STATISTICAL UNITS STANDARDS AND CENTRAL REGISTER SYSTEMS: KEYS TO THE DEVELOPMENT OF ECONOMIC ACCOUNTING

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National accountants, model builders and analysts who work with statistical material that has been compiled without the discipline of well-developed unit standards rules and central register controls may be constructing information systems that are basically unsound because of the uncertain nature of their building bricks of economic units.

This paper draws attention to the nature and importance of statistical unit standards and central register systems in the provision of economic statistics for economic accounting, planning and management. These are viewed as essential conceptual and operational tools for compiling economic statistics on an integrated basis and for making progress towards establishing a comprehensive data base with positive links between macro economic analysis and data about individual economic agents. Some of the problems and possibilities for countries who wish to proceed along these lines are discussed, with particular reference to the experience of Australia.

I. INTRODUCTION

This paper is primarily addressed to the national accountants, model builders and analysts who work with statistical material. It is intended to draw their attention to the nature and importance of the statistical unit standards basic to central register systems supporting economic accounting. It has something to say also to the accounting profession, survey statisticians and data processors. Appropriate solutions to the problems raised will require a meeting of the minds of all of these parties.

From the perspective of the data processing community this topic is a particular instance of a problem which becomes more acute as information systems are required to serve a wider and wider range of uses and users. It is a problem which has always been a basic concern of statisticians—that of resolving the great variety of perceptions of real life activities into the more limited number of standardized perceptions for which numerical summarizations acceptable to information system users can be produced. Essentially it is a problem of language.

William Kent (1978, p. 203) puts this general information system development problem very succinctly:

> "In an absolute sense, there is no singular objective reality. But we can share a common view of it for most of our working purposes, so that reality does appear to be objective and stable.

*At the time of writing the author was an officer of the Australian Bureau of Statistics formerly responsible for a field which included the subjects discussed. The article draws on this and recent experience in New Zealand, Jamaica and Papua New Guinea and has benefited from comments from ABS colleagues. However the views expressed are solely the author's and are not necessarily shared by the ABS.

But the chances of achieving such a shared view become poorer when we try to encompass broader purposes, and to involve more people. This is precisely why the question is becoming more relevant today: the thrust of technology is to foster interaction among greater numbers of people, and to integrate processes into monoliths serving wider and wider purposes. It is in this environment that discrepancies in fundamental assumptions will become increasingly exposed."

Such a monolith is the conceptual system represented by the United Nations *System of National Accounts* (SNA)[1] and its various extensions and elaborations. The SNA's remarkable achievement has been to establish a common enough view of the full range of economic processes for data to be assembled and economic debate conducted using concepts and terminology which are now generally understood and accepted throughout the world.

The current version of the SNA was a response to the growing demand for the several branches of national accounting to be brought together in a common accounting framework in which all the elements would be fully detailed in a way that would enable the many different aspects of economic activity to be analysed as required.

What the SNA does is to integrate and link the definitions and classifications of all flows and stocks into a coherent structure. To the extent that it specifies the main variables of interest to economists, as derived from items which have general currency in business and government accounting, it approaches the ideal of a unitary accounting system. Such a system might express a direct and explicit linkage between the accounts of the individual economic agents and the accounts of the nation so as to provide the kind of flexible and positive analysis that users would like to have.

The reality however is that we are generally a long way from achieving this ideal, even though the SNA framework has been available since 1968, economic censuses and surveys have applied its standards and there have been great strides in data base system capabilities. It would seem that we have the kind of situation envisaged in the quotation from Kent, which would lead us to suspect that some of the system's fundamental assumptions have come under strain in imposing the SNA's common set of perceptions of transactors and transactions and very wide range of purposes on accounting "realities," which reflect much more particular and self-regarding information requirements.

One fundamental assumption of the SNA is that it will be practicable to collect data at individual unit level in terms which will be consistent with the definitions of the SNA's national aggregates and component transaction types. A second assumption is that it will be possible to collect this data in respect of the standard transactor units of the system which provide the basis for disaggregating the national accounts in terms of the structure of the economy, showing the flows between institutional sectors and industries.

By and large the first assumption is realistic enough and its weak points (in areas like the valuation of changes in stocks and capital consumption) have to do with problems of measurement rather than with differences of perception as

[1]United Nations (1968a).

between those responsible for business accounting information systems and those responsible for national accounting systems.

It is in regard to the second assumption that differences in perception are most likely to cause problems in developing national accounting systems along SNA lines and in meeting the aspirations of users to have access to economic data base systems within this framework. It is these problems of statistical units standards that this paper will examine. It will be argued that they demand a very significant effort on the development of working rules for defining and classifying statistical units and on their application in practice, particularly through a continuously maintained central register of economic units. Where this has not been done the credibility of disaggregated national accounts and models is necessarily suspect and comprehensive economic data bases are not in prospect.

II. Aspirations and Priorities

In developing their national accounts, government statisticians have generally seen as their first priority the compilation of consolidated accounts for the nation with its key national aggregates, such as gross domestic product and its components. In gathering the necessary data on production, income and expenditure flows they have used a great variety of data from many sources which do not all discriminate between different classes of transactors in any systematic way. Some approximate breakdowns by sector and industrial origin are assembled but are subject to considerable reservations as to the possibilities for more detailed analysis.

In this context, the problem of relating the information requirements of the national accounts to the information available from business and government accounting records is generally manageable in the sense that the suppliers, collectors and users of the data share a common enough view of the data items involved in compiling the national aggregates for most of the working purposes of reporting and summarisation. Census and survey return forms can ask for items required to measure a business's contribution to domestic product and national income in terms that are intelligible to respondents and likely to be on record. Even with small business operators in the informal sector, who do not keep summary accounts, there is still likely to be an adequate understanding of the basic concepts in respect of which information is required.

During this phase of national accounting development, where progress is heavily dependent on the statistician's skills in drawing inferences from incomplete and uncertain numerical data, users have to work within the considerable limitations of each country's published accounts and supporting tables. The system is being developed "from the top down" and the promise of positive and explicit linkages between the statistical aggregates and unit records remains remote.

The statistical context takes on a new dimension when governments undertake the development of integrated census and survey systems intended to provide a unified "from the bottom up" economic accounting system.[2] They may still

[2]See for example, Fergie (1975).

necessarily be relying on the statistician's estimating skills in order to achieve their objectives economically, but the general form of a data base matching the SNA's cohesive theoretical system begins to appear, along with a new level of user aspirations.

It is at this point that the developmental capacity of the government statistical service very often becomes overloaded and progress towards a unified information system is stalled. The "road block" is likely to be the establishment of adequate statistical unit standards at the operational level of population listing, classifications, survey collection and data processing. Not uncommonly, the national accounts continue to be elaborated under pressure of demand, notwithstanding the fact that the economic units in population listings of names and addresses are not what the survey designers and users assume them to be.

This uncertainty about the constituent transactor units of the national accounts is really not surprising because the standard units of observation and classification of the SNA are essentially peculiar to national accounting. Terms like "enterprise" and "establishment" are used quite loosely in business circles without the comparatively precise and uniform meaning attached to them in the SNA and essential to its exposition of the stocks and flows in the economy. Except as reporting requirements have been imposed by external agencies, the need for uniformity in identifying component units has not been an issue for business accounting. Thus a complex business enterprise will disaggregate its accounts in whatever divisionalized arrangement suits its own internal management control purposes. For purposes of external financial disclosure, conventions relating to the transactions of an enterprise as a whole have long been established, but the accounting profession has only recently taken an interest in setting disclosure standards for components of an enterprise and this does not extend to defining unit structures on a standard basis across industries, as is required for statistical analysis of production by industrial origin.[3]

Certainly, the accounting professional associations have not seriously sought congruence between their units standards (e.g. for segment accounting) and national and international statistical reporting. There is little evidence, for example, of a desire to promote inter-company comparisons in terms of a common perception of "industry," where complex enterprises would segment their accounts on the same basis as they enter into industry statistics via the returns for their component establishments supplied to the government statistician. Nor have they been persuaded to recommend the strict domestic/foreign operations split so fundamental to their statistical reporting and international statistical comparison.

It may appear that the problem of translating statistical unit standards into data collection and processing practice is significant only for advanced economies. It is in fact a problem for any country which has a significant modern sector with large multi-activity undertakings. In many developing countries big transnational businesses may dominate the scene and there is little prospect of simulating and

[3]Standards set by the International Accounting Standards Committee in IAS14 *Reporting Financial Information by Segment* have been adopted by many countries. See Lurie (1979), Miller and Scott (1980), and Postner (1984) pp. 438-9 for discussion.

monitoring the effects of policy decisions relating, for example, to structural adjustment, without a disciplined approach to delineating and classifying the economic units in respect of which data are to be collected and presented. It may be that such multi-activity undertakings are small in number although important in scale. In that case the application of the standards may not be a big task. But the standards still have to be established at the level of working rules and they have to be applied consistently via the discipline imposed by a central register system, albeit a small one maintained for the purpose of keeping this small but complex and important part of the economy under statistical control.

The task of establishing and implementing statistical unit standards can be viewed as a two-way process. Thus the SNA's simplified perception of the transactors of the economic system, and of the types of transactions that are recorded in respect of them, provides a broad theoretical framework. But this is not enough. The SNA provides guidelines with alternatives so that the process of establishing standards in a particular country will require decisions about how the general principles are to be interpreted and applied in that country's system of economic statistics. Along with the process of resolving the conceptual problems there will begin the operational process of identifying the elements of the unit structures that actually exist (in the perception of the accountants of the various economic agents) and of trying to fit these to the definitions of the statistical model. Where the conceptual standards and the operational experience impact on one another there will be specific decisions relating to the cases requiring interpretation of the definitions. As these are documented, the standard definitions will be modified or elaborated by way of working rules. This is a continuing task of some complexity and of considerable consequence for the quality of economic statistics.[4]

To appreciate this, it is necessary to first consider the general accounting structure and unit specifications which the SNA design requires, before considering what is involved in matching these requirements for a national information system to the highly individual accounting structures and information systems that will provide the source data.

III. The SNA's Perception of Economic Agents and Their Accounting Unit Structures

The SNA represents the economic agents operating in the domestic economy as existing in two forms. Thus they are perceived as physical entities and as legal entities. The individual economic agent (such as a company) is visible in its physical operations at farms, factories, stores, offices, depots, etc. on a one-to-one or one-to-many basis. Its legal manifestation can be independent of physical form, as with a company which has been registered, but is not yet operating.

[4]A complete set of conceptual standards for an integrated system of economic statistics would need to cover:

(a) standard transactor units, or the "units of observation" in the system;

(b) standard classifications, or groupings of the transactor units with similar characteristics; and

(c) standard data items, or the classes of transactions undertaken by the transactor units and recorded by the system.

The SNA's accounting structure can then be understood as providing accounts for the nation as a whole which are analogous to those of an enterprise with branch accounts for each of its physical establishments. A full range of accounts is expected to be available for every enterprise, covering financial transactions as well as those relating to its activities in producing goods or services. But unless the establishment and enterprise are equivalent (i.e. one-to-one) it is not expected that a full range of accounts will be available for establishments. It *is* expected that basic data on their production activities will be available, but it is recognized that, if they are part of a larger enterprise, they are unlikely to be centres of financial decision-making and to have branch accounts which impute financial transactions to them.

The SNA then makes the best of this situation by presenting an analysis of financial transactions as taking place between enterprises and an analysis of physical production and consumption transactions between establishments. This latter analysis involves treating each of the establishments of a multi-establishment enterprise as if it were an independent transactor along with those establishments which are equivalent to enterprises (i.e. single-establishment enterprises).

The SNA could have recommended analysis of the production process at the level of enterprise units as the "building bricks," but this would not be as analytically useful in a country in which multi-establishment enterprises are significant.[5] With establishment data it is possible to depict the origin of production in industry detail as well as the geographical location of production and capital formation in most industries.

The accounting structure of the SNA is based on this distinction between enterprise-type and establishment-type units.[6] One set of accounts is specified for establishment-type units classified by kind of economic activity (industry), and a different set of accounts is specified for enterprise-type units classified into institutional sectors which are distinguished by differences in financial role and behaviour. For establishment-type producing units (classified by broad function and by kinds of activity) the accounts relate to production, consumption expenditure and capital formation. For enterprise-type owning units[7] (classified to institutional sectors), income and outlay, capital finance, reconciliation and balance sheet accounts are proposed. It is only in the consolidated accounts for the nation that the relation between production and expenditure accounts and the income and appropriation accounts is shown.[8]

The SNA recognizes that in complex enterprises there may be two levels of accounting in enterprise-type units as well as the third level of accounting in respect of establishments.

> "For example, a business corporation may control a number of establishments producing similar or very different commodities and so assignable to the same or different industrial categories. And the corporation may

[5]Production accounts for institutional sectors composed of enterprise units are in fact also called for in the European System of Accounts and in the UN/OECD National Accounts Questionnaire.

[6]Units analogous to the business enterprise and establishment for non-profit institutions and for the public sector are not self-evident. Hence, "enterprise-type" and "establishment-type."

[7]The SNA, para 5.3, uses the rather less apt term "financing unit."

[8]For a discussion of this see United Nations (1982).

itself be only one of a number, all of which are controlled by a giant business enterprise. A similar situation exists in government... as a consequence it is necessary to set up the accounting system so that government can be seen not only as the producer and final consumer of a variety of services, each with its own cost structure, but also as the institution concerned with allocating finance to these and many other objects." [9]

There are some problems in deciding whether reporting at the legal entity (e.g. corporation) level, as distinct from the enterprise (group) level, is to be used for financial statistics.[10] But such units can be readily identified in the private sector, at least, and can be expected to have the necessary accounting data (although this is not necessarily so for small unincorporated businesses).

The feasibility of recognizing establishment-type units is much more open to question because the need to maintain production account records for each physical producing unit of any enterprise does not have the same universal recognition in business accounting practice. And where the establishment is recognised it is not necessarily accounted for as if it were an independent economic agent operating at "arms length" in its transactions with other establishments of a complex enterprise. Yet the logic of the SNA's objective, of presenting gross product originating in each industry or geographical region, would require corporate overheads and indirect expenses to be allocated to component establishments to be valued at market prices on at least an approximate basis.

Much more so than the enterprise (which is difficult enough to define consistently across all sectors), the establishment is very much the artefact of the statistician, rather than a concept which has currency with business or government accountants. Consequently, the concept requires careful definition as a standard for different industries and careful operational translation using terms that the respondents will understand.

Essentially the concept is that of a physical producing unit, defined as follows:[11]

"*Establishment.* In concept, the combination of activities and resources directed by a single owing or controlling entity towards the production of the most homogeneous collection of goods and services, usually in a single location but sometimes over a wider geographic area, for which separate data can be compiled in respect of the production and all the intermediate inputs, labour and capital resources employed for this purpose, directly, or in support of, or ancillary to, the production."

It will be apparent that this is not a simple concept that will be readily communicated and consistently applied even as a standard across an industry, given the different physical forms in which production is organised in different

[9]United Nations (1968) para 5.4.

[10]Terminology differences sometimes make it difficult to know what has been done. Australia, for example, prefers the legal entity as the unit but calls it the "enterprise" level as distinct from "enterprise group." U.S.A. prefers the enterprise group level which it calls the "enterprise." This paper will use the term "enterprise" in the latter sense.

[11]United Nations (1968), p. 232.

industries and the variety of branch accounting practices that will apply. But, however well the producing units are defined in standards definitions, problems will arise at the working level in applying these standards simply because they are not general accounting standards.

IV. Basic Problems in Implementing Unit Standards

The implementation of statistical unit standards in practice implies very positive controls by government statisticians over their data sources. Unfortunately, however clear their standards may be in principle, in practice they may not have this control even over their own direct surveys.

Most commonly the necessary discipline is lacking when economic statistics collections are developed separately by different agencies for various unrelated purposes and when it is necessary to make the best of whatever population lists can most readily be extracted from administrative sources. Typically in a developing country it is necessary to rely on compilations or listings from administrative records relating to economic agents which are identified only by the name and address, with nothing to indicate the coverage of the unit to which the name and address attaches. This is the case, for example, when a social security agency requires all employers to submit returns relating to their employees but is indifferent as to whether this is done on a legal entity basis, an enterprise basis or whether separate returns are provided for the enterprise's establishments in each region. To the extent that practice varies, the nature of the statistical units represented by their administrative records will be uncertain.

There are two basic problems here. Firstly, economic agents, who undertake the transactions we analyse in the national accounts, are not all independent self-defining statistical units, such as individual persons. They may be associations of persons including partnerships, trusts and corporations, or they may be government instrumentalities. They may also be groupings of these acting together in joint ventures or under the common ownership and control of a parent company or central or local government, sometimes as transnational or international organisations. Thus there are sometimes difficult choices involved in determining the statistical units for which data are required and can be provided in respect of different kinds of economic transactions.

The second basic problem for the design, management and analysis of economic statistics is that the "boundaries" of such units are not necessarily defined by, or implicit in, the name of the unit.[12] Thus, when a questionnaire is addressed to a company at a particular address without a clear specification of the coverage required, persons completing the questionnaire might (e.g.) limit the coverage to operations of the company at that address, or cover all locations of that particular entity, or cover all locations of the whole group of companies for which it is the parent company.[13] Again they might limit coverage to operations in the country concerned or cover all operations throughout the world. Or,

[12]See Sunter, p. 701.

[13]Note that it is common in surveys to have a "reporting unit," e.g. a head office which completes the return, which differs from the "statistical unit," i.e. the units for which data are to be supplied, e.g. the company's manufacturing establishments.

depending on the context of the enquiry, they might limit coverage to particular categories of employees or to a particular industry and the basis of their reporting may be quite different from what the statistical agency really wants for its particular purposes (if it has thought this through) and different again from what it thinks it is getting.

Anyone familiar with the development of business surveys under "crash programme" conditions, in an inexperienced developing country's statistical office, will recognize the sort of quandries which arise in practice. A company begins as a simple factory owner and completes manufacturing survey forms for its factory. Later, without any change in name, it takes on wholesaling activities. Does it now include these additional activities? What does the statistician really want? Does he know what in fact he is getting? Will this vary from year to year when someone else has the job of completing the form? Generally speaking it is difficult to be confident about this unless government statisticians have some procedure for determining (and updating) the structures of each of their listed businesses and government agencies and include, with the name and address on the questionnaire, a specification of the coverage required (e.g. "operations of all establishments in Jamaica"). Typically, developing countries will not have any structured and continuously updated register of economic units and the credibility of their surveys and the national accounts based on them will be seriously in question in regard to gaps/duplications in coverage and to the validity of industry dissections.[14]

Certainly this condition would block the development of economic data base systems of the kind some expect should follow on their acquisition of a computer data base management system.

V. Standard Statistical Units—Required Attributes for a System of Integrated Economic Statistics

Two conclusions emerge from the above observations. Firstly, a properly controlled economic accounting system will demand economic units to be listed in a standard way for the purpose of establishing and controlling reporting requirements and for positively linking information about individual units from different sources.

Secondly, in the face of the ambiguities surrounding the identification and delineation of economic units in practice, the standard units concepts and definitions will need to be worked out with a great deal of care if they are to be both consistent in principle and operationally workable.

Key considerations which arise in establishing these standards are that the units should be:

(a) consistent with the overall conceptual framework of the UN system of national accounts;

(b) capable of being related one to another in a structured fashion, while mutually exclusive and jointly exhaustive of all units in the system (ideally covering the whole of economic activity in the country);

[14]See M. C. Fessey, *Business Censuses and Surveys in Developing Countries*, p. 99.

(c) recognizable in the "real world" and readily identifiable by users and suppliers of statistics;
(d) units for which standard data required for national accounts and related economic collections can be supplied.

Each of these objectives is discussed in turn.[15]

(a) *Consistency with SNA Framework*

Development of units concepts and definitions which are consistent with the SNA helps ensure that the system produces economic statistics which will be comparable with those of most other countries and which will be consistent (at least conceptually) with the national accounts produced within the country concerned.

The standard transactor units suggested in the SNA are described in only very general terms which require interpretation and expression in the form of working rules which will be in accord with the structure of business and governnent in the country concerned. This is a process which is refined on the basis of operational experience and needs to be pursued in parallel with the development of industry and institutional sector classifications, which again may involve necessary local adaptations of UN standards. This can be done in ways which preserve the objective of a fully integrated system consistent with the broad SNA framework. But it needs to be done with care by a central statistical authority with the necessary expertise.

(b) *A Mutually Exclusive, Exhaustive and Structured System*

This objective can be viewed as ensuring that the standard units of the system fit together both *across* the economic system and *up* through the various levels of ownership and control in respect of which economic analysis might be pursued. Thus it requires:

(i) horizontal integration, or integration of statistics across subject-matter fields, so that statistics produced from one part of the system can be compared validly with statistics produced from another part of the system (e.g. manufacturing statistics with distributive trade statistics). This requires that transactor units be defined as uniformly as possible and so their boundaries do not overlap, or do not leave gaps when aggregated with other units of an enterprise;
(ii) vertical integration, or integration of statistics through the various levels of transactor units, so that statistics for one type of unit can be related to statistics for another type of unit. Thus, transactor units should be defined within a hierarchy of units, which define relationships (e.g. of ownership and control) between units. Identifying and relating the units of complex businesses and government organizations in this way makes it possible to collect data in respect of one level from a unit at a higher level (e.g. the head office of a corporation can be asked to provide data

[15]For discussions of the issues from an Australian perspective see Australian Bureau of Statistics (1984).

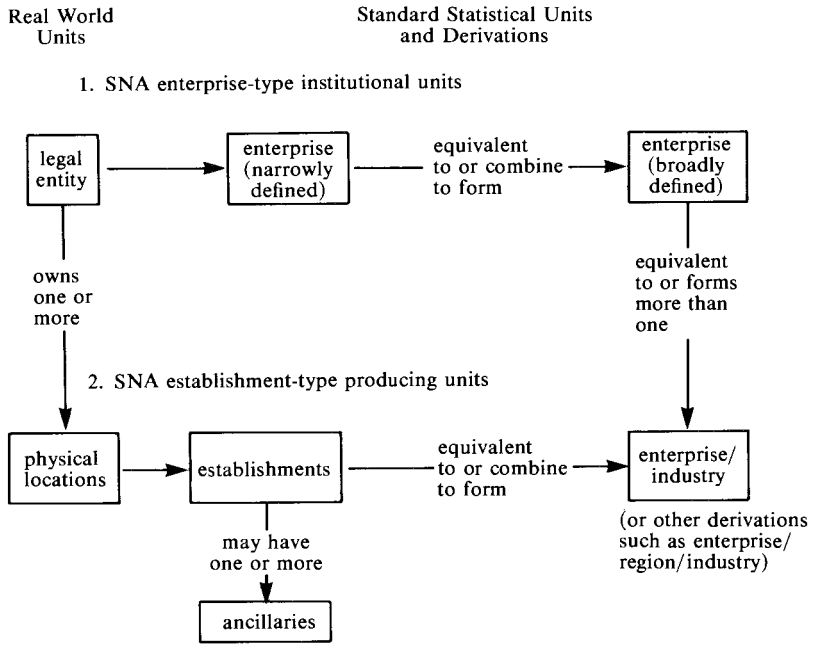
relating to the producing establishments it owns, so ensuring full and consistent coverage of all units at that lower level without gaps or overlaps).

(c) *Capable of Being Readily Related to "Real World" Units*

What is involved in distinguishing different kinds of units and their relationships for the purpose of controlling statistical collections and compilations is an attempt to translate real world units (of infinite variety of form) into units which are as homogeneous as possible, for the purpose of forming groupings by industry, size or other attributes which will have useful meaning for economic analysis.[16]

By "real world" units is meant units which can customarily be recognised in either legal or physical form. Thus, the business world commonly recognises the single *legal entity* and can observe the physical *location* at which personnel and plant owned by the legal entity are employed in a factory, shop, office or other place of business.

The single legal entity, as ISIC defines it,[17] in the case of a market economy may be a corporation, joint stock company, cooperative association, incorporated non-profit association, partnership, individual proprietorship, or some other form of association. It owns and manages the property of the organization, enters



[16]For example, if the economy were dominated by a massive multi-activity enterprise, it would not be satisfactory to treat it as a single producer to be classified to its predominant activity. The statistician would want it to provide statistics in respect of each of its component production units which were similar in kind to other production units which in the general case report separately as separate legal entities.

[17]United Nations (1968b).

into contracts, receives and disposes of all its income, and maintains independent profit-and-loss and balance-sheet accounts and other records. This definition will need elaboration to cover the various entities which will be encountered in a particular country, but the general idea of "owning" units, recognizable as transactors in contract law, is clear. Here the distinction can be drawn between 1) the unit which owns and manages its plant and personnel and 2) its plant and personnel, as these can be described in terms of the addresses at which the legal unit operates.

Thus, the standard statistical equivalent of the legal entity is the enterprise, narrowly defined. Exceptions may be (e.g.) to attach non-operating legal entities to individual related operating legal entities in the same enterprise group to form statistical enterprises or to merge two legal entities to form one statistical enterprise because of a lack of separate management accounting information, or because their operations are inextricably mixed. If the legal entity operates internationally, only the resident operations in the country concerned would be included in the statististical enterprise.

The ability to derive "hybrid" standard units, such as enterprise/industry (all the establishments of the one enterprise in a specified industry category) is of particular operational value (see the next section's discussion of data availability). Examples of other such derived units for which the building block is the establishment-type unit are enterprise/region and enterprise/industry/region, used to provide production and employment statistics.

(d) *Units for which Standard Data Required for National Accounts and Related Economic Collections can be Supplied*

As discussed, the statistician's need to identify such different types of unit within the structure of business organizations arises from the fact that businesses are fully accountable only as legal entities, so that unequivocal figures of key accounting terms, such as value added, are unlikely to be available for locations unless the locations have a one to one relationship with a legal entity.[19]

Accordingly the units standards developed for statistical purposes and embodied in central registers recognise the need to utilize data available at one accounting level (e.g. the enterprise) in association with data available at another level (e.g. for each component establishment). Rules may then be devised to make the best use of the information generally on record at each level.

For example:

—Value added may be attributed to an enterprise as naturally deriving from its profit and loss accounts. However, its establishments may not maintain accounts as independent profit-maximizing units and in order to report their contribution to enterprise value added it may be necessary to have arbitrary rules for attributing or apportioning some costs and revenues to each component establishment.

—Industry classification is a natural attribute of an establishment as a physical production unit. However, to associate industry classification with the

[19]In Australia, some 90 percent of non-agricultural enterprises are single establishment enterprises. But the remaining 10 percent account for the great majority of private non-farm activity.

enterprise requires aggregation rules, e.g. the step by step method for determining the predominant activity of enterprises by reference to the component establishments.

—It may be necessary in a sample survey to select enterprises (the selection unit) to supply statistics in respect of each of their enterprise/industries (the reporting unit) so as to compile statistics relating to units of the establishment type (the statistical unit). This is done in Australia for large multi-establishment enterprises in order to collect quarterly economic indicator information which would be consistent at broad industry level with more detailed annual or periodical establishment census data. The respondents respond more readily than they might if data were required for each establishment rather than for units made up of all of their establishments in the one broad industry category.

The question of availability of data is, of course, implicitly recognized at a very broad level in the SNA conceptual framework. As we have seen, there is expected to be a general class of units for which income, outlay and capital financing data are available. In defining the standard for establishment units and the working rules for handling their identification in different industries, a basic requirement is that such units be able to report the transactions relevant to the SNA concepts of production, intermediate consumption and capital formation. This would include measures of turnover, stocks, purchases and other expenses of production, fixed capital expenditure, wages and salaries, employment and inputs and outputs of commodities, measured, where possible, in quantitative as well as monetary terms.

Most statistical data relating to economic units have to be derived from accounting records of some kind and accounting standards may vary from country to country and between different industries. Availability of data in accord with these general conventions may vary considerably from business to business depending on such factors as whether they summarize monthly or annually, keep records on computer and are cooperative in their attitude to the government statistician. In fact the "availability of data" may depend on how firm is the request for the data.

This means that, for each type of unit, the precise boundaries of the unit could be defined differently according to how one approaches the question of whether the standard data are available.

At one extreme one could define a unit in terms of the availability of accounting records in each particular case—which might amount to accepting whatever kind of unit happened to suit the records of the individual respondents to statistical collections. This would cut right across the idea of statistical units having some degree of uniformity of definition (e.g. in terms of activity and location in the case of establishments).

At the other extreme one could adopt a particular basic definition of the ideal or desirable unit and require the data to be supplied for such units in all cases. Such an approach would obviously not be acceptable if a very large proportion of respondents had to complete the returns on an estimated basis.

In practice some countries take a more rigorous line than others in pressing for uniformity. Australia exemplifies the more rigorous approach. Considerable weight is given by the Australian Bureau of Statistics to the *general* practice of

businesses and other organisations in maintaining accounting records relating to their whole operation and to separate parts of their operations.

Thus in Australia the standard establishment unit for manufacturing establishments is the individual physical location (with some splitting rules to be applied to locations with very large secondary activities). In that case a minority of manufacturing enterprises have to provide estimates because their accounting system does not recognize the establishment units required. Arrangements may include accepting "careful estimates" which conform with the unit definition or taking as a proxy an organisational or accounting unit which very nearly meets the unit definition.

For some industries, for example, the road freight industry, it has been found that in the general case the necessary value added and other standard data cannot be supplied for each physical location of enterprises engaged in those industries. In fact the road freight producing unit is more realistically conceived of as the whole system of locations and mobile units that move between them. Accordingly in Australia, the "establishment" for this industry is the combination of all locations of the one enterprise mainly engaged in road freight transport activities. Similar considerations apply to such industries as electricity, gas and water, other transport industries, communications, finance and investment, insurance and services to insurance, government administration, justice, research and scientific institutions and lotteries and gambling services. For such industries it is neither practicable nor meaningful to represent production in geographical terms below the State or provincial level, or, in some cases, the national level.[20]

Some countries focus their interest on the enterprise, broadly defined to combine corporations under common ownership or control. In that case the component enterprise/industry unit would consist of all the establishments, of the one group of enterprises, that are in the specified industry category. Alternatively, they would be formed out of each legal entity in the group. One might expect that enterprises would generally find the former requirement the more natural one, given the new financial segment accounting standards which are in terms of industry sub-divisions of the corporate group.[21]

Any such hybrid units should be constituted of combinations of whole establishments in order to preserve the consistency of the system. To the extent that it is sometimes necessary to negotiate some compromise between the statistical office's perception of these units and the units which the enterprise finds feasible for reporting purposes, the outcome should be embodied in the units as represented in the central register system. Countries which take a "soft" view of availability of data in defining the enterprise's establishments may find it easier to accept the enterprise's existing branch accounting break-up than countries that take a firmer and more rigorous line in trying to enforce standards that are in accord with the SNA ideal. "Rigour" of course is not achieved simply by careful specification of the reporting requirement. The respondent may well report on

[20]Australian Bureau of Statistics (1984) pp. 83-88.

[21]Australian Accounting Research Foundation (1984). Postner (1985) advocates a unit of this nature as the standard statistical unit for purposes of both production and financial statistics. Given a joint effort to achieve a convergence between business accounting and economic accounting standards this may well be achievable and eminently worthwhile in the interests of more unified business and economic accounting.

whatever basis he thinks will best approximate the requirement with minimal effort on his part. So long as accounting systems are designed around internal information requirements only, trade-offs of one kind or another are bound to occur in meeting uniform national reporting requirements.

VI. Central Registers Apply Unit Standards To Statistical Operations

The discussion so far has concentrated on the nature and importance of statistical units standards. The message is that a country cannot begin to build a cohesive economic accounting system for analyses at any desired level, until it establishes national standards governing the identification of the different categories of economic transactors for which economic transactions are to be monitored and presented in the national accounts.

But beyond the conceptual problems of definitions and working rules there is the need for a parallel technological apparatus in the form of a central register of economic units. This is the physical system required to obtain and maintain the lists of real world and standard statistical units for the purpose of controlling the coverage of statistical collection systems and of facilitating the association and further processing of data relating to these units.

Together the conceptual standards and the physical system implementing these standards constitute a central register system. Based on the standards applied to information on the population of economic units, a register system will consist of a file or files storing the descriptive data on the units and their relationships plus computer facilities and procedures required to produce, maintain and access this information.

The general rationale for developing such registers on a centralised basis is that they are needed 1) to eliminate, or avoid, duplication between various enquiries in constructing lists of the units and 2) to ensure comparability and continuity in the data that are gathered and compiled in the inquiries. Centralization of the register may not necessarily demand the storing of the list on computer, but it does imply the continuous updating of the register and ready access for selecting populations and samples to meet needs of different agencies at different times both for the conduct of statistical surveys and for compiling and analysing data. This would be prohibitively expensive and inefficient to manage on a manual basis.

Even with the aid of a computer, a central register may consume very considerable resources in its development and in its subsequent maintenance and it is generally given low priority in developing countries. Nevertheless it will be no less important for a developing country to survey its economic units in a disciplined fashion and it is likely that it will need a continuously maintained central register facility to do this at least for its larger and more complex economic units.

Certainly user requirements will vary from country to country and, in particular, objectives for developing register systems will be constrained by the availability of computer facilities and expertise and by such factors as the nature of the legislative authority for the statistician to access or control business registration processes and to make the register available to users.

(a) *Requirement to Support Economic Censuses and Surveys*

A central register is most obviously needed for the support of economic censuses and surveys such as are generally conducted by mail in developed countries. But with the increased availability of computers it is now being argued that a register of enterprises and establishments, classified by industry and maintained by a single agency, is essential for the successful implementation of a programme of economic statistics, whatever method of enumeration is used.

The general argument is as follows[22]:

—A reliable frame is critical to the operation, whether the inquiries are carried out by complete coverage, sampling methods or a combination of the two or whether the canvas is by mail or field enumeration.

—If a mail canvass of all establishments is planned, a complete register is absolutely indispensable. Even where a complete field enumeration is planned, the cost of compiling a register may well be more than offset by savings in subsequent operations, such as the verification and control of enumeration.

—If they are available early enough, data compiled from the register will also assist greatly in the development of efficient plans for the census. Information in the register on kinds of activity can be used to decide the number and types of questionnaires, information on physical location can guide the geographical allocation of the statistical agency's resources and knowledge of establishment size can be used in sampling and coverage decisions.

—In later stages of the census operation, the directory can serve as the medium for imputing data for non-respondents.

Resource constraints may well govern the scope and coverage attempted by a central register system. But, given that the system is needed to support statistical programmes for the preparation of national accounts and input-output analysis which are necessarily comprehensive, it follows that ideally a central register of economic units should be correspondingly comprehensive. Within its scope in *principle* would then be:

—Economic units—those units which engage in the production of goods and services and those units which own the producing units and make the financial decisions in respect of them. "Persons" and "household" units would not be included as such; but to the extent that their names and/or addresses happen to identify producing and/or owning units, those names and/or addresses would be recorded on the register, e.g. a person may be the sole proprietor of a business.

—Industry—all industries of the industrial classification.

—Institutional sectors—all domestic sectors (other than households which are not unincorporated enterprises), i.e. financial institutions, non-financial enterprises (both private and public), general government (central and local government and social security funds), private non-profit institutions serving households, and those households which are non-financial unincorporated enterprises.

—Type of legal organization—the register would cover all forms of association, including economic units which are incorporated (both private and public), unincorporated (individuals, partnerships, trusts, government departments and other public sector units, cooperatives).

[22]See United Nations (1981) Chapter IV.

—Operational status—legal entities which are non-operating and locations which are not yet in operation would need to be included to the extent that it is necessary to deal with them appropriately in defining enterprises and establishments.

In *practice* the scope of the register may not be comprehensive in these ideal terms. An integrated system can still exist, and supply data for national accounts which is not comprehensive in scope, provided the scope is clearly defined and the boundary with other sources used for the national accounts is also clearly defined.

While "scope" defines the conceptual boundaries, "coverage" describes what is to be actually included within the boundaries delineated by the desired scope. It relates to the quality or depth at which the register is maintained. Thus, on cost-effectiveness grounds, it might be decided to limit coverage to economic units with employees, or to units with more than (say) 10 employees or some other cut-off.

Another approach might be to have periodical intensive updates of particular industries, timed perhaps to precede a major census or survey, and then to allow the list to degrade in the intermediate years. However, such inconsistency in level of coverage and the currency of benchmarks over time or across industries may in fact reduce the quality of the estimates in on-going surveys. Thus, where "number raising" procedures are used to expand the sample-take in these surveys, artificial increases in the time-series may result from the fact that the framework list does not reflect the true movement in population numbers.

(b) *Requirement to Promote Integration of Statistical Programmes*

While pressure for central registers of economic units comes most particularly from those needing lists for censuses and survey operations, there is also a growing acceptance of the need to use a central register of economic units as a means of promoting greater cohesiveness in the statistical programmes of government and private agencies, whether they are based on direct statistical surveys or not.[23] This requires that the central register be generally used to provide:

—the common record of standard statistical units for deriving consistent sample frames and census lists for enquiries conducted at different times for different industries by different agencies or sections of agencies;

—details, where applicable, of the current relationships between those units;

—the store for the key classification systems and for the classifications accorded to each unit;

—other indicative information about each unit;

—the mechanism for linking data collected by individual direct collections, e.g. economic census/surveys and population census/surveys and via indirect administrative channels such as through income tax, Customs and social security agencies;

—an instrument for minimizing and controlling respondent burden.

[23]See for example Fergie (1975) and United Nations (1981).

Desirably the central register would become authoritative for administrative as well as statistical purposes, such that its units standards and classifications would be applied also to continuous record systems designed mainly for management purposes, but having potential value for general economic statistics. The extent to which the register lists of units and classificatory and indicative information about the units could be shared with other agencies will depend on the confidentiality provisions applying. In many countries the legislation specifically permits general access to the names and addresses, together with limited classificatory information such as employment-size class and industry.

(c) *Requirement to Provide a Statistical Data Base*

The possibilities of a central register serving as a statistical data holding in its own right have not generally been realized. This is because it demands a higher level of reliability, comprehensiveness and up-to-dateness of the coverage, classifications and sizing variables than may be acceptable for the purpose of controlling censuses and surveys, which are able to correct for errors (e.g. "deaths," changes in classification, etc.) in the course of their operations. General illustrations of the kinds of analysis that users would welcome are:

—to provide counts of units with specified characteristics or combinations of characteristics;

—to provide a periodic analysis of the structure of the business population in terms of (e.g.) its industrial concentration, overseas ownership, geographical location, etc.

—to trace the changes over time in the industry, size, area of location, etc. of individual units.

Different uses would place different demands on the register system—for example, if overseas ownership is to be recorded on the register for statistical analysis, there would need to be some economical means of updating for changes in this ownership occurring from time to time.

The requirement for the facility to trace structural changes in individual units would be particularly demanding insofar as it would necessitate time stamping register data for each change made, so that time-series information on each unit might be available.

The range of data which users would like to see recorded for each statistical unit on the register of economic units will tend to be even greater when the register is to be used directly as a source of statistics than when it is being used only as a basis for drawing census and survey lists. Experience to date indicates that it is desirable to limit strictly the information to be held on the register and to carry other data (particularly that which is not stable by nature) on separate statistical data bases. The register can be linked with these for the purpose of the production of statistics from data items beyond those which it is necessary to store on the register for the purpose of the register's primary function of survey list generation.

If the register is to be readily linked with other data sysems, suitable linkage mechanisms will need to be developed to facilitate this.

(d) *Requirement to Provide a General Purpose Reference Source*

There may also be a generally perceived need to have a comprehensive central register available for public reference and this may be an important means of gaining public acceptance of the need for registration procedures.

The minimum range of items of information about each unit that users would want held on the register for general reference is likely to be very similar to that necessary for the purpose of supporting economic censuses and survey operations. It may not be as necessary to maintain such rigorous standards of classifications for many purposes of reference although users would want the information to be up to date and authoritative.

Few countries can claim to have adequately met all of these desiderata. Most developing countries have yet to attempt to establish minimal central register systems addressing requirements a) and b) for a limited range of industries. For them much more needs to be said about the process of developing and maintaining a central register system since few developing countries have seriously addressed the problem. Here objectives need to be examined in relation to the cost constraints, technical environment and organizational arrangements involved and this will include considering the strategies for obtaining and updating the lists as well as the technical matters of computer system functions and design.

In most countries such a programme is likely to be complex enough to warrant being controlled by way of a systems development methodology which, given full management commitment, will enable all involved to proceed with a clear understanding of what is required of them in each development phase. Thus a feasibility study would be followed by a report on user requirements which would establish the subsequent development strategy to be pursued by the system designers and others involved. The published literature on the development of central registers may be sparse, but countries such as Australia (which has been down this track in a recent redevelopment) have substantial unpublished documentation and there can be some scope for lifting off and adapting systems components and units standards and classification procedures from them.

VII. General Conclusions

This paper has addressed the nature and need for statistical units standards to be developed and embodied in central registers of economic units. Clearly such standards and facilities are fundamental to the development of a cohesive system of economic statistics. It is a complex task and one likely to deserve high priority in most countries. To the extent that investment in this infrastructure is neglected in building up economic accounts, any analysis by industry and sector will be difficult to sustain with any conviction.

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