

CONCEPTUAL CONSIDERATIONS ON SATELLITE SYSTEMS

BY D. SCHÄFER AND C. STAHMER

The Federal Statistical Office of the Federal Republic of Germany

In this paper, some considerations are presented on possible concepts of satellite accounts. These accounts are special data systems on specific, socially important fields of study (e.g. environment, health, education) which could supplement the core system of national accounts and which are linked to the core by common classifications and transition tables for transactors and transactions. The special advantage of satellite systems are the possibilities of meeting new demands on data, of testing new concepts which are suitable for the described field and at the same time of leaving the extent and concepts of the core system unchanged.

In the paper, the main emphasis is laid on the need to standardize the concepts of satellite accounts world-wide. This is necessary not only for comparing the results of analyses for different subject fields on a national level, but also in order to enable international comparisons of the data to be made for one field of study. Furthermore, a more detailed description of the concepts for the production part of the satellite system is given.

I. GENERAL CONSIDERATIONS

For the revision of the international systems of national accounts, which has been scheduled for the early nineties, it is intended to leave the basic conception of the "System of National Accounts (SNA)" of the United Nations unchanged. The present concepts have proved successful in particular for short and medium-term observations of the economy. The desire for stability and continuity in the national and international systems of national accounts is being supported both by the producers of the data, who will be able to standardize their accounting methods on a long-term basis according to pre-set concepts, and many users who wish to be able to found their economic analyses and model computations on time series of data from national accounts which remain unchanged over a long period.

On the other hand, in the past few years new demands have increasingly been made on national accounts which can no longer be met by means of the traditional instruments. This refers, *inter alia*, to the examination of activities which, in fact, are related to economics, but do not involve monetary transactions. This includes in particular the interrelationship between the economy and the environment, but also activities which are not marketed, such as production activities of households for their own purposes. Critics were correct in arguing that the aggregates of national accounts cannot provide sufficient information on economic welfare until the yield from these activities and the effects of diminished environmental quality due to economic factors are taken into account as well.

Note: This paper was prepared by the authors for presentation at the Working Party on National Accounts and Balances (Geneva, May 2-5, 1988) under the auspices of the United Nations Economic and Social Council, Statistical Commission and Economic Commission for Europe.

For several years, increasing interest has also attached to the economic impact of development trends and political measures in fields of collective (social) concerns, such as public health, research and development, environmental protection, education, arts and culture or tourism. Apart from questions concerning the volume of expenditure in these functionally defined fields of study, priority is also given to questions relating to their significance for production, structural changes, employment and the level of prices, to the repercussions of the general economic development on these fields as well as to the results and beneficiaries of activities in these fields.

An empirical analysis of these questions requires that the economic transactions concerning the relevant field should be identified and recorded within the entire economic circuit and thus as part of national accounts. Moreover, the relevant monetary data must be linked with non-monetary indicators. So far, only sparse data are available in national accounts on these fields of collective concerns. The corresponding monetary transactions frequently represent partial aggregates of the topics presently shown in national accounts which cannot be identified at first sight. A presentation of the non-monetary data relating to these activities, which alone would provide an extensive insight into the relevant field of study, is often completely lacking.

In order to account for these new demands, in spite of the above-mentioned efforts to leave the basic conception of the SNA unchanged, experts have for several years been working on the development of "satellite systems associated with the system of national accounts," each of which contains data on one specific, socially important field of study. The monetary data predominantly represent partial aggregates of the traditional system of national accounts which, in contrast to the satellite systems, will hereinafter be referred to as core system. Non-monetary data are often added from other sources. By means of the compilation of satellite systems, it is possible to prevent the core system of national accounts from being inflated due to the inclusion of additional classifications and differentiations which are relevant to only one specific field. Furthermore, possibilities are opening up for developing alternative concepts tailored to the respective field, for showing their impact on the results recorded in the core system as well as for compiling and presenting the data for a partial field systematically and in a clear form.

On the international level, the discussions on the concepts of satellite systems have only just started. At this early stage, it seems important to try to develop clear conceptions of the contents and the structure of satellite systems. By defining the term "satellite system," before it becomes a vogue word used for heterogeneous topics in international discussion, one may avoid having the term lose its significance. There is the risk that all those accounting systems might be referred to as satellite systems which, though not meeting the conceptual requirements of national accounts or not fitting into their framework, still are to be linked with the national accounts. The consequence of a conceptual vagueness of this kind on the national level might be that the conceptual structure and thus the data of satellite systems for differing fields of study would not be comparable. An international comparison of national data on one specific field of information would not be possible either. Difficulties would also arise for analyses that require

a combination of the data of the satellite systems with the core system of national accounts. For these reasons, it seems particularly important, at this initial stage of discussions, for the international organizations to try to develop precise concepts, to limit the area of application of satellite systems and to establish an unequivocal linkage with the core system.

The work on the compilation of satellite systems has been considerably intensified over the past few years. Reference should be made here, for instance, to the activities of the OECD concerning satellite systems on tourism or the proposal made by the United Nations Statistical Office to consider satellite systems on the environment in the SNA.¹ Essential impetus was furnished mainly by the work of French colleagues at the "Institut National de la Statistique et des Etudes Economiques (INSEE)" who, at the suggestion of the group of experts working on the revision of the SNA, recently submitted a proposal for a section on satellite systems to be included in the revised SNA.² In their contribution a clear and systematic outline of concepts and contents of satellite systems is given. It is our aim to offer experience acquired with the establishment of satellite systems in the Federal Republic of Germany, some supplementary suggestions on three selected points of emphasis: on the subjects of satellite systems (Section 2), on the relationship of satellite systems to the core system of the SNA (Section 3), as well as on the presentation of various subject fields in satellite systems - in particular with regard to the presentation of their production aspect (Section 4).³

II. SUBJECT FIELDS FOR SATELLITE SYSTEMS

With regard to the delimitation of the content of the subject fields which may be presented in a satellite system, a broad definition could be chosen, as in the French proposal, which distinguishes three "families" of satellite systems:

- accounts on economic activities (e.g. agriculture accounts, trade accounts)
- generalized functional analyses (e.g. health, research)
- other fields of satellite accounts (e.g. public aids to the productive system, alcoholism).

Such a broad definition requires that the term "satellite system" has to be associated with general characteristics, such as a structured information system comprising data on a specific subject, linkage of monetary and non-monetary data and establishment of a connection between the economic aspects of a subject field on the one hand and overall economic considerations on the other. The French proposal, however, provides concepts and a pattern of presentation for satellite systems only on the basis of "generalized functional analyses." It is not apparent how they can also be used for the other "families".

There is the alternative of confining the subjects of satellite systems. In this case, only those reporting systems should be referred to as satellite systems for

¹See United Nations Statistical Office, Environment Statistics Section, Environmental Accounting and SNA, Draft, New York, 1987.

²See Pierre Teillet, "A Concept of Satellite Accounts in the Revised SNA," *Review of Income and Wealth*, Series 34, No. 4, December, 1988.

³See also U.-P. Reich, C. Stahmer *et al.*, Satellitensysteme zu den Volkswirtschaftlichen Gesamtrechnungen, Publication series "Forum der Bundestatistik," Volume 6, issued by the Federal Statistical Office, Stuttgart and Mainz, 1988.

which a functional approach is of prime importance. A new concept will thus be given priority in national accounts, only basis elements of which have so far been included in the SNA and which actually cannot be included entirely since the objectives of the SNA focus on institutional or commodity-related aspects. The main emphasis of the functional approach is on the immediate purpose of economic activities and the transactions connected with them. The decisive aspect is first of all the purpose to which these economic transactions are directly linked and not with which production activity they are connected. Thus, not only services provided in hospitals may be assigned to the function of health care, but also health services rendered free of charge to a company's staff by the company doctor.⁴

If the functional aspects currently included in national accounts are extended to a comprehensive functional approach in satellite systems, the question arises as to what subjects might or should be presented under this aspect.⁵ Possible subjects could be derived both from a functional analysis of the sphere of transfers—such as social protection—and from the sphere of production. With regard to the sphere of production, possible subjects for satellite systems should primarily relate to the sphere of services since the SNA so far has not provided a detailed presentation of services which have gained increasing economic importance over the past few years.

This is mainly due to the fact that in the SNA another concept of presentation was chosen for services than for goods. Unless services are rendered to third parties, but have only ancillary functions within the institutional unit for the production of commodities intended for sale (internal services), there is no gross output recorded for them.⁶ Likewise, the inputs of the ancillary activities are only (non-identifiable) partial aggregates of the total inputs recorded for the relevant sector. The SNA explicitly shows only that part of the services which is rendered by the institutional units (enterprises, government institutions, private organizations) to third parties (external services).⁷ The task of a satellite system would be not only to present the external services under a specific functional aspect, but also to provide the most complete description possible of the internal services.

The subject field of a satellite system cannot be treated comprehensively by ascertaining only the value of the characteristic services of a satellite system. In order to show the interlocking of the characteristic activities with the national economy, it is also necessary to identify and include the commodities connected with the production of services. These commodities in most cases are goods not related to the services by production, but complementing them. This applies, for instance, to medicaments in the case of health services, to textbooks for education

⁴See also A. Vanoli, "Sur la structure générale du SCN à partir de l'expérience du système élargi de comptabilité nationale français," *Review of Income and Wealth*, Series 32, No. 2, June, 1986, pp. 180ff.

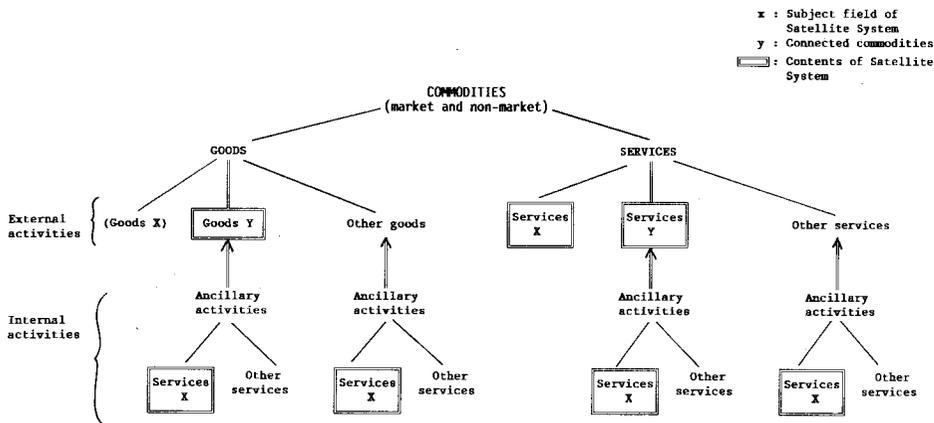
⁵Examples of functional aspects are the classifications of the purposes of government, the purposes of private non-profit bodies serving households, of household goods and services and of outlays of industries by purposes.

⁶See EUROSTAT, *European System of Integrated Economic Accounts*, Section 267, 2nd Edition, 1984.

⁷Examples for external production are health services provided to third parties by a public or private hospital. The services rendered by company doctors, however, are part of internal production.

and to travel guides for tourist services. An overview of the characteristic activities and connected commodities described for a specific subject field is given in Table 1.

TABLE 1
SUBJECT FIELDS FOR SATELLITE SYSTEMS



A confinement to a functional approach would entail that the “family” referred to in the French proposal as “accounts on economic activities” could as such no longer be considered as satellite systems. Though the examples cited there in this connection represent meaningful extensions of national accounts, they should rather be considered as complementary analyses or as an independent part of the national accounts than as satellite systems.⁸ One reason for this is that separate concepts have already been developed on an international level for subjects such as agriculture, energy or trade which basically still follow the institutional approach but, in contrast to the core system, comprise additional information and more detailed figures. Reference should be made here for instance to the guidelines issued by the European Communities on the agricultural accounts and on the input-output tables of energy flows. On the other hand, the development of a comprehensive functional approach has been rather neglected to date. We think that our considerations more comprehensively treat the functional aspects than those of the French proposal. Though the “accounts on economic activities” are not considered as possible subject fields for a satellite system, they might constitute building blocks for a comprehensive function-orientated satellite system. It is quite conceivable that satellite systems on distribution or transport could be compiled from a functional viewpoint, which for external production also provide for a complete presentation of production activities. The subject fields listed with the third family “other fields,” e.g. public aids to the productive system, alcoholism or road accident accounts, certainly represent major subjects which should be studied under macroeconomic aspects. However, they will probably require other methodological concepts than a functional analysis within the scope of satellite systems.

⁸With regard to the term complementary analyses see, for instance, INSEE: *Système élargi de comptabilité nationale*. Collections de l'INSEE, C 140-141, 1987, pp. 63 f.

III. CORE SYSTEM AND SATELLITE SYSTEM

Insofar as satellite systems comprise monetary data which—frequently as sub-aggregates—also appear in the core system of the national accounts, uniform concepts should apply to both the satellite systems and the core system. It is only in this way that a relationship can be established between the aggregates of the satellite system and the corresponding values of the overall economy. Similarly, combined computations using data from both the satellite systems and the core system, e.g. as part of the input-output analysis, can be carried out only if uniform concepts exist. The harmonization of concepts mainly relates to the definitions of the transactions recorded, the statistical units applied, the classifications and the valuation methods. There must of course still be some freedom of manoeuvre for specific disaggregations and differing arrangements of the data. This conceptual harmonization does not exclude the possibility that the satellite system may also comprise supplementary data which are subject to differing concepts. However, in this case as well it is advisable to show how the data of supplementary computations are derived from the data adjusted to the national accounts. The relationships between the core system and the satellite system can thus be better illustrated to the users of statistics.

Satellite systems may also comprise monetary data which have no equivalent in the national accounts. This applies for example to the value of activities performed by households for own consumption or to the valuation of changes in environment quality. In these cases, it is not possible to directly adopt concepts of national accounts. The definitions and valuation methods will have to be redefined. It will however be necessary to make sure that the result forms a consistent data system together with the other monetary data of national accounts.

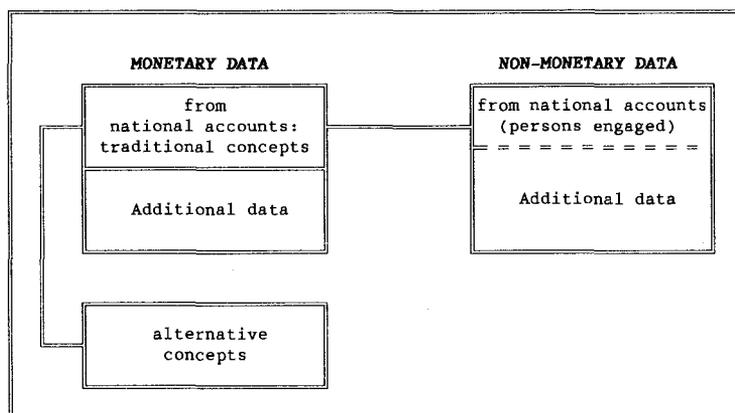
It will be easier to link up the core system with a satellite system if the data are derived step by step from the core system.⁹ The following three stages of work may be distinguished:

1. The first step is to develop the necessary definitions and classifications for a specific range of subjects (for characteristic activities, connected commodities, transfers, financing and producing units, beneficiaries). These will make it possible to disaggregate the various parts of national accounts (e.g. accounts, input-output tables, capital stock, non-monetary data such as persons engaged) under the specific aspect of the satellite system concerned.
2. After the first stage of disaggregation of the information from national accounts, the data intended for the compilation of a satellite system could in a second step be separated from the framework of national accounts and combined in an independent sub-system. Although this sub-system would comprise only partial values of national accounts, its structure could be adjusted to the specific requirements of the satellite system to be compiled.

⁹For similar considerations see A. Vanoli, "Sur la structure générale du SCN à partir de l'expérience du système élargi de comptabilité nationale français," *Review of Income and Wealth*, Series 32, No. 2, June, 1986, pp. 181 f.

3. This sub-system would then have to be supplemented by means of monetary and non-monetary data which are either derived from the sub-system by modifications of the concepts or which usually are not included in the traditional national accounts (e.g. the valuation of housework, data on the pollution burden caused by the economic sectors). The linkage of non-monetary data with the data from national accounts may involve a series of statistical, but not conceptual, problems. This is, however, not true of the additional monetary data. As far as activities are valued which are not included in national accounts, such as specific activities which do not appear in the market (housework and the like), the connection will probably be achieved in a rather easy way since there is no overlapping. If, however, within the scope of a satellite system alternative concepts are to be presented for economic activities which are also part of the core system, the whole matter becomes quite difficult. Alternative concepts prove to be meaningful if definitions and conventions agreed upon for the core system—e.g. for production, consumption or capital stock—are not suitable for a specific problem. It will probably be advisable in this connection to separate the alternative computations from the rest of the data. A satellite system would in this case consist of the following blocks of data (Table 2):

TABLE 2:
SATELLITE SYSTEM



IV. PRESENTATION OF THE SUBJECT FIELDS

For the presentation of a subject field in satellite systems, three points of emphasis must be determined: production, financing and beneficiary aspects. All three aspects are appropriately described and explained in the French proposal for the presentation of the concepts of satellite systems. A comparison with the requirements to be met by satellite systems shows, however, that it would be expedient—at least if one proceeds from the experience acquired in the Federal Republic of Germany—to further supplement or extend the presentation of the production aspect in the French proposals. While the presentation of financing

also comprises cross-analysis of final and initial financing in addition to data on the financing of producers, the interrelationship aspect has not been taken into account as far as the presentation of expenditures made by producers. The inclusion of cross tables into the production part requires that both the production of characteristic activities and the use of commodities relevant to a subject field should be recorded. For presentation of the production activities and the use of commodities, the obvious solution seems to be to proceed from the data of the input-output computations.

In order to establish the relationship to the income and financial flows, it seems expedient to use institutionally defined producing sectors (statistical units: enterprises or establishments) as a basis. The production of the "characteristic" services could then be recorded—if the respective sector also produces other goods—as a sub-aggregate. However, within the scope of satellite systems, it also seems necessary to completely present the commodity flows relating to characteristic activities. The appropriate conceptual framework for both forms of presentation can be provided by the input-output part of the "System of National Accounts" of the United Nations. It comprises institutional production accounts as well as a presentation of commodity flows, and with the "make" and "use" matrices also provides transition matrices between the institutional and the commodity classification for gross output and intermediate consumption.

In Table 2 we show in schematic form possible disaggregations of the input-output part of the SNA under the aspect of one specific satellite system. The table was extended or modified with regard to the row and column classification. As far as the sectoral classification in the columns of the table is concerned, each sector was further subdivided into three sub-sectors. The first sub-sector in each case records the expenditure and the receipts for the production of the services characteristic of the satellite system concerned, insofar as they are provided to third parties outside the respective institution (external production of commodity X). The second sub-sector contains the expenditure and receipts for services which are produced as ancillary activities for the internal purposes of the respective institution (internal production of commodity X) and the third sub-sector comprises the other production. The column "Commodity transactions of the rest of the world" shows exports of goods and services in the expenditure part and imports of goods and services in the receipt part. The rows of Table 1 first record the characteristic services of the respective satellite system referred to as commodity X, then the commodities Y (mainly goods) connected to the characteristic services and finally the other commodities. In contrast to the supply and disposition tables, the balance of taxes linked to production and subsidies is not shown as an item of expenditure, but taxes linked to production are recorded in the expenditure part, while subsidies are included with the receipts. The consumption of fixed capital represents an internal flow (from the income to the capital finance account) which is shown in the expenditure part as well as in the receipt part. The comprehensive concept of expenditure furthermore comprises the property and entrepreneurial income. The total input aggregate referred to as "Current expenditure" is equivalent to the gross outputs (plus subsidies). In contrast to the traditional make and use matrices, the gross capital expenditure is transferred to the investing sectors, so as to be able to present the

TABLE 3:
EXTENDED DISPOSITION AND SUPPLY TABLES AS A BASIS FOR A SATELLITE SYSTEM

Specification	Domestic production										Final domestic use				Commodity transactions of the rest of the world	Total
	enterprise sectors			government sectors			private non-profit organizations		domestic services	final consumption			gross capital expenditure			
	ext. prod. X	int. prod. X	other prod. X	ext. prod. X	int. prod. X	other prod. X	ext. prod. X	int. prod. X	other prod. X	other prod.	households	private non-profit organizations	general government			

Expenditure

Commodities X	+	+	+	+	+	+	+	+	+	-	+	+	+	-	+	+
Commodities Y	+	+	+	+	+	+	+	+	+	-	+	-	-	-	+	+
Other commodities	+	+	-	+	+	-	+	+	-	-	+	-	-	+	+	+
Consumption of fixed capital	+	+	-	+	+	-	+	+	-	-						
Taxes linked to production	+	+	-	+	+	-	+	+	-	-						
Compensation of employees	+	+	-	+	+	-	+	+	-	-						
Property and entrepreneurial income	+	-	-	-	-	-	-	-	-	-						
Current expenditure	+	+	+	+	+	+	+	+	+	-					+	+
Gross capital expenditure	+	+	-	+	+	-	+	+	-	-				a)		
Total expenditure	+	+	+	+	+	+	+	+	+	-	+	+	+		+	+

Receipts

Commodities X	+	-	-	+	-	-	+	-	-	-					+	+
Commodities Y	-	-	+	-	-	-	-	-	-	-					+	+
Other commodities	-	-	-	-	-	-	-	-	-	-					-	-
Subsidies	+	+	-	+	-	-	+	-	-	-					+	+
Current receipts	+	+	+	+	-	-	+	-	-	-					+	+
Consumption of fixed capital	+	+	-	+	+	-	+	+	-	-					-	+
Total receipts	+	+	+	+	+	-	+	+	-	-					+	+

* Indications in the tabular groups: + Possible cases of disaggregation of the supply and disposition tables within the scope of a satellite system,
- no data available, or disaggregation of disposition and supply tables not meaningful within a satellite system.

a) Transfer of gross capital expenditure to the investing sectors (negative item amounting to the value of gross capital expenditure).

total expenditure for the individual producing sectors. However, for certain analyses it seems expedient to decrease total expenditure by fixed capital consumption and undistributed profits. Analogously, the total receipts would have to be reduced by fixed capital consumption. It should furthermore be noted that the corresponding row totals of the expenditure and receipt part in Table 2 are, in fact, identical (supply = disposition), whereas the column total are not.

The tabular groups in Table 2 have been marked to show whether they may represent possible cases for disaggregation of the basic tables for purposes of a satellite system. The columns "External production of X" and "Internal production of X" can be entirely included in a satellite system. Reference should be made to the fact that for the internal production of X only the relevant expenditure for the inputs upon their production is recorded, but neither the property and entrepreneurial income nor gross output are recorded, which emphasizes their character of ancillary activities. Accordingly, on the use side (row "Commodities

X” in the expenditure part) only the use of the external production of commodity X is shown. The sub-sectors “Other production” contain aggregates relevant to the compilation of a satellite system only insofar as they receive external services X or produce/use connected commodities Y. Whereas for the internal production of X only the inputs and for the external production of X both the inputs and the use and supply of commodities are shown, Table 2 in the case of the connected production Y provides only for a presentation of the use and supply of commodities.¹⁰ The investments necessary for producing the services are included in Table 2 among the “Other commodities.” The transfer to the investing sectors shows their significance for the differing sectors of the internal and external production of X. Finally, reference should be made to a peculiarity of private consumption: In accordance with the conventions of national accounts, households do not produce any commodities. If services rendered by households—without being marketed—are studied in a satellite system, it is meaningful to cover at least the relevant inputs from a disaggregation of the national accounts data. As part of private consumption, households may therefore also purchase “Other commodities,” which could be taken into account for the compilation of specific satellite systems.

If the data of the extended disposition tables are transformed according to a mere commodity classification of the producing sectors, this yields extended commodity X commodity tables, which can be broken down in accordance with the investigation objective of the respective satellite system. This type of table is mainly suitable as a basis for analyses of the macroeconomic significance of the relevant field of study.

A breakdown of the data of input-output tables according to the aspect of one specific satellite system entails a great amount of work. Therefore, work of this kind would seem to be feasible only at several years’ intervals, for instance every five years. This does not exclude the possibility that individual data of the satellite system could be collected annually in order to get a better insight into the development over time of specific overall indicators. With a view towards improving the temporal comparability of the data, endeavours should be made to convert the results at current prices to constant prices.

¹⁰The presentation could, however, also be extended to the relevant inputs.