1. Principles

The fundamental principle of the study is that better forecasts can be made of coefficients and flows in the economic system by direct methods than by mechanical projection. By direct methods we mean the enlistment of expert and technical advice for the compilation of specific estimates. In each sector of economic activity there exist sources of information, either published in the form of trade association memoranda, consultants' reports, technical journals, etc., or unpublished, in the notes of businessmen, which remain largely untapped. These sources can provide not only estimates of particular parameters, but also the background information essential to investigate the variance of any parameter.

The superiority of the direct method is acknowledged by Stone and others who have made projections of interindustry coefficient matrixes. But the size and diversity of a large industrial economy has so far ruled out the method for practical purposes in projections of the U.S. and U.K. interindustry matrixes although selected coefficients have been projected this way in both matrixes. However, in the Irish economy there is much more scope for direct methods.

This is so, not only because of the size of the economy, and particularly of the industrial sector, but because of the highly skewed distribution by size...
of the coefficients in the Irish interindustry matrix. Several studies in different countries have shown that input-output estimates are relatively insensitive to errors in small coefficients: it is the larger coefficients which have the determining influence on results. Accordingly, the study will concentrate on the larger coefficients, or rather flows\(^{(1)}\). In any case, it would be quite impossible to obtain information on the smaller items for some future year so the projection to 1970 must be based upon the existing input-output tables for 1956 and 1960. These will be used as the bench-mark, from which all adjustments will be made.

It would naturally be an advantage to have a table for a more recent year. But even if such a table were available one would still have to revise the coefficients to 1970. This year is not only the terminal one of the Second Programme, but one in which many of the tariff reduction will make themselves felt. Once a matrix representing the economy of the period 1969-71 has been constructed one can then make a great number of experiments which may be of some practical as well as academic interest.

\(^{(1)}\) Errors in the estimates of sector outputs in input-output systems are a function of the input coefficients, weighted by final demand. Although final demand cannot be predicted exactly, the relative value of such sector's share is known. Accordingly, errors in output estimate will be minimised by attempting to minimise errors in the estimates of large flows in the system rather than large coefficients. Our objective is, therefore, to estimate the coefficients corresponding to the principal flows in 1970.
Of practical importance would be calculations of the consequences of alternative patterns of exports and imports. It would also be useful to calculate the effects of variations in cattle prices upon incomes in other sectors of the economy. A comparison of the movement of the single factoral terms of trade (i.e. the quantity of imports purchased by one unit of Irish labour) from 1956 through 1960 to 1970 would be of more academic interest. Another purpose which the projection could serve would be as a planning framework, which would be continually adjusted as new information became available, ultimately turning into a historical table for 1970.

It is the objective of the present study to disaggregate the existing sectors of production as far as is useful, and as far as information permits. New sectors will be added for major new industries established between 1960 and 1970.

The initial projection will be in constant 1960 prices. A further objective would be the creation of a table, perhaps more aggregative than the original, in 1970 relative prices. This would be obtained by applying to the original projection indexes of the change of the relative prices of the outputs of each sector between 1960 and 1970.

2. Practical Problems

The foregoing principles can be implemented to a greater or lesser extent, depending on the resources – principally man hours – which can be devoted to gathering and compiling data. The available resources are quite small, and therefore there must be severe economies of effort. The general objective, however, is not to obtain the most accurate
possible picture of the Irish economy in 1970 - far beyond our means - but to demonstrate the practicability and usefulness of the methods outlined above. The general objective will be satisfied if the results obtained are better than those which would be obtained by more mechanical projections.

(i) Sector Classification

Of the three major divisions of the economy, agriculture, industry, and services, the first is well-documented. The input-output table for the agricultural sector, 1960, prepared by An Foras Taluntais, illustrates the extent to which agriculture can be disaggregated into its component activities. We hope that a similarly detailed table can be prepared for 1970, i.e. about fifteen sectors.

The services division generates about 35% of the GDP, but there is very little information about this sector available (other than employment data). Fortunately, it purchases relatively little from other sectors - except labour - so that errors in the estimates of services output will not seriously affect the output estimates of industrial and agricultural sectors. We would not expect to revise for 1970 the input coefficients into the services sectors, unless specific information becomes available. We should, however, like to separate trade from transport, and divide the latter into its principal constituents.

There were 22 industrial sectors in the 1960 input-output classification. This number can be more than doubled if each Census of Production Industry is treated as a separate sector, and if major projects - including new industries - are allocated to sectors of their own. The actual extent of disaggregation will
depend upon the importance of the activity, the stability of coefficients under the existing classification system, and the availability of data. It is clear that the industrial division of the economy will provide the greatest increase in employment and income to 1970, and that the establishment of new industries, and the differential growth rates of those existing in 1960, will lead to substantial changes in many coefficients.

(ii) General Procedure

1960 is the year to which the detailed information in most C.I.O. Survey Reports refer. It is also the year of the latest input-output table, and the base year for the N.I.E.C. projections. For these reasons, it seems likely that 1960 will be the 'bench-mark' year for most projections of inter-industry flows in 1970.

The published C.I.P. reports show the principal inputs and outputs of each Census industry in 1960. This will be the principal source of data for disaggregation of columns: the breakdown of the row distribution is more difficult. Henry's worksheet will be helpful as will be the C.I.O. Reports in this connection. The "other" inputs and outputs which are not specified in the C.I.P. reports must be distributed in some arbitrary manner, using the 36 sector table as a guide. Proceeding by one column at a time, a detailed table for 1960 will result, which will be most accurate in its principal flows.

The purpose of preparing this table is to identify the major flows and the unstable flows (i.e. those which are likely to change most between 1960 and 1970). Several types of substitution are possible: one
material for another, (e.g. synthetic for natural fibres in textiles), imports for domestic products, (and vice versa), purchased services for direct labour, energy for labour, capital for labour etc. The first two types are perhaps the most relevant in present circumstances.

As Geary's work has shown, the most important inputs in any column are often value added and imports. The N.I.E.C. projections of net output and gross output may be a useful guide to changes in value added. Changes in imports, by purchasing industry, are much harder to forecast. This is the type of information which can best be collected directly - in fact it can only be collected directly. Nor can historical statistics be any guide to future changes in product mix and technology, which may be however within the planning horizon of the intelligent business-man.

(iii) Outline of work

The first step is to prepare an input-output table for 1960 in which the industrial sectors have been disaggregated. The basic data come from the Census of Production, supplemented by the CIO Reports, Trade and Shipping Statistics and the 36-order table. The work at this stage involves essentially the reconciliation of the detailed table to the 36-order table. In this connection, Henry's worksheets will be essential. The worksheets used for the present study show the different goods produced and consumed by each industry as reported in the Census of Production for 1960 with their sectors of origin and destination estimated.

The second step is the estimation of the principal flows - or more exactly, the coefficients
corresponding to the principal flows— at this level of classification in 1970. No general rule can be laid down as to how this is to be done, except perhaps that one tries to find the best information available. A few examples may make this clear:

a) The amount of flour used in a loaf of bread, the amount of tobacco in a cigarette, and the amount of timber used in a house are all fractions which are quite stable, and their corresponding coefficients can be expected to change very little by 1970.

b) Coefficients of household consumption expenditures can be computed, using the results of household budget studies in Ireland and Britain. Such coefficients are generally quite stable.

c) "In a year of normal water flow, output from hydro-electric stations is estimated at 720 million units. In a very dry year this figure could fall by a half, and in a very wet year it could increase by a third." Booth, IV, p.45.

d) The quantities of cotton cloth domestically produced and vehicles domestically assembled in 1970 depends upon factors which cannot easily be foreseen.

Information in these examples comes from a variety of sources, and a different degree of confidence can be attached to the estimates in each case. One of the advantages of the direct method, however, is that it provides background information so that conditional forecasts can be used intelligently in applications of the estimates. The gathering of such background information on the factors determining these estimates is often a useful addition to knowledge of the economy, apart from the numerical values concerned.
Each flow can be treated in each of three ways. As dependent on the output of the consuming sector, as dependent on the output of the producing sector, or independent of either. A fourth treatment gives a linear relation. The precise treatment in each case depends upon the appropriateness of the assumptions, which in turn depends upon a knowledge of the circumstances prevailing in each sector.

The detailed projection for 1970 requires the synthesis of information from various sources within the input-output framework. It must be regarded as an exploratory study with two objectives subsidiary to the main objective of obtaining the numerical estimates. These are
a) to show that detailed information which can contribute to an improved model of the future economy is readily available;
b) to identify major gaps in statistical information.

In order to apply a range of analytical models, it is essential to have a flexible data framework. This means that information should be kept as detailed as possible. In particular, ancillary tables will show the sources of supply and disposition of the principal commodities, and imports will be recorded likewise.

The final stage will be reached when a consistent table or set of tables has been prepared for 1970. This will be the foundation for a variety of experiments, of which three may be mentioned:
a) An analysis of changes in relative prices, including wages and taxes

b) An analysis of different patterns of foreign trade

c) An analysis of the factorial terms of trade.
Procedure for identifying principal flows

In 1960 the total value of intermediate flows was £438.7 million (295.7 domestic and 143.0 imports). This compares with flows for final consumption of £837.9 million (745.2 domestic and 92.6 imported).

Given any level of sector classification the number of non-zero flows can be counted and some mean or median value chosen as the cut-off point, below which size all flows could be neglected for the purpose of specific projection to 1970.

However, as the level of aggregation is lowered from 36 sectors to CIP industries and then to commodity flows, and we must necessarily work with a flexible classification, it is impossible to establish a priori a fixed cut-off point. For example, the flow Soap/Households may be larger than some arbitrary level, but when soap is disaggregated to soft, hard, toilet, shaving, other, each flow may fall below that level.

One systematic procedure would be to begin by listing in order of size the largest flows in the 1960 36-order table, including imports. These would then be broken down into their constituent commodity flows, taking care that these commodity flows are not smaller than commodity flows possibly concealed in the "smaller" 36-order flows.

As a working rule, one might suggest that one could ignore, in 1960, flows which fell below:

- at 36-order level, £0.667 million
- at CIP level, £0.3335 million
- at commodity level, £0.1 million.