products which are not subjects to foreign trade in any form, e.g. gravel, bricks, building units, bread etc. These are valuated at internal prices and for that very reason their economic efficiency cannot be compared to that of other products.

The following indicator is prescribed by the National Planning Office for the evaluation of the efficiency of production expanding investments:

$$g = \frac{\text{result}}{\text{input}} = \frac{T\,\$ \cdot v\,\text{Ft/\$}}{M + A_b + A_i + L + E} \cdot \beta$$

where:

T = is the production value per annum in $ or Rubel,

v = the rate of conversion of foreign exchange, the forint equivalent of $ or Rubel,

M = wage costs per annum,

$A_b$ = cost of material input converted into Forint,

L = amortization,

E = comprehensive capital requirement of production (at national economic level),

$\beta$ = o,2o (value of the efficiency coefficient of the investment).

Only the term E needs further explanation.

$$E = B + F + B_k$$

where B is the sum of the basic investment including also the costs of the accessory investments.

F = value of the working capital necessary for starting the production, and

$B_k$ = the normative value of accessory investments calculated according to materials.

Taking into account $B_k$, substitutes, as a matter of fact, "$\alpha$", the price adjustment factor of materials.

$B_k$, as a part of E, multiplied by $\beta$ increases the sum of inputs.

The value of $B_k$ is, according to regulations, two and a half fold of the value of home produced materials. Thus:

$$B_k \cdot \beta = 2.5 \cdot A_b \cdot 0,20 = \underline{0,5\, A_b}$$

So, the inland material expenditure (material + transport + renewals) is taken into account, on the one hand, as part of the term $A_b$ (second member of input), and on the other hand, as accessory investment charge ($0,5\, A_b$). $A_b + 0,5\, A_b = 1.5\, A_b$

The value of 1,5 is the rounded value of 1.56 for $\alpha$ which was deduced on page 32.

The significance of time for economic efficiency and the calculation of the time factor

The valuation of the role of time means a particular problem in the endeavour to increase industrial production, and in the planning and implementing of investments. Time in itself has no economic importance. The importance of time follows from the rate of expanded reproduction. This may also be observed in the practice of countries with market economy. In these countries the role of time is, generally, considered on the basis of the annual magnitude of the rent paid for the free-of-risk use of the capital. The change of capital over time takes place, so to say, tangibly before the eyes of the capitalist producer when he deposits his capital in the bank. Today's capital increase in the course of years, with the interest untouched, according to the laws of compound interest. The role of time is, generally similarly evaluated when projetors draw up investment plans.

In countries operating under central planning, the classical interest loses its economic content. Thus, in the planning and implementing of investments it cannot fulfill

any function, thus neither the function of characterizing the role of time. The time problem has to be solved on the basis of the real categories of socialist planned economy. In Hungary, several economists deduct the role of time from the rate of increase of the national income.

The economic efficiency coefficient of investments expresses the effect on the increase of the national income exerted by one Forint invested. The capitalist obtains for every Forint of his bank deposit yearly "k" Fillér income without any risk. Under socialist planned economy, investments raise the productivity of labour practically free of risk -, so that per each Forint invested the national income increases annually by $\beta$ forints.

Now, let us consider how this surplus changes over time. The increment of national income attained by investments is, similarly to the total national income, distributed according to the aims of consumption and accumulation. The ratio of the national income allocated to investments is denoted by "i". The actual, as well as the planned, figures of the latter can be estabiched from plans and statistics.

The share of the increment of the national income allocated to investments enables, at a later period, to produce further additional products, and so on. Thus, only a part of the increment becomes converted into capital, while another part is turned over to consumption! Therefore, from the aspect of the national economy, not the regular compound interest formula but a partially capitalized interest computation formula should be applied. The formulae of this computation are the following:

By investing the amount B, the new (additional) value to be obtained on average by the end of the n-th year (after having put the project into operation) will be:

$$T_n = B \cdot \beta \cdot q^n - 1$$

where:

$T_n$ = the new (additional) value at the end of vear n,
B = the total amount invested,
$\beta$ = the value of the economic efficiency coefficient of investments,
q = $1 + \beta \cdot i$,
i = the ratio of the national income allocated to investments.

When this mode of reckoning is followed, not only the new value allocated to investments is considered as result, but also the ratio of the increment of the national income which is turned to consumption, the two combined form the total increment.

The economic role of time is characterized by one forint investment and the average sum of the new values which can be produced by this investment.

This indicator is called the time factor indicator and is expressed by:

$$t_n = 1 + \beta \cdot \frac{q^n - 1}{q - 1}$$

At present, the time factor is calculated in Hungary in the following way. The value of the economic efficiency coefficient of investments is 0,20. The ratio of the national income allocated annually to accumulation is about 25 per cent. On this basis, the value of the time factor is as follows:

| At the end of the year: | value of "t" |
|---|---|
| 1 | 1,2o |
| 2 | 1,43 |
| 3 | 1,66 |
| 4 | 1,90 |
| 5 | 2,16 |
| 6 | 2,43 |
| 7 | 2,71 |
| 8 | 3,01 |
| 9 | 3,32 |
| 10 | 3,65 |

The time factor is mostly used in connection with the following problems:

- The investment sum is corrected in the case of such projects whose realization lasts several years i.e. it is debited with a "loss of interest", calculated with the time factor.

- For calculating the capacity of investments in case of demand changing over time.

- In case of investments where the input related to the realization of the investment and the results due to the opening up of the new project turn up spasmodically, at irregular intervals, (e.g. mining, afforestation, power generation).

- For the calculation of the correct amortization of projects of long duration.

The discussion of the above mentioned special problems surpasses the scope of the present study.

Solution of the Major Practical Problems of Economic and Technical Planning. Evaluation of Technical Variants

In the introduction of the present study, (on pages 7-8), the main types of those technical variants were enumerated which appear most frequently in practice: the choice of the most economic variant greatly influences the investment requirement of the new project. The range of technical variants is very wide indeed and includes in addition to the dimensions of parts, elements, tubes and conduits also the choice of the optimum technology, the size and site of the plant, and the problem of correct choices appears in several forms at all times and in all places.

The quotient of results and input i.e. the value of the economic efficiency indicator can be numerically determined only if the value of results as well as of the input is determinable. While the value of input is determinable in each and every case, the results can be determined numerically only in the case of investment variants which are an independent accounting unit from the aspect of accountancy. The result cannot be determined numerically e.g. for single buildings, machine units, junction lines, power network, auxiliary workshops, roads and sewerage systems, etc. This means that the presented formulae concerning the economic efficiency of investments cannot be calculated for the majority of technical variants. For the preparation of plans, however, there is no need for this. For the determination of the mutual relative economic efficiency of variants it suffices to determine numerically the input, since the results of the variants are identical. The variant whose input value is minimum will be of highest economic efficiency.

The valuation of input from the aspect of the national economy can be performed by applying the formulae shown on page 30 .

The general formula is: $R = B \cdot \beta + M + A \cdot \alpha$

where $\beta$ is the economic efficiency coefficient of investments, and

$\alpha$ the price adjustment factor of materials.

In the present Hungarian price system

$$R = 0,21\ B + M + 1,56\ A$$

According to the instructions of the Hungarian Planning Office dated 1958 the formula is:

$$R = 0,20\ B + M + 1,5\ A$$

Under the present Hungarian conditions the formula of total input in a pure producer type price system is as follows:

$$R = 0,15\ B + Ö,$$

It is interesting to compare the above input formula with the practice which is generally followed in the technical planning of countries with market economy, where the value of the total input is, usually, calculated by following formula:

$$R = B \frac{K}{100} + Ö$$

where K is the percentage of the bank rate.

As a matter of fact, this formula shows the overall production costs from the aspect of the capitalist who raises credit.

The projectors use in their calculations, according to the costing of the entrepreneurs, the above formula for the evaluation of the technical variants. In this way, the rate of interest plays a role in the material, form and size and, generally, in all other features of the project which influence the operating costs. If the interest rate changes, the relation between invested capital and operating costs changes, too.

If we now draw a comparison between countries with a market economy and the Hungarian practice, the following can be stated:

1./ The formulae used for the determination of total input of the technical variants

correspondto each other as regards their economic content, though, because of the different pattern of the price system, they deviate in their form. This is proved by the fact that if the formula of the National Planning Office used at present in Hungary is transformed for a producter type price system, even the formal differences between the two formulas becomes eliminated.

2./ There is however, a difference between the numerical magnitude of the economic efficiency coefficient of investments ($\beta$) and the rate of the interest (k). While in Hungary $\beta$ is 15 per cent, in countries with market economy k ranges from three to eight per cent and the projectors apply, usually, this percentage. Thus there is a considerable difference between the two kinds of key-numbers.

What is the economic content of this difference?

The difference can be attributed to the different aspects of evaluation. In Hungary, operating under a centrally planned economy, the evaluation is performed from the aspect of the total national economy. Therefore, the effects of investments are taken into account on the level of national economy, and the economic efficiency coefficient of investments was determined on the basis of the average impact it exerts on the increase of the national income. Its lower limit is the increase of the net income due to one Forint investment. This corresponds, in the capitalist system, to the category of the <u>average rate of profit.</u> The factor $\beta$ of 15 per cent is, therefore, in my opinion, a correct value supported by the economic conditions of Hungary.

<u>The application of the interest rate is motivated by private, individual aspects of entrepreneurs and investors.</u> The total costs of the entrepreneur are expressed in fact by the operating costs + interest on capital engaged. It is clear, however, that this is a case of individual evaluation and not one from the aspect of the national economy. It follows that, in my opinion, <u>calculations with interest rates do not bring about the application of the most fabourable variants from the aspect of the national economy,</u> and, as a matter of fact, for the sake of decreasing the costs of production i.e. the input arising from current operation, wasteful investments are made.

If one has to choose between technical variants in countries with a market economy, then, in my opinion, instead of applying interest rates, it would be more to the purpose to calculate with a capital charge expressing the average percentage of the total national economic gain (the sum of profits + interest on capital +earnings of the firm + amortization reserve + taxes). This form would reflect the aspects of the national economy more correctly and the economic pattern of investments would be, in this case, optimum.

Evaluation of Economic Variants: Information on how to Chart the Trend of Industrial Development in Accordance with the Endowments of the Country

In Hungary one of the most important problems of economic management is to develop export and to substitute imported products by inland production. In this context two question arise:

a/ what products should be produced on the existing productive capacities,

b/ which industrial branches should be developed and the production of what products be enhanced by productive capacity expanding investments.

The subject of investigations is, in both cases, the economic comparison of different Hungarian production and production development possibilities. The common aim of these measures is to ensure the relatively most advantageous realization of domestic labour input by dint of foreign trade i.e. to decrease the Hungarian input of the "yield" of a unit of foreign exchange. Thus, the different possibilities for the development of production turn into economic variants. For the evaluation of their economic efficiency, indicators are used which are formed according to previously expounded principles.

The selection of the export articles to be produced with the existing productive capacities, with due regard to marketing possibilities, relies upon so called "export efficiency" calculations. The export efficiency indicator (G) is the following:

$$G = \frac{\text{input}}{\text{result}} = \frac{(\ddot{O} - A_{i1}) \text{ Forint}}{(T - A_{i2}) \text{ \$ or Rubel}}$$

where Ö is the production cost in Forint,

$A_{i1}$ = the price of import materials used for production in Forint,

T = the export price of the produet in $ or Rubel, and

$A_{i2}$ = the price of import materials used for the production in $ or Rubel.

Thus, G shows the costs in Forint needed for the "yield" of one $ or Rubel. The smaller the value of the indicator, the higher the eeonomic efficiency of producing the product with existing capacities.

In Hungary regular export efficieney calculations are made for the more important products. In order to increase the aceuracy of calculations, we try to eliminate accumulation from the production cost along the whole chain of production, and to express input as "wage eosts on the national economic level" (to ealeulate at "real production cost" prices). These calculations are widely used for the determination of the special line of production of plants.

The second sphere of problems is the purposeful determination of the economical trend of industrial development. The trend of industrial development and the objectives of productive investments are determined on the basis of weighting several points of view simultaneously. "Economic efficieney" is only one of the aspects, though often it can be the deeisive factor in itself.

The importance of economie effieieney related to the determination of investment objectives was for long years a highly debated question. Prior to 1953, autarchic tencies prevailed in planning and the endowments of the country as well as market relations were disregarded. Sinee 1957, however, a considerable change has taken place in this respect and, today, great importance is attributed to the economic efficiency when investment objectives are set.

Sinee the economic efficiency of production expanding investments is in Hungary generally judged on the basis of foreign eurreney returns issuing out of production and the total domestic input used for the same, the applied economic efficiency indieator - whether the development actually furthers export or is meant for the internal market - corresponds to the indicator prescribed by the National Planning Office in 1958

and reviewed on page 40 of this study.

In the course of years economic efficiency calculations were performed for several thousand investments. These are grouped by industrial branches and so it is possible to compare within single industrial branches the economic efficiency of plants producing similar products and, in this way, the order of setting up projects can be decided expediently.

The calculations performed up to now call the attention to the fact that the economic efficiency of the various development possibilities shows marked differences even within single industrial branches. Therefore, it does not suffice to perform investment efficiency calculations on the level of plants, but, the economic efficiency must be established separately for single products, and groups of products respectively, even if, the elaboration of the fixed and working capital requirement needed for the production of single products takes a lot of trouble.

The minimum of economic efficiency determined on the basis of the average economic efficiency of development possibilities is of particular importance. This value can be used as a normative to judge single investment-projects. If the development of exports is the objective of the investment and its economic efficiency does not reach the compulsory normative, it should be only implemented if it is supported by other important reasons. It seems expedient to establish the economic efficiency normative of investments close to the average value. It is undesirable that new projects should lower the average level of economic efficiency. e. g. if, in the pharmaceutical industry, the input requirement is on the average ten Forints for the yield of one $ and the established normative is Forint 11.50, then a development project cannot be realized where the yield of one $ requires Forint 12,00 total input.

The situation is the same in the case of investments aimed at import substitution. The substituting variants, which must be investigated in order to reach a decision, are the import of the product and its production in Hungary. The total input of the domestic development is established according to the previously decribed method. In the case of import, the sum of the disbursed foreign currency is the input. The rate of conversion of the foreign currency is established on the basis of the average cost in

Forint of the Hungarian product to be exported per unit of foreign currency to be earned. The necessary data were established by dint of the national economy's input-output tables. From the aspect of economic efficiency it is jusitfied to start the Hungarian production if the domestic input of the export equivalent needed for the import of the product surpasses the total input of the home production of the product in question.

III.

## Application of Prospective Value Relations in Economic Efficiency Calculations of Investments

The uniform economic efficiency calculation introduced in 1958, was of great practical importance. Before this instruction was issued the investors applied the most diverse methods for the evaluation of the efficiency of investments. The methods were generally chosen with the aim to extenuate the projects, to make them look more efficient than justifieds. Since the new methodology specified the cost components which have to be taken into account and settled the mode of their calculation, the possibility of extenuation considerably decreased.

Practical experiences revealed, besides the above mentioned results, also the inadequacies of the methodology.

The value of 1,5, given for the price adjustment coefficient of materials was often critisized. This figure was an average value of the national economy and it was fully justified to criticize its inaccuracy in the case of certain actual investments. Other critical comments, again, disapproved of the static character of the method of computations.

From this aspect, the economic efficiency indicator of production expanding investments was, indeed, not homogeneous. In the instructions on calculations it was prescribed that the foreign trade organs have to prepare price forecast studies regarding the world market prices of products. For the numerical determination of the economic efficiency coefficient of investments we started from a ten year's perspective and the constants of the national economy which are necessary for the determination of the value of $\beta$ were also established by taking into account several years of development. The value $b_g$ - the investment requirement for releasing one unit of labour - was not reckoned at its present magnitude but at an estimated value of ten years' ahead. The term $b_k$ is based on data of investments planned at present. The realization of the latter and the

boosting up of production takes three to four years. On the other hand, the prices of all Hungarian materials and the costs of investments were evaluated with the present labour productivity and on the basis of present production costs.

It was rightly objected that particularly large investments determine the development of one or another industrial branch for 20 to 30 years ahead; therefore, one must try to determine the capital requirement and labour demand of the development by considering value relations in 10 to 15 years' time, instead of the value relations of the present price system.

For the sake of increasing the accuracy of calculations and to apply value relations to be expected in the future, as well as to improve the actual methodology, the National Planning Office edited and published for the purpose of experimental calculations the methodology entitled "Evaluation Method of the Economic Efficiency of Development Variants Aiming at Identical Results". Since February 1965, this methodology has to be applied for the efficiency computations of larger investment projects.

The new methodology adopted the chief economic efficiency indicators of production expanding investments from the former methodology, unchanged; it also considers the variant of a minimum per unit expenditure as the most economic one. The unit of product can be determined, in case of technical variants, by natural units of measurement e.g. tons, pieces, etc. In the case of economic variants, the "yield" of foreign currency must be regarded as the object of the production, and here one $ or one Rubel fulfill the role of the unit of product.

However, the evaluation of expenditures means a further development of the earlier methodology. Instead of the average material price adjustment coefficients applied up to now, price adjustment coefficients of industrial branches were set up; the appendix of the methodology contains the values of the latter for 95 industrial branches.

The price adjustment coefficients of industrial branches were determined as follows:

On basis of the national economy's input-output tables, as well as relying upon concrete data of investments planned in the last years, the accumulation and wage

content of products, and also the capital requirement of production by industrial branches was determined (the fixed and working capital requirement of industrial branches needed for the production of a product of one Forint value). From the input-output tables the input requirement of different branches from the output of various other branches was also known. By applying the material ratio coefficients of these branches the capital requirement for the end products of single branches was calculated on the level of the national economy. The asset engagement charge (capital-charge) was established by employing the 20 per cent economic efficiency coefficient of investments (0,20 E.). The sum of the capital charge thus obtained and of the wage content of the products form the price adjustment coefficient for industrial branches.

The price adjustment coefficients obtained for industrial branches show a considerable dispersion (from 1,16 to 2,70) in comparison to the national economy's average price adjustment factor of 1,5.

The total input formula changes as follows if price adjustment coefficients for industrial branches are applied:

$$R = B \cdot o,2o + M + A_b + C_b + A_i \cdot C_i$$

where $C_b$, the average price adjustment coefficient of Hungarian materials, has to be formed as the weighted average of material consumption and the price adjustment coefficient of the industrial branch:

$$C_b = \frac{A_{bj} \cdot C_j}{A_b}$$

where $C_b$ is the average price adjustment coefficient,

$C_j$ = the price adjustment coefficient of branch j,

$A_{bj}$ = value of the inland material originating from branch j, and

j = the serial number of branches.

The average price adjustment coefficient of import materials ($C_i$) must be calculated in the above way, as the weighted average of price adjustment coefficients of import materials of different provenance.

This method of computation rendered the determination of inputs more exact.

It was a far more intricate problem to enable the practical accounting of future, prospective value relations. As a first step, on the basis of the wage cost index of industrial branches determined with the aid of the input-output tables, the investment expenditures and the material costs calculated at current market prices were converted to a wage-level valuation system net of accumulation. Subsequently, we started from the assumption that the productivity of labour increases from year to year to a different degree in the individual industrial branches. Accordingly, in the prices of products the accumulation content increases and the wage cost ratio decreases. Similarly, one has to take into account, though to a smaller extent, changes in the raw material requirement of the products, or more precisely, the decrease of the per unit consumption.

The data of two Five Year Plans were the starting point for working out the productivity and material cost indices. Relying upon the data of Five Year Plans for industrial branches (from 1961 to 1965 and from 1966 to 1970) we determined the perspective indices for the increase of productivity and the decrease of the material input for a period of 10 years. By applying these indices and on the basis of the input-output data of industrial branches we determined the changes in the wage content and material content on the level of the national economy for the end products of the industrial branches. The wage ratio indices to be expected in ten years for the products of different industrial branches were obtained as aggregate values of two key-numbers. The material prices determined at wage level were corrected accordingly. In the final analysis, price adjustment coefficients were obtained which, starting from the present prices, show the formation of value relations in ten years' time.

Thus, the input is assessed in three valuation systems:

- at actual domestic prices,

- at production cost on wage level (net of accumulation),

- at production cost on wage level reflecting the productivity relations in ten years' time.

From among the three valuations the third one i.e. the calculation on the basis of value relations in ten years, is considered as the decisive valuation. In spite of this, we find it necessary to perform all three calculations so that the possibility should be given for the economic analysis of the difference between the three valuations.

The calculations do not cause considerable surplus work since the starting data of the calculations in the three types of value systems are identical, and the multiplications by the price adjustment coefficients, given in the Annex of the instructions are simple.

By way of illustration let us now present the price adjustment coefficients for a few industrial branches according to the three valuation systems:

| Denomination of the branch | Price adjustment coefficients per one Forint of home-produced material requirement | | |
|---|---|---|---|
| | at current prices | at wage level | at value relations in 10 years |
| Coal-mining | 1,23 | 0,96 | 0,75 |
| Oil and natural gas production | 2,07 | 1,64 | 1,17 |
| Peat-winning | 1,39 | 1,16 | 1,01 |
| Briquetting | 1,37 | 0,99 | 0,75 |
| Power generation | 1,61 | 1,22 | 0,88 |
| Brick and roof tile industry | 1,39 | 1,06 | 0,80 |
| Quarrying | 2,00 | 1,77 | 1,31 |
| Starch manufacture | 1,54 | 1,09 | 0,82 |

The above figures show that prices are adjusted in a different degree according to the differing increase of the prospecitve productivity of industrial branches or, more precisely, for each industrial branch price reductions of different degree are computed.

For instance, while peat prices are reduced by 27 per cent, and coal prices by 39 per cent, a 44 per cent price reduction for oil and 45 per cent for power production is computed.

Taking into account prospective value relations will bring about that, in the future, less importance will be attached to the cost of material as is done at present, and greater consideration will be given to economizing on the expenditure on live labour. As a consequence, in case of decisions based on efficiency calculations, preference will be given to variants representing a higher technical level. There can be no doubt that this is the desirable trend.

These practical calculations performed prove that the improvement of the former computing methodology is to a purpose. If the computations show that, according to each of the three valuation systems, one and the same variant is the most advantageous one, the scruples which had often been raised against the results of efficiency calculations on account of the distortions of the price system, can be disregarded. When however, the different valuation systems point to different variants as being the most advantageous, the possibility is given to clarify the cause of the deviations by economic analysis, and to establish the most advantageous variant.

The calculations of the canned-food industry caused the greatest surprises hitherto, because of the deviating price pattern of industrial and agricultural produces.

The application of the expounded new economic efficiency methodology of investments was ordered by the instructions issued for the preparation of the Five Year Plan (from 1966 to 1970). Presumably, for about 250 to 300 major projects will investment efficiency calculations be prepared by applying prospective value relations. By the end of this year we shall be able to draw up more precisely the order of efficiency of various industrial branches from the aspect of export development, and, by so doing, render indispensable help in the elaboration of the 3rd Five Year Plan.

We intend to continue our pioneering work aimed at planning prospective value relations by relying upon the experiences of practical calculations. (The method of calculating prospective value relations had been worked out and the practical computations were directed by Mr. Gábor Révész, Head of Section of the National Planning Office.)

## IV.

## Methods of Decreasing the Capital Requirement of Production with Special Regard to Countries with Highly Controlled Prices and Countries with Surplus Labour

In connection with the efficient pattern of investment it was emphasized that a given production target can be realized by variants of differing capital intensity. The supplementary part of investments is usually determined by projectors on the basis of calculations of their own. For that purpose the formula (B . $\beta$ + Ö) is used in international planning practice and the variant of the highest economic efficiency is chosen according to the theory of minimum input.

The submitted investigations and calculations have proved that the above formula of total input can be applied purposefully also for calculations on the level of national economy. It is suitable for the determination of the optimum pattern of investments and to ensure thereby the maximum rate of increase of the national income. There are, however, two important preconditions for the truly correct choice between variants, should this formula be applied.

1. The prices used for the calculation should be prices of the producer type price system.
2. The value of $\beta$ , the economic efficiency coefficient of investments should be chosen in compliance with the endowments and other conditions of the national economy.

As was shown, the formula (B . $\beta$ + Ö) discloses the value of total input only in the pure producer type price system. If, for whatever reason, the prices do not contain accumulation in proportion to the fixed and working assets in the production, the total input should not be calculated by the above, generally accepted formula, but by the formula (B . $\beta$ + M + A . $\alpha$ ). The mutual weighting of costs of wage and material character must be performed with the aid of the correctly calculated "$\alpha$", the material price adjustment coefficient, by multiplying material prices with $\alpha$ . If the value of $\alpha$ is not established correctly, the investing bodies will not economize in an optimum way on wage and material costs when making the choice between variants: they use more

material for the sake of decreasing the wage costs than would be econonic indeed, or vice versa.

The above described deficiency in the field of technical planning was, a few years ago, a general occurence in Hungary. It happens even today that price adjustments are disregarded in detailed calculations. This is, probably a repeatedly occuring mistake of technical planning in all countries applying construed or greatly indluenced price systems.

Another great deficiency occuring when the capital requirement of production is determined is the application of investment efficiency coefficients of inaccurate magnitude. In most of the countries the main hindrance to the expansion of production and to developing the economy by the latter, is the lack of capital. This mainly holds good in respect of countries where there is a relative abundance of manpower and the natural increase of population is high, too. The contrast of surplus labour, on the one hand, and the lack of capital, on the other, is in these countries particularly striking.

The precondition for an optimum development is to employ the labour force and make investment inputs in the given period in accordance with the available possibilities.

Therefore, where free manpower is available and will be probably available in a perspective of ten years, too, those forms of production development must be sought for which can be realized with the smallest investment. To use a mathematical expression: the determinative constraint for the development of production is the restriction of investments.

If the aim of the expansion of production is not profit but the maximum increase of the volume of national income, then investments must be planned in such a way that maximum net production value should be attained per unit of investment, as it is done in countries operating under socialist planned economy. (The difference between the value of production and costs of material character is: T - A.)

In countries with market economy the aim of private capital investment is not the aforesaid but to reach maximum profit. The difference between the two objectives

is the greater, the bigger the contrast between surplus labour and lack of capital. Therefore, in several countries, the mechanism of free market economy gives wrong information as regards industrial development; information, which does not meet the national economic interest of the country and causes such allocation of capital investment as will not bring about the maximum impact on the national economy.

This mistake can be narrowed down to its essentials by stating that industrial development is superfluously capital intensive or, by elucidating the question from another aspect, it can be said: the available capital is used in such a way that less labour force is employed than in an optimum case.

In my opinion the desirable line of procedure is the following:

In every phase of the planning of investments, the "total input" which comprises the investment as well as the operating costs, should be calculated in a way favourable not for single entrepreneurs but for the national economy. The values thus calculated must be taken as a basis for the choice between variants (both technical and economic.)

The above thesis has nothing to do with the fact whether the country in question is operating under socialist or capitalist economic system. The correct procedure is, in both cases, identical.

Part I. and II. of the present study comprise the methods for the calculation of total inputs in compliance with the endowments of the national economy as well as the economic justification of the calculations. In these calculations, as it was shown, the valuation of labour and capital defined in relation to each other is expressed by the magnitude of $\beta$, the "economic efficiency coefficient of investments". Therefore, the correct valuation of labour and capital in conformity with the actual situation of the national economy must be ensured by the correct determination of the value of $\beta$. It is quite clear, that the mechanical application of the bank interest rate, for the calculation of capital charges, is wrong, if it is applied independently of time, space and price systems! This is the element of calculation which directly brings about relative waste of capital.

The investment requirement for the development of economy depends upon the objectives of the investments and on the technical solutions chosen for the realization of these objectives. The role of the economic efficiency coefficient of investments is equally important for the solution of both problems. The capital requirement of the individual industrial branches is very different. In Hungary for instance, the dispersion of the investment requirement for one Forint of product p.a. is between 0,5 and 10,00 Forints. The investment requirement for the creation of one place of work shows similar dispersion. Therefore, from the aspect of the capital requirement of production, the determination of the trend of the development of production and that of concrete objectives of productive investments is of decisive importance.

The economic development of a country and the determination of investments in single periods is a highly intricate task.

For taking decision, in addition to the efficiency of the expansion of production, a number of other relations and aspects have to be taken into consideration. There is, however, no doubt about the importance of economic efficiency. For the choice between "economic variants", satisfying other aspects too, economic efficiency in itself may be decisive and determine the trend of development. That is why so great importance is attached to economic efficiency calculations applied for the evaluation of economic variants. (These calculations were submitted in Part II.)

Due to economic efficiency calculations, the magnitude of the coefficient $\beta$ - which shows the value relations of labour input and investment input - also affects the determination of the trend of development!

In countries with considerable surplus labour and where the value of $\beta$ is considered as equal to the bank interest rate, $\beta$ exerts an undesirable effect!

Thus, in order to ensure correct results, in the economic efficiency calculations of investments, when the total input needed for the yield of one $ or one Rubel is calculated, it is also necessary to reckon with a value of $\beta$ being in conformity with the endowments of the country.

The above requirement is likewise important for the calculation of the efficiency of "technical variants".

If the objective of the production was once decided, the technical variants differ from each other, in essence, in respect of labour and capital requirement. The lower the coefficient $\beta$, the higher is the economic efficiency of the variant of bigger capital requirement, because the "part of supplementary investments" increases. Since, however, identical production objectives can be realized by dint of very different technical and technological solutions (mechanization, automation, and different dimensions of buildings) the investment requirement of the production considerably depends upon the correct value of $\beta$. This is not a question of raising the investment requirement by only a few per cents, because a change of requirements amounting to even 100 - 200 per cent is not rare! For example: In Hungary, the value of $\beta$ was established, in the present price system, at 20 per cent. Now, if we mechanically applied for the economic and technical planning of investments the classical "interest rate" of four to five per cent, the capital requirement of the production would,according to my estimation, increase by 30 to 40 per cent.

Hungary is a country of rather average industrial development and does not dispose, practically, of free manpower reserves. The danger of wastefulness is by far greater in less industrialized countries which possess considerable labour reserves (e.g. Africa, Asia) because the value of the economic efficiency coefficient ought certainly to be determined, in these countries, at a far higher value than 20 per cent !

In countries at an initial stage of industrialization, the economic efficiency coefficient of investments is far higher than the one of 20 per cent applied in Hungary. In my opinion, it would be fairly right to reckon in the case of several countries, even considering a perspective of 10 to 15 years, with a value for $\beta$ of about 40 to 50 per cent.

The economic pattern of investments changes considerably in the case of an investment efficiency coefficient of 40 to 50 per cent; the supplementary part of investments, as well as the sum of total investments, decreases to a high degree. If an identical sum of capital is employed, with $\beta$ of 50 per cent far more workers can be kept employed and a higher national income be produced than if the value of $\beta$ is calculated at 20 or 5 per cent.

Obviously, it is highly important to determine the economic efficiency coefficient of investments in conformity with the country's actual and expected manpower situation as well as, in compliance with its wealth of capital and its price system,because

by applying an optimum value for $\beta$ in the planning of investments, the rate of development of the national economy can be greatly accelerated.

The realization of the propounded special method for the economic and technical planning of investments in conformity with the endowments of the country is not an easy task.

The technical sciences show a world-wide international progress which is not limited by the boundaries of countries. The projectors employ dimensioning formulae which have been used for decades, handbooks containing computation charts and key-numbers. The use of these aids becomes international, too. The mathematical, physical and chemical connections and ratios include also economic calculations and coefficients (e.g. the interest rate). As a consequence, the labour situation, the accumulation of capital and the special features of the functioning domestic price system of the individual countries are disregarded and methods of calculation which have become international are applied independently of the above mentioned endowments of the country. In Hungary, for instance, even ten years after the nationalization of the plants and the establishment of centralized planned economy, a number of planners used to apply the unchanged efficiency calculations from 20 - 30 years ago, in a fundamentally changed price system. In addition to central regulations, an extensive informative activity was necessary, and is necessary even today, in order to change this inadmissible practice.

It means a further difficulty that in the propounded economic efficiency calculations the interests of the national economy prevail, and consequently, in countries with market economy the problem arises how the contradictions between the interests of the national economy and those of private capitalists can be eliminated. By which price, credit and taxation policy can the two kinds of interest be purposefully reconciled.

The only aim of this study was to expound the problem of the economic efficiency calculations of investments and, by presenting the correct methods of evaluation, to draw the attention to the contradictions between the optimum calculations from the aspect of the national economy and the present practice. The problems related to the realization of the suggested methods surpass the scope of this paper.

It is firmly believed, however, that although the problems are considerable, they can doubtless be solved by purposeful international effort and collaboration.

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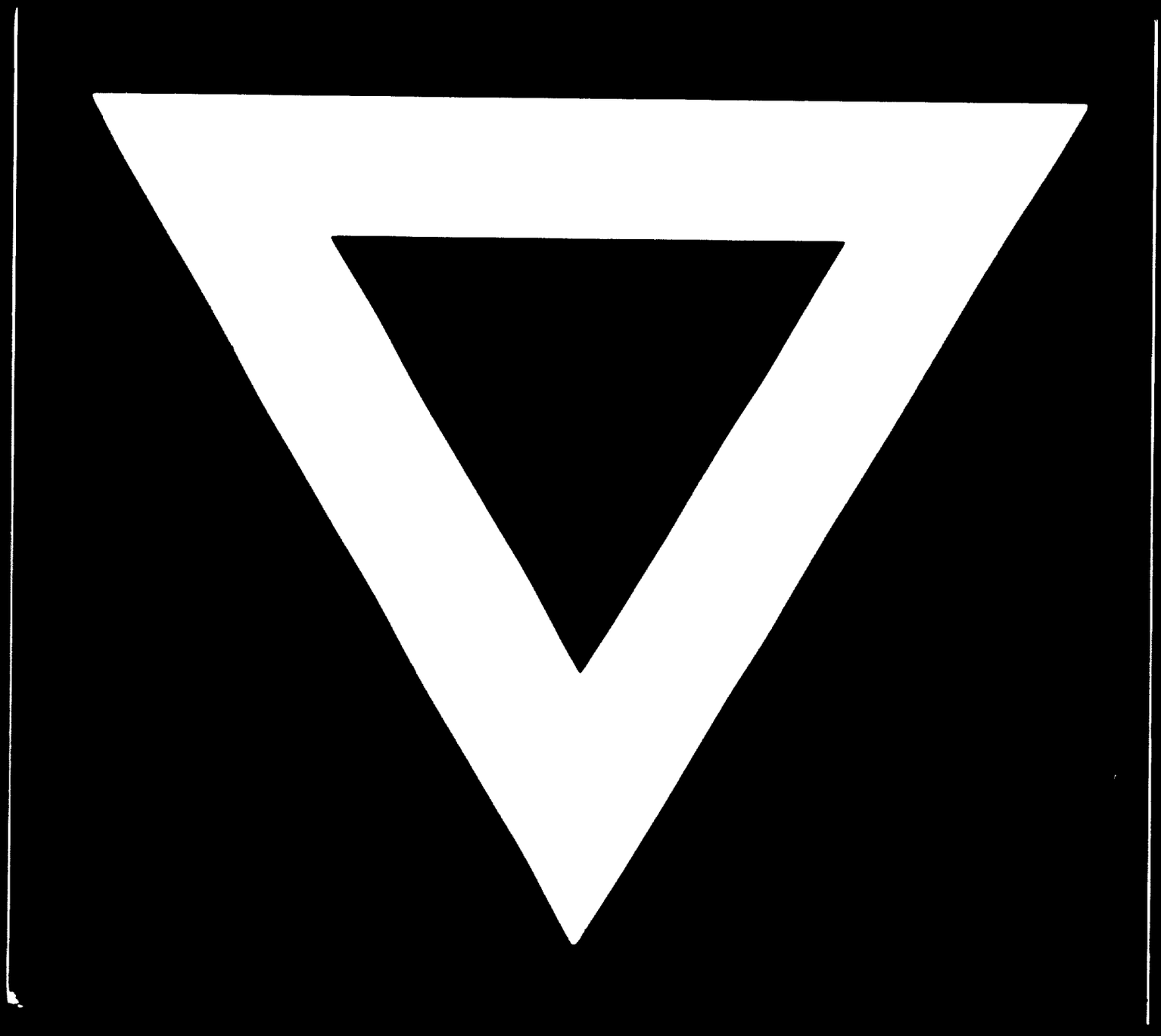

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