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INTER-INDUSTRIAL ASPECTS OF PROJECT EVALUATION

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I. Setting the problem

1. Economic growth is determined by social and political factors on the one side, by economic factors on the other. The role of both kinds of factors is equally important and a generally valid priority cannot be determined even in case of economic factors (land, labour, capital, institutions, etc.). Stimulation and acceleration of economic growth requires social, political and institutional changes and investments both in capital goods and "in man". Priority cannot be given either to capital or to "human" investments. In some stages of development "human" investments may enjoy priority (e.g. in developing countries improvements of health conditions, elementary education, in developed countries training of scientific personal), in other periods priority may be assigned to capital investments, moreover, these two kinds of investments may be interconnected (see e.g. capital investments in health and educational institutions, human investments in vocational training for new establishments). This paper deals only with capital investments, more precisely with investments in fixed assets from a special point of view, namely as far as interindustrial aspects are concerned.

2. Capital investments in fixed assets may be classified roughly in three groups: investments aiming (i) replacement, (ii) substitution in order to reduce costs, increase productivity and competitiveness and (iii) establishment of new capacities. In the majority of the cases these aims cannot be distinguished precisely; replacement mostly brings modernisation and often widening of capacities. Establishment of new capacities yields more often than not an increase in productivity etc. Nevertheless, in most cases one of these interrelated aims may be considered as primary. In order to facilitate the exposition of the following ideas, this study will focus on investments of fixed assets aiming at the establishment of new capacities. In developed economies, replacement of obsolete and substitution of existing fixed assets may have the same or similar significance as the establishment of new capacities, but in developing economies

the latter are of greater importance. This latter type of investments have generally a greater impact on the rate of growth and the structure and balance of the economy, than the former ones and therefore they are more convenient to illustrate the complicated problems of interdependencies of investment activity. Productive and non-productive investments may also be distinguished in this study; the more complicated type, productive investments will form the basis of the discussion.

3. By interindustrial aspects of investment activity is meant analysis and consideration of interindustrial relationships influencing balance and efficiency of the investments and of the economy, as well as criteria and problems of distribution of investments by sectors/branches of the economy. In developed economies, interindustrial relations are as a rule more numerous and more complicated than in developing countries. In spite of this fact the analysis of these relations in developing countries is not of less importance owing to a special sensibility of these economies to structural changes and unbalance. In developing economies we are confronted with more rapid structural changes, since increases, though small by their absolute size, may yield high rates of changes of the structure and over time, due to the low level of development in general.

4. Investment process includes various activities; it starts with a preliminary design of development serving as a general framework of resource allocation. It includes preparation and evaluation of individual projects as well as implementation and ex-post supervision and evaluation of the chosen projects. Interindustrial relations must be taken into account at all these stages but they appear in condensed form at the project evaluation. The present paper deals with the consideration of interindustrial aspects at the stage of project evaluation. It gives first a brief description of usual methods of project evaluation with some critical remarks, then it attempts to raise some further suggestions, first of all <u>from the point of view of developing economies</u>. The discussion begins with the case of developed economies, all the more since methods recommended for and used by developing countries grew out from the practice of the former countries.

II. Project evaluation in developed market economies

5. In developed market economies balanced growth must be regulated and stimulated by price mechanism. According to the opinion of the majority of economists of these countries, this mechanism leads not only to an equilibrium but also to an efficient allocation of resources and a quasi-optimal path of growth. That means that decisions of individual entrepreneurs based in the first place on prices and further on other information are generally correct both concerning current production and investment activity. We may add, however, that the price mechanism may fulfil its function of optimisation only in case of perfect competition, a condition practically never met, and even in this case only approximately. The recognition of these imperfections of the functioning of the price mechanism is reflected in the increasing scope and role of state planning and intervention in most developed market economies. State planning and measures of economic policy are intended to correct both current production and - maybe even at a larger scale - investment and development activities.

6. Private profitability as the main criterion of project evaluation in developed market economies may beconsidered. It can be measured by various formulae dealt with in detail in production, engineering and accounting handbooks and manuals. It is common in these formulae that (i) both costs and benefits are measured from the entrepreneur's point of view at actual market prices (with anticipations), and (ii) only the stage of the production process performed by the given project will be evaluated, disregarding its impact on efficiency of other production units and activities. Two most often used types of calculation and evaluation may be mentioned: comparison of the pay-off periods and comparison of total costs and benefits of the project by means of discounting methods. The first criterion disregards the working time of the projects, the time after the pay-off period, respectively and similarly the time preference aspects. This criterion concentrates on the quickest possible return of the invested

capital, or liquidity and on reducing duration of the risk. The other type of evaluation is based on comparison of total (investment and operating) costs and benefits of the projects, calculated at market prices and for the full working time of the projects further present and future values made equivalent by discounting methods, (present worth or annuity). Consideration of other (even not measurable) factors is, of course, also recommended, in both cases and is in fact widely practised.

Recent researches investigate also the actual motives of investment decisions of private enterpreneurs and the calculations and evaluations actually performed.[1/] The results point to a rather modest role of the calculations; routine decisions are wide-spread and, among the calculations, pay-off indicators and simplified cost-benefit comparisons are preferred.

7. Project evaluation in developed market economies takes into account interindustrial aspects only indirectly by prices and market studies. It is supposed that by taking into consideration the prices and by use of market studies, of analyses of actual and expected (estimated on base of time series) demand and supply curves and conditions, investments may be correctly allocated to the structure of the economy. Both logical considerations and practical experiences, e.g. data on under-utilisation of capacities seem however to hint at deficiencies of this process. Nowadays it is quite generally acknowledged that a mutual information among the investors (as e.g. by Konjunkturtests), as well as a more or less extensive and intensive coordination of investments plans and projects may be recommended also in developed market economies. These steps may reduce risk, smooth unbalances of growth. Prices serve also as guides for efficiency and as it is often supposed they are also relevant from an interindustrial point of view. Wide use of taxes, subsidies, direct investment allowances, claims to analyses of external economies, social costs etc.

1/ See e.g. the works of John E. Meyer and Edwin Kuh concerning the US; B.R. Williams: International Report on Factors in Investment and Behavior, Paris, 1962, as for the coordinated research programme of six OECD countries; a survey of Erich Gutenberg (FRG) etc.

indicate, however, that this mechanism needs corrections in this respect as well. To quote Robert Stone, National Economic Development Council, London: " ... positive action is necessary ... to make the economic system work better and the mechanism by which these are put into effect. One of the most important ways in which this can be done is to bring private costs as nearly as possible into line with economic cost to the community as a whole.... Another important area where action is needed to make the "market" work better is the need for a more rational and informed base of reaching investment decisions."[2/]

III. Project evaluation in centrally planned economies

8. Within the group of countries called by the UN terminology centrally planned economies (and by themselves: socialist economies), it is possible to make a distinction between developed and developing countries, too. Nevertheless, from the point of view of the problems discussed in this study, this distinction does not seem to be especially fruitful. Besides their common features (as the public ownership of the means of production, the central planning with similar targets and policies, etc.) there are, of course, important differences among these countries and in some of them, significant changes and improvements are going to be performed in the methods of central planning and administration of the economy. From the point of view of investment activity and project evaluation problems, the centrally planned economies may be studied perhaps better if not classified according to the level of development but according to the size of the country and the share of foreign trade. These two interconnected factors seem to account for more of the actual differences and problems and for more of experimental improvements than a breakdown into developed and developing economies. As for the size of the country and the share of foreign trade, there is on the one side the Soviet Union, a self-sufficient economy with a population over

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2/ The Economic Journal, March 1965, (page 11, resp.14).

two hundred million and on the other side the small and medium size countries in Eastern Europe (among them Hungary) with a high share and an outstanding role of the foreign trade.

9. To begin with the common features, in centrally planned economies the overwhelming part of the investments (and the new establishments exclusively) are financed from central state funds. In the framework of a rather detailed nation-wide planning, the central institutions determine the total investment expenditure of the country and distribute it between directly productive and other (social overhead) goals. Further, on the funds available for productive investments are distributed among major sectors and branches of the economy. Individual project evaluation and selection will be performed for major projects centrally and for other projects by delegation to lower authorities.

The distribution of the investments by sectors and branches is based in the first place on the coordinated production programmes of the sectors and branches. The harmonisation of these sector programmes proceeds by use of successive iterative methods analysing mutual effects, impact on material and product balances (mostly expressed in physical units) and resources available for investment and operation as well. The first experiments started recently on utilisation of input-output and other mathematical methods. In this framework the distribution of investments by sectors and branches will be evaluated from the point of view of the requirements of the leading sectors and balanced growth.

10. Special efficiency calculations and project evaluations help decision-making in case of alternative solutions of identical project targets, i.e. substitutive and technological variants, and variants as for size and location. For this purpose, besides partial measures, synthetic formulae are used comparing costs and benefits per annum, benefits measured by total value of output or value added, costs by operating costs and

normative charge on capital. This charge on capital may be interpreted also as the opportunity cost of capital, or social marginal rate of substitution between labour and capital, or prescription of a standard period of recoupment. In order to equate time differences in the implementation of the projects, discounting methods are applied, too. The relationships of the new establishments with input-providing sectors will be taken into account in case of major specialised suppliers (e.g.thermoelectric station and coal mine) by evaluating these total complexes as connected or multi-purpose projects (as far, benefits, operating and investment costs). In other cases only additive (indirect) investment requirements of the supplier's sectors will be considered. Costs of major social overhead capital investments needed by the new establishments are calculated and included as well. Corrections of actual prices in order to measure social values as a rule are not considered necessary.

11. In the last years a great deal of refinement and differentiation of these formulae took place in most centrally planned countries, which can not be dealt here in detail.[3] Only some characteristic problems and modifications from the Hungarian practice will be mentioned connected with inter-industrial aspects of project evaluation. These at some extent may be regarded typical for most of these countries in Eastern Europe, too. The modifications originate probably from the full acknowledgement of the high importance of international division of labour and foreign trade for a country of the size of Hungary, and lacking so much raw materials. The consideration of the importance of foreign trade led to a highly developed analysis of balance-of-payments effects and to measure the benefits of the projects by value of gross or net output in foreign currency equivalents.

3/ See besides national publications "Evaluation of Projects in Centrally Planned Economies" in Industrialisation and Productivity Bulletin 8, U.N. On the Soviet Union recent works of T.S. Hatchaturov, on Poland that of M. Rakovski may be recommended.

Doubts about the adequacy of actual prices engendered this idea and led to experimental uses of some kind of accounting prices measuring domestic inputs (costs) as well. The recognition of the idea that foreign trade increases possibilities of substitution among projects on an extraordinarily large scale was also very important.

According to this frame of reference, projects serving the same goal may be and are in fact compared. Efficiency can be measured only either by equalizing benefits and comparing costs or by equalizing cost and comparing benefits. Considering any export or any import-substitution as ways of earning foreign currency, these are identical goals with commensurable benefits and their costs are to be minimized and may be compared. That means on the other hand that new projects ought to be chosen not only in order to fill in lack of capacities and thus to serve balance or planned unbalance, but since this lack may be eliminated also by reducing exports or increasing imports, these projects can and must be evaluated also by the criteria of their efficiency as to earning (or saving) foreign currency.

In Hungary, available information indicates that systematic investigations about the actual role of efficiency calculations in investment decisions are not yet performed. Many indications hint at a rather limited role of these calculations, besides the various qualitative or extra-economic considerations. Recently interindustrial relations and linkages of single projects are investigated with more attention. The methods mentioned in paragraphs 9 and 10 are judged insufficient. Research work is going on in order to gain improved methods within the framework of input-output analysis and mathematical programming. Some experiences of this work and some proposals based on these experiences will be outlined in Chapter VI. - VIII.

IV. Project evaluation in developing market economies

12. From the point of view of investment and project evaluation activity, one may point out only three characteristics of developing versus developed market economies. In developing market economies (i) the overwhelming part of investment expenditure, the vast majority of the projects are subject to government decisions, respectively to direct or indirect governmental influence; further, there is acknowledged, that (ii) the functioning of market and price mechanism is especially imperfect and needs corrections, and (iii) central nation-wide planning may be recommended and is widely used to promote economic development and achievement of social objectives. As for project evaluation, private investors judge investment possibilities in developing economies essentially by the same criteria as in developed economies, primarily by private profitability. Of course they take into account the special conditions of these countries (risk and other elements) and measures of governmental development policy as well. What needs further analysis first of all, are the problems, criteria and methods of project evaluation to be performed by central authorities, governmental institutions in developing economies (either concerning self-financed projects or assistance to private enterprise.)

13. The specific problems of investments in "underdeveloped areas" appeared in the literature about some twenty years ago and in the subsequent years a great deal of criteria for project evaluation, theoretical considerations and formulae of practical calculations were suggested and discussed. From the multitude of the proposed criteria only some characteristic ones will be quoted here. The first proposals (e.g. by J.J. Polak, N.S. Buchanan) recommended - as we may call them now - "scarce-factor"-criteria: rate of capital turnover (incremental capital-output ratio) and balance-of-payments effect. The critics of these proposals acknowledged the usefulness of these partial criteria but denied their generalisation, since

they neglect implicitly other important factors (first of all labour) The more comprehensive criterion of social marginal productivity was suggested by A.E. Kahn and others. This SMP criterion is the transformation of the private profitability (MP) criterion, where instead of profit national income may be measured. In this case, prices must be corrected by divergencies of market prices and "social values" as well as external economies and diseconomies are to be taken into account.

The quantification of this SMP criterion raises, however, serious problems[4] and it may be and was in fact criticized for neglecting time aspects of the efficiency. The "marginal per capita reinvestment quotient" by Galenson and Leibenstein aims to maximize "the per capita output potential at some future point in time" and gives - according to some criticism - an exaggerated preference to future growth against present benefits. This criterion favours capital intensity arguing that in this case the share of profit and the rate of capital formation will be higher than in case of labour-intensive techniques, where a large part of the incremental output will be absorbed by wages paid to workers with a relatively high propensity to consume. Other proposals, as e.g. the marginal growth contribution criterion (by Otto Eckstein) or the time series criterion (by Amartyra Kumar Sen) also give to the time aspects an important role, but in a more balanced form. Also the use of discounted figures both for costs and benefits as suggested e.g. by J. Tinbergen[5] taken at accounting prices is intended to measure time-effects.

14. The discussion about adequate criteria of project evaluation indicated clearly that in each case (and especially in case of projects aiming at different purposes) a lot of targets and constraints must be considered simultaneously. Nevertheless, a part of these cannot be quantified

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[4] For an attempt to overcome these problems see e.g. Hollis B. Chenery, "The Application of Investment Criteria". The Quarterly Journal of Economics, February, 1953.

[5] See "The Relevance of Theoretical Criteria in the Selection of Investment Plans" 1954 in the volume Investment Criteria and Economic Growth, London, 1961.

and it is a hard task to unite even only the most important considerations in one criteria and in one synthetic formula of measurement. In order to avoid these difficulties, combinations of partial criteria are also recommended by help of qualitative or quantitative weighting of the mostly divergent ratings by single criteria. A Survey of the practice of six developing countries prepared by the Division of Industrial Development of the UN Department of Economic and Social Affairs[6/] reported that three countries used multiple criteria with a weighting of the partial criteria, and the other three countries applied synthetic formulae. Discounting methods are used only in a few cases. The Manual of Economic Development Projects prepared by the Economic Commission for Latin America (1959) recommends both the use of partial criteria and their combination by weighting and synthetic formulae.

15. Two crucial points of project evaluation were stressed in the above paragraphs: the problem of multiple criteria and the time aspect of the investments. Let us now turn to the third crucial problem the main issue of this paper; the interindustrial aspects as they appear in the course of project evaluation in developing market economies. Necessity of an analysis of interindustrial relations and effects of evaluating single projects is widely acknowledged. As for feasible methods there are recommended: (i) explicit analysis of interindustrial effects and appropriate corrections both on the costs and the benefits side of the efficiency calculations. These effects to be examined include both backward and forward linkages and recently, the use of input-output techniques is recommended, too. (ii) Use of accounting or shadow prices in the calculations of the single projects which should result by a correction of the price and market mechanism in an evaluation leading to a consistent and efficient allocation of resources. (iii) Simultaneous evaluation of the projects already selected by calculating their impact on scarce factors and utilisation of redundant resources, and further, in case of availability of development programmes, by checking their consistency

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6/ See "Evaluation of Projects in Predominantly Private Enterprise Economics" in Industrialisation and Productivity Bulletin No. 5, U.N.

with the overall programme. This analysis may be connected with the process of assigning the accounting prices and with the simultaneous improvement in project selection. (iv) Choice of projects simultaneously by use of mathematical programming probably in more subsequent steps, alternating and connecting procedures of overall and sectoral programmings.[7]

16. The limited extent of this paper does not allow a detailed comment on the methods suggested above and used in different countries but in the following section some consideration will be given. On the practical application of all the methods dealt with above R.N. Tripathy contends: "In the actual formulation and implementation of policy of allocation of investment, the planners in these (that means developing) countries may be predominantly influenced by political and social considerations rather than by strictly economic considerations."[8] We have not surveyed the actual motives of investment decisions in these countries, nor their economic considerations, but it is often pointed out by experts with practical experience that mostly simple rules of thumb, scarce-factor approaches or selection of "key-sectors" predominate. This may not lead to an underestimation of the possible role of efficiency calculations and project evaluation but may serve as a warning against extremely complicated methods and procedures. Further this may stress the importance of the adaptation of project evaluation methods to the real decision processes, to their various stages and motives.

V. Interindustrial aspects of project evaluation reconsidered

17. Interindustrial aspects will be reconsidered here from the point of view of central authorities which have to evaluate projects by social and

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7/ See e.g. Hollis B. Chenery: Development Policies and Programmes, Economic Bulletin for Latin America, March 1958.

8/ Criteria for the Choice of Investment Projects in Development Planning. The Indian Journal of Economics, July 1964.0.76.

nation-wide criteria. Further it is assumed that these authorities have means of economic policy to influence investment activity and that the effects of single projects concerning direct stimulation of the entrepreneur's initiation to invest in the backward or forward linked industries[2/] may be neglected. In this way the interdependence of the projects to be chosen may be analysed by the two well-known aspects: consistency and efficiency.

Consistency means that the implementation of the projects selected and the operation of the new establishments contribute to the balanced growth or the planned (provisional) unbalance of the economy, that their inputs needed are available and their outputs offered are required (permitting a provisional planned unbalance). The criterion of efficiency involves consistency but means a further restriction too: the degree of the utilisation of available resources (including existing capacities) should not decline but rather increase and the selection from the feasible projects must ensure the best possible fulfilment of national objectives and of development policy targets.

Establishment of new capacities means not only an addition to the existing capacities of this stage of the production process but touches backward and forward linked industries too. The importance of these linkage effects depends on the one side on the relative weight of these new capacities, on the other side on their place in the production process. The most linkage effects will be produced by capacities manufacturing domestic intermediary products for other intermediary products for domestic use; primary production has the less backward, production of final goods the less forward linkages.

16. Theoretically, consistency and efficiency should be analysed within a given selected horizon of time for the whole duration cumulating and discounting total costs and benefits. Practically this is possible, and should be demanded for single projects (by use of discounting methods). For the total set of projects, for the economy as a whole it encounters serious difficulties. Mostly one typical or some subsequent selected years are analysed in this context.

2/ A detailed analysis of these effects may be found in The Strategy of Economic Development by Albert O. Hirschmann, 1958, Yale University Press.

Consistency must be controlled evidently not only for years of operation of the projected establishments (together with efficiency) but also for the years of the implementation of the projects (as for availability of machinery, building capacity etc.). The checking of the consistency of the selected projects in the years of their implementation is based on a confrontation of total resources available for investment and requirements of the proposed projects. The scarcity of some resources, as e.g. imported machinery must be reflected in the prices of these factors and factors of this kind have to influence in this way the choice of the projects, too. In some cases actual (market) prices of these factors must be substituted from this point of view by estimated accounting prices. Evaluation of consistency and efficiency in years of operation of the establishments will be analysed next.

19. From a macroeconomic point of view, the total economy may be considered as a single production unit with three primary inputs-labour, capital, import and an output serving the final demands (consumption, gross investment and export). In the strict sense of this notion, capital and import if not received as foreign aid are not primary but produced inputs since both capital goods used for replacement and export goods paid for import must be produced by labour (and capital and import). In this sense the only primary input is labour and its output the net national product (national income). Capital and import may be handled however, and not without reason, as primary inputs. Capital goods represent a special materialized form of labour, their availability is limited, their production requires more or less time, and they serve production for more than one subsequent cycles. Imports are limited too, since as a rule they must be paid by equivalent export goods (disregarding the case of foreign aid and other sources of income), and t possibilities of the increase of export activity are limited and mostly go with decreasing returns.

20. Consistency in a broad sense may be interpreted as agreement between output of final demand and availability of primary inputs required for its production. The flexibility of primary inputs, first of all of capital, however, is strongly limited by the fact that the production process is divided and organised in single production units with given capacities, staff and management. Since the mobility of these units and the factors of production is very limited, an agreement between total final output and total final requirements of primary inputs does not mean consistency in reality: there may exist excess and lack of capacities and labour simultaneously. Therefore consistency must be analysed and satisfied not only as for final goods and primary inputs but also by intermediary stages of production, i.e. by sectors and branches of the economy. Construction of new establishments adds new capacities, new production units to a given sector (branch but in the same time may require from, respectively offer to other sectors) branches intermediary goods. Thereupon whether the projects meet the needs of the consistency or not can be evaluated only in the context of the whole system.

21. If actual (market) prices reflect the true "social" value of the goods produced and inputs used by the new capacities the efficiency of the project (in the given stage of the production process) may be evaluated by the usual cost-benefit comparisons correctly also from a macroeconomic point of view. What is called external economies and diseconomies may be analysed also in this and in each case separately. In most cases, however, we cannot rely upon the supposition that prices are adequate measures of social values at a given point of time and even less that they are adequate in a dynamic sense, taken into account all the effects of the new investments and other changes over time. In order to overcome these problems, use of accounting (shadow) prices is widely recommended. A consequent use of accounting prices requires, however, to assign a complete new system of prices. Since such a system of prices should reflect the impacts of the new investments, too, it should be built upon an overall programming of the economy.

From a macroeconomic point of view, each project may be considered and can be evaluated as a "bundle of activities" in different stages of the total production process. In this case, in order to take into account efficiency also in the preceding stages of the production process (in the backward linked industries) instead of costs of intermediary products consumed total primary inputs should be measured (total in the sense on input-output analysis). In case when the output is an intermediary product - and not a final good - forward linkages may be considered too and the efficiency concerning the final good (taken into account further processing) should be analysed. This may be analysed by use of accounting prices for the intermediary products as well. The total primary input approach encounters, however, similar difficulties as the former one, the projects analysed by accounting prices. Since primary inputs are substitutive, they must be valued (and further added and minimised), and this needs availability of accounting prices for the primary inputs (and this some kind of overall programming too). Further, investments may be and as a rule are allocated in the "linked" industries as well, and their impact on input coefficients must be considered, too.

22. Both approaches mentioned above - the project analysis by use of accounting prices and the analysis of "Bundles of activities", of total primary inputs - assumes an anticipation of the project selection and of its effects on the given projects to be evaluated and on the overall development of the economy, respectively. A third approach of efficiency evaluation may be called simultaneous choice of projects. This may be carried out simultaneously with the assigning of the accounting prices or may be based on a more comprehensive programming of the economy. Both procedures presume the availability of the whole set of "candidate" projects with detailed data needed for evaluation as well as the setting of national objectives and economic policy targets. For programmings further data are required, too, but this selection of the best combination of the feasible projects takes into account theoretically all the interindustrial relationships and effects. Practically however, this solution cannot be applied without many concessions (linearity, divisibility, etc.

Evaluation of linkage effects on efficiency may be performed in a more simple way by help of direct analysis of the major backward and forward linkages. This procedure may be combined with some elements of the former methods too. Problems and practical possibilities of these different approaches will be dealt with later.

23. It seems appropriate here to note the costs of projecting and of the losses caused by rejections of thoroughly elaborated projects. Of course a minimum degree of maturity of projects must be required also for the first rough evaluations but this first selection should be performed as soon as possible in order to avoid unnecessary further expenses. Besides feasibility analysis of interindustrial aspects forms the most important part of this first selection. One of the best methods of a preselection of projects seems to be a preliminary evaluation and distribution of the investments by sectors/branches of the economy. Some major methods of project evaluation even requires such an analysis first by sectors and they may be carried out only in a second stage by single projects. These ideas will be dealt with after reviewing methods of evaluation in a later section.

VI. Methods of evaluating consistency of the projects

24. Two methods of evaluating consistency of the single projects will be outlined here briefly: the material balance method and the input-output method. Programming methods may evaluate consistency as well but they analyse simultaneously also efficiency. They will be dealt with therefore in that context. Consistency may be evaluated also by direct analysis of the major backward and forward linkages, but this simple method does not require further treatment. All these methods mentioned and their combinations can be applied in more or less extent and comprehensiveness depending on basic data available, on the claim to accurate checking of consistency and on the level of development planning.

25. The name material balance method refers to the centrally planned economies where coordination of material balances is the main instrument of consistent planning. These balances include of course not only materials but the important final goods too, mostly in physical units. The supply side of these balances comprises anticipated production of existing capacities, expected production of the new establishments, and as a mobile item, ports. On the demand side anticipated final demand (including exports and changes in stocks) and intermediate demand are indicated. Design of these balances requires evidently an overall programming concerning growth and structure of final demand, foreign trade, major intermediate demands, etc. Further, the balances are interconnected via output and consumption of the intermediary goods. The coordination of the balances is carried out in centrally planned economies by successive steps, i.e. on trial and error basis. If material balances form a part of the actual planning system they may serve (and as a rule they do serve) also as means for evaluating consistency of single projects. In the absence of such a system of balances, they may be drawn up for the major materials and products but this needs basic statistical data and also some kind of overall planning (since balance items touch consumption, foreign trade and other basic variables of development planning, too.)

The material balance method may be used not only for evaluation of single projects but for groups of projects aggregated by sectors (branches,i.e.) for checking investments by sectors. This is valid for input-output methods, too, which are especially appropriate for sectoral analysis.

26. Input-output methods may be used to evaluate consistency of projects in two ways: either by checking overall consistency or by analysing total impact of the projects. The first approach is well-known. It may indicate the consistency or lack of consistency between final demand and total output by sectors/branches. We have to range each project in the corresponding sector and then to check whether their outputs are absorbed and their inputs are produced within the given system. Surplus of calculated total output

versus final demand indicates danger of under-utilisation of capacities in the given sector; if total output lags behind demand, this refers to problems of supply from the products of these sectors. Inconsistency may be eliminated on the one hand by changes in the structure of the final demand, of foreign trade, etc. which belongs to the competence of overall planning, and on the other hand by changing the projects to be selected.

A similar use of input-output method may help to analyse investment requirements from the point of view of consistency or to distribute preliminarily investment sources. For this aim, we have to know planned or anticipated final demand, and import, further excess capacities non-utilised in the base period, all by volume and sectoral breakdown. Based on anticipated final demand data we may calculate total output by sectors consistent with final demand. A part of this total output required may be supplied by the production of existing capacities equal to the production of the base period, by the production of the excess capacities and by import. The other part is needed from the new capacities. Investment expenditure required for establishment of these new capacities may be calculated by help of capital/output ratios.

27. A second approach based on input-output methods may measure the total input requirements of single projects (or groups of projects). For this, data are needed on the operating inputs of the given projects in the breakdown of the input-output table available (a vector). Further on, the inverse matrix of this input-output table is required. The vector-matrix product gives the total input requirements of the project which may be compared to the resources available. An example of such calculation will be presented in Appendix I. This flexible method may be applied also for groups of projects with the same output or for "sector-investments" or to evaluate the impact of choice of different technologies, etc. In this latter case we have to calculate the total input requirements only for that input items which are not identical in the two or more variants of the project.

28. The first approach mentioned above (para. 26) presumes availability of a complete input-output table, the second one (para. 27) may be applied also if only the technological (and inverse) matrix are at our disposal. The first approach involves some kind of overall planning, the second may be applied for isolated evaluations too. Both methods are burdened with the well-known assumptions of the input-output analysis. In both cases an up to date technological (and inverse) matrix is needed, i.e. corrections of the basic input-output table (matrix) corresponding to the actual and anticipated changes in technology and import-substitution have to be carried out.

The usual aggregation of the input-output tables means disadvantage as compared with material balance method but the sectoral interdependence are dealt with more correctly by input-output methods. Some experiments are going on with input-output tables in physical units which may help to overcome the problems of aggregation and may facilitate the correct use of this second approach. Some elements of this method may be combined with the direct analysis of the major backward and forward linkages and this may offer a sufficient solution too. For this purpose also a "typical" technological matrix in some standardized form may give valuable informations on the major linkages and may be fruitfully used. Possibilities of use of such standardized matrix will be dealt with later.

VIII. Methods of evaluating interindustrial efficiency effects of the projects. Use of accounting prices.

29. Some methods of evaluating interindustrial efficiency effects briefly outlined in paragraphs 21-22 will be dealt with in the following two chapters. In this Chapter the use of accounting prices will be treated.

Use of accounting (shadow) prices is one of the mostly recommended method of considering interindustrial efficiency effects at project evaluation. All manuals prepared on this topic for developing countries include such

suggestions. Elements of accounting prices (may be often not in the same sense) are largely used in centrally planned economies and recently their wider application is proposed too, e.g. in the Soviet Union or in Hungary. There are suggested several methods of use of accounting prices, which have some common features but differ in some respect significantly.

It is common in these methods that the use of accounting prices instead of actual (market) prices should give a correct efficiency evaluation from a macroeconomic (social) point of view, since accounting prices are supposed to reflect intrinsic social value. There are, however, differences concerning the following points: (i) what should be meant by intrinsic social value; (ii) whether accounting prices may be determined by some corrections of the actual (market) prices or whether this needs a special procedure; (iii) whether accounting prices should be determined only for inputs or for outputs too; and in the former case (iv) whether accounting prices should be assigned only for primary inputs or for intermediary goods as well; (v) how accounting prices should be used since they may be substituted in the well-known formulae of efficiency calculations of the single projects or they may be used as an auxiliary instrument (guide) in the process of the selection from the total set of the projects. From the descriptions of the various methods used or suggested we do not receive always clear answers on the above questions. It seems, however, that the raising of these questions may help to acquire a better insight.

30. As far as the meaning of intrinsic social value is concerned, there are two opinions and consequently there are two ideas what accounting prices should be: measures of actual social (macroeconomic) costs or equilibrium prices on opportunity cost basis. In practical uses of accounting prices we meet combinations of these solutions, too.

In order to get accounting prices measuring actual social costs, elimination of taxes and subsidies from actual (market) prices is often recommended as a first approach.[10/] Though this correction may help to

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10/ See e.g. Manual of Economic Development Projects, UN, 1958, Part two, Chapter II/II.

eliminate distortions, some objections are to be raised here. (i) Taxes and subsidies paid (or received) in the last stage of the production process, by the output-sector, form only a part of total taxes and subsidies included in the prices. (ii) In some cases taxes and subsidies reflect social costs (or benefits) and their elimination does not lead to a better approximation of social values. (iii) The distribution of profits in the prices cannot be assumed to be proportional to the costs they have to express (especially not in developing countries in case of a very imperfect competition) and the differences in profit ratio may cause even more significant distortions.

The practical importance of these objections may vary widely between countries according to the weight of these items. In Appendix II, some figures are quoted on the economy of Israel. As for the first objection, the differences of direct and total taxes and subsidies are striking only in some cases but in a number of sectors they may be considered significant. As for the third objection, the share of profits is in most cases much higher than the share of the taxes and subsidies and as indicated in the book quoted (see p.102) the rate of return to capital varies at a large scale: if measured by direct coefficients, it varies between - 3 and 68, and if by total coefficients, between 1 and 48 per cent. The data on the Hungarian economy (see Appendix III) give a similar picture on the role of the indirect effects of the sales (turnover) taxes and subsidies. The rates of return to capital vary similarly, too; they are according to the direct coefficients between 0 and 71, and according to the total coefficients between 2 and 33 per cent. The second remark above cannot be tested by the available data.

31. Some methods are used in Hungary which seem to avoid the first and par the third objection but not the second. By use of input-output tables all (direct and indirect) elements of taxes, subsidies and profits were eliminated from the actual prices and further the primary inputs of capital and import were converted in labour input (in wage terms) too. The indicators gained by this calculation (total macroeconomic labour inputs) were meant and used as

measures of actual social costs.[11] These indicators serve as a rule only for measuring costs of domestic inputs. Output in case of exported or exportable goods and costs of imported materials are valuated at "world market prices", i.e. at foreign currency equivalents. The data on total macroeconomic labour inputs proved very useful for different analyses but their application to efficiency calculations as accounting prices may be criticized.

Disregarding the deficiencies connected with the use of typical input-output tables (some of them can be eliminated by disaggregation, by combinations with product calculations or with input-output tables by products, etc.) only four principal issues will be raised here. These "accounting prices" (i) are based on data of some previous period while investments refer to future period, consequently they must be built up on planned, anticipated data (input-output table). (ii) They exclude all income elements except wages. A part of these income elements reflect (or should reflect) social costs, or benefits. (iii) They do not take into account the scarcity of capital which ought to be reflected by an adequate price system (this issue is under discussion in centrally planned economies but in Hungary it is already accepted.) (iv) They do not reflect such intentional departures from the prices which are considered necessary to balance supply and demand.

32. The first criticism mentioned above is acknowledge in Hungary and claims involved are met by some recent calculations, by help of extrapolations. The second and fourth remarks were pointed out only recently by the author and are awaiting discussion. The third objection

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11/ The calculation was performed by help of an input-output table in sector aggregation; the ratios of actual and "calculated" prices by sectors were applied to the corrections of the individual prices. Experiments are going on with input-output tables calculated by products mostly expressed in physical units.

is acknowledged and in some recent evaluations it is also avoided by means of calculating with an "accounting" charge on capital (added to the total macroeconomic inputs in labour wage terms). Some numerical examples of these calculations are given in Appendix IV.

As an example of a similar approach an appraisal of the social profitability, of the real cost of foreign exchange earned in exports, the work of Michel Bruno concerning the economy of Israel may be mentioned.[12/] He applied a correction of market prices by taxes/subsidies and excess remuneration on capital over an imputed limit of 8 per cent.

The remarks above on the Hungarian experience may lead to the conclusion that a comprehensive system of accounting prices aiming at the measurement of actual social costs is to be built up on elimination and redistribution of taxes, subsidies and profits by help of input-output analysis, respectively on a consequent macroeconomic cost calculation. Remarks (iii) and (iv) refer to a seemingly unavoidable use of some elements of opportunity cost accounting in this case too. The rate of the charge on capital is to be determined perhaps preferably on opportunity cost basis than based on data of past periods and this applies in some sense (though it is debated in Hungary) to the foreign currency exchange rates too.[13/] Accounting prices based on actual social costs does not seem to be appropriate to measure the social value of output (with exceptions of intermediary goods). For this aim, another set of accounting prices was to be defined. For goods circulating in foreign trade estimated "world market prices" may furnish an adequate starting point.

33. On the general possibilities of the use of accounting prices on actual social cost basis and in order to answer the questions raised in paragraph 30, the following issues may be pointed out:

12/ Op.cit.

13/ The actual cost basis for foreign currency exchange rate means the average costs (total macroeconomic labour inputs) of foreign exchange earned in exports.

(i) The accounting prices on actual social cost basis may be applied in the usual formulae of efficiency calculations. Their assignment is not connected with a selection from the feasible projects as in case of accounting prices on opportunity cost basis. These accounting prices may be used both for evaluating single projects and for analysis groups of projects (sector-investments).

(ii) As a first very rough approximation, taxes, subsidies, transfer payments may be eliminated from actual (market) prices. Price changes must be anticipated in each case. Use of input-output methods to eliminate even indirect effects of these items may result in some improvement. These accounting prices may be used in the usual formulae both for output and input figures.

(iii) After the above corrections accounting prices are to be defined separately for primary inputs, since these corrections do not apply to the valuation of primary capital and labour inputs. Accounting prices must be determined for capital in each case, and preferably for categories of skilled and unskilled labour too. For this purpose an opportunity cost basis seems to be appropriate even if based on rough estimations. The corrections according to point (ii) yield some kind of accounting prices for imported goods but the use of foreign currency prices and of accounting exchange rates may be recommended too.

(iv) If actual (market) prices do not deviate from social values at a large scale at the given point of time in order to get proper accounting prices, only modifications concerning changes over time are needed. Since these modifications require knowledge on the future development which may be influenced by the decisions based on the same accounting prices, they have in each case an approximative character. In case of rapid growth or structural changes of the economy which may occur in developing countries, this seems to be a valid argument speaking for a simultaneous determination of accounting prices and development plans.

(v) In case of having an input-output table detailed enough, it may be attempted to design a total system of accounting prices reflecting actual macroeconomic costs with complete redistribution of taxes, subsidies, and profits, by help of a macroeconomic cost calculation. For this purpose, accounting price of capital is needed first which may be defined on opportunity cost basis, connected with the design of the overall development of the economy.

34. Dealing with the problems of accounting prices on opportunity cost basis, we will start from the moderate and realistic proposal exposed in the Report of the First Group of Experts on Programming Techniques of the UN Economic Commission for Asia and the Far East.[14/] This seems all the more appropriate since among the authors of this excellent report we may find Jan Tinbergen as well, one of the first and most respected indicators of the use of accounting prices. According to the report (p. 40) "Accounting prices are fictitious prices which may be assigned to some cost elements, or products, with a view to giving a better approximation of the relative importance of these elements or products to the economy." Unfortunately, further questions about the scope and assignment of these accounting prices remain unanswered from this report. From examples described, however, it may be concluded that (i) the accounting prices of cost elements and intermediary products are to be defined on an opportunity cost basis, (ii) accounting prices are to be used for final products too and they must be fixed according to the development policy targets, (iii) accounting prices are not needed for each cost element or product but only for the major ones, (iv) the best way to determine and to utilise the accounting prices may be considered a trial and error method of the selection of the feasible projects.

14/ Development Programming Techniques Series N.1. Programming Techniques for Economic Development, 1960.

35. It is characteristic for this type of use of accounting prices that it assumes the availability of the whole set of feasible projects, data on the total investment resources and possibilities including not only establishment of new capacities and the knowledge of the main development policy targets as well. Consequently this method may be used only in advanced stages of the project evaluation but not for preliminary selections. Further, this procedure with a mixed use of actual (market) and accounting prices renounces the consistency of the valuation. As a rule, primary inputs as capital, labour, import will all have accounting prices but only some of the intermediary goods. In order to evaluate not only direct, but also indirect use of primary inputs at accounting prices, we have however, to change the prices of the intermediary goods too. Without such corrections the bias of the project evaluation will depend on the share of intermediary goods in the total operating costs of the project.

36. The logical way to determine accounting prices on an opportunity cost basis is either the use of the project selection method treated above or that of methods of programming. Programming may be performed either by trial and error methods or by mathematical techniques as e.g. liniar programming. It is useful to make a distinction between what is called a project selection method and a programming method, in that sense, that the former includes only the projects to be selected and the latter all the activities, i.e. existing capacities too. The former method generally assumes a preliminary choice of projects, the latter may start without such preliminaries.

The programming approach seems to be superior but requires much more basic data. In case of a limited number of feasible projects, all these alternatives may be included in the model and the programming method may give the proper project selection and the accounting (shadow) prices simultaneously. A further use of these accounting prices does not seem to be required. The number of the feasible projects, however, mostly exceeds the framework of the workable model. The projects are to be aggregated e.g. by sectors and

branches and the shadow prices thus obtained may be used for further selection of the projects, either in the usual efficiency calculation formulae or by further sectoral programmings. A similar procedure may be followed by the project selection method too and in this case the accounting prices will have not only a direct distributing but an evaluating role as well.

37. On the use of accounting prices on opportunity cost basis the following issues may be mentioned:

(i) As a first approximation accounting prices may be defined only for primary inputs. The opportunity cost basis for them may be estimated or searched by a trial and error method. These accounting prices may be applied in the usual efficiency calculation formulae. In order to reduce biases caused by neglecting the use of accounting prices for indirect primary inputs (via intermediary goods) major linkages are to be analysed in this respect.

(ii) Accounting prices are to be assigned also for the valuation of outputs. They may be based in case of intermediary goods on opportunity costs or on "world market prices" (first of all for exportable and importable goods); and in case of final goods (a) on "world market prices", (b) on priority ratings according to the national objectives and development policy targets, (c) on the elimination of taxes and subsidies from actual (market) prices, (d) on the combination of the above methods.

(iii) The trial and error method aiming at finding proper accounting prices may be improved in different ways. If it is connected with an iterative selection of the projects, criteria of choice in harmony with development policy targets must be stated clearly. Accounting prices may be calculated for major (scarce) intermediary goods as well (e.g. electric energy). If all candidate projects are included in the trial process, the accounting prices will not have an independent role. The result of the last step of iterations gives both the project selected and the final, correct accounting prices. These prices may be used, however, by evaluating even further variants

of the chosen projects. The selection of the projects may be performed in two stages. The first stage gives choice of groups of projects and proper accounting prices as above. In the second stage, usual efficiency calculation formulae may be applied for further selection, with these accounting prices.

(iv) Programming methods may yield accounting prices with a better approximation than the project selection method. They do not need a preliminary selection or suggestion of projects and they make possible a more free choice; they take fully into account activities of the economy even if not touched directly by the investments. On the other hand, for programming (either to be performed by trial and error or by new mathematical methods) a great deal of numerical data are needed on development policy targets, on resources available and other constraints, on existing capacities, technologies actually and potentially used which are not available in most developing countries. Also programming methods may be used in different ways, as e.g. (a) for a final choice of the projects when accounting prices are not more needed, (b) in two stages as by the project selection method, when the final choice will be made in the second stage by use of the accounting prices got in the first stage, or (c) in two stages when for the final choice besides the accounting prices of the first stage programming methods will be used again, etc.[15/] Some further problems of these methods and their practicability will be touched in a later section.

38. In case of assigning accounting prices by use of input-output or programming methods the accounting prices of the products will be defined as a rule for groups of products aggregated by sectors/branches of the economy. Accounting prices for products must be determined by separate calculations at a second stage. The accounting prices for "sectors/branches" may be fruitfully utilised for sectoral analysis of investments and projects. Further on, the project selection in the process of assigning accounting prices or

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15/ The result of these sectoral programmings may be used for a repeated correction of the accounting prices, too.

especially by programming may deal with not single project but groups of projects by sectors/branches. This gives immediately an analysis, respectively selection of projects by sectors. The same applies for the total primary input approach based on input-output analysis. The possibilities and problems of sectoral analysis of investments and projects will be dealt with later.

VIII. Other methods of evaluating interindustrial efficiency effects of of the projects

39. Theoretically programming methods may yield the best solution of project evaluation, but for developing countries owing to the usual lack of data needed they are seldom practicable. Therefore, only a few remarks will be added here on these methods. We have numerous examples of successful use of mathematical programmings or process analyses for sectors of the economy, for project evaluation within sectors. Thus, for instance, in Hungary linear programming methods were applied for development planning of the cotton weaving industry, paper industry, aluminium industry and synthetic fibre industry (here concave programming was used, too). We are interested here, however, in interindustrial aspects of project evaluation which are taken into account by sectoral programming only in a very limited way.

40. Some experiments on intersectoral, i.e. on economy-wide programmings are known, too, but they do not seem to give direct project evaluation and/or selection. The experiment now going on in the Planning Office of Hungary called "two-level planning" is an iterative combination of overall and sectoral programming (as mentioned at the end of paragraph 37). It is worthwhile to quote on this topic Hollis B. Chenery who has been doing for the past several years important theoretical and practical work in this field. "It is unlikely that formal methods of programming can be applied in a very detailed model of the whole economy. At best they can be used to determine the proper accounting prices for some of the principal inputs-labour, capital, foreign exchange and a few industrial materials - and to revise sector programmes.

For the latter purpose accounting prices are very important, since they make it possible to decentralize the analysis while maintaining the consistency of the result."[16/] Also the methods suggested in this line in the Soviet Union in first order by L.V. Kantorovich and V.V. Novozhilov are intended to get appropriate prices and not direct allocation of investments (the same holds for the researches carried out presently in the Economic Institute of the Academy of Sciences in Hungary.)

An important result of the overall programming of the economy may be a preliminary allocation (distribution) of the investments among sectors. The sectoral programmings and the single project evaluations may correct this distribution. Nevertheless, this distribution provides in any case an important starting point for further analysis. Theoretical, computational, machinery capacity, data availability problems of the programming methods were not treated here but they cause serious difficulties even in developed economies. Their overcoming seems to be attempted first in developed countries.

41. As a rule, accounting prices may yield a proper valuation for primary inputs but they can hardly be determined even for major intermediary goods. Since indirect use of primary inputs via intermediary goods often may exceed their direct use, this may reduce the possibility of measuring interindustrial efficiency effects at a large scale. These difficulties may be overcome not only by assigning accounting prices also for intermediary goods, but, may be even more easily, by calculating total primary inputs based on input-output analysis. In this case accounting prices are needed only for the primary inputs (as a rule for major categories of labour, capital and foreign exchange) or even - lacking proper accounting prices - alternative valuations can be simply applied as in case of parametric programming.

16/ Development policies and programmes. See: Economic Bulletin for Latin America, March 1958, p.71.

These total primary input figures may be used in the accepted efficiency calculation formulae on the one hand, and for other analyses, on the other.

42. Some further types of analyses based on total primary input data will be mentioned here which may facilitate the evaluation of the inter-industrial efficiency effects.

By help of a usual input-output table, total primary input coefficients may be simply calculated for sectors and branches of the economy. They may help to analyse the characteristics of the sectors from a macroeconomic point of view, the average impacts of investments in these sectors on requirements of primary inputs. They may help the formulation of a rational structure of the economy by sectors. In order to eliminate the influence of the actual (market) prices on these indicators they may be related to each other (as e.g. total labour/capital, import/capital, etc.) or to the value of production at "world market prices" (foreign currency equivalents).

The total input coefficients of the input-output analysis measure interindustrial effects within the limits of the chosen model. The usual open static model deals with replacement of fixed assets and exports as items of final demand. That means for instance that the usual total labour input coefficients do not include labour input needed for the replacement of fixed assets and for exports to be paid for imported materials consumed. Inter-industrial effects may be measured in a wider sense, too, by analysing further multiplier effects. The usual total labour input coefficients may be augmented for instance by the total labour input needed for the replacement of fixed assets and for exports to be paid for imported materials consumed. These indicators may be called total macroeconomic labour input coefficients. Further on, to the usual total import coefficients may be added the import needed for the replacement of fixed assets and to the usual capital coefficients the capital needed for the exports to be paid for imported materials used. Some numerical examples based on Hungarian experience are given in Appendix V. Total requirements of skilled and unskilled labour, stocks (circulating funds)

several kinds of energy and other scarce resources or goods may be analysed by similar way.

Total primary input requirements for single projects may be analysed similarly. In this case, however, the cost data of the project are needed in the sectoral breakdown of the input-output matrix utilised and problems of aggregation, respectively disaggregation are to be solved as dealt with in paragraph 29. Various criteria may be tested on this total primary input basis, synthetic formulae may be calculated, etc.

43. The simple methods of direct analysis of major backward and forward linkages do not need detailed description. I should like to emphasize the very importance of these analyses also in the cases of using more sophisticated methods. First, forward linkages, efficiency effects respectively, may hardly be treated with most of the methods above mentioned, as for instance input-output methods, and they are often neglected. Secondly, also backward linkages (effects which can well be analysed e.g. by input-output methods) are examined as a rule with aggregate calculations. A great deal of assumptions contaminating these calculations may be dropped only in case of a detailed direct analysis. The direct analysis involves usually only some major linkages, one or two connected stages of the production process, but then this is done in a realistic way, without aggregation, and taking into account such specific factors as capacity utilisation, marginal costs, returns to scale etc. The direct analysis of the major linkages and less precise methods of analysis of the further interindu effects are to be combined and possibly for single projects this may give the best solution for an adequate evaluation of interindustrial effects.

IX. Criteria and distribution of investments by sectors/branches of the economy

44. In Chapter VI. five types of evaluating consistency of the projects have been analysed which may be listed now approximatively in the

order of their complexity:

(c.1) direct analysis of interindustrial linkages,
(c.2) material balance method (see para. 26),
(c.3) input-output method of evaluating single projects (see para.28),
(c.4) input-output method of evaluating general consistency (see para. 29),
(c.5) mathematical programming methods.

These methods, as mentioned above, may and are to be combined. From these methods (c.4) always, (c.5) mostly are to be carried out rather for sector/branches of the economy than for single projects; (c.2), (c.3) may be used both for sectors and single projects while (c.1) seems to be appropriate first of all for single projects.

45. In Chapter VII. and VIII. different methods of evaluating inter-industrial efficiency effects of projects have been analysed. The following groups of these methods may be listed here:

(e.1) direct analysis of interindustrial effects (see para. 43),
(e.2) use of accounting prices (both for inputs and outputs) to evaluate efficiency at the given stage of the production process (see para. 31-36, 38),
(e.3) project selection method: simultaneous selection of projects and assigning of accounting prices (see para. 37-38),
(e.4) total primary input approach (evaluation of the "bundle of activities" touched by the project, see para. 41-42),
(e.5) programming methods (with one or more stage, see para. 38-40),

These methods may and are to be combined as well. All these methods may be carried out both for sectors and single projects. Methods (e.4) and(e.5) seem to be especially suited for sector-analysis, (e.1) for single project analysis.

46. From a macroeconomic point of view each project touches not only the given stage of the production process but a bundle of activities linked with it and it must be evaluated therefore, both for consistency and efficiency, by taking into account interindustrial impacts as well. As this notion indicates, inter-industrial impacts, effects between industries (sectors/branches) are to be analysed. The methods available for these analyses are suited in many cases only for evaluating linkages between industries (sectors/branches) and not between single projects. In other cases these methods require a two-stage evaluation, first at sector level and then by single projects. (As for the first case see e.g. the input-output methods, for the second one mathematical programmings.) That is one of the reasons why sectoral evaluation, preselection or predistribution of investments by sectors may be recommended. A second argument may be raised from the time-aspect of these evaluations. Projects may and are to be evaluated concerning their full working time. A total set of projects however, can be checked for consistency, analysed for interdependent efficiency and coordinated with the development plan - by relatively simple methods - only for a given point of time. Also this issue demands a two-stage evaluation, first at sector level for a given point of time, and then by single projects for the full working time. And finally institutional and organisational requirements may argue for an intermediate project evaluation at sector level, too, especially in case of development planning. Paul Rosenstein-Rodan emphasized, that "Estimates of priority can be more easily formulated for sectors than for projects within sectors..." "Delegation of decisions as to sectors and dispersal of decisions as to single projects composing a sector seem to be the appropriate rules of programming."[17]

17/ "Programming in Theory and in Italian Practice." Investment Criteria and Economic Growth, p.25.

47. Sector evaluation of investments does not make unnecessary neither the evaluation of single projects, nor the analysis of their interindustrial impacts. First, the final step single projects and not sectors are to be chosen. Secondly, the constraints of the aggregated sector-analyses are well-known and their results, therefore, are to be checked by single project analyses too. Some selected "best" projects of a given sector may be inferior (less efficient from a macroeconomic point of view) than some dropped "wrong" projects of another sector. Owing to the often very rough aggregation, even a coincidence of the summarized input and output figures of the single projects and the aggregate figures calculated for the same sector do not prove a real consistency. Sector-evaluation of investments, consequently, do not substitute for, but supplement and facilitate single project evaluations. The main fields of application of the sector-evaluation of investments are the preliminary distribution of investment funds and the preselection of projects by sectors.

48. The preliminary distribution of investment funds by sectors is an important part of the development planning in centrally planned economies and it seems to be necessary or at least desirable in each case of central planning. Central planning requires a certain delegation of decisions, among other those concerning investments. For this purpose a preliminary distribution of investment funds is needed. In centrally planned economies this preliminary distribution is based as a rule for consistency on the material balance method (c.2) and on direct analyses on interindustrial linkages (c.1), as for efficiency again on direct analyses (c.1) and on a more or less wide use of elements of accounting prices (c.2). Recently in some countries (as e.g. in Hungary) the application of the other methods listed in para. 44 and 45 is attempted too. A wider use of methods based on input-output analysis (c.3), (c.4), (c.4) may be recommended. These methods may be applied perhaps by help of a standardized input-output matrix also by developing countries while programming methods are to be experimented first by developing countries. For these calculations, accounting prices assigned at a sector level may prove useful. And of

course, the preliminary distribution of investment funds may be based on ranking of single projects proposed, too, without any use of aggregate data.

A preselection of projects by sectors may be recommended first of all in case of a great number of "candidate" projects and even more in case of a development planning with central and subordinated institutions. As for evaluating consistency, the whole set of methods listed in para. 44 may be used but perhaps the input-output and programming methods (e.3-5) are to be preferred. To evaluate efficiency, the project selection method (e.3), the simultaneous choice of projects and assigning of accounting prices, and the total primary input approach (e.4) seem to be appropriate in first place. Further on, economy-wide mathematical programmings may be carried out as a rule at sector level and consequently they may yield a preselection by sectors too.

49. The main criteria of project evaluation from a macroeconomic (social) point of view both for sector and single project analysis are consistency and efficiency. Criteria of efficiency need further explanation. These criteria are to be formulated in accordance with national objectives and economic policy targets. It seems to be taken into account in any case (i) if possible <u>total</u> costs and benefits at <u>social</u> values (accounting prices), (ii) the interindustrial impacts and (iii) the time aspects. This paper concentrated on the problems of the interindustrial aspects of the project evaluation. The <u>time aspects</u> are taken into account at the evaluation of single projects as a rule by use of discounting methods with an <u>accounting</u> rate of interest. This accounting rate of interest may be differentiated in the calculations by periods and it largely depends on the overall design of development which forms an important background of all these calculations and evaluations. Discounting methods may be applied from the methods listed in para. 46 at direct analysis and accounting price evaluation of projects (e.1-2) with ease, at the project selection method and the total primary input approach (e.3-4) with some and at programmings (e.5) with serious

difficulties. At sector-evaluations, when using aggregated data by sectors, discounting methods can hardly be applied. Time aspects of investments may be evaluated only with the help of the accounting prices of capital. Therefore, as a rule, simplified formulae of calculation may be recommended for sector-evaluations, without discounting procedures.

50. For project evaluation, generally partial criteria, their combination with or without weighting, or one (or more) synthetic formula are used. Partial criteria, as a rule, may give correct evaluation only in case of such projects which from the point of view of the disregarded criteria do not differ significantly. For this reason, and particularly in case of sector-evaluation, combination of such partial criteria or/and synthetic formulae may be recommended which measure possibly total costs and benefits. On the cost side, among the partial criteria, requirements on the three primary inputs, i.e. labour, capital, and foreign exchange must be represented in each case and mostly in a breakdown by their major categories as e.g. by skilled and unskilled labour, by foreign currencies, etc. From a macroeconomic point of view, the primary input requirements are to be analysed with the help of total input coefficients, i.e. by use of the total primary input approach (e.3). Further, besides their partial analysis, the primary inputs may be valued and also added by means of accounting prices. For example the following formula may be suggested:

$$\frac{\text{Domestic value added at accounting prices}}{\text{Domestic costs at accounting prices}}$$

This indicator was used in the Hungarian practice for statistical analysis but may be calculated for future periods, too. According to the Hungarian calculations the nominator is the total value of output minus total primary inputs at "world market prices" (in foreign currency equivalents), while the denominator is domestic costs at accounting prices based on total macroeconomic labour input coefficients (on total capital and labour inputs added at accounting prices). An example of these calculations will be presented in Appendix V.

In case of programming or the project selection methods (e.4-5), we can take several criteria for maximum/minimum, and other criteria may be treated as constraints. Also by use of direct analysis of interindustrial efficiency effects (e.1), various criteria may be evaluated but primary input requirements (and possibly total requirements) cannot be omitted neither by this nor by the other methods mentioned above. Benefits may be measured as a rule by total value of output or by domestic value added and, of course, in accordance with the measurement of the costs. The correct evaluation must be ensured by use of accounting prices and special benefits may be analysed separately too.

51. We may conclude from our analysis that a project evaluation from the macroeconomic point of view should be based on measuring total costs and benefits at intrinsic social values. This requires first of all adequate consideration of interindustrial and time aspects of the projects. As a rule, however, both requirements may be met only approximatively. Any methods of project evaluation, therefore, are burdened with assumptions and hypothetical elements. As Jan Tinbergen points out, "...in order to calculate the full consequence of a certain investment on the national economy one has to have a dynamic model of development of the economy (and even of the world economy)".[18/] Nevertheless project evaluation may help significantly to make adequate investment decisions in order to use national resources better and to promote development. Further on, it must be added here, that project evaluation from a macroeconomic (social) point of view may not only be facilitated by formulating national objectives and econor policy targets, but it definitely calls for more or less detailed development plans. Moreover, development planning may help entrepreneur's investment decisions, too.

X. Possibilities of use of a standardised input-output matrix

52. The coefficients of an input-output matrix are determined by a great number of different factors. The major factors are: technology, returns to scale, import, price-relations, infrastructure. In spite of these factors

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18/ Op.cit. p.12.

some empirical investigations (by W. Leontief, H.B. Chenery, T. Watanabe, etc.) indicated a great similarity of input-output matrices of different countries. Further research work has to prove whether these similarities make possible the compilation and use of a standardised input-output matrix with special reference to developing countries. In this section, some basic problems and ideas related to the use of such a matrix in project evaluation will be considered.

53. A standardized input-output matrix may be used to get an overall picture on interindustrial relations, linkages and impacts and to make some numerical calculations concerning the given economy. For both kinds of uses, the inverse matrix (that of the total input coefficients) is needed and the matrix of the technological (direct input) coefficients has only an intermediate but important role. The standardised matrix yields information about the nature of the interindustrial relations, about the major interdependencies to be analysed and this may be useful in itself, too. For more precise analyses, however, the standardised matrix has to be adapted to the given economy. The task to be solved is, therefore, a twofold one: to design a standardized matrix and to facilitate its transformation in a national matrix. In case of developing countries the second task seems to be especially important since the characteristics of these economies may deviate considerably from a "standard economy" (use of backward technologies, special price-relations, different infrastructure etc.). On the other hand the lack of basi industries which have the most interindustrial linkages may simplify the task. Of course, in each case only the major coefficients are to be calculated and analysed. In the Hungarian input-output matrix for the year 1959 e.g. from the possible 9000 coefficients of the 95 x 95 sector table only 770 coefficients had values over 1 per cent.

54. Five major factors were listed in para. 52 which have the most significant impact on the input-output matrix. From the standardised matrix one of these factors, the import seems to be eliminated in each case. The standardised matrix is to be calculated in such a way that its coefficients comprise the

total use of domestic and imported materials or otherwise formulated; it has to be drawn up for a closed economy. Further on, each country has to separate the use of domestic materials and imports according to its special conditions, i.e. to the shares of domestic production and import by sectors. That is one of the reasons why the inverse of a standardised input-output matrix cannot be used without further improvement, i.e. without the corrections of the technological matrix due to import. Since the inverse operation may encounter difficulties in some countries; the possibilities of the use of a triangularised matrix are to be investigated as well.

Corrections due to the use of other than "standardised" technologies may be carried out in a similar way, i.e. before the inverse operation. Effects of returns to scale and that of differences in the infrastructure cannot be isolated by simple methods and thereupon they may be neglected. As for elimination of the impact of price-relations, there is a possibility to attempt the compilation and use of an input-output matrix in physical units but this would require a very detailed matrix. Some supplementary figures on the major coefficients in physical units, however, may be of great use such a supplement may be recommended.

55. The possible solutions of overcoming the price problems in the transformation (adaptation) and use of the standardised input-output matrix need further investigations. If the standardised matrix is expressed in a common currency (e.g. in dollar), the corrections due to import and differences in technologies may be carried out in this currency, by use of exchange rates. Further on, the matrix may be inverted, evaluated and utilised in many respects without its conversion in national currency. For instance the ratio of direct and total input coefficients measured in the common currency may yield a great deal of valuable information. More sophisticated uses of this corrected standardised matrix require some further calculations; either a conversion in national currency must be attempted, or the related nation data (on final demand, on the single projects, and maybe the final results of the calculations too) are to be converted in the common currency. Both solutions

need the calculation of special exchange rates, a complicated task but without it the adapted matrix can hardly be used for exact numerical calculations and analyses.

56. As for the use of a standardised input-output matrix for project evaluation only some preliminary issues may be mentioned. A standardised matrix without a national adaptation may give only a general picture about interindustrial linkages and only some guidances about the major interdependences to be analysed. More help may be obtained from a corrected version of this standardised matrix. Corrections are to be made because of import and some significant differences in technology. The corrected matrix and its inversion - also in the common currency - may give a better insight in the interindustrial relations of the given economy and makes possible also some further numerical calculations. To these calculations, however, there is needed a conversion of the basic national data of the given projects in the common currency. In this way the direct analysis of the consistency effects of the projects (c.1) may be supplemented with an input-output analysis, or the input-output evaluation of the consistency inputs may be applied directly (c.2). For analysis of the impacts on primary input requirements, the calculation of the row-vectors of labour and capital is needed as well. These vectors may be calculated in a standardised form, too, but as a rule, in this case, there appear to be the most striking differences among countries and consequently possibly national data are required. Through the help of the direct coefficients of the primary inputs and the inverse matrix, total primary input coefficients may be calculated and analysed. Some methods of project evaluation based on input-output analysis dealt with earlier (e.4) may be used, too. To further analyses, however, a whole set of exchange rates is necessary and either the corrected standardised matrix must be converted in the national currency or a great number of national basic data are to be converted in the common currency of the standardised matrix.

Appendix I.

Example of calculating total requirements of intermediary and imported goods of a project aiming at furniture production

Supplier sectors	Projected direct requirements in million national currency units	Calculated * total requirements in million national currency units	1 : 2 in per cent
	1	2	3
Mining	0.5	5.2	10
Metallurgy	1.5	6.9	22
Machinery and instruments	0.9	3.5	26
Other metal products	4.1	5.3	77
Electric power	3.1	5.7	54
Building materials	2.8	4.2	67
Chemicals, rubber and plastic products	5.8	10.7	54
Wood	35.7	40.9	87
Paper and printing	0.6	1.5	40
Textile	17.2	21.3	81
Leather, apparel	0.5	1.1	45
Food	1.0	1.9	53
Agriculture	0.1	2.2	5
Domestic intermediary goods	73.7	110.4	67
Imported goods	29.0	43.2	67
TOTAL	102.7	153.6	67

*By help of the Hungarian input-output table for the year 1961.

Share of Direct and Total Taxes and Subsidies and Returns to Capital (Profits) in the Economy of Israel in the Year 1958*

Sectors	Taxes and subsidies direct	Taxes and subsidies total	Returns to capital/profits direct	Returns to capital/profits total
201 Field crops	- 3.9	- 1.5	17.5	23.2
202 Live stock	4.4	5.5	22.9	31.8
203 Citrus	2.3	3.8	34.6	37.3
204 Other agriculture	0.1	1.0	14.3	19.3
205 Mining	1.0	3.8	10.7	19.0
206 Food	0.9	4.0	5.9	21.8
207 Textile and apparel	5.2	9.3	13.1	26.9
208 Wood and carpentry	12.4	16.8	7.9	15.1
209 Paper, printing and publishing	3.7	7.3	5.3	15.2
210 Leather & leather products	1.4	3.3	23.9	36.3
211 Rubber & plastic products	6.3	8.4	15.4	22.5
212 Chemicals, oil and soap	6.0	8.4	0.2	7.5
213 Oil refineries	0.1	1.1	- 0.7	3.3
214 Glass, ceramics & cement	8.9	12.6	6.2	12.4
215 Diamond polishing	0.0	0.2	12.1	13.2
216 Basic metals	1.8	3.6	2.0	7.1
217 Metal products	4.9	7.3	6.9	13.4
218 Machinery & vehicles	6.9	9.9	5.9	12.9
219 Construction & housing	6.6	11.8	7.8	16.7
220 Electric power	3.1	5.0	3.4	8.7
221 Water	-13.2	- 9.4	5.9	3.3
222 Inland transportation	16.2	18.4	13.2	18.6
223 Shipping & aviation	1.1	2.4	- 6.0	- 0.5
224 Other communication	4.8	6.7	13.8	18.0
225 Services & trade	5.1	8.5	25.0	34.0

* In per cent of the value of output. Total coefficients calculated from input-output table. -Source: Michael Bruno, Interdependence, Resource Use and Structural Change in Israel, Jerusalem, 1962, p.93-95.

Share of Direct and Total Sales Taxes and Subsidies in the Hungarian Economy in the Year 1959*

Sectors	Sales taxes and subsidies	
	direct	total
Mining	0.5	2.3
Metallurgy	0.4	2.6
Machinery	0.1	3.2
Electrical machinery	- 0.3	2.4
Instruments	5.4	7.4
Other metal products	5.0	7.4
Electric power	0.0	1.6
Building materials	6.3	8.7
Chemicals	19.4	23.0
Rubber and plastic products	37.0	43.1
Wood	9.8	13.2
Paper	13.1	15.9
Printing	7.2	14.9
Textile	30.7	38.8
Leather	13.2	18.9
Apparel	26.3	41.4
Food	10.6	14.4
Construction	0.3	1.7
Agriculture	0.0	1.9
Transport and communication	-16.3	-13.6

*In per cent of the value of output. Total coefficients calculated from input-output table.

Example of calculating accounting prices on actual macroeconomic (social) cost basis by help of input-output analysis.

Accounting prices for (i) brick and tile products and (ii) cement and concrete products, based on data of the Hungarian input-output table for the year 1961.

A. Basic data:

	Brick & tile products		Cement & concrete products	
	Share in per cent of value of output			
	Direct input	Total input	Direct input	Total input
	1	2	3	4
a. Domestic intermediary goods	33.0	-	49.3	-
b. Imported goods	8.1	12.7	6.6	15.6
c. Depreciation	10.9	16.5	6.8	14.6
d. Wages and salaries	27.7	39.7	12.2	28.0
e. Profits	15.7	23.0	13.3	24.4
f. Taxes and subsidies	4.6	8.1	11.8	17.4
g. Total value of output	100.0	100.0	100.0	100.0
h. Capital requirement	148.4	244.1	118.0	256.5

B. Variants of accounting prices (per 100 units of value of output at actual prices):

	Brick & tile products	Cement & concrete products
(i) By eliminating taxes and subsidies paid at the given stage of the production process	95.4	88.2
(ii) By eliminating total taxes and subsidies	91.9	82.6
(iii) By eliminating total profits, taxes and subsidies	68.9	58.2
(iv) Based on total macroeconomic labour input in wage terms	56.0	43.7
(v) Based on total macroeconomic labour input + charge on wages 75 per cent	98.0	76.5
(vi) Based on total macroeconomic labour input + charge on capital 15 per cent	107.8	96.2
(vii) Based on total macroeconomic labour input + charge on wages 25 per cent + charge on capital 10 per cent	104.5	89.8

C. Methods of Calculation, illustrated on the example of the brick and tile products:

(i) = (g) - (f1) = 100 - 4.6

(ii) = (g) - (f2) = 100 - 8.1

(iii) = (g) - (f2) - (e2) = 100 - 8.1 - 23.0

(iv) = total labour + total import converted in labour (based on average cost of foreign currency earned by experts) + total depreciation converted in labour (based on average costs of the replacement of the fixed assets) = 39.7 + 7.6 + 8.7

(v) = (iv) x 1.75 = 56.0 x 1.75

(vi) = (iv) + C_{tm} x 0.15 = 56.0 + 345 x 0.15

where C_{tm} = total macroeconomic capital requirement including requirements of imports (via exports) and depreciation (via replacement)

(vii) = (iv) x 1.25 + C_{tm} x 0.10 = 56.0 x 1.25 + 345 x 0.10

Example of use of total input coefficients for evaluating sectoral characteristics and interindustrial efficiency impacts

Two sectors will be analysed based on data of the Hungarian input-output table for the year 1961.

A. Basic data

	Data per 100 units of value of output at actual prices	
	Sector A	Sector B
Accounting prices for output at foreign currency equivalents (FCE)	30	26.5
Imported goods used at FCE		
direct	2.8	1.9
total	4.0	4.5
Labour input (in 10^{-4} man years)		
direct	12.3	6.0
total	17.2	12.6
Capital requirement		
direct	184	118
total	244	257
Total macroeconomic labour		
labour (in 10^{-4} man-years)	25.4	20.5
import (at FCE)	6.9	7.1
capital requirement	345	352

Total macroeconomic labour input includes total import and total depreciation converted in labour (see Appendix IV.C). Total macroeconomic import includes import needed by depreciation for replacement of fixed assets. Total macroeconomic capital requirement includes capital needed by import for equivalent export production.

B. Sectoral characteristics

	Sector A	Sector B
Per 100 units of output at FCE		
total labour (10^{-4})	57	48
total macroeconomic labour (10^{-4})	85	77
total capital requirement	813	968
total macroeconomic capital requirement	1150	1329
total import at FCE	13	17
total macroeconomic import at FCE	23	27
Total capital requirement (total labour)(10^{-4})	14.2	20.4
Total import at FCE (total labour) (10^{-4})	0.24	0.35

C. A synthetic formula of efficiency calculation

	Sector A	Sector B
Domestic value added per 100 unit of output at actual prices	26	22
Domestic costs at accounting prices per 100 unit of output at actual prices		
variant (v)	84.7	62.5
variant (vi)	85.0	74.3
variant (vii)	84.9	70.3
Domestic value added (domestic costs)		
variant (v)	0.307	0.352
variant (vi)	0.307	0.299
variant (vii)	0.307	0.313

Variants refer to Appendix IV.B. Domestic costs were calculated by the formulae indicated in Appendix IV, but from the total macroeconomic labour input coefficients excluding costs of import, from the total macroeconomic capital requirement excluding the part needed by import.

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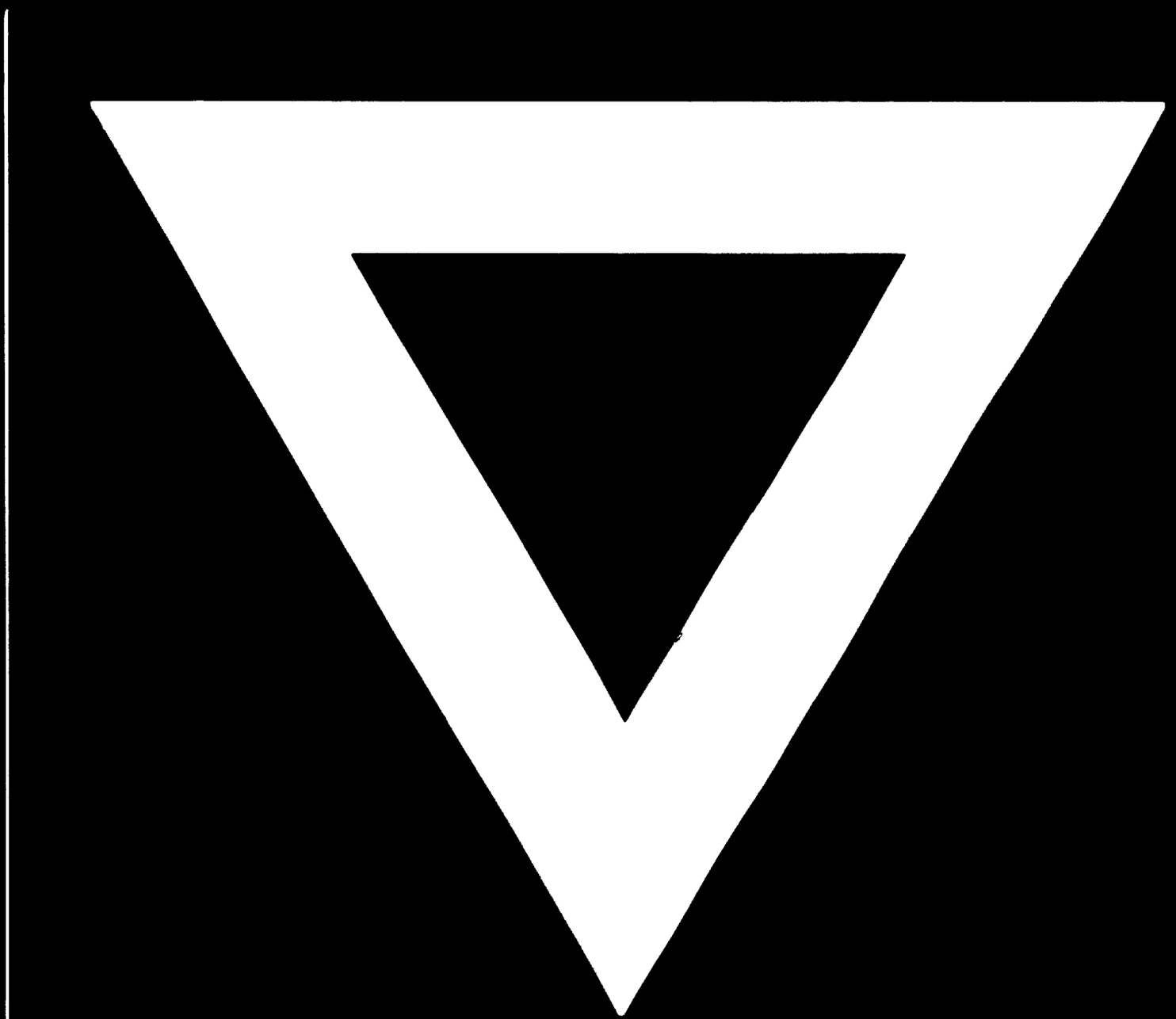

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