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COMPARABILITY OF INPUT-OUTPUT TABLES IN TIME*

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Summary

In this paper we argue that the comparability in time of statistics, and input-output tables in particular, can be filled in in various ways. The way in which it is filled in depends on the structure and object of the statistics concerned. In this respect it is important to differentiate between co-ordinated input-output tables, in wich groups of units (industries) are divided into rows and columns, and analytical input-output tables, in which the rows and columns refer to homogeous activities.

1. Introduction

The compilation of statistics can be characterized as an attempt to describe reality according to a certain system in order to provide clear and comprehensive information. This system consists of definitions, classifications and typifications. The consequences of this systematical process for the comparability of the results of the statistics in time and the subsequent implications for the choice of a scheme of input-output tables constitute the subject matter of this article. Comparability in time is understood to mean the degree to which the comparison of the results of statistics relating to two different moments in time gives an accurate representation of the change which actually took place in the intervening period.

We have introduced some restrictions in this respect. First of all, it can be established that the question of what the compilation of statistics actually comprises is a theoretical one. It concerns the relation between observations and the resulting reality when these observations are organized in a certain way. It also concerns the relation between the observations, the methods of measurement and the results of the statistics. We shall not go into these matters very fundamentally. The object of this article is to point out the theoretical problems connected with the comparability of statistics in time with the aid of practical statistics, and input-output tables in particular. This will be illustrated by the Dutch situation.

The definitions of the concepts of "accuracy", "reality", and "comparability in time", have to be seen against the background of the difference between institutional and functional statistics. Institutional statistics relate to groups of transactors which can be distinguished in the national economy, whereas functional statistics refer to transactions without any distinction being made between the groups of transactors concerned. In line with this distinction, two groups of input-output tables are distinguished here. In the first type, the division into rows and columns corresponds to the division within institutional statistics, so that these tables relate to groups of enterprises. In the second type, the row/column division is derived from that in functional statistics, so that they refer to homogeneous activities (cf. commodities in the SNA). We shall see that the most worthwhile long series of input-output tables which are comparable in time can be compiled for the latter type of tables.

This article is built up as follows. In the second chapter, the problem of comparability in time for statistics is dealt with in detail. An attempt is made to give an inventory of the most significant causes of interruptions in the comparability in time. The third chapter goes into the various ways in which the scheme of input-output tables can be filled in. The fourth and final chapter examines the comparability in time within input-output tables.

2. Momentary and continuous accuracy in statistics

2.1. General remarks

In the quantitative recording of a process, we are interested in both the level of the phenomenon observed and the change which has occurred in that level. If only one aspect and one subject are involved, e.g. one particular child's growth in height, the report will obviously give an accurate reflection of both: the height at the times the child is measured and the difference in height between two of these moments.

A quantitative description of economic processes, such as certain economic statistics for example, always refers to aggregates of transactions in goods and services in which various transactors are involved. In addition, the basic measurement is often a complex process. Economic statistics do not necessarily result in accurate information on both the level and the change in the level of certain processes. There is a certain dilemma in which the statistician is forced to choose between what we shall call momentary accuracy (accuracy with respect to the level) and continuous accuracy (accuracy with respect to thechange in that level). The following section examines the causes of this dilemma. In order to avoid any misunderstanding, we should mention that the interval of time to which a series of statistics relates is referred to in this article as a moment. In the case of statistics which refer to a whole year, the calendar year is therefore considered to be condensed to one moment of observation.

2.2. Statistics

It is characteristic of statistics that, on the basis of a selective arrangement observations, a report is made on a phenomenon involving several transactors. In the case of continuous accuracy we can distinguish functional statistics and institutional statistics. Here, functional statistics are defined as statistics which desribe an overall phenomenon, i.e. without specifications or divisions into groups of transactors. In principle, these statistics refer to all transactors taking part in the transactions concerned.

Institutional statistics are understood to be statistics which do contain some sort of specification by pre-determined groups of transactors, and in principle only refer to one certain group of transactors. These statistics are usually related to a conglomerate of inter-connected transactions. Since frequent use is made of institutional statistics in the compilation of input-output tables, we shall direct our attention to these statistics first of all.

We can distinguish the following stages in the statistical process leading up to institutional statistics.

1. Definition of the system:
   - 1a. Selection and definition of the transactions and the aspects thereof (variables) to be included in the report.
   - 1b. Construction of a classification by defining characteristics in relation to which homogeneous groups of transactors are formed.

2. Determination of the population:
   - 2a. Charting the collection of transactors; i.e. drawing up an inventory of transactors which are of significance for the statistics.
   - 2b. Typification of the transactors within the system according to the chosen classification, thereby forming a population.

3. Measurement and reporting
   - 3a. Drawing a sample. This step can be omitted if the interviews or measurements cover all the units concerned.
   - 3b. The actual measurement. This frequently takes place by way of the design, distribution, collection and subsequent checking of questionnaires.

3c. Processing the measured information so that it applies to the total extent of the phenomenon, which refers to the total population or the sub-populations concerned.

If alterations are made in any of the three abovementioned stages, they will affect the continuous accuracy of the statistics. It should be obvious that if the concepts, classifications or measuring methods are changed between two moments of observation, these observations are not comparable and will therefore not produce an accurate indication of the actual change in the phenomenon observed. In this case, even if the statistics for two successive periods of observation (t and t+1) reflect the level accurately for the definitions, classifications and methods used at both moments in time, the changes which can be computed from the results for t and t+1 are very difficult to interpret and cannot be directly related to changes which actually took place in the economic process.

Obviously, the same applies for functional statistics, though the aforementioned aspects 1b (classification of the transactors) and 2b (typification of the transactors) do not apply here. The first aspect of 2 will then consist in an inventory of the markets of transaction being drawn up. In principle, the omission of steps 1b and 2b renders the statistical process less complex and reduces the number of potential causes of interruption in the comparability in time. In addition, as we shall see in due course, different interpretations can be given to the mutations which can be calculated from two successive observations in both types of statistics.

In the following section we shall first of all pay further attention to the information provided by a very significant group of institutional statistics in the Netherlands with respect to the economic process, viz. the annual production statistics for almost all groups of enterprises. These statistics are indispensable for the compilation of input-output tables. The examination of these statistics also gives a more concrete illustration of the stages distinguished in the statistical process. The problem of comparability in time will subsequently be further worked out.

2.3. The statistical process

This section explains how the annual production statistics for industry and part of the services sector are drawn up. This comprises an extensive explanation of the statistical process in its various stages.

1. Definition of the system
   1a. Selection and definition of the transactions to be observed.

   The transactions with respect to which information is compiled for the annual production statistics are those which play a part in the process of income formation. These are production, intermediate consumption of raw and auxiliary materials, other costs and components of the value added. This description cannot define the transactions concerned with any precision; one flag can cover many loads, depending on how one views the economic process. Business-economic, fiscal and macro-economic points of view all lead to different concepts of the production process within an enterprise. The production statistics of the CBS take account of the concepts and definitions used in the National Accounts. The questions in aid of production statistics are designed in such a way that on the one hand the required information can be obtained from the administrations of the enterprises concerned, and on the other the information thus obtained, adapted where necessary, can in principle be presented in accordance with the definitions in the National Accounts. For a more detailed explanation of how production statistics are set up, the reader is referred to the annual publications of the results which all contain an explanation.

   1b. Drawing up a classification by defining characteristics in relation to which homogeneous sets of transactions are formed.

   Two important classifications which can be mentioned in connection with production statistics are the Standaard Bedrijfsindeling (Standard Industrial Classification, SIC) and the Standaard Goederennomenclatuur(Standard Goods Nomenclature, SGN). This is not the right place to go into the classification criteria which are or could be used for these two classifications. The reader is referred to the publications: by Oomens and Knol (1983) and Beekman (1983).

2. Defining the transactors and classifying individual transactors so that a population is formed.

Although the defining of transactors is mentioned at this stage, it should be obvious that it cannot be seen separately from the activities in both of the preceding stages. In defining the transactors, we establish which statistical units the results of the statistics will relate to. As Atsma rightly states, a compromise must be sought between the data which are present in company administrations and what is desirable from the point of view of homogeneity (Atsma, 1983). In statistics describing the production process, the CBS uses the concept of industrial units. Such an industrial unit can be an enterprise, part of an enterprise or a combination of various enterprises, as homogeneous as possible as far as economic activity is concerned and completely describable. In the case of economic activity homogeneity refers to the activities on the 3-digit level of the SIC. The describability refers to the availability of data on production, intermediate consumption, components of the value added and investment. Atsma goes into the problems which are encountered in defining statistical units in more detail. Oomens and Knol examine the way in which once formed statistical units (which are always a compromise between feasibility and desirability) should be assigned an economic activity code according to the SIC (Oomens en Knol, 1983). This code refers to the main activity of the unit concerned. The CBS records all statistical units involved in the economic process in a register: the Algemeen Bedrijfs-register (General Industrial Register, GIR). For every statistical unit which, as far as is known, is involved in the economic process in some way, this register contains data on charateristics such as:

- economic activity;
- where it is established;
- the size, measured by the number of persons employed.

It should be mentioned here that this description does not do justice to the actual function and potential of the GIR. We have restricted ourselves to the barest necessities for our article. A more complete description is found in Willeboordse (1985). The pulation for the production statistics for a given group of industries in a certain year is made up of all the industrial units included in the GIR under the activity code of that group. For most groups the population is then further reduced to include only units employing ten people or more in the year concerned.

3. Measurement and reporting

3a. Drawing a sample from the total poulation.

This step can be bypassed if all the units involved are included in the survey. Surveys among statistical units with less than ten employees are always conducted by means of a sample. Every statistical unit with more than ten employees is included in the surveys in nearly every group of industries, though in the services sector these groups are surveyed by means of samples.

3b. Design, distribution and checking of the questionnaires.

The questionnaires for the production statistics are designed in such a way that questions referring to matters common to all production statistics correspond with each other. These concern data on the numbers of people employed, total purchases and stocks of raw and auxiliary materials, sales and stocks of the final product, turnover and components of value added.
The variables used are defined consistently throughout the production statistics. Further specifications of manufactured and purchased goods vary from group to group, though an increasing number of groups use the SGN as the basis for these specifications.The completed questionnaires are checked as to whether all the questions have been answered and whether the reported values are plausible (wrongly interpreted questions, could result in completely wrong values being filled in).

3c. Processing the completed and checked questionnaires in order to obtain figures which apply for the overall population.

Apart from non-response, this step is mainly relevant in cases where the survey is conducted on the basis of a sample. The results are used to obtain data for the variables concerned which apply for the overall population.

The explanation contained in this section gives an overall impression of the way in which the CBS compiles its production statistics. It has been made clear that a number of instruments are applied in order to ensure that the production statistics can be related to each other and added together and that they fit within a larger framework. This aim can be summed up under the term <u>co-ordination of statistics</u>, as described by Atsma (1978) and Van Tuinen (1978). Statistics compiled on the basis of the GIR and thus relating to groups of industrial units are in fact called <u>co-ordinated statistics</u> by the CBS.

2.4. Causes of interruption of comparability in time

As we already mentioned in section 2, a change in any of the aspects of the statistical process can lead to the results of the statistics no longer being comparable in time. This goes without saying for systematical changes (stage 1). If a decision is taken to switch to different definitions or a different classification at a certain moment, the subsequent observations will be based on a different set of references and will not be able to be compared to previous observations in order to obtain a picture of the developments in time. Although this a fairly obvious case, it can occur in a disguised form. An altered definition may occur if existing concepts are given different meanings, without this being reflected in the results, as the same terminology is used.

With respect to the third stage too, the actual measurement and reporting, it should not be too difficult to see that changes here will have their effects on comparability in time. By way of illustration of interrupted continuity in this stage, we shall give just one example of a change in statistical measurement. If one were to change over from a single sample to a stratified one, e.g. by size class, for the observation of a certain group of units, it may turn out that the previous method resulted in a (systematical) distortion in the values for the overall population. In this case too it is obvious that the value based on the stratified sample may not be compared to the results of previous measurements. That is to say, such a comparison would not give an accurate picture of the changes which actually took place in the economic process; there is a comparability problem.

It should be pointed out here that systematical adjustments and changes in the methods of measuremnt are to a great extent conscious actions of a statistician. Obviously, external circumstances will also play a part in decisions taken in this respect. Changes in definitions or classifications may be partly caused by changing reouirements of the users of the statistics. A change in, for example, the variation of the size of the units could play a part in the decision to start using a sample stratified according to that characteristic. Systematical changes and altered methods of measurement remain conscious actions of the statistician, however, which he can carry out after ample preparation. This means that he can take the resulting discontinuity into account beforehand and can take measures to eliminate its effects for the users as far as possible. We shall look into these possibilities in more detail in the following section.

The interruptions in comparability in time which can occur in the second stage of the statistical process, drawing up an inventory and typifying the units, are connected with the behaviour of the units. This concerns the generation (birth) and disappearance (death) of units. Furthermore, we are dealing with changes in units which may result in individual units being transferred from one class in the classification to another. An example of this is a change in an enterprise's economic activity so that it belongs to a different group of the SIC. As such, these changes do not effect the comparability of statistics in time. It is the changes which actually take place, and thus should be reflected in the statistical report, which are at issue.

Interruptions in comparability in time only occur when the statistician cannot keep track of these actual changes in his register of units. This concerns the setting up and particularly the updating of the register of units. Tracing and processing changes which have actually taken place is a laborious and complex business. If a new enterprise comes into being, an existing enterprise ceases to operate or changes its activities, and these changes are established - and thus entered in the register - too late, this will lead to an interruption in the comparability of the statistics based on that register. More accurately, a change which has actually taken place but not been entered in the register will result in an inaccurate level of the statistics based on that register, and consequently, the change with respect to the previous moment of observation will be reflected inaccurately; this will then be expressed as a discontinuity. If this error is corrected in the register and the statistics based on the register regain their correct level, there will still be a question of interrupted comparability in time.

In this context, the difference between institutional statistics and functional statistics lies in the fact that for institutional statistics, not only does a complete register have to be kept up to date, just as for functional statistics, but that the typification of the units in the classification also has to be maintained. In view of the fact that in this context the units have to be typified by main economic activity, this is a laborious stage which requires a great amount of information on the units. In this respect, it can certainly be said that there is a greater risk of interrupted continuity than in institutional statistics. In principle however, there is no difference.

In view of the fact that the whole question of comparability in time evolves around the change expressed between two successive reports being an accurate reflection of the change which has actually taken place, it is important to look into the possible different interpretations of the changes which can be calculated by means of both types of statistics. The origin of this difference can be found in differing perceptions of reality, and is related in particular to the typification by main economic activity. In institutional statistics, reality is arranged in groups of units with a certain main economic activity. These are the subject of the observation. If an enterprise gradually shifts its production from one activity (a) to another (b), there will come a time when the main activity switches from a to b. In institutional statistics, this unit belongs to the group of activities with main activity a up to the moment when the main activity switches to b. From that moment onwards, it belongs to the group with main activity b. In functional statistics on the other hand, reality consists of sorts of activities. The units in which these activites are carried out form no part of the reality which is to be described. A gradual shift in activities of a certain unit is gradually processed in reports on, for example, production values in the activities.

In accordance with the abovementioed perception of reality, the changes calculated with the aid of institutional statistics relate to changes in, for example, the production values of a group of enterprises with a certain main activity. In the case of the gradual shift of activities described above, the unit concerned will be transferred to another group for its complete production value at the time the re-typification takes place. If the institutional statistics give the correct level both before and after the re-typification, the results will be comparable in time. The change in production value is only accurately described, however, if the results of the statistics are strictly interpreted as relating to either the group of enterprises with main activity a or the group with main activity b. The result may not be interpreted as relating to activity a or activity b however. That would be a case of a functional interpretation of institutional statistics. A shift in activities of a certain unit does not, in principle, have any effect in functional statistics, as the activities are described without the units within which they take place being taken into account. The shift in activities is then only significant in as far as it contributes to an increase or decrease in, for example, the production value in a certain activity.

From this point of view, the changes which can be calculated with the aid of institutional statistics are afflicted in a certain sense by a sort of step-problem. When the main activity of a unit shifts and the classification is subsequently re-typified, the described population changes step by step and this will have its effects on the change which is to be calculated. If the results of functional statistics for different moments in time are compared, this problem is not encountered. These statistics serve as a basis for the computation of changes, without the number and behaviour of the units in which the activities take place having to be taken into account. Consequently, a time series of results from functional statistics is much easier to interpret. This conclusion will turn out to be significant for the choice of a scheme of input-output tables.

In conclusion, we can state that problems with respect to comparability in time can occur in every stage of statistics. In the stage of setting up and adapting the systematics and the stage of measurement, potential interruptions in continuity can be foreseen and manipulated by the statistician. In the stage of inventory and typification of the units, the statistician is much more depedent on external circumstances. In these cases, interruptions in continuity will frequently only be established much later. In addition, the typification of units in the selected classification constitutes a potential additional source of continuity interruptions for institutional statistics in respect of functional ones. It can also be concluded that changes which can be calculated from functional statistics are easier to interpret than those calculated on the basis of institutional statistics.

2.5. Momentary accuracy versus continuous accuracy

From the above, it appears that if a statistician were to compile statistics which are accurate for each moment in time according to the knowledge he has at that moment with respect to definitions, classifications and methods, this will not necessarily guarantee comparability in time. If there are any sources of interruptions in continuity, the statistician has to make a choice; he must either suppress the causes of discontinuity in order to obtain observations which are comparable to the preceding ones and give an accurate representation of the change (and will then not give a true reflection of the current level); or he must give an accurate current level which implies that the difference between the observation and the previous observation will not be a true reflection of the actual change. He finds himself in a dilemma in which he must choose between momentary and continuous accuracy.

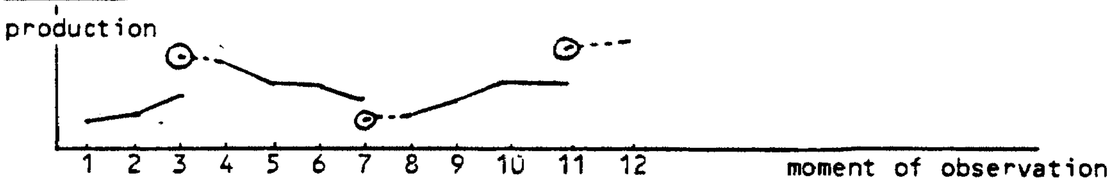
In order to find a satisfactory way out of this dilemma, it is important first of all to take a look at what the users of the statistics want. It is obvious that many users require data which give an accurate reflection of the current level of a certain phenomenon. In addition, many users are very interested in the changes in the level of a phenomenon. This is particularly true of users of the National Accounts and the input-output tables. A minimal programme for statistics could then consist of:

- the accurate level for the most recent moment of observation, according to the most recent methods: momentary accuracy;
- an accurate reflection of the change preceding the most recent moment of observation: continuous accuracy.

Obviously, users will also require data on earlier moments of observation, calculated according to the most recent methodology and therefore comparable to the current observations; these data could be given second priority. This provides the statistician with a way out of his dilemma. First of all, he compiles data for the most recent moment of observation. These data are accurate as far as level is concerned and are drawn up according to the most recent definitions, classifications and the best possible statistical methods. He then carries out a re-computation for the preceding moment of observation, again according to the most recent definitions and classifications, in order to give an accurate reflection of the change which has occurred in the intermediate period. This is not the right place to go into the theoretical problems involved in this process in any detail. We shall only mention that in certain situations, continuity interruptions in the second stage of the statistical process in particular, it is impossible to carry out the calculation according to the most recent definitions and methods, due to the fact that, for example, essential information is lacking. In that case the change could be calculated by applying previously valid definitions and methods to current observations. However, in view of the fact that the thus calculated change will always be considered in relation to the current level, this should be seen as a second-best solution. If feasible, we would always prefer the former method.

We assume here that in the case of continuity interruptions, the statistician is able to present data for the preceding moment which are comparable to those for the most recent moment of observation. This set of data is computed for the sole purpose of estimating the change in the period between the last two moments of observation as accurately as possible. Figure 1 illustrates this for the production value of an industry-group. Due to continuity interruptions, the observation at time 3 cannot be compared to that at time 4; the same applies with respect to 7 and 8 and 11 and 12 respectively.

Figure 1



The encircled points indicate re-calculated values which are comparable to those of the subsequent moment of observation. These calculations were carried out for moments 4, 8 and 12. If the statistical information supplied corresponds with figure 1, the abovementioned minimal package of information is supplied. The user has continual access to information on accurate levels and accurate changes.

If extensive and excellent documentation, and in particular a very powerful register containing the complete biography of the units as Willeboordse (1985) has described, is available, it is in principle be possible to carry out calculations for even earlier moments according to the most recent methodology, though only to a limited extent. On the one hand there are restrictions due to the fact that not all the necessary information will have been compiled in the past; on the other, this kind of re-calculation takes such a considerable amount of effort and manpower that it will never be able to go very far back in time.

There will still always be users who require long time series of comparable data for the purpose of their analyses. In principle, these can also be obtained with the aid of information supplied according to figure 1, with some additional information on the nature and extent of all the causes of interruptions in the continuity. The underlying causes of the jumps in the figure at moments 3, 7 and 11 should be described in this information.

With this information and the already available information on levels and changes, users themselves will be able to construct time series. In connection with the various possibilities for which such long time series can be used, users will also be able to decide how they deal with certain interruptions in the continuity themselves.

In most cases, users of long time series will probably be interested in the more easily interpretable comparability in time of functional statistics. However, if, as in the Dutch situation, the statistics describing the production process are institutional, a field of tension is created. It is then not inconceivable that the user will attach a functional interpretation to institutional statistics. This problem appears insurmountable for separate institutional statistics concerning a group of enterprises with a certain main activity. For data from such statistics to be converted into functional data, information on the occurrence of secondary activities in the units belonging to the population covered by these institutional statistics, and information on the occurrence of the activity concerned as a secondary activity in other units would be required.

In the construction process of input-output tables, information on all units in the economy is brought together and analyzed. It is obvious that the aforementioned field of tension is the main factor to be taken into consideration in this process, though the requirements of the users should also be taken into account as far as possible. This is especially important in view of the fact that input-output tables can be considered one of the most important sources of information in the context of economic analysis.

3. Co-ordinated and analytical input-output tables

3.1. General remarks

Input-output tables constitute a very special sort of statistics. They provide an overall view of the production structure on the basis of, in principle, all the available information on production, expenditure, income formation and foreign trade. In addition to the stages involved in compiling an individual series of statistics mentioned in the previous section, the final step in the construction of an input-output table involves the integration of a large number of individual statistics in order to obtain a consistent entity. Van Tuinen (1978) gives an extensive explanation of the process of statistical integration. For a detailed explanation of the way in which input-output tables are currently constructed in the Netherlands, the reader is referred to De Boer and Ludwig (1983).

In addition to discontinuities in the basic statistics, continuity in input-output tables is also subject to interruption due to certain variables having been assigned an incorrect level up to that time; this is then revealed when new statistics are set up. From the point of view of the statisticians involved in the compilation of input-output tables, this can be considered as a special form of continuity-interruption in stage 3c of the statistical process mentioned earlier (processing the results so that they refer to the overall population). The final section examines this phenomenon in more detail.

Input-output tables may differ from each other in the way economic activity is registered. The registration of this activity is determined by the nature of the statistics on which it is based (basic statistics) and how it is used in scientific research, preparations for and evaluation of economic policies. Different types of basic statistics and differing uses may lead to different sorts of input-output tables. With reference to the previous chapter, in this chapter we shall examine the proposition that the concepts of momentary and continuous accuracy have different effects on the various sorts of input-output tables. In the following section, the so-called "co-ordinated" input-output tables will be dealt with first, i.e. input-output tables which relate to co-ordinated basic statistics (this term is defined in chapter 2) as far as classification and registration are concerned. In section 3, the input-output tables in which the homogeneous production processes themselves are registered are looked into. As will be demonstrated, these tables are more suitable for input-output analysis than co-ordinated input-output tables. The difference between co-ordinated and analytical input-output tables can be compared to the difference between the industry x industry tables and the commodity x commodity tables mentioned in the system of National Accounts. (United Nations, 1968).

3.2. Co-ordinated input-output tables

The construction of input-output tables can be seen as the confrontation between the supply of and demand for goods and services. The supply of goods and services is determined on the basis of statistics which, for each industry-group, give the value of the goods and services produced and information with respect to imported goods and services. In each case, however, the total supply, i.e. the row totals of the input-output tables, is known. For each industry-group, the demand for goods and services is determined on the basis of cost-structure data and in the case of final expenditure categories, on the basis of, for example, export figures, household budget surveys, turnovers in the retail trade etc. and industrial investment figures.

Due to the fact that information on the supply of and demand for certain goods comes from various sources, some sort of adaptation is required in order to eliminate the inevitable differences. In order to make as much use as possible of all the available basic information in this adaptation process, it is obvious that it would be convenient to keep to the same division into rows and columns as the one present in the basic statistics. All economic activities carried out within one statistical unit would then be registered in one column of the input-output table. If a consistent division into rows is applied, all economic activities of a statistical unit will end up in one row of the input-output table. This results in the so-called co-ordinated input-output table. This table connects up with instutional basic statistics and could therefore be called institutional.

This type of input-output tables is used in various diverging areas. In the first place, co-ordinated input-output tables are statistics in which the basic statistics can be "traced". In other words, with the exception of definitions which have been adapted to conform to the National Accounts and adaptations on behalf of the units not included, the input-output tables connect up with the basic statistics. This means that the consistency between the respective statistics, and particularly between the macro-figures and the components is improved. The policy, which aims at a more powerful socio-economic structure, comprises a number of components including an export policy (aimed a reinforcing the international competitive position), a sector-structural policy and a policy aimed at the creation of employment. It is characteristic of this policy, and particularly of the sector-structural policy, that it focusses on industry-groups which are homogeneous to such an extent that they have enough common characteristics or interests (market, product, production techniques etc.) (Second Chamber, 1979). The integration of data in aid of such a policy in an input-output table should be aimed at gaining an insight in the relative position of industry-groups. It would be useful to maintain a constant statistical classification in doing this, such as the SIC of the CBS. This implies that data in aid of this policy are grouped according to industrial classes or groups and that the input-output table thus takes the shape of a co-ordinated input-output table.

There are other sorts of analysis which also require input-output tables specified by industry-groups. It is conceivable that within a certain industry-group, the relative positions of large and small companies may require investigation, or the relative positions of enterprises which are involved in export and enterprises which are not, or subsidized and non-subsidized enterprises, profit-making and non-profit-making enterprises, etc. In any investigation which links up with macro-economic data or data of suppliers to or customers of the industry-group concerned, it is important that the analysis can be placed in the context of the co-ordinated input-output table.

3.3. Analytical input-output tables

The previous section ended with the "blessings" of co-ordinated input-output tables. However, certain analyses cannot be carried out with the aid of these tables. We refer in particular to input-output analysis in this respect. In such analysis, the secondary effects which occur or the costs incurred in the various stages of the production process are allocated to the final products. These analyses are dependent on assumptions concerning the production process in relation to the registration in the input-output table. The division into rows and columns is of especial importance in this case. In input-output analyses, the basic assumption is that for each destination of a certain production process, recorded in a certain row of the table, the composition of the inputs in aid of this production is the same. This condition is fulfilled if homogeneous activities are recorded in the rows and columns, i.e. production processes or combinations of such processes with a homogeneous input-structure. This concept is comparable with (but not identical to) the concept of "commodity" in the SNA, which is connected with the result of a certain production process (United Nations, 1968). We call a table with a division into rows and columns as described above an analytical input-output table. We are well aware that this sounds misleading, since in principle every table is suitable for carrying out a certain form of analysis (including the co-ordinated table). In that sense, every table could be called an analytical input-output table. In this article we take this term solely to mean a table which is suitable for input-output analysis. This table connects up with the functional description of economic activities.

Data on homogeneous activities can be compiled as follows. On the basis of statistics on production, intermediate consumption and value added, data can be derived with respect to the total of the activities carried out in one statistical unit. On the production side, data are available on the various goods produced. It gets more difficult in the case of breaking down intermediary consumption and value added across the various activities. Hypotheses will frequently have to be used here. Care should be taken however that the hypothetical character of the estimates do not dominate the statistical character of the data. Statisticians can make use of the input structure of the industry-groups with the activity concerned as their main activity (or even only activity) in order to allocate an input structure to a secondary activity. Several operational theories, easily formalized from a mathematical point of view, have been developed in this area (United Nations, 1968 and Ten Raa, 1984). Once information per group of industries has been broken down according to the various economic activities in this way, an input-output table with a classification by homogeneous activities can be constructed by re-grouping.

4. Momentary and continual accuracy in input-output tables

4.1. General remarks

Let us once more sum up the conclusions of chapter II.

- Institutional statistics describe the pattern of economic activities according to how they are organized in units. This requires classifications and clear divisions between statistical units.
- Changes derived from the results of institutional statistics for various periods are more difficult to interpret than those derived from functional statistics.
- In connection with the above, the best solution - at least if a description of the economic activity itself is required - would be to compose long time-series of levels, comparable from year to year, of functional statistics
- For the description of production processes, the best combination would be the following:
  - momentary accuracy, combined with optimally accurate changes with respect to the preceding moment of observation, in co-ordinated statistics; this should be complemented by an analysis of the causes of interruption in the continuous accuracy;
  - long time-series of levels, comparable from year to year, of functional statistics.

Mutatis mutandis, the above also applies for co-ordinated and analytical input-output tables. The following section looks into continuity interruptions in the input-output tables in some more detail. In section 3 a possible strategy is explained for maintaining momentary and continuous accuracy in these statistics.

4.2. Continuity interruptions in input-output tables

Continuity interruptions in input-output tables can have many reasons. In the first place, changes may take place in the system. Interruptions may then result from, for example, changes in the classification by economic activity, changes in definitions (due to for example, shifting the production boundary) and changes in registration. These changes are in turn caused by changing insights with respect to the registration of the economic process, theories in the course of development, more extensive statistical estimation techniques in aid of further specification and changes in the pattern of economic activities, in which some production processes disappear and others appear. Statisticians are in control of this category of changes, in the sense that they can introduce system-changes when they choose. This does not apply for continuity interruptions in statistics based on input-output tables. The conclusions with respect to continuous accuracy drawn in the previous section are completely valid here. Finally, there are also continuity interruptions due to changes in the measurement and processing procedures. These too can be controlled by the statistician. Interruptions due to the availability of new statistics constitute a special case within this category. The object of the input-output table is to give a complete description of the economic process in a certain period of observation. Where hardly any data are available, estimates have to be made. If, when a statistical coverage is extended, it turns out that levels recorded up to then in the input-output table had been estimated incorrectly, statisticians are confronted with the problem of whether they should include the correct levels in the input-output table. A way out of dilemma is presented in the next section.

4.3. A strategy for maintaining momentary and continuous accuracy in input-output tables

As indicated in Chapter II, section 5 for basic statistics, for the compilation of input-output tables too, it is best to aim for:

- co-ordinated input-output tables with accurate levels, based on the most recent definitions, classifications and statistical methods. These tables may include changes with respect to the previous year, though these changes may not automatically be compared to each other due to potential interruptions in the continuous accuracy.
- a set of analytical input-output tables which together form a continuous series. The functional character of these tables makes it easier for their comparability in time to be maintained.

The co-ordinated tables fulfill the demand for statistical information. The series of analytical tables provide the user with dynamic information. If we focus on the practical possibilities, the first condition to be fulfilled for such a scheme is that the individual co-ordinated statistics concerning the process of production and income formation in groups of units give accurate indications of the changes from year to year in addition to current levels. Secondly, it can be stated that an annual revision of the preceding series of analytical input-output tables would be a very labour-intensive and costly business. This is particularly a conseouence of the fact that one correction due to continuity in the input-output table will lead to a host of corrections of related items. One single correction will spread across the whole table. In practice, a continuous series of analytical tables can only be constructed by, on the basis of a certain year, constructing the following tables by introducing the correct mutations year by year, in the course of which, if interruptions occur in continuity, momentary accuracy will no longer apply. Algera et al. (1981) examine the problems which arise in the construction of input-output tables in which continuous accuracy is maintained as far as possible at the expense of momentary accuracy in some detail.

The operationalization of a scheme as described above can be constructed as follows. Every year, a co-ordinated table with updated levels is compiled, relating to groups of units. As much information as possible on the main and secondary activities of these groups is included in the tables. The correct mutation of each cell of this table is calculated. By subsequently grouping this table according to homogeneous activities, what is in fact an analytical table will be created on a current level and with mutations with respect to the previous year. These mutations can then be used in aid of extrapolating the continuous series of analytical input-output tables. This procedure could result in the level of economic activity according to the analytical input-output table deviating from that recorded in the co-ordinated table. Theoretically speaking, this deviation may be either positive or negative.

From time to time, the difference in the recorded levels of total activity between the co-ordinated and the analytical tables will lead to the series of analytical input-output tables having to be revised: the revision. How often this will be necessary will largely depend on the extent to which continuity interruptions occur. For the revision year, the level of total activity according to the analytical input-output table will be equal to that according to the co-ordinated table. As should now be clear from the above, the construction of an analytical table with a current level for the revision year does not pose any specific problems. It is in fact constructed every year in the process. The problems related to revision lie in the construction of a continuous series of tables which link up with the current level. To this end, every interruption in the continuity will have to be analyzed separately, so that a series of corrections can be established for preceding years at each break in continuity. The establishment of these corrections requires the information which is quoted as essential for the construction of long time-series in section II.4. We shall not go into these problems any further in the context of this article. An extensive explanation of the problems connected with the construction of series going back in time when a revision has been implemented was included in a recent publication on revised series for 1969-1976 from the Netherlands Central Bureau of Statistics (1985). The old series from the analytical tables, together with the series for continuity corrections, constitute the basic material for the resulting series once they have been introduced.

Finally, some comments on long time-series of co-ordinated input-output tables. We stressed quite early on that the scheme presented here meets the demand for statistical and dynamic information. A frequent demand for information in economic studies is that for comparative static information. If the demand is directed at comparative static information on production processes, it can be fulfilled by time-series of analytical input-output tables. However, if a description of the pattern of economic activities according to how they are organized in units is required, this can only be met by time-series of co-ordinated input-output tables. The construction of these series has lowest priority in the above-described scheme.

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