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COMPILING INPUT-OUTPUT TABLE IN FRANCE SINCE 1950

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"Compiling Input-Output table in France since 1950"

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We will focus in this paper on the French method compilation of Supply and Use Tables (SUT) during last five decades, and specially the table of intermediate entries (see list of abbreviation at the end of paper). The calculation of annual SUT' s has been changed during this period for three reasons.

One is coming from practical questions in order to answer to the needs of Politics decisions after second world war with development of "Plans". According economical theory of W. LEONTIEF, Ministry of Finance asked INSEE to **calculate input-output coefficient**. Thus, if the first system of Supply and Use Tables (SUT) for France was established in the begin-fifties by activity sectors (i.e. "industries of enterprises" in column), France decided to compile SUT by branch instead of activity sector in order to calculate correctly input-output coefficient. **This projection has more sense for homogeneous branch than for** activity **sector**.

The second reason is explained by statistical data and development of annual enterprises surveys. Information were not available because there was no purchase survey by enterprises even a big system of enterprises annual survey was developed in the sixties. So **cells of Table of Intermediate entries (TEI) were obtained by projection of previous year according to index of volume of branch and index of price of product (i.e. input-output coefficient in volume were supposed to be constant)** : we compared then Intermediate Consumption (IC) from this projection with IC from commodity flows. The ratio between both is called "EFFET-LIGNE". If "EFFET LIGNE" is high, which means not comprised between - 2% and + 2%, we changed IC in commodity flows. But this method had some problems as the inconsistency between SUT and accounts from enterprises.

So final reason is to integrate **SUT in compilation of National accounts and specially to be suited on institutional sector accounts**. The last period is thus a totally integrated part of the compilation of annual National Accounts. It means that SUT are consistent with institutional sector accounts which was not the case in second period (1960-1995). For example, in the last base year 1995, Value added was balanced between SUT and accounts of non financial corporate and quasi corporate enterprises in the sense of changing Value Added of these last one's which was not very sensed because enterprises sources are available and very developed in France. Intermediate system of enterprise (SIE) gather all the enterprises of the economy (about 3 billion). So, we have decided to reach the target of SIE and not to keep the level from the SUT. It means **that income approach of GDP is now considered to be more priority** than demand and production approach in the new base year 2000.

INTRODUCTION

1/ During the first period (1950-1960), France compiled a SUT according international recommendations. "Table of Intermediate entries" matrix (TEI), which includes intermediate consumption (IC), production and Value Added (VA), was compiled by activity sector (year 1951). An **activity** sector gather all enterprises which produce same principal activity.

2/ The second period began from 1960 . France decided **to compile SUT by branch instead of** activity **sector**. « Homogeneous branch » consists of a grouping of units of homogeneous production (UHP). Homogeneous branch produces those goods and services specified in its classification and only those products. (ESA 1995 2.114). UHP has a unique activity identified by inputs, process and outputs, classified by reference to products . About production, development of **annual enterprise surveys** during sixty decades allows to estimate it by branch.

Then during different base year (1971, 1980 and 1995), France began to compile **SUT in price of previous year** (volume) and in constant prices. France has a long experience of constant price estimates. Some other change were made as for example treatment of **transport margins**, estimates of **subcontracting** or **chain linking approach**. But the big problem of this method consist in **inconsistency between institutional sectors accounts (ISA) and SUT**. For example, neither production, IC or VA was consistent in SUT approach and in institutional sectors accounts, specially for non-financial corporate and quasi corporate enterprises. We balanced differences but more in the target of SUT than wedging value of SUT to value of ISA even these one's where compiled directly from statistical sources.

3/ So it was decided to make **consistency between SUT and institutional sectors accounts**. The improvement of new base (year 2000) was to suppress this inconsistency. France continue to compile SUT by branch but there is consistency for the main aggregates :
We determine the level of the production, of intermediate consumption (IC) and thus value added (VA) from System Intermediate of Enterprises (SIE), a big micro data base, on which must be fixed SUT : The "output matrix" is the tool making it possible to compare the approaches " activity sectors " and "branches" of the production with the basic price. On row, we find the production by branch, which appears in commodity flows , and in columns by activity sector of enterprises.
About IC, we multiply matrix TEI (product in row, branch in column) by the structure "branch x sector" of output matrix to obtain a TEI by activity sectors (i.e. IC by activity sectors which is different from total IC of non-financial corporate and quasi corporate enterprises accounts of SIE). Then, we must reach this target by changing cells and total of IC, and so final uses. In same time, this method allows to draw closer SNA even this method is the contrary way of SNA recommendations.

FIRST PERIOD : 1950 - 1960 COMPILING SUT BY ACTIVITY SECTOR

The first period was developed during years 1950-1952. It was an accounting system just in current prices. One of institutional sectors was enterprises (public and private). Different accounts were compiled : production, generation income, distribution of income account and capital account. SUT was compiled by sectors of activity (with sales and purchases of enterprises).

1. First SUT in year 1957.

So in 1957, the first SUT with "TEI" matrix was compiled and published for the first time with 157 products and 112 activity sector. Enterprise is a statistical unit used for the study of production and industrial relationships.

This scheme was interesting on the point of view of economic complexity. But main problem was it **looks like very difficult to make some projections of input-output coefficient**. To get correct projections, it was necessary to breakdown an activity sector in different homogenous branch which produce the same product and then consider purchases of all these different branch.

Thus it is not for theoretical reasons that the French national accountants gave up for the product study the concept of activity sectors, but for practical reasons linked to the need of projection (under the pressure of "Plans" in France) and also to the existence of information on the production and the raw materials necessary to carry out such productions.

2. Origins of statistical sources of enterprises (1947-1967)

Since the first attempts to elaborate national accounts in France, a strong priority was assigned to the direct use of business accounts. This priority was endorsed by governmental bodies in charge of the definition and enforcement of business accounts standards. The Business Accounting Standards Commission set up by the French government in the post-war period defined a general accounting framework, issued in 1947. This framework was explicitly designed for two goals : to provide to each enterprise an efficient management tool, on the one hand, and to facilitate the collection of reliable data by the government for national accounting purposes.

Thus, the units in the French statistics which were and are surveyed were **enterprises** instead of local kind of activity units (LKAU). In fact, SNA 93 and ESA 95 distinguish first the kind-of-activity unit (KAU) which groups all the parts of an institutional unit in its capacity as producer contributing to the performance of an activity at « class » level (4 digits) of the NACE rev.1 and secondly the local KAU which is a part of the KAU situated in a geographically identified place. It is sometimes called « establishment » in the SNA .The main aspect is the practical observation. In France we do not dispose of information required below the level of enterprise . If we accept (local) KAU = enterprise (and not establishment !), so « industries » of ESA correspond to « activity sectors » = « institutional sectors » + « industries » (as there are defined in ESA 95 2.108).

The mix of business accounts and annual enterprise surveys adds an important feature : the system gives not only the total of sales ; it includes also the detail of sales by group of commodities (i.e. “unit of homogeneous production”), according to the classification of products used in national accounts (this classification relies on the European Classification of Products according to Activities - CPA).

SECOND PERIOD : 1960 - 1995 COMPILING SUT BY BRANCH

During this period, statistical sources of enterprises were developed in France. National accounts, which could influence this development, were also suited to these statistical sources. One can distinguish sources from enterprises (or *non-financial corporations and non-financial unincorporated enterprises*) and other sources (General Government, Households, Financial corporations, etc,…). In this paper, we will focus on the first one because the second one are considered like exogenous. It means there is no to much change in the sources since many decades, just some improvements, and that the figures from these sources must no be balanced in national accounts.

1. The “intermediate system of enterprises” (SIE) : a micro data base

Since 1967 the use of micro-data from business accounts for national accounts purpose has been expanded and improved. The “historical” tax/statistics agreement of 1967 was many times amended and even revamped. However the basics were reached since this agreement. It is worth noting that it took twenty years of efforts on both sides ! As a matter of fact our predecessors of the fifties had no computers, which made uneasy the centralization of about three million individual sets of data. Furthermore, the network of local tax controllers and the team of national accountants did not spontaneously share the same view of so-called “standardization” and “centralization”. Finally, statisticians and tax administration officials had to be extremely cautious in organizing the transfer of individual data ; on both sides, that was a matter of credibility towards enterprises. Any lack of confidence from enterprises could result in a dramatic drop of reliability of basic data.

Thus, since the late sixties French statisticians have built a data base made of about three million individual sets of records coming from enterprises’ accounts. At the same time a comprehensive system of annual enterprise surveys was progressively developed, covering mining and manufacturing industry first, then construction, transport, wholesale and retail trade, and finally non financial market services. The concepts used in their questionnaires are derived from business accounting standards. This system of annual enterprise surveys has therefore the same conceptual framework of reference as the fiscal data base. The use of a common identification code for all relations between government and enterprises allows to compare and finally to merge both sets of data. The outcome is a data base named “Unified System of Enterprises Statistics” (SUSE).

One of the most important outputs of SUSE is “SIE”. This system provides a framework for analysing the accounts of enterprises. Data are organized according to the conceptual framework of national accounts but they continue to follow accounting rules (timing, valuation, etc.) of business accounts. That explains why this system is labelled “`intermediate”. It is built by exclusively adding individual enterprises’ records, while being conceptually close to national accounts. As a bridge linking individual business accounts and macro-economic national accounts, the intermediate system of enterprises plays a key-role in the elaboration of national accounts.

2. The intermediate system of enterprises (SIE) in national accounts

Regarding the area of goods and services and primary distribution of income, French national accounts are compiled according to three classical approaches : production, expenditure, income. Each of them produces an estimate of GDP, and these three estimates must be by definition identical. The intermediate system of enterprises is more or less used as an input to each of the three approaches. It helps therefore to make GDP estimates consistent together.

2.1. Production approach

Basically the production approach refers to technical process of production in each industry. This process consumes goods and services and results in an output whose value is higher than the sum of values of goods and services consumed. The total value added by production processes in domestic industries is the source of GDP according to the production approach.

Value added = Output - Intermediate Consumption.
One of the sources of industries' output is the amount of sales of enterprises. The intermediate system participates in the estimate of sales of non financial market industries.

2.2. Expenditure approach

The expenditure approach estimates the value of commodities directed to the satisfaction of final demand, net of imports. It relies on an analysis of supply and demand where the following identity holds for each detailed group of goods or services :

Output + Imports + Taxes minus Subsidies on Products + Trade and Transport Margins *equals*
IC + Final Consumption + Gross Fixed Capital Formation + Changes in Inventories + Exports.
In this approach the intermediate system of enterprises is one of the sources for enterprises' gross fixed capital formation and is used through sales of industries in the estimate of output of commodities.

2.3. Income approach (or institutional approach)

The income approach relies on the identification of production factors' compensation. The value added of institutional sectors is estimated on the basis of their generation of income account. Thus :
Value added = Gross Operating Surplus/Mixed Income + Compensation of Employees + Taxes minus Subsidies on Production (except those levied on products).

In this approach the intermediate system of enterprises plays the prominent role for two institutional sectors : Non Financial Corporations and Households.

3. Compilation of SUT during this period (1960 -1995)

3.1 New presentation of SUT by branch (year 1960 -1980)

Compiled henceforth each year, but diffused initially for the base years (1956, 1959), the SUT, since 1962 are published annually in the three systems of price (i.e. the current prices, the prices of the previous year and one fixed year price). So, French National Accounts have a long experience of calculation of volumes both at fixed year prices and at the previous year prices.

For the year under review, here 1956, **the concern of the estimates in absolute value dominates**. One then gathers considerable information which it is not possible to seek each year. For the other years, the values are established, on a purely principal basis, starting from estimates of evolution in volume and prices which make it possible to project the corresponding cells appearing in the table of the basic year, under an assumption of stability of input-output coefficients at constant prices. Table of 1959, not very different in its framework from that of 1956, is accompanied by many appendices (table of contents of each box in imports and indirect taxes).

Table of 1962 is marked by a **substantial transformation of the methods** : intense use of the data of the companies drawn from the tax sources and the censuses of industries, output matrix sector - branch. However it is only the table of the base 1980 which will incorporate generation of income accounts by branch. Actually , French statistical system, which does not use the establishment (i.e. local kind of activity unit) as statistical unit for description of the productive system, except on employment, never will not provide basic satisfactory statistics for the development of tables of IC, which could have been compiled starting from the accounts of groups of establishments (or close units) actually observed. Duality between “sources enterprises” and “sources product”, at the ground line of 1951, which corresponded then to theoretical wishes, was maintained. Fortunately, a radical improvement of the statistics occurred, but while letting remain a great poverty relating to intermediate purchases. The table of the purchases of annual enterprise surveys had only one intermittent existence even almost limited to some product after 1980 (computers services, advertising, etc…) .

3.2 Improvements in base years 1980 and 1995 (development of SIE, link with SNA 1993)

SUT is nevertheless completely integrated into the national accounts but the concern of analysis of the technical relations, dominant in the specialists in tables input-output, tends to pass in the second plan. **The principal stress is laid on the commodity flows products**, worked out in a rather great detail (several hundreds). In this context, the table of the intermediate consumptions of the branches is then more one tool of general checking of the coherence of the accounts of goods and services that a means of observing with precision the evolution of input-output coefficients.

3.3 “ EFFET - LIGNE (row effect) ” (new concept of French SUT)

A first series of TEI was established according to two systems of price (current price, value at the prices of the previous year) according to "product" sources of evaluation.
For TEI of 1977 in Base year 1980, in current price, we respected the structure of the destinations of the various products such as it resulted from the Base 1971 for each product. This calculation was carried out on a TEI worked out on level 90 classification.
For certain products (energy, agriculture, business services), many evaluations were introduced according to work undertaken by persons in charge for branches to light certain particularly sensitive blocks of TEI , specially for energy with the consequence of increase of price of petrol (1974, 1979).
For year 1978 the compilation of TEI was initially ensured in volume by projection of the TEI value of the previous year level 90. This projection initially amounts making move each cell of TEI such as the production of the branch user, i.e. assumption that input-output coefficients remain constant in volume. This assumption could be refined if necessary by direct evaluations of cells : Cells known as fixed (see before). The addition on line of the elements of the projected table provided, for each product, an estimate of total IC. But one already had another estimate of this aggregate, that which appeared in the initial version of the commodity flow of product for 1978. **The ratio of these two evaluations is called "EFFET LIGNE".** A great part of the balance carried out by each person in charge for branches consisted in choosing one of these estimates or an estimate ranging between the both. For goods, the most frequent modification related to breakdown between IC and inventory changes in the users. At last, the estimates of the commodity flows were retained after possible corrections. The difference between projection and the value appearing in the commodity flows was distributed between the branches users in proportion to their respective consumption, except fixed boxes, which means that all the technical coefficients were modified then at the same rate.
TEI in current prices of 1978 was elaborate starting from the table at the previously given price of the year 1977. A new significant assumption was made to multiply each box of the TEI volume by the index of corresponding price. for a given product, the index of price was regarded as identical for all the branches users. This assumption was made on level 90 nomenclature products. The development of the TEI for the years 1979 to 1981 was then carried out gradually by respecting the advance presented in detail for the year 1978. This work allowed first critical examination of the values added by branches which resulted from it.

During this long period, some improvements were made, specially in base year 1995, for example in the **constant price estimates (business services, education, heath,..)** (i.e. input method for education), or in new treatment of **transport margins** according SNA 93, **chain linking approach** instead of constant price estimates.

THIRD PERIOD : SUT IN BASE YEAR 2000 (BY BRANCH BUT LINKED WITH ACTIVITY SECTORS).

1. Principle and framework : consistency with enterprises data sources

One principle of base year 2000 is to estimate most correctly **IC for each branch and for each product at a 118 product branch level classification**. Commodity flows are lines of our "SUT". They are calculated as a reconciliation of all kinds of sources on each specified product; Commodity flows at G level (118 items) grouping of NACE-CPA rev.1 class 4, the level of synthesis in SIE and SUT, calculation of VA by branches, sectors...

In row, the identity between supplies and uses of products supposes that commodity flows by products can be compiled. It may be noted that this step is more difficult with a lack of information. But in France, as a general approach to national accounting, it is more developed because it is considered a good procedure to compile VA of whole economy and also because of lack of information about the input structures of industries. In general, it can be said that commodity flow method is appropriate for rectangular systems with many product groups. Elaboration of industry uses provides a major method to fill in the use table along each row. The aim of the method is to trace across each row of TEI the IC of every good and service by industries and by various institutional sectors as final demand.

The consumption of a product as intermediate inputs is determined by three factors: (i) input coefficients of this product by the industries which consume the product as inputs, (ii) outputs of the industries that consume the products as inputs (iii) output of the product itself. Given final uses (i) and (ii), it is possible to estimate intermediate uses of a product and then to estimate its total uses.

The commodity flow approach gives a clear advantage in identifying many flows. Some data are very well known and can be elaborated in the detailed classification, imports, exports, taxes and subsidies and products, and sometimes final consumption expenditure.

Data on household expenditures collected in household surveys are useful for making benchmark and annual estimates of distribution of household expenditures by broad categories (i.e. objects of expenditure). To break down these broad expenditures into a more detailed product classification, and to supplement the gaps in the household expenditure surveys, which are generally based on small samples, it is necessary to resort to a census of retail sales or annual retail sales statistics. In annual enterprises survey, it is possible to distinguish the sales by trade industries in the different kinds of products. For example, it is possible to know sales of fuel by supermarkets and so on. It is then possible to compile a table called 'products-industries matrix'. However, household surveys would not give any estimate on imputed gross rents, or direct information on imputed service charge of banks, non-life and life insurance, though interest and premium payments may be given, and these ESA-defined expenditures must be independently estimated.

After estimate household final consumption, export from foreign statistics, and change in inventory from SIE, it is possible to identify whether they are current (i.e. IC) or capital goods (GFCF), and even where they are used. For example, tractors are capital goods that are used in agricultural industries. When compiling commodity flows at a very detailed level, it is thus often possible to allocate the supply of a particular product to only one domestic use : IC of a well defined branch, final consumption expenditure, GFCF. Therefore, France compile commodity flows by product according to a more detailed classification (472 products).

At the 5-digit level, the CPC identifies more than 1800 products. Ideally, all of the components of the equation between supply and uses could be estimated separately. We used this information to share IC and GFCF in electrical and machinery durable goods (table 1). In practise, IC is often calculated as a balancing item if there is no GFCF.

Table 1
Share between final uses from detailed PRODCOM level of example Manufacture of office machinery and computers (year 1996)

PRODCOM	**CLASSIFICATION**	**share of uses**			**commodity flow**						
		IC	GFCF	HFC	PRO	IMP.	EXP.	tot.	IC	GFCF	HFC
30011100	Automatic typewriters and machinery		50%	50%	0	0	0	0	0	0	0
30011200	Electric typewriters		50%	50%	0	0	0	0	0	0	0
30011320	computers		10%	90%	0	0	0	0	0	0	0
30011330	Accounting machines		100%		0	0	0	0	0	0	0
30011350	Cash registers		100%		0	0	0	0	0	0	0
30011370	Other machinery of SH 8470		100%		0	0	0	0	0	0	0
30011430	Parts and accessories of the machi	100%			0	0	0	0	0	0	0
30011450	Parts and accessories of the machines	100%			0	0	0	0	0	0	0
30012170	Apparatuses of photocopy electrostat		100%		1	1	0	2	0	2	0
30012190	Apparatuses of thermocopie and photocopy		100%		1	2	2	0	0	0	0
30012330	Duplicators of office		100%		0	0	0	0	0	0	0
30012350	Printing machines, to address, stamp, sort,		100%		1	0	0	0	0	0	0
30012370	Machines with sorting, counting		100%		0	0	0	0	0	0	0
30012390	Other machines and apparatuses of office of the		100%		0	0	0	0	0	0	0
30012393	Commercial terminals of self-service store: billetery		100%		0	1	0	1	0	1	0
30012400	Parts and accessories of the machines of N 8472	100%			0	1	0	1	1	0	0
30012500	Parts and accessories of the apparatus	100%			0	3	2	2	2	0	0
30021100	Automatic machines of treatment		100%		0	1	1	0	0	0	0
30021200	Portable micro-computers	30%	30%	40%	2	3	1	4	1	1	2
30021300	Small data processing machines	20%	45%	35%	13	2	1	14	3	6	5
30021400	Data processing machines		100%		22	1	5	19	0	19	0
30021500	Other automatic of data processing, numerical	100%			0	10	10	0	0	0	0
30021630	Printers	10%	65%	25%	3	9	7	5	0	3	1
30021650	keyboards	100%			0	0	0	0	0	0	0
30021670	Other exit or input units	100%			1	6	3	4	4	0	0
30021673	Screens (screens plasma, LCD)	50%	50%		0	0	0	0	0	0	0
30021677	Commercial terminals of self-service	50%	50%		0	0	0	0	0	0	0
30021679	Other exit and input units	50%	50%		0	0	0	0	0	0	0
30021730	Central storage units		100%		0	0	0	0	0	0	0
30021755	Storage units to discs: optics (magneto-optical)	50%	50%		0	1	0	0	0	0	0
30021757	Other storage units to discs	50%	50%		1	6	2	5	2	2	0
30021770	Storage units to bands	50%	50%		0	1	1	0	0	0	0
30021790	Other storage units of the HS 8471	50%	50%		0	0	0	0	0	0	0
30021800	Other machines of the HS 8471, n.c.a.	50%	50%		4	4	3	5	3	3	0
30021900	Parts and accessories of the machines of the HS	97,5%		2,5%	3	19	11	11	10	0	0
30029000	installation of computers	100%			0			0	0	0	0
	total (millions francs)				54	71	50	75	28	39	8
	estimated								41	57	12
	commodity flow (benchmark 95)								51	51	9
	difference								-10	6	3

Source : PRODOM branch annual survey 1996

This example shows that we have reduced IC of Manufacture of office machinery and computer product about ten billions and increase at the same time GFCF about 6 and Final household consumption about 3 between the two benchmark year 1995 and 2000. To explain the method, after estimating ratio of breakdown for these three aggregate respectively for instance 20 % , 45% and 35% for small data processing machines (PRODCOM 30021300), we estimate the domestic market equal to 14 (13 output + 2 imports - 1 exports) and apply those proportions to estimate IC, CFCF and household final consumption. For example IC = 20% * 14 = 3.

2 - Surveys used to compile IC matrix in year 1999

The most commonly used approach consists in starting from the total IC by industry, i.e. the row 'Total'. Then, there is a balancing process with the amounts which are available for intermediate use in the different product commodity flows. Finally, an equality is obtained between the sum of the row 'Total' by industry and the sum of the column 'Total' by product.

In France, especially where accounts rely on data sources on enterprises (institutional approach), IC may be initially known at the level of the whole economy. The source of information come from the business accounts of enterprises. Some adjustments are necessary to pass from the IC of these accounts to IC of national accounts. We call these adjustments "intermediate system of enterprises - passage to annual accounts" (SIE - PAC).

Note that inputs as reported in business accounts are rarely detailed enough for the purpose of SUT compilation. Even when more detailed business accounts are obtained, they contain only broad categories of inputs. For example, the category of other services is reported instead of the detailed information such as computer and related services, research and development services, other business services etc. In these cases, it is necessary to make supplementary surveys to break down these aggregate items. Then , from SIE - PAC , it was possible to distinguish two kind of purchases : (1) purchase of goods, (2) purchase of services.

For compilation of "Intermediate entries table" (TEI), we use a lot of surveys in year 1999. If we breakdown the TEI between 4 quadrants, "top left" is well known because of different surveys (branch survey at a very detailed level : example seats for motor vehicles, …).

Then the "bottom left" is also well known by a survey on purchases of services products by manufactured goods industries. The only question mark is to pass from business accounting to national accounts (for example even if insurance premiums usually appear as operating costs in business accounts, the insurance service is measured in a different way in national accounting, through the equality : Premiums earned + premium supplements – claims due.

The "top right" is not very precise but the amounts (purchase of goods by services) are not so much big. And it could be added that public accounting allow to know purchase of goods by non market services. So the most important problem was the estimation of IC of services by services. About 55% of IC of total services are not very well allocated (figure 1).

Note also that intermediate consumption is broken down by 118 branches as domestic production. Until recently the uses side had an extra branch showing the intermediate consumption of FISIM; this branch has disappeared as FISIM is now distributed by uses.

Our principle was to estimate IC by branch, then IC by different institutional sectors, and by "sectors" of activity. IC of non financial corporation was estimated by difference between the total and the other institutional sectors.

At this step, it is still IC by branch of non financial corporation institutional sector.

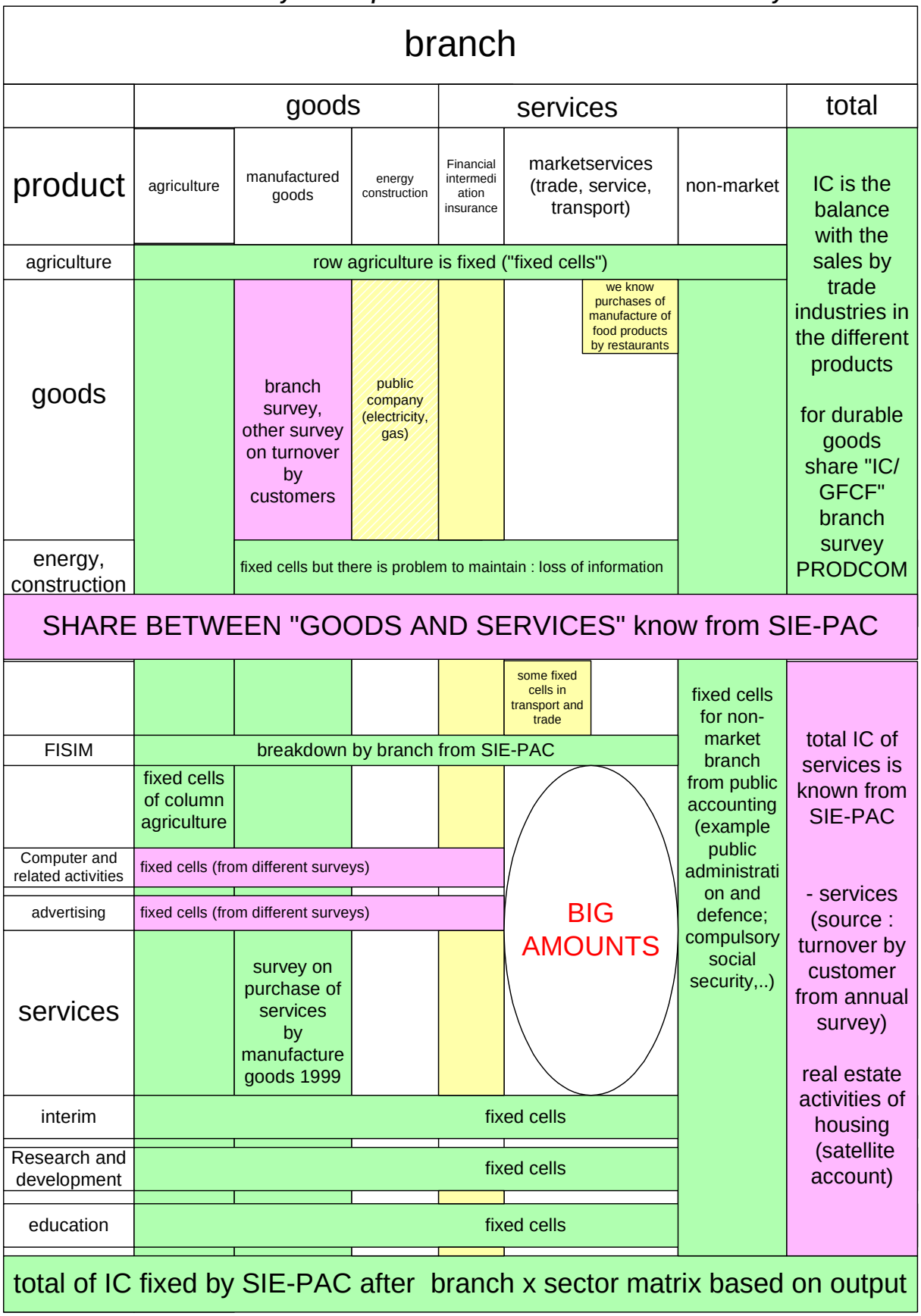
Next step is to calculate IC by "sectors" of activity of non financial corporation because total IC are observed by sectors in SIE - PAC.

This is possible when multiplying :

- TEI by branch (product in row, branch in column) x
- Output matrix structure in % (branch in row, sectors in column).

See table 2 (step 4)

Figure 1
Statistical sources and survey for compilation of table of intermediate entries in year 1999



green : very good estimated ; rose : good estimated ; yellow : almost good estimated ; white: bad estimated

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3. Compilation of SUT in current years according to an numerical example : EFFET-COLONNE

The method to estimate TEI in current prices from year to year (and also in volume) , is a little bit different than that one for a base year. We will explain hereafter by the mean of a numerical example (table 2). So there are different steps in the estimation of TEI year 2000 from TEI year 1999. We assume that commodity flows have been made for year 2000 in current price and in volume.

◆ First step is to estimate cells of TEI. These estimates are obtained by projection of TEI of previous year, according to index of volume of branch and index of price of product. We will then think in value terms. We take into account fixed cells too (gray in table 2) . These cells are known from survey every year as for the benchmark year and there is no reason to change the corresponding amounts.

◆ In a second step and step 3, we compare IC obtained by projection with IC obtained by commodity flows in volume (step 2 in numerical example). The ratios between both are called "EFFET-LIGNES" and step 2 consists to reduce these EFFETS in current prices (step 3 in numerical example).

◆ Step 4 consists to estimate SUT in current price. Then, after multiplying IC by the rates of VAT (taxation), we calculate IC of branch just for enterprises sectors. IC of enterprises are obtained by difference with other institutional sectors, "exogenous » by branches and products or only by branches. In the numerical example, agriculture is produced by households and non market services by General Government so that IC for enterprises sectors do not concern these two branches .
Then, we multiply the matrix of technical coefficient for enterprises by the "branch x sector" matrix based on output (step 4) to obtain a TEI by « activity sectors ». Hypothesis of technology by branches means all combination of inputs and outputs only depend of branch and not of sector. To reinject them in branches, we must inverse the matrix of structure branches-sectors. So we obtained a total of IC by « activity sectors » which is different from total IC of SIE. Then, we must reach the total IC of SIE -PAC by changing some cells.

◆ Last step consists to change the cells in TEI by branch in proportion without changing the fixed cells (IC of product agriculture and energy or IC by agriculture and by non-market services) (green color).

Table 2
Resolution of table of intermediate consumption (TEI), by Products and branches/sectors

SUT year N-1 in value reference year **(year N-1 at current price)**

FIRST STEP : SUT IS SUPPOSED TO BE KNOWN FOR year n-1 WHICH IS BASE YEAR

branch / **product**	agri-culture	energy	goods	const.	trade	market serv	non-m. serv	**Total IC**		final cons. house.	final cons. GG	GFCF	change invent. prod.	change invent. users	Export	**Total uses**
agricullture	102		230			17	7	356		153		3	-3	-2	78	585
energy	14	90	93	10	42	38	25	312		231					23	566
goods	109	41	1 367	241	40	248	148	2 194		1 353	45	446	9	8	914	4 969
construction	1	10	4	39	2	19	35	110		27		546		1		684
market services	15	40	592	119	102	526	99	1 493		1 233		88			258	3 072
non-market services								0		87	1 075					1 162
tota IC	241	181	2 286	409	186	848	314	4 465		3 084	1 120	1 083	6	7	1 273	11 038
value added	234	185	858	275	838	1 976	946	5 312								
PROD° branch	475	366	3 144	684	1 024	2 824	1 260	9 777								
transfers	-44		44					0								
incidental sales			11			87	-98	0								
PROD° product	431	366	3 199	684	1 024	2 911	1 162	9 777								
importations	49	90	938			161		1 238								
duties taxes	1		9					10								
trade margins																
- on IC	44	28	284		-356			0								
- on HFC	76	41	476		-593			0								
- on GFCF			35		-35			0								
- on exports	12		28		-40			0								
taxes on product	-28	41						13								
Total supllies	585	566	4 969	684	0	3 072	1 162	11 038								

SUT year N in volume (price of previous year)

SECOND STEP : CALCULATION OF "OTHER CELLS" BY PROJECTION OF TECHNICAL COEFFICIENT

branch / product	agri-culture	energy	goods	const.	trade	market serv	non-m. serv	Total C. I.	C. I. C.F.	final cons. house.	final cons. GG	GFCF	change invent. prod.	change invent. users	Export	Total uses
agricullture	89		234			18	8	349	349	156		4	8	4	81	602
energy	15	93	97	10	44	40	29	328	328	237					23	588
goods	110	**43**	**1 397**	**251**	**41**	**264**	169	**2 275**	2 265	1 392	48	460	-2	0	975	5 138
construction	1	**10**	**4**	**41**	**2**	**20**	43	**121**	114	28		570		1		713
market services	15	**42**	**605**	**124**	**105**	**560**	108	**1 559**	1 618	1 286		91			278	3 273
non-market services	0	**0**	**0**	**0**	**0**	**0**	0	**0**	0	89	1 092					1 181
tota IC	230	**188**	**2 337**	**426**	**192**	**902**	357	**4 632**	4 674	3 188	1 140	1 125	6	5	1 357	11 495
value added																
product° branch	493	382	3 213	713	1 052	3 008	1 286	10 147								
transfers	-47		47					0								
incidental sales			12			93	-105	0								
PROD° product	446	382	3 272	713	1 052	3 101	1 181	10 147								
importations	51	92	1 007			172		1 322								
duties taxes	1		10					11								
trade margins																
- on IC	43	29	293		-365			0								
- on HFC	77	42	490		-609			0								
- on GFCF			36		-36			0								
- on exports	12		30		-42			0								
taxes on product	-28	43						15								
Total supplies	602	588	5 138	713	0	3 273	1 181	11 495								

EFFET-LIGNE
=2275/2265

1397 = 1367 * 3213 / 3144

technical coefficient supposed to be constant

fixed cells in grey (survey, information)

explanation : projection of technical coefficient

The estimation of this IC start from the assumption that the technical coefficient does not change from year N-1 to year N. For example, we multiply 1367 by the volume index of output of manufactured goods industry which is equal to 3213 / 3144. Problem is with that calculation (and same for the other cells) , “EFFET LIGNE” are too much different from interval [-2%,+2%] . For example, for market services products, EFFET LIGNE is equal to 1559 /1618 =0.963 so it not in the gap [-2%,+2%] .

After this step, it is necessary to estimate the SUT in value of year (n) by multiplying all the cells (aggregates) by the price index we have calculated before.

Table 2 (following) Calculation in value year n

SUT year N in value

STEP 3 : CALCULATION OF SUT IN VALUE Year n

branch / product	agri-culture	energy	goods	const.	trade	market serv	non-m. serv	Total C. I.	I.C. C.F.	final cons. house.	final cons. GG	GFCF	change invent. prod.	change invent. users	Export	Total uses
agricullture	91		241			19	8	359	359	163		4	9	6	86	627
energy	16	107	101	11	46	42	30	353	353	248					26	627
goods	115	**45**	**1 456**	**262**	**43**	**275**	174	**2 370**	2 361	1 431	49	472	-2	0	1 023	5 334
construction	1	**10**	**4**	**45**	**2**	**21**	44	127	**119**	29		**592**		1		741
market services	16	**44**	**635**	**130**	**110**	**588**	113	**1 636**	**1 699**	**1 340**		94			289	3 422
non-market services	0	0	0	0	0	0	0	0	0	93	1 125					1 218
tota IC	239	206	2 437	448	201	945	369	**4 845**	**4 891**	**3 304**	1 174	**1 162**	7	7	1 424	11 969
value added	275	190	882	293	891	2 201	958	5 690								
product° branch	514	396	3 319	741	1 092	3 146	1 327	10 535								
transfers	-49		49					0								
incidental sales			12			97	-109	0								
PROD° product	465	396	3 380	741	1 092	3 243	1 218	10 535								
importations	52	111	1 066			179		1 408								
duties taxes	1		10					11								
trade margins																
- on IC	44	32	306		-382			0								
- on HFC	81	44	504		-629			0								
- on GFCF			37		-37			0								
- on exports	13		31		-44			0								
taxes on product	-29	44						15								
Total supplies	627	627	5 334	741	0	3 422	1 218	11 969								

we multiply cell in volume by the price index of each product

approach	PROD	USES
GDP	5 716	5 670

4. Suppression of « EFFET COLONNE »

When we multiply the matrix of technical coefficient (product in row, branch in column) by the output matrix (branch in row, sectors in column), we obtain an intermediate consumption matrix by sectors in column. Note that the total column of output matrix is the level we found in the previous table (example 3319 for goods).

So it is possible to compare the total of IC by sectors with the total of IC from SIE. There is a difference what we call in France “EFFET COLONNE”. For example, for goods, it is equal to 12 (2216 - 2196). The method consists in adding 20 on the whole of the sector proportionally with the no change on the fixed cells (here energy product are fixed cells). For example, as IC of goods product by goods branch was before 1456 (see table step 3), it will be now 1470 (= 1456 * (2216 -100))/(2196-101) to reach the level of 2216 and then to suppress “EFFET COLONNE”.

Then when the level of IC is equal for all sectors to the IC of SIE and for the total (4006), we inject this adjustment in the IC matrix by branch. Note that the total by branch for the whole economy (except agriculture and non market services) is the same than the total by activity sector (4006) .

Table 2 (following) Wedge to IC of SIE

STEP 4 : CALCULATION BY SECTOR OF ACTIVITY AND SUPPRESSION OF EFFET COLONNE

SECTOR OFACTIVITY

SUT of enterprises including unincorporated (from step 3)

branch	ENE	GOOD	CONS	TRA	MS	total
product						
energy	107	101	11	46	42	307
goods	45	1 456	262	43	275	2 081
constr	10	4	45	2	21	82
trade	0	0	0	0	0	0
m. services	44	635	130	110	588	1 507
total PRO	206	2 196	448	201	926	3 977

PHASE 1

BRANCHES

Output matrix in structure

branch	ENE	GOOD	CONS	TRA	MS
product					
energy	0,94	0,04	0,02	0,00	0,00
goods	0,00	0,92	0,01	0,00	0,07
constr	0,00	0,02	0,97	0,00	0,01
trade	0,00	0,00	0,00	0,95	0,05
m. services	0,00	0,04	0,01	0,00	0,95
total PRO	**0,94**	**1,02**	**1,01**	**0,95**	**1,08**

step of calculation for estimate new IC

structure of output matrix (trsnposed)

branche	ENE	GOOD	CONS	TRA	MS
sector					
energie	0,94	0,00	0,00	0,00	0,00
industrie	0,04	0,92	0,02	0,00	0,04
constr	0,02	0,01	0,97	0,00	0,01
comm.	0,00	0,00	0,00	0,95	0,00
services	0,00	0,07	0,01	0,05	0,95
total	1,00	1,00	1,00	1,00	1,00

PHASE 2

matrix multiply = TEI * structure of output matrix

IC BY SECTOR OF ACTIVITY

sector	ENE	GOOD	CONS	TRA	SM	total
product						
energy	101	99	14	44	49	307
goods	43	1 359	269	41	369	2 081
constr	9	6	44	2	21	82
trade	0	0	0	0	0	0
m. services	42	613	136	105	611	1 507
total IC	195	2 077	463	191	1 051	3 977
IC SIE	200	2096	460	190	1060	4006
difference	5	19	-3	-1	9	29

NEW "TEI" BY BRANCH (FINAL TABLE)

we share new total of IC proportionaly except fixed cell

branch	ENE	GOOD	CONS	TRA	MS	total
product						
energy	107	101	11	46	42	307
goods	47	1 470	259	43	278	2 097
constr	11	4	45	2	21	83
trade	0	0	0	0	0	0
m. services	46	641	129	109	594	1 519
total IC	211	2 216	444	200	935	4 006
total CI	211	2216	444	199	935	4 005

PHASE 5

inverse of transposed output matrix

branch	ENE	GOOD	CONS	TRA	MS
sector					
energy	1,06	0,00	0,00	0,00	0,00
goods	-0,04	1,08	-0,02	0,00	-0,04
constr	-0,02	-0,01	1,03	0,00	-0,01
trade	0,00	0,00	0,00	1,05	0,00
m. service	0,00	-0,07	-0,01	-0,05	1,05
total	1,00	1,00	1,00	1,00	1,00

=-x outside diagonal

=2-x on diagonal

PHASE 3

PHASE 6

WEDGE ON SIE

NEW "TEI" BY SECTOR (FINAL TABLR)

sector	ENE	GOOD	CONS	TRA	SM	total
product						
energy	101	99	14	44	49	307
goods	45	1 372	266	41	373	2 097
constr	10	6	44	2	21	83
trade	0	0	0	0	0	0
m. services	44	619	136	104	617	1 519
total IC	199	2 096	460	190	1 061	4 006
IC SIE	200	2096	460	190	1060	4006
difference	1	0	0	0	-1	0

OLD TEI (table previous page)

branch	ENE	GOOD	CONS	TRA	MS	total
product						
energy	107	101	11	46	42	307
goods	45	1 456	262	43	275	2 081
constr	10	4	45	2	21	82
trade	0	0	0	0	0	0
m. services	44	635	130	110	588	1 507
total IC	206	2 196	448	201	926	3 977
écart	5	20	-4	-2	9	28
nouv. tot.	211	2 216	444	199	935	4 005

EFFET COLONNE

PHASE 4

calcul of difference on IC in SUT by branch

difference of matrix * inverse of transposed

branch	ENE	GOOD	CONS	TRA	MS
total	5,20	19,54	-3,72	-1,76	9,02

transposed output matrix

sector					
branch	ENE	GOOD	CONS	TRA	MS
energy	0,94	0,04	0,02	0,00	0,00
goods	0,00	0,92	0,01	0,00	0,07
constr	0,00	0,02	0,97	0,00	0,01
trade	0,00	0,00	0,00	0,95	0,05
m. service	0,00	0,04	0,01	0,00	0,95

In blue : those figures that will be changed to be wedge with IC of SIE-PAC, in gray fixed cells of energy product.

explanation : last step calculation in VALUE and in VOLUME of year 2000

So at last step, we can introduce these new estimates in the SUT of year 2000. Finally, IC will be 4884 instead of 4845 by projection and VA will be equal to 5651 instead of 5690 by projection. So it is necessary to change finals uses, for example household consumption expenditure of goods will be 1406 instead of 1431, to target IC as 2386 instead of 2361, and for services it will be 1391 instead of 1340 to target IC as 1648 instead of 1699. Same for GFCF of construction , we replace 592 by 583 (see last step). In fact, it more complicated but this is the principle.

Table 2 : step 5 calculation in value and step 6 reduction of EFFET LIGNE

SUT year N in current prices

STEP 5 : CALCULATION IN VALUE after suppression of EFFETS COLONNE

branch / product	agri-culture	energy	GOOD	const.	trade	serv marc.	serv non-m.	Total IC	IC C.F.	final cons. house.	final cons. GG	GFCF	change invent. prod.	change invent. users	Export	Total uses
agricullture	91		241			19	8	359	359	163		4	9	6	86	627
energy	16	107	101	11	46	42	30	353	353	248					26	627
goods	115	47	1 470	259	43	278	174	2 386	2 361	1 431	49	472	-2	0	1 023	5 334
construction	1	11	4	45	2	21	44	128	119	29		592		1		741
market services	16	46	641	129	108	594	113	1 647	1 699	1 340		94			289	3 422
non-market services	0	0	0	0	0	0	0	0	0	93	1 125					1 218
tota IC	239	211	2 457	444	199	954	369	4 873	4 891	3 304	1 174	1 162	7	7	1 424	11 969
value added	275	185	862	297	893	2 192	958	5 662								
product° branch	514	396	3 319	741	1 092	3 146	1 327	10 535								
transfers	-49		49					0								
incidental sales			12			97	-109	0								
PROD° product	465	396	3 380	741	1 092	3 243	1 218	10 535								
importations	52	111	1 066			179		1 408								
duties taxes	1		10					11								
trade margins																
- on IC	44	32	306		-382			0								
- on HFC	81	44	504		-629			0								
- on GFCF	0		37		-37			0								
- on exports	13		31		-44			0								
taxes on product	-29	44						15								
Total supplies	627	627	5 334	741	0	3 422	1 218	11 969								

step 5

TES année N en prix courant

Last step (6) : CALCUL IN VALUE after reduction of EFFETS LIGNE and suppression of EFFET COLONNE

branche / produit	agri-culture	energy	GOOD	const.	trade	serv marc.	serv non-m.	Total CI	IC step 4	final cons. house.	final cons. GG	GFCF	change invent. prod.	change invent. users	Export	Total uses
agricullture	91	0	241	0	0	19	8	359	359	163	0	4	9	6	86	627
energie	16	107	101	11	46	42	30	353	353	248	0	0	0	0	26	627
industrie	115	47	1 470	259	43	278	174	2 386	2 361	1 406	49	472	-2	0	1 023	5 334
construction	1	11	4	45	2	21	44	128	119	29		583		1		741
services marchands	16	46	641	129	108	594	113	1 647	1 699	1 392		94			289	3 422
services non marchands	0	0	0	0	0	0	0	0	0	93	1 125					1 218
total CI	239	211	2 457	444	199	954	369	4 873	4 891	3 331	1 174	1 153	7	7	1 424	11 969
valeur ajoutée	275	185	862	297	893	2 192	958	5 662								
PROD° branche	514	396	3 319	741	1 092	3 146	1 327	10 535								
transferts	-49		49					0								
ventes résiduelles			12			97	-109	0								
PROD° produit	465	396	3 380	741	1 092	3 243	1 218	10 535								
importations	52	111	1 066			179		1 408								
droits de douane	1		10					11								
marges commerciales																
- sur CI	44	32	306		-382			0								
- sur cCONSO FINALE	81	44	504		-629			0								
- sur FBCF	0		37		-37			0								
- sur exportations	13		31		-44			0								
impôts sur les produits	-29	44						15								
Total ressources	627	627	5 334	741	0	3 422	1 218	11 969								

last step

	PROD	USE
GDP	5 688	5 688

"LIST OF ABREVIATIONS"

AG :	Agriculture (activities)
C.F.	commodity flows
CONST :	construction (activity of construction)
Chang. invent.	change of inventories (prod = producers, user = users)
CPA :	Classification of Products according to Activities
ENE :	Energy
ESA :	European system of accounts (1995)
Final CONSUMP :	final consumption
GCF :	Gross capital Formation
GDP :	Gross Domestic Product
GFCF :	Gross fixed capital Formation
GG :	General Government
GOOD :	manufactured goods (activity of manufactured goods)
IC :	intermediate consumption
ISA :	institutional sectors accounts
HFC :	Household final consumption
HOUSE :	households
KAU :	kind of activity units
LKAU :	local kind of activity units
MS :	market services (or sometimes market SERV.)
NON M. SERV.	Non market services (or sometimes SERV N. M.)
PROD (PRODUC) :	Production
SIE :	Intermediate system of enterprises (French micro data base of enterprises)
SIE PAC :	Intermediate system of enterprises - passage to annual accounts
SNA :	System of National Accounts (1993)
SUSE :	Unified System of Enterprises Statistics
SUT :	Supply and Use Tables
TEI :	Table of Intermediate entries (which is also use matrix of intermediate entries)
TRA :	Trade (activities of trade)
VA :	Value added
UHP :	Units of homogeneous production