UNITED ARAB REPUBLIC

THE INSTITUTE OF NATIONAL PLANNING

Memo. No. 159
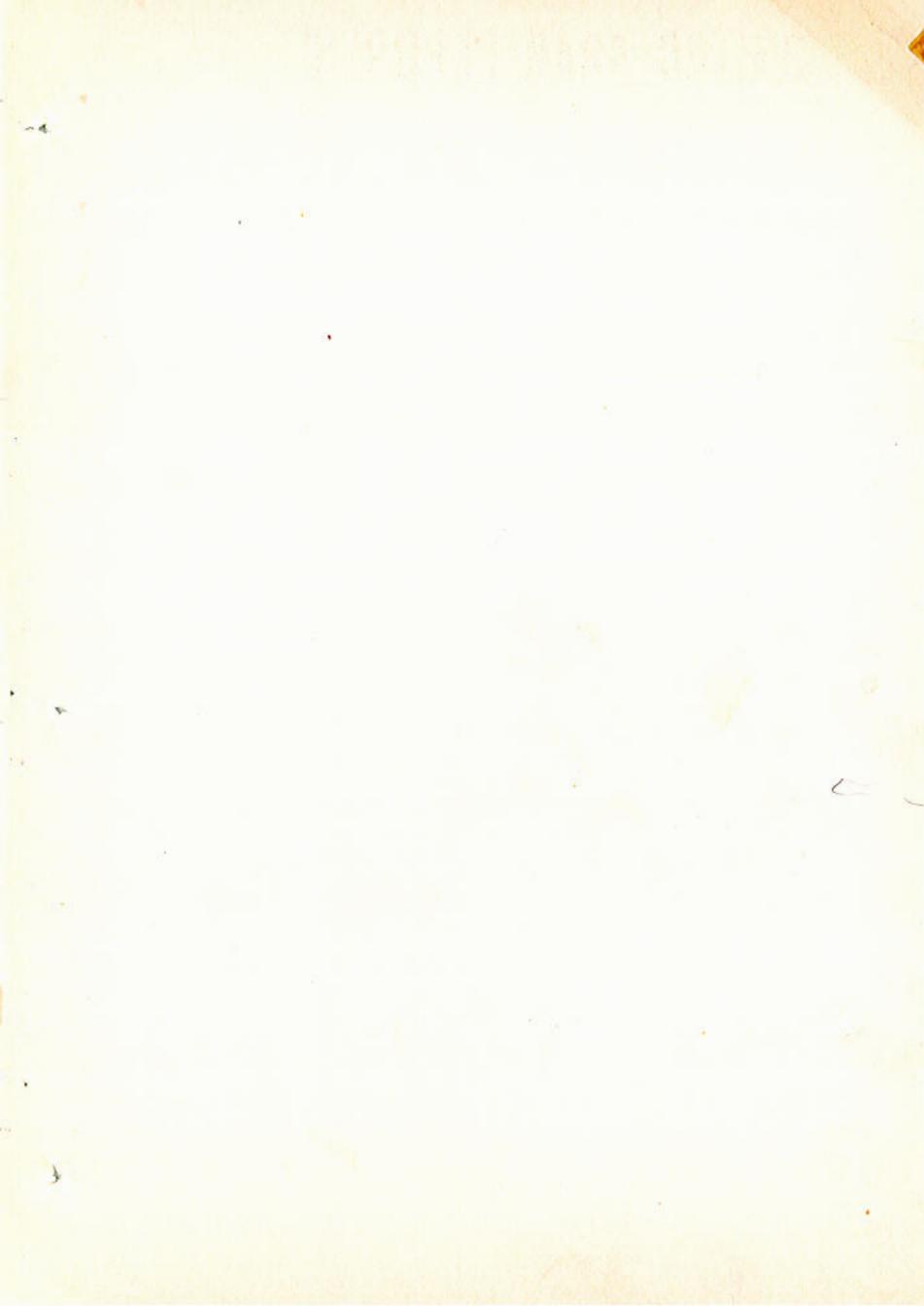
THE APPRAISAL OF INVESTMENT
PROJECTS

THE SEMI-INPUT-OUTPUT METHOD

by

Prof. Jan Tinbergen

January 1962.

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An important element of development planning consists of the appraisal of individual investment projects. It is mainly by its appraisal that we can learn something about the country's "comparative advantages" and which industries should therefore be expanded in order to meet the import requirements of the economy. The goods to be imported rather than produced at home are of course those in which the country is not likely to have comparative advantages, even in the future.

In order to appraise an investment project, say in some industry A, we must first of all know what the "value added" in this industry will be per unit of invested capital. By value added we understand, as is well known, the gross value of the goods to be produced once the project is ready for operation, less the value of all material inputs; the latter are such things as the raw materials or semi-finished products used, fuel, lubricating oil etc. Among the material inputs we have also to include the wear and tear of machines and other means of production used. If the so-defined value added of the project in operation is aA, the capital invested during the construction period kA, then the ratio aA/kA is the yield for the nation as a whole of the project. It is not, however, identical to the yield for the investor, since aA not only contains profits, but also all other income produced by the production process started, such as wages and salaries.

The yeild so far discussed represents only the direct effects of the project for the country's income. In order to arrive at a complete appraisal we have to know more. I am not now hinting at such effects as, for instance, the employment effect or the effect on future savings. These are questions for themselves, of great importance, but not to be taken up in this article. The point to be dealt with here is that we have not yet found the complete income impact of the project. There are so-called indirect effects which we must also estimate.

Input-Output Analysis

It is the so-called method of input-output analysis which has clarified our ideas about this further problem. In order to briefly explain the essence of this method we must think of the subdivision of all economic activity into a number of sectors (or industries), each of them characterized by a product and a method of production. If we choose a sufficiently large number of sectors we can think of each of them as a homogeneous process with a homogenous product. 1) What the method emphasizes is that such a process requires a number of "inputs" in order to obtain a certain output. These inputs consist of the products

of some other sectors and, in addition, quantities of production "factors", such as labour, land or capital. For the sake of simplicity we will disregard land inputs and labour inputs, assuming that these factors are abundant.

The production of our good A, envisaged by the project to be appraised, therefore will require certain inputs from other sectors B,C, etc. The production of these inputs, however, in turn will require inputs from other or the same sectors. The process is interdependent and, with the aid of an algebraic method, we can calculate how much more must be produced of everything in order to make possible a new level of production, increased by the quantity of the project, of good A (2). We can also find, how much more capital will have to be invested in order to make this increased production of other sectors possible.

Clearly the"yield" we should now calculate in order to appraise the joint undertaking, must be based on the values added of all the sectors and the capital needed in all sectors. Vital to this entire procedure is the fact, known from its simplest occurrence, that projects are "complementary", i.e., that one activity cannot be expanded without also expanding a number of others.

1.)   Some sectors may be "empty", i.e., that in the country concerned, the good in question is not produced, but only imported.

2.)   It is usual, in input-output literature, to require that consumption of A increases by this given amount. But we can also require that production shows a given increase, considering increased consumption as an unknown.

Important as the contribution made by input-output theory is, it has, however, led to some exaggeration in its application. It is the intention of this note to indicate what seem to be the proper limits within which to apply the method. The exaggeration just mentioned consists of the application of the method to all the sectors of an economy. The need to increase production as a direct or an indirect consequence of the increased production in A does not exist for all sectors. It does not exist for the sectors producing goods which can be obtained by international trade. It only exists for the sectors of which the products cannot be imported - the so-called "national goods".

Such goods are the goods of which transportation is impossible, such as buildings, or, usually, electricity. One has to add the services, which are also non-transportable: inland transportation, trade, banking, etc. These goods and the corresponding sectors represent the really complementary activities to the project originally considered.