Spanish experience on the implementation of a computerized system according to ESA-95 I/O framework.

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Summary:

This paper describes the process of adaptation of the Spanish National Accounts to the ESA95 methodology, in particular in the I/O structure. Some features are outlined: First, the central role of the annual I/O table in the current National accounts series; second, the main conceptual and formal changes introduced by ESA95 I/O elements as compared to the former ESA79; third, the steps taken in Spain to answer the important challenges of implementing ESA95 in two fields: statistical improvement; and a revision of the working procedures, based on a new computerized working system.

1. INTRODUCTION.

Since the implementation of the 1980 base year, the Spanish National Accounts (Contabilidad Nacional de España - CNE) compiled by the Spanish Statistics Institute (INE) have been giving an increasing importance to the I/O tables as a central framework of the whole accounting system. Since 1985 an I/O Table according to the "European System of Accounts. 1979" (ESA79) system has been compiled yearly.
Nowadays, as in other European countries, the INE is facing a new and important change : the implementation of ESA95 methodology. One of the fields with more outstanding changes from the old system to the new one is the I/O area, both from a conceptual and a formal point of view. The challenge of the new system implementation requires the complete renovation of the estimates methods, including the (computer based) working system.

The paper focuses on the basic points of the transformation process from the old to the new system, summarizing the projects accomplished up to date by the INE National Accounts Division . The scheme of this paper is as follows : In section 2, a short description of the current CNE is made, emphasizing the role played by I/O tables ; Section 3 outlines the main requirements outlined by ESA95 both from a conceptual and statistical point of view; Section 4 provides a description of the way in which the INE has tried to answer to ESA95 challenges. In this point the new statistical sources and database management system is described . Finally, in section 5 some final comments will be made about the future.

2. A SHORT DESCRIPTION OF THE SPANISH NATIONAL ACCOUNTS AND THE ROLE OF I/0 SYSTEM.

Let us comment briefly on the Spanish National Accounts general structure. In the first place, the system - and particularly, the I/O tables - fulfills, broadly speaking, a 99% of all the ESA-79 definitions and rules.
The elaboration of the CNE, as of most National Accounting systems, have to comply with pre-established stages and deadlines. As far as Spain is concerned, the estimates do not reach the character of "definitive" until four years of the reference date[1], being revised and completed in each of the new estimates. These revisions are conditioned by methodological reasons, but mainly by the timely availability of some structural primary statistics. According to those principles, the definitive estimate is the one containing an annual I/O table, which besides providing the estimates of that year with a greater robustness also improves those of other phases of National accounting. Until then, since new information and/or new breakdowns are added, each subsequent stage achieves a greater precision.

In the specific field of I/O information, table 1 shows tables and other elements linked to I/O analysis accomplished by the INE . We particularly concentrate on the most recent stage of the CNE development, which began in 1980[2]. Observing the number of projects and the reference dates make it possible to get an idea of the magnitude of the effort carried out. Some of the most relevant projects have been: the elaboration of the I/O energy tables for 1980 and 1985 ; the elaboration of the economic table of 1986 which constitutes an important step in the recent development of National Accounts in Spain[3] ; the backward estimates of the

1 For any reporting year t four versions are compiled: The first estimate is compiled in February t+1 (as a total of quarterly results); Separate annual results are calculated in September t+1 . These are revised in September t+2 and September t+3. Final (definitive) estimates, based on an I/O table, are compiled in September t+4.

2 The first I/O tables for the Spanish Economy were the 1954 tables. Between this date and 1980 six I/O tables were compiled (1958, 1962, 1966, 1970, 1975 and 1979 - an extrapolation from the 1975'-). In Spain there is also an important tradition in the regional I/O field, being compiled, since 1960, about 50 different I/O tables for the seventeen regions and even for the sub-regional areas ("provincias").

3 In 1986 Spain became a member of the EU and there was a radical change in the fiscal system with the introduction of value added tax (VAT) ; it likewise drastically modified the valuation criteria and the structure of I/O and Economic Accounts.

current 1986 series, partially based on an I/O methodology[4]. As a result of these processes, there exists currently a series of homogeneous I/O tables for the Spanish economy from 1980 to 1993.

Therefore I/O has been a central element in the Spanish National Accounts during the last two decades.

3. THE CHALLENGES OF THE IMPLEMENTATION OF ESA-95 I/O FRAMEWORK: A SHORT SUMMARY.

We can describe here the main challenges we are facing in implementing the ESA95 in our accounting system. The introduction of the ESA95 is going to be made at the same time as a change in the National Accounts benchmark year estimates. That is why the traditional aims of the change in the benchmark year (updating of statistical sources, updating of the relative weights of the economic activities...) have to be run parallel to the introduction of new concepts. Table 2 summarizes some of the most important differences between the ESA-79 and ESA-95 from an I/O perspective. Obviously, this table is not meant to be exhaustive but merely to highlight the main items, in particular seven categories:

1) Structure.

Evidently, this is the first and most conspicuous item, which has radical change, from the ESA79 single table system, to the ESA95 (or SNA93) I/O framework made up by an interrelated set of tables; Supply&Use; Symmetric; ...

2) Elementary/ Aggregated production units.

ESA-95 requires two different but complementary types of production units : (local) Kind-of-Activity units (broadly speaking, equivalent to establishments) ; and units of homogeneous production (UHP) (purely theoretical units with a single type of product). The former, closer to the statistical data ; the latter, to the theoretical production functions.
In ESA-79, in theory the tables had to be compiled by UHP, (with exceptions for by-product and incidental sales of public administration) but in practice most countries (Spain included) were closer to the non-homogeneous (units or branches) approach.

3) Secondary production.

This point is closely related to the previous one : In ESA-79 the secondary production is shown only in an aggregate “net” way - in the row of transfers - and , theoretically, restricted to by-product and incidental public administration sales; in practice, there were

Table 1. I/O tables Compiled by the Spanish Statistical Institute (INE)

Name and reference date	Valuation	Methodology	Import	National Accounts Integration	Other characteristics
I/O tables for the Spanish Economy. 1980	Producer Prices (P.P.)	ESA-70	Complete Import matrix	X	First table elaborated in Spain according to ESA-70.
I/O tables for the Spanish Economy. 1985	P.P.	ESA-79	I. Matrix	X	First table elaborated in Spain according to ESA-79.
I/O Tables for the Spanish Energy Sector. 1980	P.P.	ESA-79 + Energy I/O European methodology	I. Matrix	X	The first energy I/O table compiled in Spain. Compatible with the 1980 I/O economic table. It contains physical data for the energy resources and uses.
I/O tables for the Spanish Economy. 1986	P.P. VAT net	ESA-79	I. Matrix	X	- Adapted to the new fiscal system (introduction of VAT). - Mix table : * Direct methods. * Indirect methods (Extrapolated from the 1985 I/O T).
I/O Tables for the Spanish	P.P.	ESA-79 +	I. Matrix	X	Compatible with the 1985 I/O economic table. It contains

[4] See INE(1993).

Energy Sector. 1985		Energy I/O European methodology			physical data for the energy resources and uses.
System of I/O for years 1980 to 1985.	P.P. VAT net	ESA-79	Total by products	----	Included inside the backward series 1964-1991. It contains : Adaptation of the 1980 and 1985 I/O Tables to the VAT net valuation ; estimates of tables for 1981 to 1984.
I/O yearly tables for the Spanish Economy : 1987- 1993.	P.P. VAT net	ESA-79	I. Matrix	X	Since 1985, an I/O table is compiled yearly, with the "definitive estimates" of the Spanish .Nat Ac. Series.

Source : Updating from Cañada(1995).

Table 2. Main differences between ESA-79 and ESA-95 in the I/O system .

	ESA-79	ESA-95
General Structure	A unique general I/O table.(Except the breakdown between domestic and imported flows)	A system of different linked tables ; Supply &Use, Symmetric ; Branches/Institutional sectors table...
Production units/Branches	Units of homogeneous production./ Homogeneous branches.	2 types : - S&U : Kind-of-Activity Units/ Non-homogeneous branches. - Symmetric : Homogeneous Units/ branches.
Secondary output treatment.	Only for by-products and incidental sales of Gen.Government : Net flows in the transfers rows.	- Output: Explicit identification and treatment in the Supply matrix. - Intermed. Consumption: Estimates for the transformation from the use table into the symmetric table.
Differences in concepts : **- Production.** **- Inter. Consum.** **/Final Consum. Borderline, etc**	- Main items for production: Production boundary ; New "Market" and "non-market" (plus "own final use") definitions ; Intangible products. - Changes in the Intermediate/Final consumption borderline. (intangible assets : mineral exploration, computer software, literary or artistic originals, etc.)	
Valuation Criteria a) I/O general criteria. b) Production. c) Imports d) Final Demand.	a) Different types of I/OT upon the general valuation criteria. (1) b) Producer prices (exc. Invoiced VAT). c) Cif/ Ex-customs (exc. Invoiced VAT) d) Split by products : Prod.prices (exc. Inv.VAT). Total : Purchasers' prices (exc. deductible VAT).	a) Different types of valuation for the same variable upon the type of table b) Basic prices (exc.Inv.VAT). c) By products : CIF. Total : FOB. d) Different types of valuation for the same variable upon the type of Use table : - Basic prices Use table :Split by products : Basic prices (exc. Inv.VAT). Total : Purchasers' prices (exc. deductible VAT). - Purch. prices Use table : Split by products and total : Purchasers' prices (exc. deductible VAT).
Taxes & Subsidies on production.	By products and by activities.	Complete tables for Intermediate Consumption and Final Demand.
Distribution (Trade and transport) margins	For each industry's intermediate inputs or for every component of final demand: total recorded in the corresponding rows for trade and transport	Complete tables of margin rates for Intermediate Consumption and Final Demand.
Institutional Analysis Links	Compatibility of figures only for aggregated figures: Identity of measures in I/O and in the Inst.Accounts	Explicit (production, generation of income accounts ; gross cap.for.) in the Inst.Sectors/Branches cross table

(1) The predominant Criteria in Europe has been the "Producers' prices exc. Deductible VAT".

cases in which some other secondary production is included: It was decided to record all the original costs of the branch's overall production, instead of resorting by the sometimes unrealistic technology hypotheses. The transfer row allowed that the distribution of all similar products could be recorded in the same category (row).

This structure is quite different from the SNA/ESA95 concept of the "make" table (called in SNA93/ESA95 "supply" table) which implies explicit figures of main and secondary production by industries (branches).

3) New definitions.

The items collected in table 2 are obviously mere examples, because it would be out of place to detail here all the novelties introduced in the new system. We have outlined some of the most important : the definition of a production boundary ; the change in the "market/non-market" criteria ; change in the borderline between uses of products as Intermediate or as final consumption (as in the case of intangible fixed assets : computing software, etc.).

5) Valuation.

There have been important changes in this aspect, because ESA-79 gives open alternatives of valuation for the I/O Tables. The ESA95 is stricter, and the criteria are clearly specified. For example, the production has to be valued at basic prices, instead of the "second best" criteria of production prices, which was the predominant alternative used in Europe.

There are also differences in the general background : The need to estimate some variables simultaneously with different kinds of valuation ; i.e. the intermediate consumption and the final demand components have to be estimated at basic as well as at purchasers' prices.

6) Margins matrix.

Closely related to the valuation rules emerges the necessity of compiling explicit and very detailed estimates of the distribution (trade and transport) margins. Of course, in the old system it was also necessary to make a detailed estimate of the margins, to construct the I/O columns and rows of these services. But obviously, it was possible to make more general and aggregated estimates than in the new system.

7) Taxes and subsidies.

As in the previous item, the ESA95 requires explicit estimates of matrices (product/branch or products/final transactions) for each of the categories of taxes and subsidies in the system.

8) Institutional links.

Last but not least, the new system defines a link table between the Institutional and the I/O analysis that forces to specify, from the beginning of the estimates process, the connection between the two approaches. In the old system this connection had to be obviously fulfilled by figures coherence, but its non-explicit character implied a lot of imprecision.

There are many other items of differences between the two systems, but the above are a good sample of the magnitude of the changes involved.

From the description above, it may be inferred that ESA95 needs a more complete statistical base to fulfill the latest elements. We have already mentioned the distribution margins.
We can also mention some information needed to accomplish the symmetric tables compilation: the "Technical coefficients". These are both a traditional source and at the same time a result of I/O compilation. Should data about the breakdown of the production structures be scarce, they be made up for technical information.
However, in ESA-95 this type of information has to be an essential part of the database, because of the need to compile the two different but complementary tables : the non-homogenous use table ; and the homogeneous symmetric table.

Apart from the above, let us remark from the table the necessary connection between production and institutional approaches in the primary data. That is, in the new system, all the original data should have an institutional reference. It is not sufficient, as in the old system, to have for instance data from production units and after the balancing process, make a breakdown of the figures. In ESA95, you should know in the primary data to which type of institutional unit belongs every production unit. Only by this desegregation may be calculated for instance the market/non-market productions.

4. THE REVISION OF THE SPANISH NATIONAL ACCOUNTS : A NEW WORKING COMPUTER ORIENTED SYSTEM.

Let us know tackle of how to take up these challenges. From the above description it may be concluded that the implementation of ESA95 needs many fresh endeavors and instruments of the National Accountants Team. Two main areas of requirements may be pointed out:
- First, a through statistical effort is necessary. The much more detailed ESA95 requires a more minute and complete statistical base.
- Secondly, a change is also necessary in the working methods.

Let us have a look at these two categories

4.1. Improvement of Statistics.

From the beginning of ESA95 implementation, we were aware that the Nat. Ac. statistical base had to be improved. Although part of our requirements have been covered by the Statistical Institute itself, an additional effort had to be made for some specific areas. That is why we set up a work program liable to provide us with the necessary information. The main points of the program are:

a) Fiscal and Social Security data.

Here lie some of the new system's most significant innovations: the availability of elementary fiscal data considerably improve institutional approaches and income estimates, while also yielding values for those functional areas not covered by economic statistics. As far as Social Security is concerned, these data will make it possible to achieve more accurate estimates of labor data and to satisfy the new system's imperative demand for minuteness.

b) Specific "Intermediate Consumption/technical coefficients" Research.

The lack of sufficiently detailed information production structure, as defined in the I/O framework, had to be made up by additional work. Three types of tasks were made in this field :
- Implementation of a specific yearly Intermediate Consumption survey. Since 1995, the National Accounts Department in coordination with the INE-Industrial Statistics Department has been compiling a yearly survey of intermediate consumption[5].
- Technical Coefficients group. An ad hoc National accountants team has been specifically responsible for the investigation and construction of production structures (breakdown of current and capital expenses, technical coefficients) using all possible sources (specific surveys and inquiries, technical studies from different Public Sector departments, etc.).
- Expert task forces. Periodically we have organized special meetings with representatives from different activity sectors, mainly from large companies as well as employers associations :The principal areas research upon are : Fishery, chemicals production, motor vehicles and auxiliary industry, retail trade, etc. ;

c) Distribution (trade and transport) Margins.

The compatibility of different types of valuation means that a whole matrix system of margin rates is required. This is one of the most important and difficult requirements of the system to fulfill because it means that, for each cell of the intermediate and final demand matrixes (in the use table) the following information is needed:
- The structure of distribution channels of the product destined to this cell. (the so-called distribution tree).
- And the margin rate to apply in each channel.
For this reason this has been one of our main Research areas.

d) Inter-department working groups for specific areas.

They are made up of members of National Accounts department, and other Public Institutions linked to each specific matter. There are six groups of topics: Agriculture (with the Ministry of Agriculture) ; Construction (with the Public Work Ministry) ; General Government Economic data (with Ministry of Economy) ; Financial sector (with Bank of Spain) ; Tourism (with the Tourism Office) ; Non-market Health estimates (with the Ministry of Health).

e) Specific investigation works.

Some expert professional teams were hired to research on particular areas: Market health activities ; Market education activities ; Non profit Institutions serving Households ; Rent activities ; Sea transport.

4.2. A new computing based working system.

From the previous description it is obvious that the increase of complexity of the new ESA and even the larger amount of information now available needed a re-structure of the working methods. Traditionally the benchmark years estimates implied an opportunity to update the weights and to adapt the National

[5] The Industrial Survey is a yearly investigation which covers all the Spanish companies whose principal activity is industrial. It investigates all the firms with more than 20 employees, and a sample for the which with less than 20 employees. Although the questionnaire is very detailed, does not fulfill all the (increasing) needs of National Accounts. The Intermediate Consumption. survey is a sampling survey which completes the data currently collected by the annual Industrial Survey

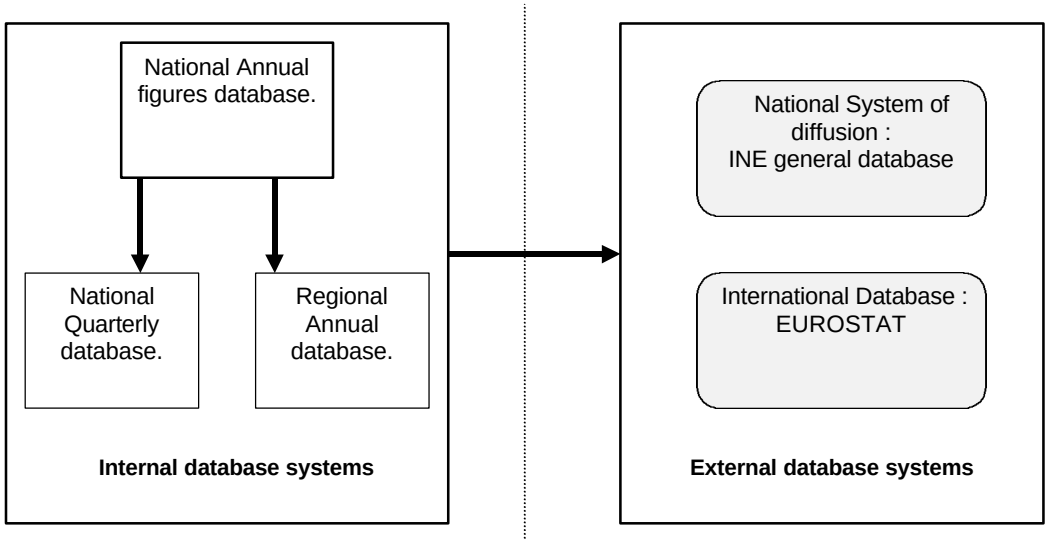
Accounts to the economic reality. In the case of the CNE-95, these traditional objectives should be compatible with the important methodological changes of the ESA-95.

There is only a way to satisfy the new accounting necessities: The implementation of a new integrated computing system. Of course this is not the moment to describe in detail technical aspects of the new computing system. We can only outline the main points of the transformation.

4.2.1. The current system.

The current system (see fig.1) is composed of three complementary blocks of estimates : The Annual National Estimates; the Quarterly Estimates; the (Annual) Regional Estimates. The first of these subsets - annual National - is the central structure of the system: It provides data for regional estimates, which follow, as in most countries, the "top/down" criteria ; it also provides the time series for the econometric and short term estimates of the quarterly accounts. However, these three subsets are only connected in the way just described and in practice each one is independent as to its methods and characteristics.

Figure 1. Scheme of the Current Spanish National Accounts Databases System.



As far as the characteristics of the National Annual estimates are concerned, figure 2 shows a schematic illustration of the working system. It begins with data collection from many different sources (statistical surveys, general government data, customs data, etc.) and their further adaptation to National Accounts by each specialist ; the adaptation is necessary because usually data don't fulfill the same criteria as those of National accounts: Valuation, classification, timing rules,... Naturally, specialists have to solve the problem of lack of information in fields not covered or incompletely covered by statistics, thanks to an additional search of data, hypotheses, etc.

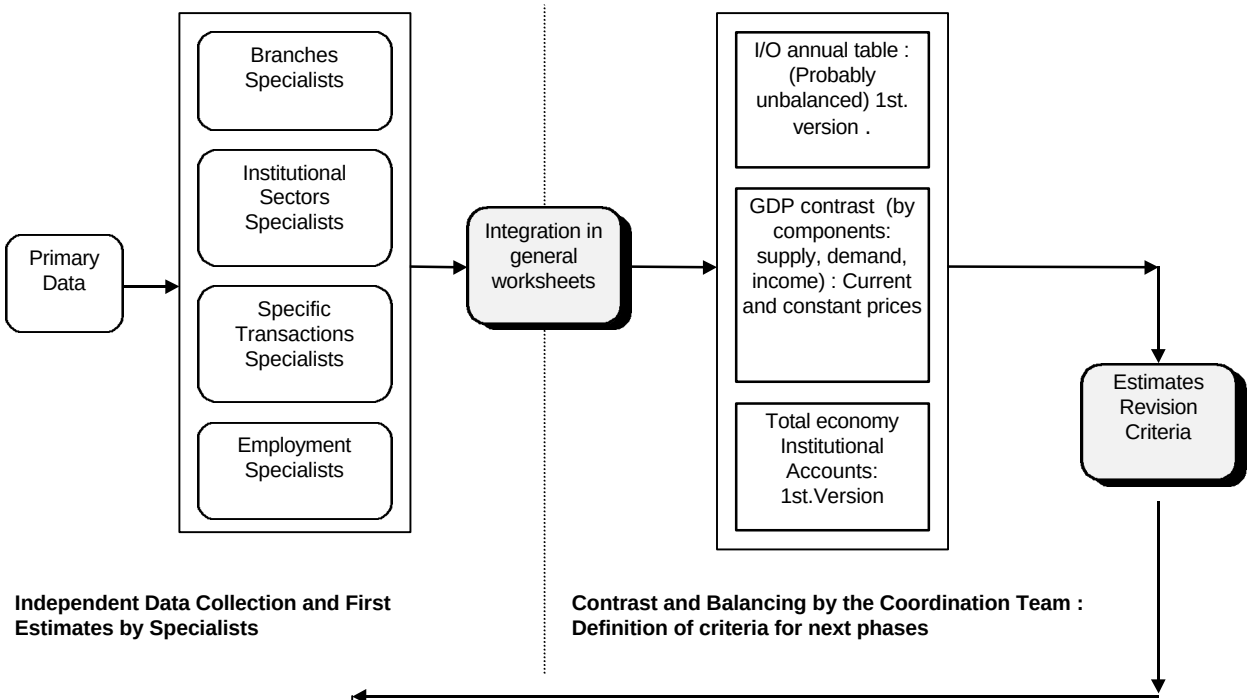
Each of the specialists work in separately, and the partial independent information is stored across different worksheets with a common design established by the coordination team.

At a further stage, all the independent estimates are inserted into global integration systems interrelated by automatic procedures of error contrast and common general rules, thus facilitating data deliveries of each one to the coordinator of balancing structures : I/O tables; Accounts for total Economy; Constant and Current estimates of GDP and its components (supply, demand, income). These three structures are then analyzed by a small supervision team, which goes through the data with the cooperation of each specialist.

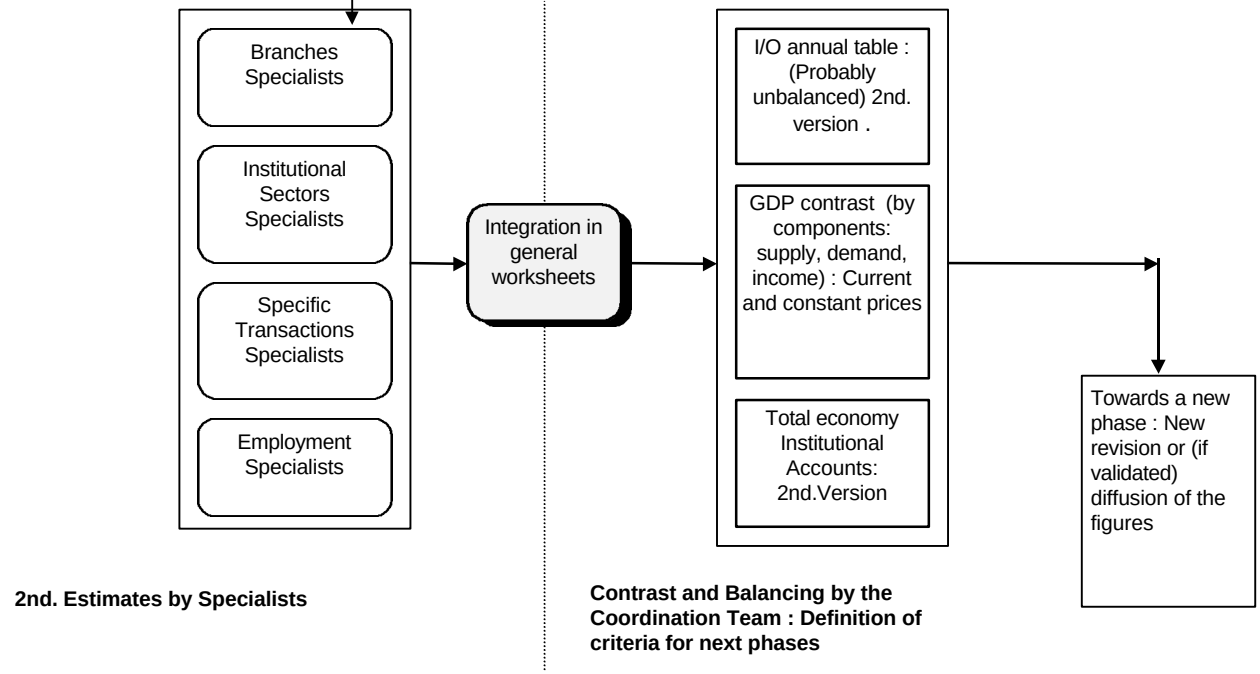
This analysis leads to two possible kinds of processes: If figures are not balanced or produce unrealistic estimates, a new revision of estimates is started, the lines of which are established by the supervision team; or if the results are deemed accurate, they are introduced into the database of final estimates. Once the process is finished, a structured database according to ESA79 is available and then may be distributed to domestic and international users. The purpose of this database is only the diffusion of results and therefore contains only balanced estimates.

Figure 2. Scheme of the current working system for the annual National estimates.

First Phase : Data collection, first independent estimates and first balancing.



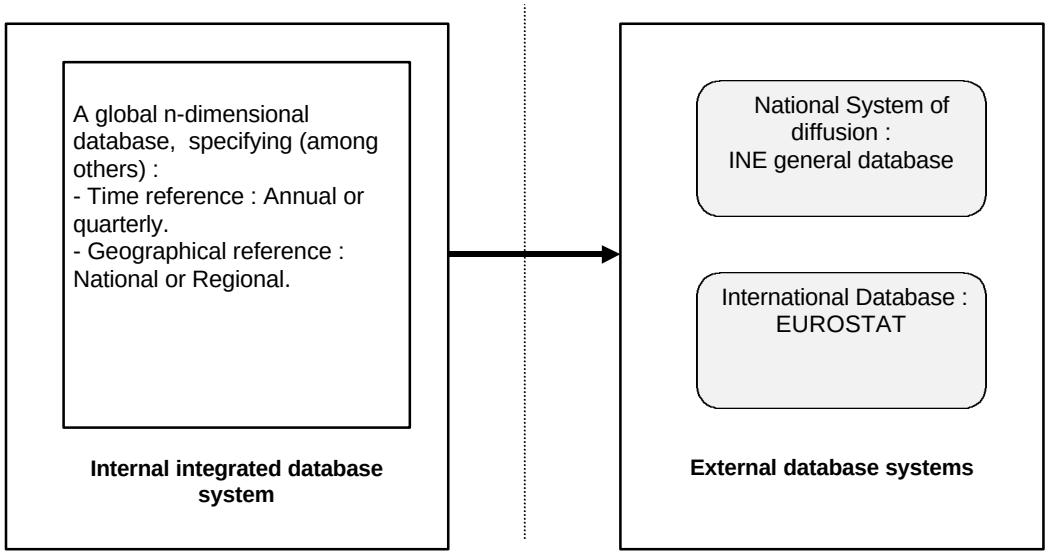
2nd Phase : First revision of independent estimates and 2nd. balancing.



4.2.2. The new system.

Figure 3 shows the general lines of the new system. The aim of the new computerized working system is integration. This view affects all the different aspects of National accounts (annual, regional, quarterly) although we concentrate on Annual National, which are the only ones applied up to now.

Figure 3. Future (ESA95) Database systems



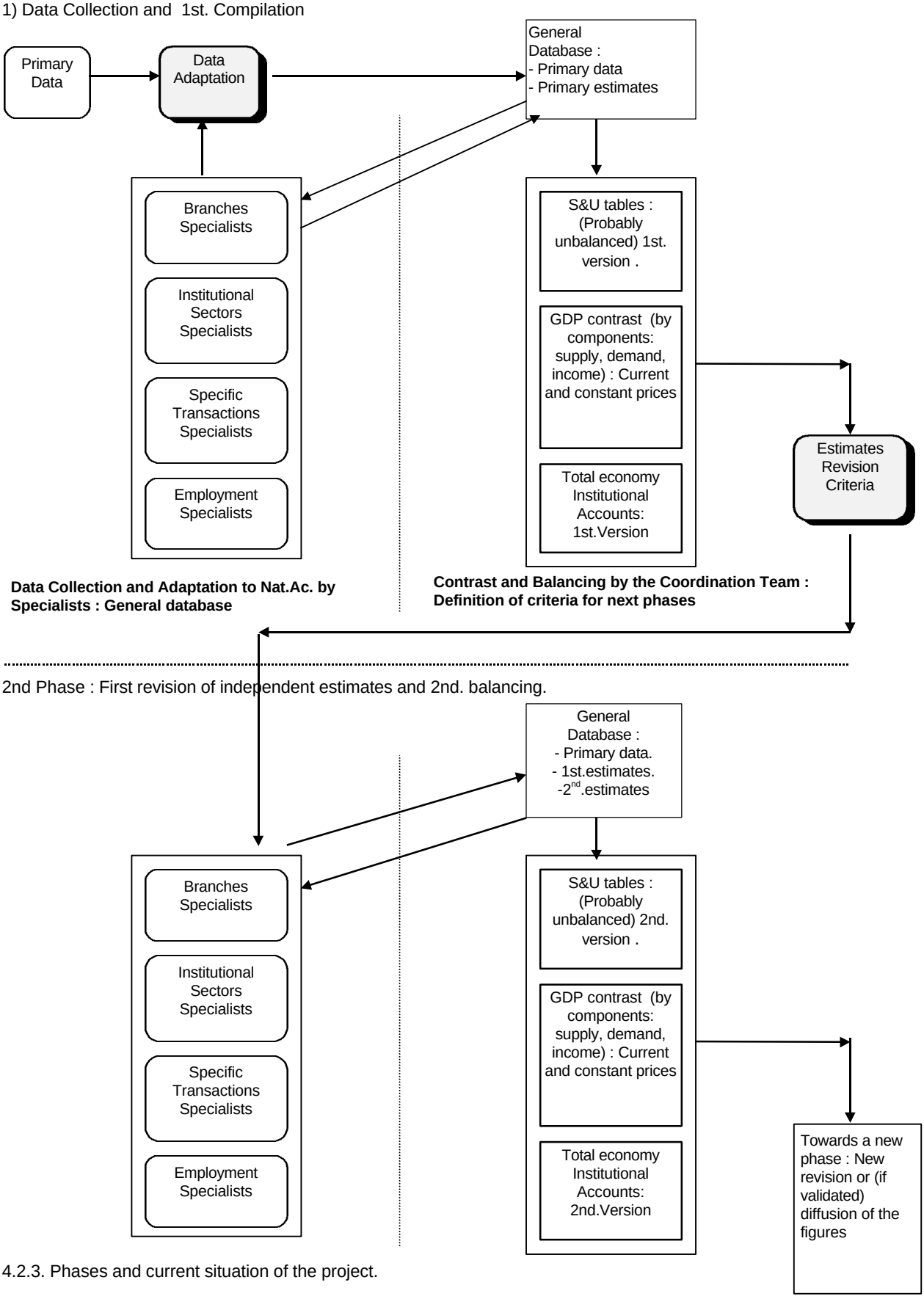
In the (Annual) National Accounts subset (figure 4) the first difference lies in the role of primary data within the system . These data, after their adaptation to ESA by the specialist (and by automatic correspondence programs) are going to be stored in the general central database; in this way, the simultaneous use by different accountants and also its further check against the National accounts estimates is possible.

The second aspect is the balancing procedure . With the adequate controls, the new automated system will allow not only partial or global balancing tables (supply, use, goods and services accounts...) but also a set of supplementary compilation tools in order to improve the process: views to check the concept; comparative ratios...

In technical computer terms we could say that we are creating a relational database in which, broadly speaking, there are different blocks of information with common codification. This database is based on
- A client/server technology.
- A n-dimensional concept of the data.

This kind of system is the only one which allows a balance between the different and sometimes contradictory needs of National Accounts task : To achieve the flexible and easy access to the database, but with restriction systems to control exactly who uses and consults what part of the information ; to facilitate reviews of the figures ; to store and to manage the versions of the process, etc.

Figure 4. Scheme of the new ESA95 Spanish National Accounts Working Computing System: Data Collection and 1st. and 2nd. Compilations of the "Supply&Use/Institutional Accounts" System.



4.2.3. Phases and current situation of the project.

The phases of the implementation process are the following:
I) Conceptual design of the new database.
II) Experimental model.
III) Estimate of the base year ("annual" National accounts) 1995.
IV) Estimate of the accounting series 1995-1997 ("annual" National accounts).
V) Integration of the quarterly accounts in the new base.
VI) Integration of the regional accounts in the new base.

Up to now we have completed the previous part of the project, that includes phase I and II. Let us describe shortly.

I) Conceptual design.

The definition of a new database has implied the next tasks:
* To translate to a computing language the relationships between variables of the model (formulas with ESA95 criteria).
* To define some auxiliary elements of the system: Working interfaces ; Procedures of work and of error contrast, ...
* Codification system. As an essential previous task for the process one must to define the variables codes system. Codification must be compatible with the ESA regulation (which establishes the rules for data transmission to European Institutions) ; It must be compatible also with the characteristics and needs of the Spanish economy.

II) Experimental model.

The INE has recently published a handbook of the new ESA95 I/O framework, including a simplified (personal computer) version of the CNE database[6] . The pc application allows to compile a complete ESA95 I/O system including : all the central tables (supply, use, symmetric -by the two technological alternatives-) ; the auxiliary valuation tables (taxes and subsidies ; distribution margins) ; and the Cross classification tables which link branches and institutional sectors by the production and generation of income accounts.
The model was designed for personal computers ; therefore the simplified database is only a set of interrelated worksheets. However, many of the characteristics of the original real database are included, i.e. a computing help system in hypertext about ESA95 rules (which are summarized in the program itself), and on the practical compilation process.

5. SOMME FINAL COMMENTS.

Although the improvement in sources and methods of the CNE facing the ESA95 implementation is quite obvious, we would like to point out some remaining problems in the final process. Three categories of items may be stated: conceptual, statistical, and computerizing .

The first group refers mainly to the ambiguity still existing in the ESA95 text itself. Some of the fresh theoretical developments will have to be approached in the future, i.e. market/non-market boundary, institutional sectors delimitation, current/constant prices...

We can also mention an important feature: The change in the classifications system. The ESA95 came about simultaneously with a new classification system in the different fields of National accounts transactions and in general in economic statistics (products and production activities classifications[7], demand components functional classifications: COICOP, COFOG ,...) . Furthermore, and as has been pointed out in many documents, the new classifications do not satisfy the requirements of the new National accounts systems ; they are even contradictory to our aims. Then, an intermediate National Accounts system is needed.

In the statistical field, there are also some areas in which the lack of statistics (or al least the detail required) has to be supplemented by new research. For instance, the case of some business and personal services. On the other hand, there are the problem of deal with the new information sources... checkings have to be made, comparisons with other sources be established. Obviously, the greater the amount of information, the greater the need for analysis capacity.

6 Cañada (1997).
[7] The CPC and the ISIC were approved some years ago ; but the process of adaptation, first in the European Community (with the equivalents CPA and NACE rev.1) and after in each of the member countries, implies that the Spanish statistical System has very recently begun to work with the new classifications.

Finally, as to the design of the new computerized system, we have elaborated almost entirely a structure adapted to I/O framework and we are testing this structure simultaneously with the compilation of the 1995 new estimates. By the end of the present year we will finish the third stage of the project - the development of a whole relational database for the I/O framework.
Nevertheless, the implementation of forthcoming stages very much depend on future human and financial resources. Let us hope the latter will timely arrive.

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