

Quarterly National Accounts Inventory

Sources and methods of Italian
Quarterly National Accounts

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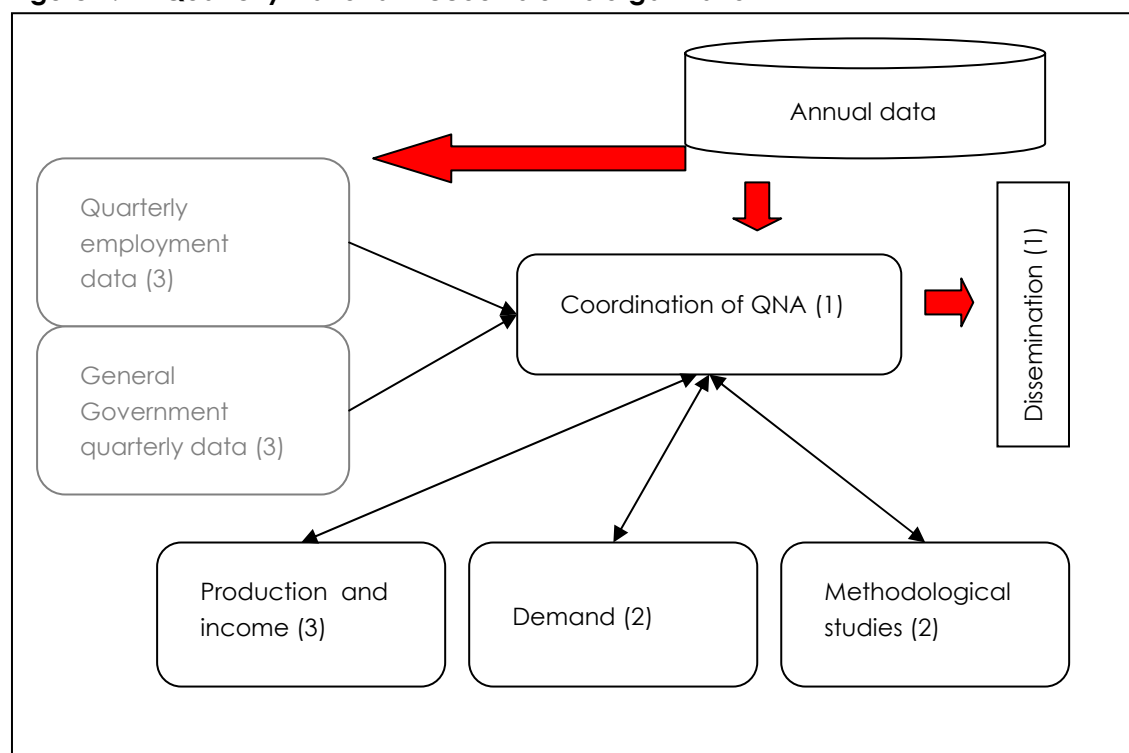
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1 Overview of the system of quarterly national accounts

1.1 Organisation and institutional arrangements

Italian Quarterly National Accounts (QNA) are produced by the Istituto Nazionale di Statistica (ISTAT) within National Accounts (NA) Directorate. NA directorate is organized in four divisions: Director division (that comprehends institutional sector accounts, supply and use tables and annual data balancing), GDP production side division (that comprehends income and employment), GDP expenditure side division and General Government and Public Finance statistics division. QNA estimates are produced within the third division. QNA production is organized in three units in charge respectively of production and demand approach and of methodological studies. Two other units - owing to other divisions - provide General Government quarterly data and quarterly employment data. Figure 1 shows the organisation chart (staff number in brackets).

Figure 1.1 – Quarterly National Accounts Units organization



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1.2 Publication timetable, revisions policy and dissemination of QNA

Quarterly National Accounts are compiled following the ESA95 definitions and structure. Data are consistent starting from the first quarter of 1980, and are released at 70 days after the reference period. In that occasion the first 17 tables of ESA95 questionnaires are published. Data published cover all the production side, expenditure side and income side components.

Data are available at current prices, at previous year's prices and in chain-linked volumes (reference year 2000). They are expressed in raw form, in calendar adjusted form, and in seasonal and calendar adjusted form.

A preliminary estimate is produced at 45 days from the end of the reference period. The estimate is made using the methodology and the sources used for regular quarterly estimate even if a greater use is made of forecasting. Though estimates are made for all quarterly national accounts aggregates, the only information made available to users is total GDP in seasonal and calendar adjusted form, expressed in chain – linked volumes. In order to produce European flash estimate, Eurostat has access to some greater details (both for expenditure and production components).

The GDP data are preliminary when first released at t+45 days. These estimates are subsequently revised at t+70 days. Every new release revises data of current year and of the preceding two years. The data become final after 4/5 years from their first release. When a major revision occurs the entire time series are revised. The press release clearly indicates which quarters are revised.

1.3 QNA compilation approach

The reduced availability of quarterly information does not allow a direct approach in quarterly national accounts (QNA) production. Though some studies are currently under investigation a Supply and Use Table (SUT) is not available in QNA yet. Quarterly aggregates are therefore derived through an *indirect* method using related time series, which are indicators observed at higher frequencies (quarterly or even monthly). The choice of such related indicators is crucial to guarantee the accuracy of QNA estimates. Different criteria are used to select indicators, the most important ones are: i) coherency with the economic concept of the aggregate; ii) statistical correlation between the (annualized) indicator and the annual aggregate; iii) timeliness and accuracy; iv) length of the series.

The estimate of GDP is derived from both production and expenditure approaches: changes in inventories are derived as a balance between the GDP production estimate and the other expenditure components. This implies that this variable includes a certain amount of statistical discrepancy. Although a real balancing process between supply and demand is not done, the final estimate of GDP is obtained through a validation process of the supply and expenditure components. Concerning the income approach, compensations of employees are derived independently while gross operating surplus/mixed income is derived as a balance.

1.4 Balancing, benchmarking and other reconciliation procedures

As said before the lack of any sources for changes in inventories at the quarterly frequency does not allow the same balancing procedure adopted in ANA. The current practice is to derive changes in inventories as a balance of the uses and resources account. Being the accuracy of the balanced item certainly inferior to independently-derived estimates, the magnitude of the resulting changes in inventories is considered as an implicit measure of the quality of the other estimated components. A sort of "qualitative" balancing procedure of GDP and expenditure components is sometime carried on if production side and demand side

estimations are too different. This process guarantees a better coherence of the account, reducing statistical discrepancies included in inventories.

The indirect estimation of QNA is grounded on the use of benchmarking techniques. Such procedures guarantee a perfect alignment of quarterly data to the corresponding annual series, i.e. the sum (or the average) of the quarters of a year gives exactly the same amount of the year. In Italy, benchmarking in QNA is largely founded on the proposal of Chow and Lin (1971). The use of an alternative approach based on the proposal of Fernández (1981) has been recently introduced in QNA production on the basis of suggestions and comments received from a study commission set up by ISTAT to evaluate temporal disaggregation methods.

Temporal disaggregation techniques are not always necessary: in some cases, quarterly series present only minor differences with respect to the annual values, under these circumstances a *quasi-direct* approach is followed (i.e. imports and exports of goods).

Before their publication, QNA estimates are subjected to the following control and validation processes:

- *comparison with short-term information* (different from those used in QNA);
- *analysis of revisions of previously published QNA estimate*;
- *coherence between production and employment data*;
- *soundness of indices on costs and margins*.

1.5 Volume estimates

In 2006, ISTAT introduced chain-linked volume measures both in ANA and QNA, in compliance with the Commission decision 98/715/CE on prices and volumes measures in National Accounts. Volume estimates, previously expressed in constant prices of a fixed-base year, are now calculated at prices of the previous year.

QNA aggregates are published at current prices (CP), at prices of the previous year (PYP) and in chained volumes (CLV) using the annual overlap (AO) technique. Time series in volumes begin with the first quarter of 1981 (at the average prices of 1980). CLV series are expressed in monetary terms with reference year 2000.

The calculation of volume estimates in Italian QNA is essentially based on a system of quantity and price indicators. Quantity indices are used directly in temporal disaggregation of the corresponding annual chain-linked series, while price indices enters a two-step calculation: first, annual deflators are disaggregated using the relevant price indices, then the volume estimates are derived by deflating the current prices estimate with the quarterly deflator resulted from the first step.

The CLV series in monetary terms are not additive, i.e. the sum total of the CLV sub-aggregates (e.g. final consumption expenditure, gross capital formation, exports, imports) differs from the value of the CLV aggregate (e.g. GDP). However, the combination of Laspeyres index with annual weighting and the AO technique makes the quarterly chain-linked estimates additive in the reference year and the year after (currently, 2000 and 2001). For the other years, discrepancies exist and are not allocated over the components. Instead, the estimates expressed in PYP are always additive.

1.6 Seasonal adjustment and working day correction

ISTAT uses a unified seasonal adjustment procedure that is the model based approach of TRAMO-SEATS (Gomez and Maravall, 1997). Seasonal adjustment (SA) and calendar (CA) adjustment in QNA production is performed on the indicators. The CA considers the following effects:

- i. The Trading day and Specific national holidays effect (TD);
- ii. The Working day and Specific national holidays effect (WD);

- iii. The Leap-year effect (LY);
- iv. The Easter effect (EE).

The model chosen for each indicator is used to derive the adjusted series, subtracting the overall effect due to calendar regressors from the original aggregates, when possible at monthly level. The calendar effects also affect annual data as the number of working/trading days normally varies from year to year. Therefore, the adjusted annual totals (obtained transferring the quarterly adjustment to raw annual data through an econometric model that exploits the relationship between the annualized indicator and the annual data) should differ from raw annual totals.

The next step consists in removing the seasonal component from the indicators. Seasonal adjustment is performed at a quarterly frequency. This choice was supported by the results of studies that showed that performing temporal aggregation prior to seasonal adjustment consistently reduces the variance of the revision errors. Seasonal adjustment is performed on the indicators adjusted for calendar effects and outliers.

QNA are produced and published expressed in raw form, in calendar adjusted form, and in seasonal and calendar adjusted form.

1.7 Additional information

Italian QNA and preliminary GDP estimate are published by issuing the press releases [Conti economici trimestrali](#) - available also in English - and the press release [Stima preliminare del Pil](#). The complete set of QNA is available for all users on the web database Conistat (<http://con.istat.it>), available also in English. ESA95 questionnaires are sent to Eurostat and other institutions (ECB, OECD, IMF).

In accordance with the principles IMF's Special Data Dissemination Standard program (SDDS), ISTAT publishes in November a press release calendar giving the precise release dates for the coming year, (www.istat.it/salastampa/comunicati and <http://dsbb.imf.org>).

The IMF website [SDDS](#) provides information about coverage, periodicity, timeliness, sources and methods and dissemination practices of Italian QNA.

A comprehensive description of the methodology of quarterly national accounts is contained in the workshops proceedings *La nuova contabilità nazionale* (Roma 12-13 gennaio 2000, vol. 1, ISTAT) and [La revisione generale dei conti nazionali 2005](#) (Roma, 21-22 giugno 2006).

The results of the study commission on temporal disaggregation techniques for QNA (see chapter 3) are presented in some contributions downloadable from [ISTAT website](#).

The innovations introduced with the National Accounts revision in 2005 are described in a set of papers available at <http://www.istat.it/istat/eventi/2006/continazionali/>.

2 Publication timetable, revisions policy and dissemination of QNA

2.1 Release policy

Italian QNA are compiled by the Istituto Nazionale di Statistica (ISTAT) following ESA 95 schemes. They are now published after 70 days after the end of the reference quarter. Data are released simultaneously to all users by issuing the press releases *Conti economici trimestrali*. Press agencies attending the briefing are given, on an embargo basis, the data approximately 30 minutes before the publication in order to enter the data into their systems. They are not allowed to transmit the data until 10:00 a.m. at which time the data are released into the public domain. At 10:00 a.m. copies of the press releases are made available on the ISTAT website both in Italian and in English (www.istat.it/salastampa/comunicati/in_calendario/contitri). The complete set of QNA is available for all users on the web database Conistat (<http://con.istat.it>). ESA95 questionnaires are sent to Eurostat and other institutions (ECB, OECD, IMF).

A preliminary estimate is produced after 45 days from the end of the reference period. The release dates are coordinated among the European National Statistic Institutes (NSI) and Eurostat to guarantee the simultaneous publication of results among NSI of member states. The methodology used to produce the preliminary estimate is the same used for regular estimation of QNA. In principle even the indicators used are the same, anyway they are often incomplete at t+45 days so a greater use is made of forecasting (see chapter 9). As for QNA, data are released through a press release called *Stima Preliminare del Pil* disseminated through a briefing to press agencies. After the briefing press release is made available on the website (www.istat.it/salastampa/comunicati/in_calendario/stimapiil).

In accordance with the principles IMF's Special Data Dissemination Standard program (SDDS), ISTAT publishes each November a press release calendar giving the precise release dates for the coming year. The press release calendar is available both on ISTAT website (www.istat.it/salastampa/comunicati) and on SDDS webpage (<http://dsbb.imf.org>).

Being produced through an indirect method, QNA are completely consistent with ANA when the latter are available. For the current year (when the annual aggregates are not available) quarterly estimates are calculated as extrapolations of benchmarking models through related series. Generally at mid February a flash estimate of the fourth quarter of the previous year is produced giving a provisional estimation of annual growth of GDP in chain-linked volumes and in seasonal and calendar adjusted form. Annual data are released only fifteen days later (generally the 1st of March). In the period between the release of annual data and that of QNA for the fourth quarter (generally on the 10th of March) QNA and ANA may differ.

In general all quarterly estimates, including flash estimates are revised with every new publication. Quarterly figures can be revised for three main reasons: changes in the basic data sources, revisions of seasonal factors due to new information and/or increasing sample size, and changes in the annual accounts. At each release, current and previous two years' quarters are allowed to change, both for raw, calendar and seasonal adjusted data. When new annual totals become available, new econometric relationships are estimated on annual basis and the quarters of the last four/five years may change due to new estimated parameters of the annual regressions. When historical (benchmark) revisions are introduced, all quarterly data may be revised.

Quarterly institutional sector accounts (QSA) are now transmitted to Eurostat 95 days after the reference period (in the next future this delay should decrease to 90 days) and they are fully consistent with QNA main aggregates disseminated 70 days after the end of the reference period. Some consistency problems arise with Balance of Payments (BoP) statistics. In fact BoP

statistics are generally transmitted to Eurostat at t+90, too late to be used in QNA estimates. This implies that, to keep the complete consistency between QNA and QSA, this data are employed in QSA estimates only with a quarter of delay.

General Government Quarterly Accounts (STPFS) are transmitted to Eurostat at t+90. Generally they are disseminated to all users within 100 days after the reference period through a press release (http://www.istat.it/salastampa/comunicati/in_calendario/contoPA). STPFS are fully consistent with QNA main aggregates released 70 days after the end of the reference period.

The main short term statistics used in the production of QNA are Industrial production index (IPI), Service production index (SPI), household budget survey (HBS) and labour force statistics (LFS).

IPI and SPI releases are settled by the STS regulation, which states the publication of the first within 45 days after the end of the reference month, and for the second one within 90 days after the end of the reference quarter. IPI is then available both for the preliminary estimate at t+45 days and for the QNA estimate, while SPI is not available for the preliminary estimate but is supplied under embargo for the QNA estimate.

HBS is a monthly survey, checked on quarterly basis and published on annual basis. HBS results are supplied under embargo to National Accounts direction generally within 60 days after the reference quarter, therefore they are available for QNA estimates at t+70days.

Finally LFS are published at t+80 days but generally they are supplied to National Accounts direction within 70 days from the reference quarter.

2.2 Contents published

Estimates for QNA are made for the production-side, the expenditure-side and the income-side. QNA comprehend a complete analysis in both current prices and previous year's prices expressed in chain-linked measure (reference year 2000) in millions of euro starting from the first quarter of 1980. Detailed data are produced and published according to breakdowns by productive activity, by expenditure category and by income.

Both current prices, previous year's prices and chain-linked measure (reference year 2000) are published for productive activity and expenditure components. Only data at current prices is produced for the income measures. The data are disseminated in raw, calendar adjusted and seasonally adjusted format in accordance with the ESA95 transmission program. The first 17 tables of ESA 95 transmission program are produced and published.

Production side estimates are conducted with a breakdown for 32 economic sectors. Level of publication shows a smaller detail (estimates are published for 16 economic sectors). In the current year only six main branches are disseminated: (1) Agriculture hunting, forestry and fishing; (2) Industry including energy; (3) Construction; (4) Trade and transports; (5) Financial, renting and business activities; (6) Other service activities (see table 2.1). The same detail of estimation and publication is used for employment and compensation of employees.

The breakdown by expenditure category shows estimates for: (1) Household final consumption (further broken down by purpose and by durability); (2) Non-profit Institutions Serving Households (NPISH) final consumption; (3) General Government final consumption; (4) Gross Fixed Capital Formation (estimated for 14 kinds of goods and published by 6 kinds of goods); (5) Changes in Inventories; (6) Acquisition less Disposals of Valuables; (7) Exports of goods and services; and (8) Imports of goods and services.

Table below (table 2.2) shows the estimation and publication detail level used for final household consumption. Estimates are made for 29 consumption functions; data are published

with a detail of 12 COICOP functions when annual data are available, while in current year only the breakdown by 4 durability category is available.

Table 2.1 Breakdowns of production side and income side estimates

Reference NACE rev.1	Publication detail	
	complete year	current year
AA Agriculture, hunting and forestry	A Agriculture, hunting, forestry	(A+B) Agriculture, hunting, forestry and fishing
BB Fishing	B Fishing	
CA Mining and quarrying of energy producing materials	C Mining and quarrying	(C+D+E) Industry, including energy
CB Mining and quarrying except energy producing materials		
DA Manufacture of food products	D Manufacturing	
DB Manufacture of textiles and textile products		
DC Manufacture of leather and leather products		
DD Manufacture of wood and wood products		
DE Manufacture of pulp, paper products; publishing and printing		
DF Manufacture of coke, refined petroleum products and nuclear fuel		
DG Manufacture of chemicals, chemical products, man made fibres		
DH Manufacture of rubber and plastic products		
DI Manufacture of other non-metallic mineral products		
DJ Manufacture of basic metals and fabricated metal products		
DK Manufacture of machinery and equipment n.e.c.		
DL Manufacture electrical and optical equipment		
DM1 Manufacture of cars		
DM2 Manufacture of other transport equipment		
DN Manufacturing n.e.c.		
EE Electricity, gas and water supply	E Electricity, gas, water supply	
FF Construction	F Construction	F Construction
GG Wholesales and retail trade; repairs	G Wholesales, retail trade; repairs	(G+H+I) Wholesales and retail trade, repairs; hotels and restaurants; transport and communications
HH Hotels and restaurants	H Hotels and restaurants	
II1 Transport and storage	II Transport, storage and communication	
II2 Communication		
JJ Financial intermediation	J Financial intermediation	(J+K) Financial, real estate, renting and business activities
KK Real estate, renting and business activities	K Real estate, renting, business activities	
LL Public administration (PA), defence; compulsory social security	L PA, defence; compulsory social security	(L+M+N+O+P) Other service activities
MM Education	M Education	
NN Health and social work	N Health and social work	
OO Other community, social and personal service activities	O Other community, social, personal service activities	
PP Private household with employed persons	P Private household with employed persons	

Non-profit Institutions Serving Households (NPISH) final consumption and General government (GG) final consumption are estimated together by adding the different

components (compensation of employees, consumption of fixed capital and intermediate consumption). Nevertheless NPISH final consumption and GG final consumption are published separately; the split between the two components of final consumption is done on the basis of annual shares.

Table 2.2 Breakdowns of final household consumption estimates

reference COICOP	Publication detail	
	complete year	current year
Food and non-alcoholic beverages	1. Food and non alcoholic, beverages	Non durable goods
Beverages and tobacco	2. Alcoholic, beverages, tobacco	Non durable goods
Clothing and footwear	3. Clothing and footwear	Semi-durable goods
Repairs of clothing and footwear and laundry		Services
Electricity, gas and other fuels	4. Housing, water, electricity, gas and other fuels	Non durable goods
Gross rents, regular maintenance and repairs		Services
Furniture and furnishings, carpets, cooking appliance, refrigerators etc.	5. Furnishings, household equipment and routine maintenance of the house	Durable goods
Semi-durable household goods		Semi-durable goods
Non-durable household goods		Non durable goods
Services for routine household maintenance		Services
Medical and pharmaceutical products	6. Health	Non durable goods
Other medical product		Durable goods
Hospital services		Services
Purchase of vehicles	7. Transport	Durable goods
Accessories for personal transport equipment		Semi-durable goods
Fuel and accessories		Non durable goods
Transport services		Services
Telephone equipment	8. Communication	Durable goods
Mail and phone services		Services
Durable equipment and accessories for entertainment	9. Recreation and culture	Durable goods
Semi-durable equipment and accessories for entertainment		Semi-durable goods
Non-durable equipment and accessories for entertainment		Non durable goods
Services of entertainment and culture		Services
Education	10. Education	Services
Hotels and restaurants	11. Hotels and restaurants	Services
Jewels and watches	12. Miscellaneous goods and services	Durable goods
Other personal effects		Semi-durable goods
Articles for personal care		Non durable goods
Other services		Services

Gross fixed capital formation is estimated with a detail of 17 products. Data are released according to the PI6 breakdown. The level of detail of estimation and publication of gross fixed capital formation is shown in table 2.3.

Changes in Inventories are estimated as a whole and are published in uses and resources account table. Also Acquisitions less Disposals of Valuables are published in uses and resources account table.

Exports and imports are estimated and published separately for goods and services.

c) The Income analysis breakdown shows the following aggregates: (1) Employment; (2) Compensation of employees (both produced and published at the same level of the production side estimates - see table 2.1); (3) Gross Operating Surplus of Corporations; and (4) Other Income.

Press release contains tables on GDP and expenditure components (namely imports, household and collective consumption, gross fixed capital formation, changes in inventories and valuables and exports) in levels, growth rates (both on previous and on correspondent quarter) and in contributions to growth. Value added further broken into six main branches of activity is also published in levels and in growth rates. Finally consumptions broken down by durability are released both in levels and in growth rates.

For further details see the *Conti Economici Trimestrali* press release (www.istat.it/salastampa/comunicati/in_calendario/contitri/20071207_00/).

Table 2.3 Breakdowns of gross fixed capital formation estimates

Reference CPA	Publication detail
1 Products of agriculture, hunting and related services	01+02+05 Products of agriculture, forestry, fisheries and aquaculture
02-05 Products of forestry, logging, fish, other fishing products and related services	
28-33 Fabricated metal products, machinery and equipment, computers 36 electrical machinery and apparatus, radio, television and communication apparatus, optical instruments, watches and clocks; manufacture of furniture; manufacturing n.e.c. ; Medical, precision instruments	28-33+36 Metal products and Machinery
34a Motor vehicles: cars	34+35 Transport equipment
34b Motor vehicles: trailers and semi-trailers	
35a Planes	
35b Motorcycles, cycles; manufacture of other transport equipment	
45a Construction work of houses	45a Housing
45b Construction work of other building	45b Other construction
15-27 Food Textiles; furs; leather, wood and paper products; printed and recorded media; plastic and other non metallic mineral products; basic metals	remaining divisions Other products
50 Sale, maintenance and repair of motor vehicles and motorcycles	
70 Real estate services	
72a Computers and related services: purchased software	
72b Computers and related services: auto produced software	
74a Other business services: surveying	
74b Other business services: notaries expenses	
92-93 Recreational, cultural and sporting services	

Though flash estimate is made at the same detail of quarterly national accounts on the demand-side and the supply-side, the only information made available to users for the preliminary estimate is the total GDP in chained-linked volumes (reference year 2000) in calendar effect and seasonally adjusted form. The press release contains a table of GDP in levels and growth rates both on previous and on correspondent quarter. A table with the last three releases of GDP is also published to show the latest revisions of GDP estimates.

For further details see the *Stima preliminare del PIL* press release (http://www.istat.it/salastampa/comunicati/in_calendario/stimapil/20071113_00/)

2.3 Special transmissions

As said before both the flash estimate and the QNA are published through a press release available for all users on ISTAT website (see paragraph 2.1). These two press releases are regularly sent to Eurostat and to other institution (namely IMF, OECD, ECB, ISAE and Ministry of economy and finance) via e-mail. Concerning the preliminary estimate Eurostat has access to some greater details (both for expenditure and production components), generally one day

before the publication of the press release to guarantee the estimation of European preliminary estimate.

The complete set of QNA is regularly updated on the web database Conistat (<http://con.istat.it>) and is available for all users free on charge. A special transmission is made via e-mail to Eurostat and to other institutions (namely IMF, OECD, ECB, ISAE and Ministero dell'economia). The complete set of ESA95 questionnaires are sent to Eurostat (and available on [NewCronos database](#)) and other international organizations (namely IMF, OECD, ECB).

2.4 Policy for metadata

Italian ANA and QNA subscribe to the SDDS (<http://dsbb.imf.org>) therefore they observe a given standard providing information about coverage, periodicity, timeliness, sources and methods and dissemination practices.

A comprehensive description of the methodology of quarterly national accounts is contained in the workshops proceedings *La nuova contabilità nazionale* (Roma 12-13 gennaio 2000, vol. 1, ISTAT) and [La revisione generale dei conti nazionali 2005](#) (Roma, 21-22 giugno 2006).

The results of the study commission on temporal disaggregation techniques for QNA (see chapter 3) are presented in some contributions downloadable from [ISTAT website](#).

The innovations introduced with the National Accounts revision in 2005 are described in a set of papers available at <http://www.istat.it/istat/eventi/2006/continazionali/>.

3 Overall QNA compilation approach

3.1 Overall compilation approach

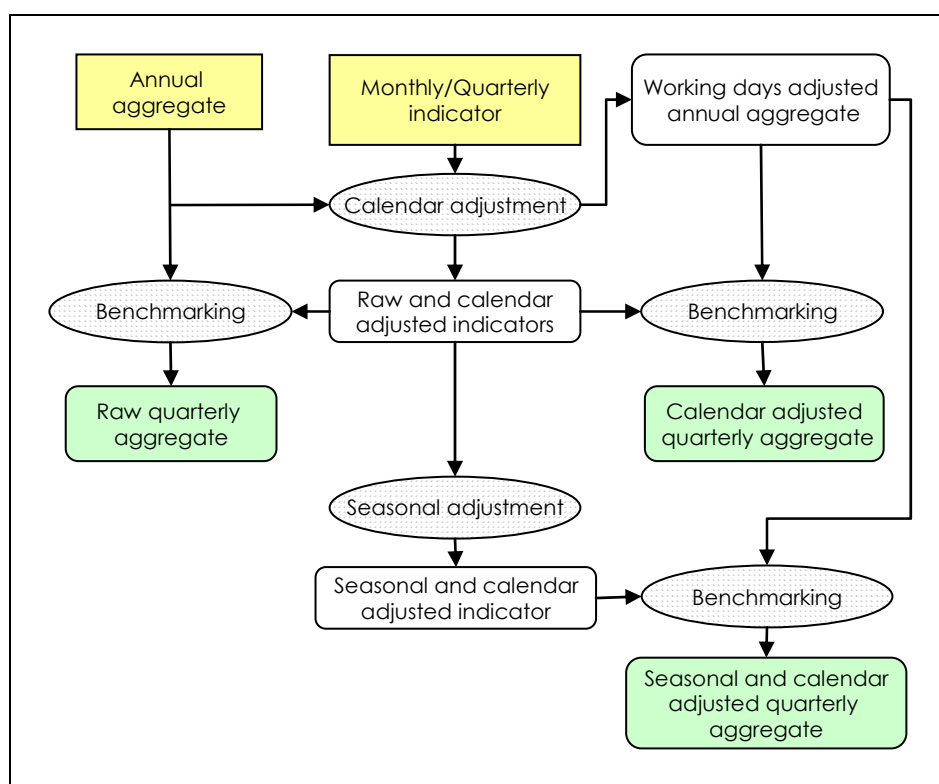
QNA in Italy are estimated using an *indirect* approach. The reduced availability of quarterly information does not allow following the same approach used to compile annual national accounts. In effect, though some experiments are currently under investigation, a Supply and Use Table (SUT) is not available in QNA yet. Quarterly aggregates are therefore derived indirectly using related time series, which are indicators observed at higher frequencies (quarterly or even monthly). The choice of such related indicators is crucial to guarantee the accuracy of QNA estimates. Different criteria are used to select indicators, the most important ones are: i) coherency with the economic concept of the aggregate; ii) statistical correlation between the (annualized) indicator and the annual aggregate; iii) timeliness and accuracy; iv) length of the series.

The adjustment for seasonal and calendar effects is done on indicators and transferred to quarterly aggregates through benchmarking techniques. This approach always guarantees the coherency between annual and quarterly aggregates, that is the sum (or the average) of the quarterly values is equal to the annual total. Annual data adjusted for working/trading days effect are also produced to ensure the coherency with the seasonal and calendar adjusted quarterly series. The adjustment to annual data is derived from the relationship with the corresponding indicator series.

The estimate of GDP is derived from both production and expenditure approaches. Actually, an independent estimate of changes in inventories is not feasible due to lack of quarterly information; therefore, changes in inventories are derived as a balance between the GDP production estimate and the other expenditure components. This implies that this variable includes a certain amount of statistical discrepancy. Although a real balancing process between supply and demand is not done, the final estimate of GDP is obtained through a validation process of the supply and expenditure components. Concerning the income approach, compensations of employees are derived independently while gross operating surplus/mixed income is derived as a balance.

QNA estimates are produced at current prices, at previous year's prices and in chain-linked volumes (in monetary terms). Generally, current prices estimates are first derived on the basis of quarterly indicators on values; volume estimates are then obtained by deflation with quarterly prices. Some exceptions to this practice exist when volume information are directly used in the estimation process.

Figure 2 shows the production process for a generic QNA aggregate. The inputs of the process are the annual data and the quarterly/monthly related indicator. The first step is represented by the calendar adjustment of the indicator, possibly at monthly level. As a result, a calendar adjusted indicator is obtained: this is used to calculate the working day adjusted annual aggregate. The seasonal and calendar adjusted indicator is obtained through seasonal adjustment of the quarterly calendar adjusted indicator. Benchmarking techniques are used to quarterly disaggregate the annual data (unadjusted and adjusted for working days effect) using the raw and pre-treated indicators. The output of the process is given by the raw, the calendar adjusted and the seasonal and calendar adjusted quarterly aggregates.

Figure 3.1 – The production process of QNA aggregates

3.1.1. General architecture of the QNA system

The QNA system is based, as said before, on estimates of GDP from the production-side, the expenditure-side and the income-side. Data are available since the first quarter of 1980 at both current, previous year's prices and chain-linked, according to ESA95 reference schemes.

From the production-side, estimates are conducted at a level of detail of 32 branches of economic activity (see chapter 2). The estimation relies mainly on the derivation of a system of volume/value indices and input-output prices used to obtain quarterly value added via a double-deflation approach. The system is based on 43 volume/value indicators and 63 price indices.

Concerning the expenditure components, private consumption is derived from different sources (household budget survey, commodity flow approach, car registration, etc.) at a disaggregation level of 29 functions according to the COICOP classification (60 volume/value indicators, 29 consumer prices). Gross fixed capital formation is estimated mainly using the commodity-flow approach for 16 kinds of investment goods (25 volume/value indicators, 16 price indices). Imports and exports are obtained by combining information on external trade statistics for goods and balance of payment data for services (8 volume/value indicators, 4 price indices).

Compensation of employees and employment data are estimated for 32 sectors, the same level used for the output components.

3.2 Balancing, benchmarking and other reconciliation procedures

3.2.1. Quarterly GDP balancing procedure

In Italy, quarterly GDP is mainly determined from the production components. Short-term Indicators on output are generally more reliable than other sources. Furthermore, the lack of any sources for changes in inventories at the quarterly frequency makes impossible the GDP compilation from the expenditure side. Then, the same balancing procedure adopted in ANA cannot be accomplished. The current practice is to derive changes in inventories as a balance of the uses and resources account, i.e. subtracting the estimates of consumption, gross fixed capital formation and net exports from the production-based GDP estimate. The accuracy of a balancing item is certainly inferior to independently-derived estimates of the other components, since it also includes possible statistical discrepancies between production and expenditure components' estimates. Given this property, the magnitude of the resulting estimate of inventories is considered as an implicit measure of the quality of the other estimated components. When the estimate of inventories is considered unreasonable (for historical or economic point of views), a sort of "qualitative" balancing procedure of GDP and expenditure components is done by adjusting production (then, GDP) and expenditure components in order to reduce their distance. This process guarantees a better coherence of the account, reducing statistical discrepancies included in inventories.

The resulting GDP estimates are used in the income account along with the estimates of compensation of employees; the gross operating surplus and gross mixed income represents the balancing item.

The current practice for quarterly GDP balancing might be subject to radical changes in the future. In fact, a supply and use scheme has been recently introduced in ANA both at current and previous year's prices. The same approach used in ANA, implying a balancing procedure for each product of the supply-use table, cannot be adopted in QNA due to the lack of information on changes in inventories. Nevertheless the use of SUT approach as a reference scheme could be very useful to value the discrepancies between production side and demand side estimates.

3.2.2. Benchmarking QNA and ANA

An indirect estimation of QNA is grounded on the use of benchmarking techniques. Such procedures guarantee a perfect alignment of quarterly data to the corresponding annual series, i.e. the sum (or the average) of the quarters of a year gives exactly the same amount of the year.

Benchmarking techniques can be divided into two wide classes:

- methods that do not involve the use of related information;
- methods that make use of related information.

Techniques of the former group are based on purely mathematical criteria for decomposing annual data in quarters, having the objective of providing a sufficiently smoothed path coherent with the temporal aggregation constraints (as the method proposed by Boot, Feibes and Lisman, 1967). The main drawback of these methods is the lack of any economic foundation in the quarterly distribution: short-term movements are derived from purely mathematical criteria. In the NA framework, it is certainly preferable to make such distribution on the basis of observed information.

Historically, quarterly disaggregation of ANA aggregates in Italy has always been done according to statistical techniques that make use of related information. The relationships between NA aggregates and reference indicators can be estimated at annual frequency. A

selection process of indicators is carried out for each aggregate, on the basis of goodness-of-fit measures at the common frequency (correlation, significance of regression coefficient, diagnostics of residuals, etc.). For the current year, indicators play the fundamental role of predictors of the annual values not yet available from ANA: their selection is thus crucial in order to offer reliable preliminary estimates of the NA main aggregates to the users.

Generally, only one indicator is chosen for each aggregate. If more indicators are available for the same variable, a weighted index is calculated. This practice is followed to make models more parsimonious in terms of parameter estimation.

In Italy, benchmarking in QNA is largely founded on the proposal of Chow and Lin (1971). The authors proposed a solution of the problem based on a generalized least-squares regression that exploits the relationship with one (or more) indicator series and restricts the quarterly results to be in line with given annual benchmarks. This solution is called "optimal" (Eurostat, 1999), to distinguish it from procedures which divide the estimation process in two operationally separated phases: preliminary estimation and adjustment to fulfil annual constraints (i.e. Denton, 1971). Furthermore, these methods are usually referred to as temporal disaggregation techniques in the literature when they imply the estimation of statistical relationships between the variables involved.

The original proposal of Chow and Lin is based on the assumption of an AR(1) process for the quarterly disturbances, that is

$$u_t = \rho u_{t-1} + \varepsilon_t.$$

This choice implies a smoothed distribution of the annual residuals in the quarters, guaranteeing a better closeness to the movements of the indicator series. However, this is true only when ρ is positive in a range between 0 and 1. There exist different methods to estimate the AR(1) parameter from the data: the most appropriate one from the statistical point of view is maximum likelihood, assuming the hypothesis of normality of ε_t .

In Italy, the value of ρ is estimated according to maximum likelihood. The use of this approach is rather recent, introduced in 2005 on the basis of suggestions and comments received from a study commission set up by ISTAT to evaluate the temporal disaggregation method used in QNA and propose alternative, more recent and feasible techniques. The conclusions of the commission, composed of academics, ISTAT researchers and selected users, are substantially in favour of the Chow-Lin approach, with possible extension to other hypothesis for the disturbances u_t .

Among these extensions, the proposal of Fernández (1981) has been evaluated as the most suitable one. Fernández proposed a random walk model for u_t , that is

$$u_t = u_{t-1} + \varepsilon_t$$

which implicitly assumes $\rho = 1$. This solution is particularly appealing when the maximum likelihood estimation of the AR(1) process provides a negative value of ρ , which would distribute the quarterly residuals with a distorting high-frequency seasonal pattern. Such cases are frequent, for example, when the relationships between aggregates and reference indicators are poor: then, the assumption of a random walk model for residuals provides more satisfactory results than the Chow-Lin AR(1) assumption.

According to these results, the AR(1) assumption of Chow-Lin is considered as the first choice for any disaggregation process, while the I(1) assumption of Fernández is chosen as an alternative in case the estimation of the AR(1) coefficient is not positive.

To improve the relationships between aggregates and indicators, each regression model is carefully analysed and tested every year. The specification of models are checked and possibly adjusted according to a selection strategy shared by every researcher in QNA. This

process is done once a year, generally in the period immediately before the publication of the results of the first quarter. In this process, well-known deterministic effects (such as dummy variables, linear or quadratic trends) are used to improve the estimation of indicators' coefficients. The standard diagnostic tests on residuals are assessed to evaluate the quality of the estimated models (normality, Durbin-Watson, serial and seasonal autocorrelation, etc.), along with graphical inspections of the estimated residuals. When an acceptable specification of the model is found, a final test is performed to evaluate its out-of-sample accuracy in predicting the annual values. This aspect is crucial because the models are used during the current year to predict the annual NA value.

Temporal disaggregation techniques that require an estimation of regression models are not always necessary. In certain cases, quarterly series present only minor differences with respect to the annual values. For example, the calculation process might induce the presence of rounding errors: it would be useless to distribute such small discrepancies in a regression context. Moreover, for certain aggregates a *quasi-direct* approach is followed (for example imports and exports of goods) that generates very small discrepancies. In such cases, the method proposed by Denton (1971) is used in place of Chow-Lin. In fact, this approach does not require any estimation process: the distribution of the differences between the annual totals and the quarterly (aggregated) series is done via a 'movement preservation principle' that guarantees a strict closeness of the disaggregated and preliminary series in terms of growth rates.

3.2.3. Other reconciliations of QNA different from balancing and benchmarking

Before their publication, QNA estimates are subjected to the following control and validation processes:

- *comparison with short-term information* (different from those used in QNA). In Italy there are short-term statistics which are widely used for business cycle analysis. The following information are considered in the validation of QNA results: consumption of electricity, that is strictly related to the production of the industrial sector; sentiment indicators from the monthly consumers and producers surveys (produced in Italy by ISAE), in particular the assessment on stocks by manufacturing firms; GDP preliminary estimates of other countries (prevalently USA and main European countries).
- *analysis of revisions of previously published QNA estimates*. Revisions of growth rates of the main NA aggregates are analysed and carefully verified. When large revisions are encountered, an analysis of the causes is carried out to understand whether they originate from revisions of sources, statistical reasons (i.e. seasonal adjustment) or possible mistakes. Possible changes of the estimates can be done when such revisions are considered unreasonable.
- *coherence between production and employment data* (productivity analysis). In Italian QNA, employment data are estimated independently from production and value added (differently from the ANA, where their estimation process is strictly linked). Therefore, the implied measures of productivity might present some interpretation problems deriving from the different sources used. For this reason, productivity indices are calculated and verified for each sector to discover possible misalignments, especially for the extrapolated quarters of the current year (that are not subject to an annual constraint).
- *soundness of indices on costs and margins*. The very last control of QNA data is done through an economic analysis of indices on costs and margins for the main sectors (agriculture, industry, market and non market services). The following indices are produced (and also published on the web-site Conistat): variable costs per unit

(compensation of employees + intermediate consumption divided by production), labour costs per unit (compensation of employees divided by production), and mark-up (output deflator divided by variable costs per unit). Abrupt changes of these indices might be interpreted as signals of incoherence between production, income and employment data; possible actions can be undertaken according to this analysis.

3.2.4. Amount of estimation in various releases

The estimates of QNA become definitive after 4/5 years from their first release, after the revision process of annual data is completed. During this period, QNA estimates are subject to revisions due to different reasons: revisions of annual data, new and updated short-term information and statistical effects (i.e. seasonal adjustment). Disregarding annual revisions and statistical factors, revisions of QNA are strictly related to the amount of short-term information available in each release. The first release is certainly the one more affected by imputations of missing data, given the (partial) lack of sources at 70 days for several aggregates. Table 3.1 shows the percentage amount of short-term information available at two different releases: the first release of the accounts after 70 days and the successive one at 160 days from the end of the quarter (not considering the GDP flash estimate after 135 days).

Concerning the release at 70 days, it can be noticed the larger percentage of information for production components than expenditure components (90.3% against 82.4%). From the production-side, the percentages vary from 98.4% of industry to 80.8% of other service activities. The coverage for imports and exports is 90% each, while both consumption components show a percentage around 80%. Gross fixed capital formation presents the largest coverage from the expenditure-side (91.9%).

In the second release of a quarter the information set is almost totally available (98.2%) for production components, with some exceptions. The agriculture production (based on harvest forecasts of the current year) at that date is still provisional; the indicator on effective production of financial sectors is sometimes missing at t+160, and when available is still very provisional; finally, administrative sources on the public sector are not completely available.

Table 3.1 Amount of short-term information at different QNA releases

Value added	Weight	% of coverage	
	2000	t+70	t+160
Agriculture and Fishing	2.3%	85.0%	95.0%
Industry, including energy	28.9%	98.4%	100.0%
Construction	4.6%	90.0%	100.0%
Wholesale and retail trade; hotels restaurants; transport; communication	21.3%	87.8%	100.0%
Financial intermediation, real-estate, renting and business activities	22.8%	90.4%	94.0%
Other service activities	18.4%	80.8%	98.1%
Taxes less subsidies	6.2%	90.0%	100.0%
GDP production-side	100.0%	90.3%	98.2%
Expenditure components		t+70	t+160
Households consumption	61.3%	80.3%	85.5%
Public consumption (including NPISH)	17.5%	80.0%	98.0%
Gross fixed capital formation	20.6%	90.4%	97.7%
Exports	27.5%	90.0%	100.0%
Imports (-)	26.9%	90.0%	100.0%
GDP expenditure-side	100.0%	82.1%	90.0%

Concerning the expenditure components, the total percentage of coverage is again smaller than that of output components (90.0%). In particular, the estimate of household consumption is based on 85.5% of total information, due to delay in the transmission of tourism indicators and the lack of information for rents.

3.3 Volume estimates

3.3.1. General volume policy

In 2006, ISTAT introduced chain-linked volume measures both in ANA and QNA, in compliance with the Commission decision 98/715/CE on prices and volumes measures in National Accounts. Volume estimates, previously expressed in constant prices of a fixed-base year, are now calculated at prices of the previous year: the new system guarantees up-to-date price structures in the calculation of period-on-period changes of volumes.

The calculation of volume estimates in Italian QNA is essentially based on a system of quantity and price indicators. Quantity indices are used directly in temporal disaggregation of the corresponding annual chain-linked series, while price indices enters a two-step calculation: first, annual deflators (calculated as the annual ratio of current and chain-linked series) are disaggregated using the relevant price indices, then the volume estimates are derived by deflating the current prices estimate with the quarterly deflator resulted from the first step.

Quantity and price indices used are prevalently published by ISTAT (i.e. industrial production indices of volumes and prices, consumer prices indices, etc.). The Laspeyres formula is applied to the calculation of both price and volume indices. The weighting scheme is generally taken from a fixed-base year (2000, at the moment), with few exceptions of price indices which have weights that are regularly updated at annual frequency (for example, consumer prices). Given the absence of chain-linked indicators, the quarterly movements of QNA chain-linked series are approximated by means of fixed-base Laspeyres indices.

Chain-linking of QNA entails additional computational complexities with respect to the case of the ANA (Eurostat, 2002). The index formula and the weighting scheme chosen are the same of the annual accounts, namely the Laspeyres volume index with annual re-weighting. This choice makes immediate the required consistency between annual and quarterly data, and, in a sense, is the only way to achieve it in an indicator-based system. Furthermore, the quarterly frequency requires the choice of a technique to construct the chain-linked volume series (IMF, 2001). Generally, the most used techniques are: the *annual overlap* technique (AO), which implies the use of the average prices from the previous year as weights for each of the quarters in the current year; the *one-quarter overlap* technique (QO), with the fourth quarter of the year compiled at both the average prices of the current year and the average prices of the previous year and the resulting ratio providing the linking factor for the current year. The AO technique has been finally chosen according to the following desirable property: it provides quarterly chain-linked series which are perfectly consistent with independently derived chain-linked ANA series, a necessary condition in a production system based on temporal disaggregation. The most important drawback is instead related to the possibility of introducing breaks from the fourth quarter of a year to the first quarter of the following year, which also appear in the respective quarter-on-quarter rate of change. Empirical evidence revealed that the impact of such breaks is small or negligible for National Accounts main aggregates.

QNA aggregates are published at current prices (CP), at prices of the previous year (PYP) and in chained volumes (CLV) using the AO technique. Time series in volumes begin with the first quarter of 1981 (at the average prices of 1980). CLV series are expressed in monetary terms with reference year 2000. For those components series which have shown zero or negative values in the past (i.e. changes in inventories) CLV series are not calculated: the real movements of such

components can be assessed from the series expressed in PYP and from contributions to GDP growth.

The CLV series in monetary terms are not additive, i.e. the sum total of the CLV sub-aggregates (e.g. final consumption expenditure, gross capital formation, exports, imports) differs from the value of the CLV aggregate (e.g. GDP). However, the combination of Laspeyres index with annual weighting and the AO technique makes the quarterly chain-linked estimates additive in the reference year and the year after (currently, 2000 and 2001). For the other years, discrepancies exist and are not allocated over the components. Instead, the estimates expressed in PYP are always additive. Then, any aggregation of components in volume is conducted on PYP series, applying afterwards the chain-linking technique considering the corresponding aggregate at current prices.

The lack of additivity of volume measures also impacts on the calculation of contributions to GDP growth. There are various techniques available to compute contributions to growth from CLV data. The technique adopted by ISTAT is based on the series evaluated at PYP. Given the additivity property of such series, the quarter-on-quarter contributions to GDP growth from a component X for quarters 2 to 4 is given by:

$$Q \text{ Cont } X_t = (X_t \text{ PYP} - X_{t-1} \text{ PYP}) / \text{GDP}_{t-1} \text{ PYP}.$$

However, for the first quarter the expression is not correct, since the fourth quarter (t-1) is evaluated at prices of year T-2 and the first quarter at prices of year T-1. Therefore it is necessary to inflate the T-2 prices to T-1 by multiplying with the reference deflators:

$$Q \text{ Cont } X_t = (X_t \text{ PYP} - X_{t-1} \text{ PYP} \cdot (X_{t-1} \text{ Def} / X_{t-2} \text{ Def})) / \text{GDP}_{t-1} \text{ PYP} \cdot (\text{GDP}_{t-1} \text{ Def} / \text{GDP}_{t-2} \text{ Def})$$

The same operation needs to be done to calculate growth contributions for year on year growth rates. For quarters 1 to 4:

$$Y \text{ Cont } X_t = (X_t \text{ PYP} - X_{t-4} \text{ PYP} \cdot (X_{t-1} \text{ Def} / X_{t-2} \text{ Def})) / \text{GDP}_{t-4} \text{ PYP} \times (\text{GDP}_{t-1} \text{ Def} / \text{GDP}_{t-2} \text{ Def}).$$

Quarterly and yearly contributions to GDP growth of main components are regularly transmitted to Eurostat within the ESA95 questionnaires and published on the database Constat.

3.3.2. Chain-linking and benchmarking

As explained in section 3.2, temporal disaggregation (or benchmarking) techniques play a fundamental role in Italian QNA. Then, temporal additivity to annual data is always guaranteed with this system. The introduction of chain-linking in ANA has required some adjustment of this practice given the lack of additivity of CLV series. In effect, temporal disaggregation techniques cannot be used to annual series expressed in average prices of the previous year, that would be additive but are not proper time series. Instead, such techniques are used to disaggregate the annual CLV series and, obviously, the current series. Fixed-based volume indicators are used to disaggregate annual CLV when chain-linked indicators are not available: in such cases the estimated results can be considered as a good approximation of the underlying quarterly CLV aggregate. This series, along with the disaggregated current prices series, can be used to derive the implicit quarterly PYP series using the AO "unchaining" technique (basically the inverse process of the AO chaining technique)

A practical example is the new deflation technique used to derive volume components from the GDP production side. In the past, the calculation of fixed-base constant value added was obtained through an adapted version of the double deflation technique for the quarterly case. In fact, the absence of quarterly sources on the value of intermediate consumption (for almost all production sectors) makes unfeasible to follow the same practice adopted in ANA. The previous quarterly double deflation technique consisted of the following 6 steps:

- i) quarterly disaggregation of annual *production at current prices*;
- ii) calculation of *production at constant prices* by deflation of i) with output prices;

- iii) quarterly disaggregation of annual *value added at constant prices* using as indicator the output of step ii) (which implies the assumption of a stable value added-to-production ratio at constant prices);
- iv) calculation of *intermediate consumption at constant prices* from the difference of ii) and iii);
- v) calculation of *intermediate consumption at current prices* by inflation with input prices;
- vi) calculation of *value added at current prices* from the difference of i) and v).

Step iv) is no longer possible with CLV measures, given the lack of additivity between components and aggregates. Then, the new quarterly double deflation technique is modified as follows:

- i) quarterly disaggregation of annual *production at current prices*;
- ii) calculation of *production in chained volumes* by deflation of i) with output (possibly chain-linked) prices;
- iii) quarterly disaggregation of annual *value added in chained volumes* (in monetary terms) using as indicator the output of step ii) (which implies the assumption of a stable value added-to-production ratio in chained volumes);
- iv) quarterly disaggregation of value added-to-production ratio at current prices using two indicators: value added-to-production ratio in chained volume (derived by dividing iii) and ii)) and output prices-to-input prices ratio;
- v) calculation of quarterly *value added at current prices* by multiplying quarterly production at current prices (step i)) with the ratio estimated at step iv).

As a result, value added and production are both available at CP and in CLV: these can be easily transformed into estimates at PYP (given the use of the AO technique), which satisfy the additive property and can be properly used in aggregation and calculation of balances.

3.3.3. Chain-linking and seasonal adjustment

Seasonally adjusted (SA) chain-linked volumes are derived from the disaggregation of annual (calendar adjusted) chain-linked series through the use of SA indicators. In fact, seasonal adjustment is performed on indicator series (see the next section for details), obtaining raw, calendar adjusted and seasonally (and calendar) versions which are used to decompose the reference annual series.

An indirect SA approach is followed for the calculation of SA aggregates (i.e. SA aggregates are derived by aggregation of SA components). Again, chain-linking has an impact on this practice, given the lack of additivity of chain-linked volumes. However, aggregation of SA series can be done on SA component series at previous year's prices: the resulting SA aggregate can be chain-linked (with the AO technique) with the SA series expressed in current prices to derive the SA chain-linked aggregates. This practice guarantees automatically the consistency with the annual (calendar adjusted) aggregate. Instead, discrepancies still exist between SA components and SA aggregates: such differences are not allocated because additivity is not a property of CLV series.

3.4 Seasonal adjustment and working day correction

3.4.1. Policy for seasonal adjustment

Since 1998, ISTAT uses a unified seasonal adjustment procedure that is the model based approach of TRAMO-SEATS (Gomez and Maravall, 1997; version 2005). The choice of this procedure has been taken by an expert Commission named SARA (Seasonal Adjustment Research Appraisal) set up by ISTAT in 1997, in order to compare the performances of some of the methods recommended by Eurostat, namely X12-Arima and TRAMO-SEATS. The latter approach was found to be more appropriate in the estimation of unobserved components of

the series. In that occasion a lot of methodological papers has been produced (ISTAT 1998), and some updating of methodological description of seasonal adjustment procedure is now available on ISTAT web site (<http://www.istat.it/istat/eventi/2006/continazionali/>)

Seasonal adjustment (SA) in QNA is performed on the indicators: more that 300 indicator series are adjusted, generally from the first quarter of 1980 till the last quarter. Seasonal component is then transferred to the quarterly aggregate through benchmarking. Even if the indicator is available at monthly level, SA is performed at a quarterly level because it has been verified that this practice significantly reduces revisions (Di Palma and Savio, 2001). This is the main difference with the practise adopted by ISTAT in the seasonal adjustment of short term indicators that are adjusted and published at monthly level.

ISTAT SA procedure uses partial concurrent adjustment that is the choice of the model is made once a year, while parameters are updated whenever a new observation becomes available. The ARIMA models and the log transformation are chosen automatically by TRAMO program and then verified through the normality test on residuals and the analysis on revision statistics that TRAMO produces. To produce SA aggregates an indirect SA approach is followed, that is SA aggregates are derived by aggregation of SA components.

3.4.2. Policy for working-day correction

Each indicator used in QNA estimation, excluding employment and compensation of employees, is analysed to check for the existence of calendar effect. When possible, Calendar Adjustment (CA) is performed on monthly indicators. As a first step, the presence of calendar effects is carefully assessed for each indicator (Di Palma and Marini, 2004): the choice is made on the basis of economic and statistical criteria. Four effects are tested:

- v. The Trading day and Specific national holidays effect (TD)
- vi. The Working day and Specific national holidays effect (WD)
- vii. The Leap-year effect (LY)
- viii. The Easter effect (EE)

For the EE checks were carried out with different lengths (from 1 to 12 days) and the evidence is that the significance of the coefficient is higher using a 6-days length. Accordingly the length of the EE is fixed to 6 days for all the series.

The Akaike Information Criterion (AIC) is used to assess the goodness of fit of the models containing the regressors corresponding to the effects seen before and the model without any regressor for CA. The ranking resulting from AIC is helpful in identifying the nature of the relationship of the series from calendar effects. Another aspect considered at this stage is the significance of the estimated regression coefficients. A maximum level of 5% of probability error, corresponding to a t -value around 2, is accepted. The same tests are carried out to detect Additive outlier and Temporary change.

Obviously the t -test gives the statistical significance of a coefficient but does not give information about its meaningfulness from an economic point of view. This can be assessed by the sign of the coefficient, and to a lesser extent by its magnitude; the final choice is delegated to the experience of the researchers who validate the results obtained.

For example, positive coefficients for WD and TD regressors are expected to arise for variables related to industrial activities; in these cases a negative value would generate opposite corrections for calendar effect. Secondly, the value of a coefficient can vary over time and this could cause different correction mechanisms from period to period. Our model considers only fixed regressors and then it is preferable to have robust estimates of the coefficients; this is why a stability analysis of the estimated coefficients of CA is carried out once a year.

Another important validation made by researchers is the detection and the estimation of outliers. In fact different outliers in subsequent estimation might cause strong differences in seasonal adjusted series. To avoid such revisions in the latest revision of QNA (March 2006) a change in SA procedure has been introduced. Now outliers are identified once a year, together with the identification of ARIMA model, then during the year they are kept fixed. The existence of possible new outliers is tested only on new observations.

The models finally chosen are used to derive the adjusted series, subtracting the overall effect due to calendar regressors from the original aggregates. The calendar effects also affect annual data as the number of working/trading days normally varies from year to year. Therefore, the adjusted annual totals (obtained transferring the quarterly adjustment to raw annual data through an econometric model that exploits the relationship between the annualized indicator and the annual data) should differ from raw annual totals. As a consequence, annual growth rates can vary from year to year according to the relative number of days.

The next step consists in removing the seasonal component from the indicators. As said before, in our approach, seasonal adjustment is performed at a quarterly frequency. This choice was supported by the results in Di Palma and Savio (2001), which shows that performing temporal aggregation prior to seasonal adjustment consistently reduces the variance of the revision errors. Seasonal adjustment is performed on the CA indicators adjusted for outliers. Removing any deterministic effects from a time series improves the process of decomposition of time series into stochastic components (trend, cycle, seasonality and residual). In particular calendar effects are expected to disturb mainly the seasonal component: the removal of calendar components definitely improves the quality of the seasonal adjustment process. The overall adjustment of national accounts aggregates for both seasonal and working/trading day components guarantees a clearer picture of business cycle.

QNA are produced and published expressed in raw form, in calendar adjusted form, and in seasonal and calendar adjusted form. They are disseminated through paper publication (in particular press releases) and internet publications. The complete set of QNA data is always updated and available on Conistat database (<http://con.istat.it>).

Users are made aware of the methods and the practices used in calendar and seasonal adjustment through methodological papers and notes added to the press release. ARIMA models and parameters used in the SA process are issued only for internal usage.

As said before the quality of the SA process is assessed by the researchers who deal with QNA production. The first analysis conducted at this purpose is the graphical inspection of the mean and the standard deviation of the raw and the SA series. To evaluate the quality of ARIMA models the Ljung-Box statistics on residuals is used. A stability analysis over time is carried out once a year when the ARIMA model is fixed. Another important indicator used to evaluate the quality of SA process is the similarity of quarterly growth rates (on the corresponding quarter of the previous year) of raw and SA series. Also an examination of the significant peaks of the autocorrelogram of the raw series is carried out. At last, as said before AIC and BIC statistics are used to validate the choice of the CE adjustment model.

4 GDP components: the production approach

4.1 Gross value added, including industry breakdowns

In the QNA system, the quarterly supply-side aggregates are estimated separately for market and non-market activities. The methods and sources used in the estimation of production and value added differ substantially between market and non-market activities (86.5% and 13.5%, respectively, of total value added in 2000). The non-market value added is mainly concentrated in the L-M-N-O sectors, ranging from 99.9% for public administration (L) to 11.1% for other community, social and personal service activities (O). The L sector is entirely estimated using the non-market approach, while the M-N-O sectors are derived from the sum of independent estimates of market and non-market components. Instead, only the market approach is used for the rest of the economy, considering the share of non-market production contained therein as negligible. The detail of value added estimates is shown in chapter two (table 2.1).

The evaluations are done at market prices since many indicators are evaluated at market prices, while many others form a good proxy. Only afterwards, the evaluations are done at basic prices, as required by Eurostat.

For each branch of economic activity, the quarterly production and value added aggregates are estimated by means of the new quarterly double-deflation procedure described in paragraph 3.3.2. Hence, the quarterly input-output price system constitutes an integral part of the production process of the supply-side aggregate time series.

The input-output prices system

The quarterly calculation of input-output prices is done coherently with the annual procedure, namely gathering the same information and adopting the same accounting framework. Nevertheless, the annual method cannot be fully replicated due to the lack of the same information at quarterly level. Therefore, quarterly deflators of production and intermediate consumption are estimated disaggregating the corresponding annual deflators through reference quarterly (price) indicators.

The calculation of quarterly deflators is done through the following steps:

- Construction of a monthly system of input and output price indicators;
- Disaggregation of the production deflator with the reference output price indicator;
- Disaggregation of the intermediate consumption deflator with the input price indicator.

This procedure guarantees both the coherence with the national accounts' annual data and the strict closeness to infra-annual price indices, which are generally used to evaluate price tendencies.

Output prices are calculated as the weighted average of domestic production prices and export prices. Likewise, input prices are given by the weighted average of domestic production prices of intermediate goods and import prices. The weights are derived from the supply-use tables at the previous year's prices, while the calculation is done on a monthly basis for 101 branches.

The most important sources used for constructing input and output quarterly price indicators are collected from the following surveys (carried out by ISTAT):

- production prices of industrial goods [\[S16\]](#);
- consumer prices [\[S15\]](#);
- foreign trade statistics (import and export unit values) [\[S9\]](#).

Concerning prices of industrial goods, they are distinguished by final and intermediate goods for constructing output and input prices, respectively. The coverage is nearly complete for industrial goods.

Consumer price indices are used as a proxy of the production prices for the following service activities:

- Hotels and restaurants (HH);
- Transports and storage (II1);
- Post and communication services (II2);
- Financial intermediation (JJ);
- Other community, social and personal service activities (OO);
- Private households with employed persons (PP).

As regards foreign trade statistics, Istat produces monthly indices of import and export unit values. In QNA, they are considered as a proxy of import and export prices of agriculture and industrial goods. The indices used are based on a Fisher-type weighting, with weights that vary annually. Import and export unit values are chain-linked using the annual overlap technique.

Additional sources are considered for agricultural and construction sectors. Specific input and output price indicators for agriculture are collected from a survey conducted by ISTAT on prices of products purchased and sold by farmers [\[S17\]](#); indices of construction costs of a residential building, an industrial building and a motorway section are employed as input and output prices for construction activity [\[S18\]](#).

Agriculture, hunting and forestry and fishing (AA-BB)

The quarterly value added of the agricultural sector in volume terms is calculated through a pure double deflation approach, as the difference of independently-deflated production and intermediate consumption. The indicators used for the temporal disaggregation of the agricultural and livestock production are constructed from the annual productions in volume terms of a group of agricultural and animal products, which covers about 90% of the overall production (Table 4.1).

Table 4.1: Products used for temporal disaggregation of the agricultural production

Crops				Animals
Soft wheat	Carrots	Wine	Kiwifruit	Bovine cattle
Durum wheat	Strawberries	Olives	Nursery products	Swine
Rice	Sugar beet	Olive oil		Sheep and goats
Hybrid maize	Tobacco	Oranges		Poultry and rabbits
Potatoes	Sunflower	Lemons		Milk
Fresh beans	Soya beans	Mandarins		Eggs
Artichokes	Flowers	Apples		Straws
Tomatoes	Forage plants	Pears		
Courgette	Table grapes	Peaches		Other
Pepper	Sold grapes	Nectarines		Agricultural service activities

Next, a quarterly indicator is calculated as the sum of the quarterly productions of each product, determined according to a fixed quarterly calendar of production and harvesting. The indicator is then used to quarterly disaggregate the total agricultural production in volume terms.

Likewise, the annual intermediate consumption are disaggregated according to a fixed quarterly calendar applied to different inputs of the production process (seeds, fertilisers, pesticides, feeding stuffs and veterinary expenses, energy and other expenditure). The indicator obtained is used for quarterly disaggregating the agricultural intermediate consumption in volume terms.

The production of fishing is disaggregated by the quantity of fishery products landed in national ports [\[S3\]](#). Value added is calculated following the standard double deflation

approach described in section 3.3.2. Specific price information on fishery products are not available; some information on price tendencies are collected from the [ISMEA](#) website,

Manufacturing industries (CB-DN excluding DF)

The estimates of the 15 manufacturing sectors are conducted using as indicator the industrial production index (IPI) of the relevant activities [\[S1\]](#). IPI is a reliable and timely indicator, published on a monthly frequency within 45 days after the end of the reference period.

IPI of the 15 branches of manufacturing activities are first calendar adjusted at monthly frequency then aggregated at quarterly level and seasonal adjusted (see section 3.4).

After inflating the raw, the calendar and the seasonally adjusted indicators with the corresponding output prices, they are used to quarterly disaggregate the annual production at current prices.

Once obtained quarterly production at current prices value added at current prices and in volume is derived using the quarterly double deflation approach (see section 3.3.2).

Energy industries (CA, DF, EE)

The quarterly estimates of energy sectors are based on a method that uses a wide set of information. In the breakdown assumed for the supply side estimates (see chapter 2, table 2.2) the energy sector is divided into Extraction of energy minerals (CA), Manufacturing of coke, refined petroleum products and nuclear fuel (DF) and Electricity, gas, steam and hot water energy supply (EE). The estimate, however, includes 29 elementary products for which detailed information on price and quantity is available.

Production is estimated by means of the aggregation (net of taxes) of elementary indicators calculated quantity per price. The tax revenue component of the production results from the quantity sold of the most relevant energy products¹. This is very important for the refined petroleum products and gas supply activities, activities in which the tax revenue is extremely significant.

Another important information, used in the estimate, is that on the quarterly costs for the manufacturing activity (DF): regarding intermediate inputs of coke (coal mainly of foreign origin) and of refined petroleum products (domestic and national raw and unfinished oil), which were expressed in value terms by means of the production and import prices.

Construction sector (FF)

The procedure applied to estimate the aggregates of the construction sector differ from the one used for other sectors, in fact production side estimates are obtained using expenditure side estimates. The basic information used in the quarterly disaggregation of construction sector aggregates is represented by the *construction production index (CPI)* [\[S2\]](#). This indicator produced at monthly level but published at quarterly level covers all the construction activities referred to both new activities and maintenance. The CPI is now published, at national level, about 65 days after the end of the reference quarter, nevertheless QNA producers receive, under embargo, the monthly index about 65 days after the reference month (this imply that two months are available at t+45 days from the reference quarter).

The estimation process consists in four main steps:

- i) preliminary treatment of indicators (forecast of a month is necessary, CA, SA);
- ii) quarterly disaggregation of investments in chained-linked volumes using CPI;
- iii) quarterly disaggregation of production in chained-linked volumes using chained-linked investment obtained in ii)²;

¹ Namely Super premium gasoline, unleaded gasoline, diesel fuel, heating gas oil and methane gas.

² Being the difference between production and investments the ordinary maintenances the hypothesis is that the ordinary maintenances follow the same pattern as that of the total investments in constructions.

- iv) quarterly disaggregation of value added in chained-linked volumes using chained-linked production obtained in iii);
- v) quarterly double deflation approach is applied to derive value added at current prices.

The aggregation level at which investments must be estimated is laid down in a Community Regulation³, according to which investments in constructions must be disseminated separately for Residential buildings (Housing), and Non-residential buildings and public works (Other construction). The splitting of quarterly investment in construction between housing and other construction is made using the annual shares of the two components; in fact, currently, no short-term information is available to distinguish between the two components⁴.

The basic short term information used to deflate the investments in constructions includes the following elementary indices:

1. *Construction cost index of a residential building*: this monthly index measures the variations registered over time in the costs directly attributable to the realisation of a house building⁵. Published since January 2003 in basis 2000, it is disseminated at about t+90 days.
2. *Construction cost index of an industrial building*: this quarterly index measures the variations registered over time by the direct costs sustained to construct an industrial building. It is published in basis 1995 with an average delay of about 120 days.
3. *Construction cost index of a motorway section*: this quarterly index measures the variations registered over time by the direct costs sustained to construct 100 meters of road. It is published in basis 1995 with an average delay of about 120 days.

Market services

Short-term information used in the estimation of the production of market services includes a rather un-homogeneous set of elementary time series (in terms of reference period, time and sectorial aggregation level, type of aggregate, etc.), systemised and aggregated to form synthetic branch indicators. Some of the basic information necessary to calculate the synthetic branch indicators is available only one or two months after the end of the reference period. Therefore, it is necessary to forecast such elementary indices. In general forecasting, calendar adjustment and seasonal adjustment are performed on elementary indicators.

The estimation procedure entails to calculate first the quarterly production, generally at current prices, then deflated using the relevant chained linked output deflator. In some cases (namely wholesale and retail trade services, real estate, renting and business services, education services and health and social services), when the output prices are not representative of the sector, quarterly disaggregation is performed both at current prices and in chain-linked volumes and the output deflator is then obtained as an implicit measure. In both cases the quarterly and value added is estimated by means of the *new double-deflation procedure* described in paragraph 3.3.2.

- *Wholesale and retail trade services; repair services of motor vehicles, motorcycles and personal and household goods (GG)*

The reference indicator to disaggregate the Wholesale and retail trade sector production is represented by the quarterly trade margins. They are estimated by applying the trade margin

³ See Eurostat (1998, 1999).

⁴ Community Regulation on short term statistics (Regulation 1178/98) requires the publication of the construction production index divided into the two components. According to this Regulation, NSI will provide three quarterly indices: the construction general index, the housing and non-residential buildings index and the civil engineering index. When the transmission of these short term indicators will be operative, they could help to have better quality estimates.

⁵ In particular, all costs sustained for labour, materials, transports and leases are surveyed.

shares drawn from the 2000 input-output table to the quarterly expenditure items: household goods consumptions (12 consumption functions), investments (6 kinds of goods), total exports of goods and intermediate consumption of goods (32 branches). The indicator is used at both current prices and in volume terms.

- *Hotel and restaurant services (HH)*

The indicator used to disaggregate the hotels and restaurants production at current prices is represented by the quarterly household consumption expenditure in hotels and restaurant services (consumption function COICOP 21) at current prices.

- *Transport and storage services (II1)*

The production of the transport services at current prices is disaggregated by means of a composite indicator made up of the weighted mean of the indices of the different transport activities. The weights of the different components (rail, road, sea and air transport) are drawn from the National accounts data (year 2000). Regarding the rail transport, the quantity indicator is represented by the monthly traffic (passengers and tons-km)⁶ [S6]. The quantity indicator is then inflated with the output prices of the rail transports to obtain an indicator in current prices.

Concerning the road transport, the quantity indicator is represented by the monthly motorway traffic relative to trucks (expressed in millions of vehicles-Km)⁷ [S7]. The quantity indicator is then inflated with the output prices of the internal transports to have an indicator in value terms.

Finally, for sea and air transport quarterly turnover indices (division 62-Ateco 2002, air transport and division 61-Ateco 2002 sea transports)⁸ are used. The indices are published within 90 days after the end of the reference quarter but are supplied under embargo within 70 days to QNA division.

- *Communication services (II2)*

The production of the communication services at current prices is disaggregated by means of a composite indicator: a weighted mean of the turnover of the postal companies (Group 64.1-Ateco 2002) and telecommunication companies (Group 64.2-Ateco 2002) [S8]. Also these indicators are published within 90 days after the end of the reference quarter but are supplied under embargo within 70 days to QNA division.

- *Financial intermediation (JJ)*

The quarterly production of financial intermediation sector is elaborated in current prices for the three different components: a) commissions and fees (directly measured), b) revenues from FISIM (see paragraph 4.2) and c) the production of insurance services. The production of a) estimate is carried out by means of an indicator on commission derived from the *Matrice dei Conti* (Bank of Italy) [S14]. From a theoretical point of view this is almost the same approach used for annual estimates; actually the use of this quarterly indicator generates a lot of problems in quarterly estimates. First of all it is available with a big delay (between 115 and 170 days from the reference quarter) and in addition it always shows big revisions both at different quarterly releases and with respect to the annual data.

Quarterly output of insurance services, both life and non-life, is estimated on the basis of quarterly premiums: this methodology reflects insurance proceeding of charging a fee on premiums earned to remunerate their activity.

⁶ The train traffic data are provided by the Italian Railways (Ferrovie dello Stato).

⁷ The motorway traffic data are provided by the Italian Association of Toll Motorways and Tunnels Operators (Associazione Italiana Società Concessionarie Autostrade e Trafori)

⁸ The production of the turnover quarterly indices in the market service sector is regulated by the Community STS regulation, whose purpose is to allow comparing the short-term economic statistics produced by the European Union's member states.

Once obtained quarterly production at current prices by adding up the estimates of a), b) and c) value added at current prices and in volume is derived using the quarterly double deflation approach (see paragraph 3.3.2).

- *Real estate, renting and business services (KK)*

The indicator is the weighted mean of two indices: the employment of the corresponding activities and the total intermediate consumptions of the whole economy multiplied by the expenditure coefficients drawn from the 2000 input-output table. This indicator is constructed in volume terms and at current prices.

- *Education services (MM)*

The indicator for disaggregating the private education services is made up of household expenditure in education services (consumption function COICOP 20) at current prices and in volume terms.

- *Health and social services (NN)*

The indicator for disaggregating the private health service production is made up of the household expenditures in health services (consumption function COICOP 11) at current prices and in volume terms.

- *Other community, social and personal services (OO)*

The indicator is the sum of the expenses sustained for recreational services, including repairs of recreational goods (consumption function COICOP 19) and other services (consumption function COICOP 24) at current prices.

- *Private households with employed persons' services (PP)*

Production of private households with employed persons' services corresponds to the income of the same activity. Therefore no quarterly disaggregation is performed for this sector.

Non market services

Value added for non market activities at current prices is evaluated by adding up the costs of labour, the amount of taxes paid less subsidies received on production and the consumption of fixed capital: the indicator is built as the sum of quarterly compensation of employees, other taxes on production and consumption of fixed capital paid by non-market sector. Sources and methods for D1 and D29p are described in sections 6.1 and 6.2 respectively. Considering K1, no short-term information is available then it is estimated using a trend indicator.

Chain-linked volume measures at quarterly level for value added is obtained for L and O activities using the annual data and the quarterly employment as a proxy in the disaggregation method. Differently, value added by M and N activities is obtained by using the quarterly double deflation approach where chain-linked measures of production are obtained using a trend indicator.

4.2 FISIM

The methodology of estimation of Financial Intermediation Services Indirectly Measured (FISIM) in the National Accounts allows the detailed calculation and allocation of FISIM produced by banking and financial intermediaries (resident and non-resident domestic) to the user sectors as intermediate or final consumptions. For Non-financial corporations, Financial auxiliaries, Insurance corporations and pension funds, General Government, Households as owners of dwellings, Household as owners of unincorporated enterprises and Non-profit institutions serving households the FISIM are recorded as intermediate consumptions, while the FISIM for Household as consumers are considered as final consumptions.

The calculation of FISIM on is based on the multiplication of the stocks of loans and deposits for each institutional sector by the relative interest rate spreads (the spread for the loans being the difference between the effective interest rate on the loans and the internal reference rate

and the spread for the deposits the difference between the internal reference rate and the effective interest rate on the deposits). At annual level the internal reference rate is an endogenous inter-banking interest rate, estimated by dividing the inter-banking interests flows (source: *Matrice dei Conti*, Bank of Italy) by the inter-banking stocks (source: *Conti Finanziari*, Bank of Italy). This is the only difference with the estimation of FISIM at quarterly level; in fact in this case the internal reference rate is estimated using as indicator the inter-banking interest rate to six months. This is the only reason why the quarterly estimation process of FISIM is not a direct one. Therefore, once obtained the indicators for each sector, they are seasonally adjusted and then used to quarterly disaggregate the annual figures.

The imported and exported FISIM are estimated with an external reference rate as a weighted average of imported and exported interests flows and the relative stocks.

4.3 Taxes less subsidies on products

Taxes on products (d21) are divided into: taxes on value added (VAT) (d211), taxes and duties on imports (d212) and taxes on products (d214). The data are collected by the Fiscal Policy Department of the Ministry of Economy and Finance (MEF). Data on taxes are provided on a monthly basis, on an assessment and on a cash basis and with the breakdown of taxes by type. The basic data on an assessment basis are rectified with time adjustments to obtain consistency with ESA 95 concepts (on Accrual basis⁹). These adjustments eliminate the time lag between accrual and assessment time of recording and they are made to align the time of assessment with the time of economic accrual. The indicators so obtained are seasonally adjusted (not calendar adjusted) and they are used in temporal disaggregation. Taxes on products, except VAT and import taxes are made by industries. The breakdown by industries is obtained assigning one or more type of taxes at respective industries. The items are estimated at current price.

The ESA95 regulation (4.39) for subsidies on products is not easy to apply in practice. However, it is possible to identify types of support, for which the most appropriate stage of accounting can be determined. For transfers to quasi-corporations or public-sector companies, it is generally more appropriate to use budget commitments. Therefore, the actual outgoings from the treasury are the flow which comes closest to the accrual principle, in terms of both the amount and the time of recording. For other forms of subsidies, which in any case account for less substantial amounts, the cash records are regarded as the most reliable. Data are collected by MEF. When the direct information is significant the data are seasonally adjusted (not calendar adjusted) and they used as indicators to quarterly disaggregate the annual figures.

In volume terms the estimate of taxes less subsidies on products is carried out by means of an indicator obtained multiplying the rates of taxation by the relevant expenditure categories (namely consumptions, gross fixed capital formation and exports). The deflator is obtained implicitly.

⁹ An economic transaction has to be recorded at the time in which the economic effects are produced, that is, when the economic value is created, transformed or extinguished, or when claims and obligations arise, or are transformed or are cancelled (ESA95, par. 1.57).

5 GDP components: the expenditure approach

5.1 Household final consumption

The quarterly estimation of household final consumption expenditure is based on the functional classifications (COICOP) grouping expenditure on goods and services in homogenous categories according to the type of need (see chapter two).

Estimates of household consumption are conducted in volume terms. When indicators are expressed in values they are preliminarily deflated. The deflators are obtained by means of the monthly consumption price index. The same deflators allow passing from the final series in volume, which result from the process, to those at the previous year's prices and at current prices.

The quarterly estimate of the households' expenditure for goods and services is obtained, integrating the data from the survey on the Italian Households Consumptions named Household Budget Survey (HBS) [S11] with those obtained through the commodity flow approach, and with a series of specific indicators for some consumption functions.

When more than one indicator is available for the same function, an econometric analysis is performed to derive a synthetic indicator. Indicators are selected according to the significance level of parameters of the OLS regression while the weights are the regression's coefficients. Table 5.1 shows the percentage of utilisation of each indicator over total final household consumption.

Table 5.1: Percentage of utilisation of each indicator over total final household consumption

Main indicators	Percentage
Household budget survey (HBS)	30%
Commodity flow	22.6%
Sales index	11.2%
Turnover index	2.2%
Other	34%

Most of services (clothes repair, recreational services, medical and hospital services, education, other services) and the fuel expenses (both for house and transport) are estimated by means of the HBS indicators. The other consumption goods, goods for entertainment, jewellery, leather goods and other personal hygiene items, are instead obtained as a combination of the HBS indicators with the commodity flow indicators. Concerning food expenses, the retail trade index [S10] is used in addition to the information given by the HBS. ISTAT monthly survey on retail sales it is used also to estimate quarterly expenses for dwelling.

The commodity flow approach is theoretically the same as the one used in annual estimates, however the quarterly procedure is simplified due to the limited availability of data quarterly level.

The commodity flow approach gives the value of the resources (domestic production plus imports) potentially available for final and intermediate uses and attributes such value to the different uses through the destination shares of the internal and imported components detected by annual tables of import uses. The domestic production is estimated by means of the monthly industry's turnover index for domestic uses [S12], while the indicator for the imported component is the value of the monthly imports of consumption goods. Turnover and imports are matched together using as weights the regression's coefficients of the annual relationship between consumption and the annualized indicators of turnover and imports.

The estimate of the expenditures in hotels and restaurants services is conducted by means of quantity index derived by ISTAT survey on Occupancy in hotels [S5]. The indicator consists in the overnight stays of Italians and foreigners in the different accommodation structures, both hotel or complementary. These data, available at monthly level are aggregated at quarterly level and then seasonally adjusted. This indicator presents a strong seasonality in the third quarter, due to the large increase of the number of overnight stays in July and August (about 36% of the year). However, the related annual aggregate also includes restaurants activities, which probably are not affected by such a highly pronounced seasonal profile. To make this indicator more suitable for the whole aggregate, the seasonal peaks are markedly smoothed.

The motor vehicle purchases estimate is based on a quantity index constructed on the basis of monthly car registrations detected from Ministry of Transports, Anfia (National Association of Car Manufacturers) and Unrae (National Union of Distributors of Foreign Vehicles) [S4] and available for brand, model, and legal personality of the owner. The legal personality allows separating final household consumption from the investments.

As regards transport services' purchases, including expenses for train, road, water and air transports, a composite indicator was constructed based on various sources. For air transport expenses the information used is the passenger traffic detected by Assaeroporti (Italian Association of Airport Operators). Concerning rail transport expenses, information relative to passenger traffic is taken from the Italian railways (Ferrovie dello stato). A supply - side approach is applied to the households' expenses for sea navigation for which the indicator is represented by the turnover quarterly index of sea transport enterprises produced by ISTAT (see section 4.1). The turnover index is used also in the estimation of communication services.

Coherently with the annual estimate the quarterly private pharmaceutical expenditure is estimated on the basis of purchases of class C medicines (not refunded by the National Health Service) detected by Farmindustria and on the basis of purchases of medicines with prescription charges detected by Federfarma [S13].

No short term information is available for the rents, therefore quarterly disaggregation is performed through a trend indicator. Expenses sustained for domestic services are estimated on the basis of the employment (in labour units) in the correspondent activity.

Finally, the new treatment of the indirectly measured financial intermediation services (FISIM) involves attributing the financial intermediation service consumption to various economic operators. For details of the estimation see section 4.2.

5.2 Government final consumption, including split individual/collective consumption

To estimate Final consumption expenditure for General Government (GG) and Non-Profit Institutions Serving Households (NPISH) at current prices a components approach is adopted.

No short-term information is available for final consumption of NPISH. Since GG and the NPISH together form the macro sector of non-market services, the quarterly figures for these two sectors are jointly calculated.

The procedure consists in estimating the main components of final consumption expenditure for GG and NPISH: gross value added and intermediate consumption by NACE activities (i.e. production) and social transfers in kind. The first is obtained by adding up data of compensation of employees, other taxes on production and consumption of fixed capital paid by GG by NACE activities.

Quarterly sources for GG consumption expenditure are supplied on a raw basis. Such information does not cover the total amount of expenditures, so the quarterly figures are compiled using an indirect approach based on infra-annual indicators.

The estimation method of compensation on employees and other taxes on production by activities is explained in sections 6.1 and 6.2 respectively.

Concerning non-market consumption of fixed capital, no short-term information is available, therefore the quarterly disaggregation of annual consumption of fixed capital by NACE activities is done by means of a statistical mathematical method (Denton, 1981) using a linear trend as indicators.

The procedure for calculating non-market quarterly intermediate consumption is basically the same described in section 6.1: intermediate consumption is estimated by the main GG bodies. These results are then aggregated to obtain an indicator for total GG and then assigned by sector of activity.

Looking at the sources, the Ministry of Economy and Finance (MEF) provides data on State budget commitments. In the case of Local health authorities, the profit and loss accounts compiled by Local Public Health Units supplied by the Ministry of Health is used when available (i.e. period 1980 Q1-1996Q4 and from 2003Q1 onwards); when it is not available the gap in the series is filled using the quarterly information taken from quarterly cash accounts report. This last source is also used as a proxy for the estimation of intermediate consumption for other local bodies and Social Security Funds. Since quarterly information is not available, these figures are broken down by NACE activities using annual data: the quarterly estimates for the bodies whose activities clearly belong to a specific NACE activity are directly assigned as indicator, for the remaining NACE activities; the final indicator is split following the annual structure.

Finally, social transfers in kind are obtained using as an indicator the accrual data on social transfers in kind paid by Local health authorities from the profit and loss accounts compiled by Local Public Health Units. This kind of data suffers of the same problem mentioned above for intermediate consumption.

An indicator for quarterly final consumption of the GG and NPISH as a whole is obtained by adding up intermediate consumption and non-market value added (the production) and social transfers in kind.

Since quarterly information is not available, the annual structure is used for the breakdown of final consumption between GG and NPISH.

To obtain the estimate of individual consumption of GG at current prices (P31), the quarterly figures of social transfers in kind (D631) and the production by NACE as a proxy of individual consumption are used (P1i, i.e. education activities). For the activities with mixed services (P1m, i.e. other community, social and personal service activities), the annual weight of individual services (Π) in each activity are used to split the two components. The final indicator is thus given by the formula

$$P31 = \sum P1i + \sum P1m * \Pi + D631.$$

No direct information is available at quarterly level to estimate P3 for GG and NPISH in volume terms. Therefore, it is implicitly derived from the following expression

$$P3 = D1 + K1 + D29 + P2 + B2 - P11 - P12 - VR + D631$$

with:

- D1 is compensation of employees;
- K1 is consumption of fixed capital;
- D29 is other taxes on production;
- P2 is intermediate consumption;
- B2 is operating surplus;
- P11 is market output;
- P12 is output produced for own final use;
- VR is incidental sales.

From these items it is possible to calculate the value added.

In the first step the quarterly indicator for D631 and VR is obtained using a trend in temporal disaggregation, starting from the annual data at the previous year's prices.

In the second step B1 is estimated by NACE activity LL and OO. The number of employees is used as indicators. Then for these industries it is possible to estimate the output P1 as the algebraic sum of B1 and P2 at the price of previous year.

The third step consists in calculating the output (P1) for sectors MM and NN. Given the lack of direct sources, a linear trend is used. Value added (B1) for these industries is estimated as the difference between P1 minus P2 at previous year's prices, following the same method used in ANA. Finally, the sum of P1 and D631 minus VR is used as an indicator to estimate P3 at prices of the previous year.

The calculation of individual consumption of GG (P31) in volume terms is based on the quarterly series of social transfers in kind (D631), as clearly linked to individual consumption, and on the quarterly volume estimates for non-market output (P1) and incidental sales (VR) of GG in the Education, Health and Social work, Other community, social and personal service activities are obtained.

Concerning VR and D631, quarterly sources in volumes are missing. It has been therefore decided to use again linear trends as reference indicators.

The indicator for P31 at prices of previous year is obtained as

$$P31 = \sum P1 - \sum IS + D631$$

where the sum \sum is made on values referred to the Education, Health and Social work, Other community, social and personal service activities.

5.3 NPISH final consumption

See paragraph 5.2.

5.4 Gross capital formation

a. GFCF

The quarterly gross fixed capital formation estimates are carried out at great level of detail identifying 15 asset types (see chapter two, table 2.3). The quarterly disaggregation of annual data on gross fixed capital formation is mainly done by means of the commodity flow approach shown in the previous section. As will be explained below other specific indicators are used to disaggregate some kind of good.

The estimates of quarterly gross fixed capital formation are done at current prices and then deflated with different prices according to the type of asset. The only exception is the estimation of quarterly investment in commercial vehicles that is done in chained-linked volumes and then inflated with the relevant price index.

Agriculture, forestry and fishing

The quantity indicators necessary to quarterly disaggregate this kind of investment are derived from growth calendar of plantations and of livestock consistency. This two series are then inflated with the relevant quarterly deflators to obtain estimates at current prices.

Machines and equipment

Machines and equipment are estimated by means of the commodity flow approach already seen in section 5.1. The only difference is that domestic production and imports are kept separated: the quarterly disaggregation of domestic production is obtained by means of the industry's turnover monthly index for domestic uses, while the quarterly imports are calculated through the quarterly imports' value of investment goods. The indicator used to estimate the quarterly deflator is a weighted average of the quarterly production and import price indices of capital goods.

Constructions

For the estimation of investment in construction see section 4.1.

Transport equipment

Investment in transport equipment is estimated mainly by a quantity per price approach for three different components: car expenditures, commercial vehicles and aircraft.

The estimation method of quarterly expenditure of cars is the same seen in section 5.1. Regarding the prices index, an exhaustive monthly-updated price dataset by brand and model is constructed. These prices are multiplied by the corresponding number of registrations to obtain a first estimate of the expenditure for investments in cars. The final estimate is carried out by subtracting the value of the cars registered as zero-km.

The estimate of commercial vehicles is done using a monthly indicator given by the number of new vehicle registrations detected by UNRAE (National Union of Distributors of Foreign Vehicles), divided into nine categories (industrial vehicle grouped into six weight classes, trailers and semi-trailers, buses and coaches). The aggregate indicator is a weighted mean of the different categories indicators where the weight system is calculated on a yearly basis and is represented by the percentage of each aggregate on the total number of new vehicle registrations. The UNRAE data are available only two months after the reference quarter, for this reason the t+70 estimate is carried out only with partial data, this often leads to considerable revisions between the first and the second estimate.

The expenditure for investment in aircrafts is based on the registrations data drawn from the Italian Civil Aviation Authority's archives (Enac). Moreover, Enac gives information on the cancellations from the aeronautical registry, which allows estimating the disinvestments in aircrafts. Being Italy mainly an importer country, the prices are estimated on the basis of information, gathered from Foreign Trade data.

Other investment goods

The item of other investment is a rather un-homogeneous one since it includes goods production activities, service activities and immaterial goods therefore the methods used for the various components are quite different.

The extraordinary maintenances of cars are quarterly disaggregated, using as indicators the quarterly series at current prices and at constant prices of investments in cars.

The quarterly real estate expenditure is estimated, using as reference indicator the quarterly series of investments in houses. Such procedure is also applied for investments in mineral prospecting.

The procedure for estimating software is more complex, as it is distinguished into purchased software and self-produced software.

The quarterly estimate of the first component is based on the quarterly turnover index of the computer sector's enterprises.

As regards the self-produced component, the indicator is based on a weighted average of the compensation of employees available at 32 branches where the weights are derived from annual accounts.

No short-term information is available for entertainment, literary or artistic originals then quarterly disaggregation of this component is carried out by means of a trend indicator.

b. Changes in inventories and valuables

An independent estimate of changes in inventories is not feasible due to the complete lack of any quarterly information on this variable. For this reason, changes in inventories are derived as a balance between the GDP production estimate and the other expenditure components. The current practice is to derive changes in inventories as a balance item of the uses and

resources account, i.e. subtracting the estimates of final consumption, gross fixed capital formation and net exports from the production-based GDP estimate.

The accuracy of a balancing item is certainly inferior to independently-derived estimates of the other components, since it also includes possible statistical discrepancies between production and expenditure components' estimates. Given this property, the magnitude of the resulting estimate of inventories is considered as an implicit measure of the quality of the other estimated components. When the estimate of inventories is considered unreasonable (for historical or economic point of views), a sort of "qualitative" balancing procedure of GDP and expenditure components is done by adjusting production (then, GDP) and expenditure components in order to reduce their distance. This process guarantees a better coherence of the account, reducing statistical discrepancies included in inventories.

Valuables include mainly goods from branch 57 relative to jewellery and goldsmith. For this reason the quarterly disaggregation of valuables is carried out using as indicator the quarterly investments of branch 57 obtained through the commodity flow approach as seen in previous section. The indicator used to quarterly disaggregate the annual deflator is the weighted average of the consumption price index for expenditure in jewels and quarterly import prices.

5.5 Imports, exports

The method used to compile the quarterly figures of imports and exports of goods and services differs substantially from those used for estimating the other aggregates. For external trade, in fact, quarterly estimates at current prices are not obtained through a temporal disaggregation of the annual figures, but in a direct way. This is possible for two reasons: the first is that all the information necessary for the compilation of the annual estimates is available also at quarterly frequency, except for some minor adjustments; the second is that imports and exports of goods and services do not vary in the balancing process of annual accounts in order to ensure the consistency between the balance of goods and services in National Accounts and in the Balance of Payments (BOP).

Exports of goods (P.61) are obtained as follows:

A. Exports of goods from Foreign Trade Statistics (FTS)	+
B. Coverage adjustments (BOP)	–
C. Goods (FTS) reclassified as services	+
<u>D. Services (BOP) reclassified as goods</u>	<u>=</u>
Exports of goods (P.61)	

Imports of goods (P.61) are obtained as follows:

E. Imports of goods from FTS	+
F. Coverage adjustments (BOP)	–
G. Cif/Fob adjustment (BOP)	–
H. Goods (FTS) reclassified as services	+
<u>I. Services (BOP) reclassified as goods</u>	<u>=</u>
Imports of goods (P.61)	

Exports of services (P.61) are obtained as follows:

J. Exports of services from BOP	–
K. Exports of construction services reclassified as property income	+
L. Exports of FISIM	+
C. Goods (FTS) reclassified as services	–
<u>D. Services (BOP) reclassified as goods</u>	<u>=</u>

Exports of services (P.62)

Imports of services (P.61) are obtained as follows:

M. Imports of services from BOP	–
N. Imports of construction services reclassified as property income	+
N. Imports of FISIM	+
H. Goods (FTS) reclassified as services	–
<u>I. Services (BOP) reclassified as goods</u>	<u>=</u>

Exports of services (P.62)

Items A, C and E are available from Foreign Trade on a monthly basis at $t+55$ days from the end of the reference quarter and are revised upwards 13 months after the end of the reference year due to the late arrivals of the Intrastat annual declarations provided by traders which are below the established thresholds. Since in annual National Accounts imports and exports for the last year incorporate this bias, FTS monthly series for the last year are used as benchmarking indicators. For the current year quarterly figures are obtained multiplying the disaggregated series by the year over year growth rate of foreign trade data. This approach has been established in accordance with the BOP compilers in order to reach a full consistency of the two accounts.

Items B, F, G, J and M are available on a monthly basis from BOP. It is important to note that BOP annual data are released 3 months later the annual National Accounts. This in turn implies that all the revision made in that period are not reflected neither in annual nor in quarterly series of National Accounts. In order to be consistent with the dynamics of BOP data, for current year quarterly figures of services are calculated multiplying the quarter to quarter growth rate of BOP data by the values of the corresponding quarter of the NA series.

For items D and I, the correction is the same as that used for annual series.

Items K and N are estimated only on annual basis and the same correction is applied to quarterly series.

Concerning items L and N, at present FISIM is identified in Italian National Accounts but not in BOP. However, from the first quarter of 2004 BOP compilers estimate and transmit to Eurostat and the European Central Bank the value of imported and exported FISIM and the correction to interest flows. The methodology of estimation has been jointly established in order to avoid future discrepancies when these flows will appear also in BOP.

Imports and exports in volume terms are obtained by deflating the current prices estimates using the external trade unit values (for goods) and the indices of prices of service activities of foreign countries (for services).

6 GDP components: the income approach

6.1 Compensation of employees, including components (wages and salaries)

Compensation of employees (D1) "is defined as the total remuneration, in cash or in kind, payable by an employer to an employee in return for work done by the latter during the accounting period." (ESA95, §4.02). Compensation of employees is broken down into two components: wages and salaries (D11) and employers' social contributions (D12). The methods and sources used in the estimation of these aggregates differ substantially between market and non-market activities (73.3% and 26.7%, respectively, of total compensation in 2000). The non-market income is mainly concentrated in the L-M-N-O sectors, ranging from 99.9% for public administration (L) to 23.3% for other community, social and personal service activities (O). The L sector is entirely estimated using the non-market approach, while the M-N-O sectors are derived from the sum of independent estimates of market and non-market components. Instead, only the market approach is used for the rest of the economy, considering the share of non-market production contained therein as negligible. In the rest of the section we describe the relevant aspects of the two approaches. It is important to stress that the income account is not compiled in real terms but only estimated at current prices.

The estimation of compensation of employees for market activities is obtained from the temporal disaggregation of per-capita annual figures. The compensation of employees, wages and salaries, and social contributions yearly series are divided by the corresponding number of employees in terms of full-time equivalents (FTE, without considering wage supplement fund for company crisis and restructuring): this preliminary operation is necessary because it takes the effects of the employment concept used in NA out of the income aggregates, making more favourable the comparison with the available short-term statistics on labour costs.

The temporal disaggregation of per-capita figures is based on two indicators, both produced by ISTAT:

1. The Labour Cost Index (LCI, wages and other costs) in industry and services [\[S21\]](#);
2. The wage index from collective agreements [\[S22\]](#).

The first source is extracted from the administrative survey OROS, conducted by ISTAT on INPS (Istituto Nazionale di Previdenza Sociale) data, the most important Italian Social Security institution. The administrative data are integrated with statistical information drawn from the survey on large industrial and services firms and from the ASIA archive. The main aim of the OROS survey is to produce quarterly information on changes of gross wages, other labour costs and total labour cost for Italian firms in the private sector (sections C to K of the Nace Rev.1 classification) with at least one employee. The production of these indices started in 2004, given the importance of this source and the strong relationship with NA data, they were introduced in the QNA system during the major revision in 2006. However, some conceptual differences exist between OROS and NA definitions: managers' compensation is excluded from this survey, flows are recorded on a cash basis and employer's imputed social contribution are not available.

A serious problem of this source is the relative shortness of the series: time series are only available from 1996Q1. A back recalculation of the relevant indices was performed for the period 1980Q1-1995Q4, exploiting information from the survey on large firms (years 1986-1995) and historical data from a survey of the Ministry of Labour on actual wages and salaries (years 1980-1985).

The OROS indices of wages and salaries, back-calculated from 1980Q1, are used to estimate per-capita wages and salaries of sectors from C to K (25 sectors). The raw indices (in base 2000) are first collected, then they are seasonally adjusted with TRAMO-SEATS, without

correction for calendar effects (we did not find statistical evidences in favour of this choice, probably due to the shortness of the series).

The same approach is followed for the calculation of social contributions, using the corresponding indices of the other labour costs. The disaggregated series, once transformed in levels from the multiplication with the estimated quarterly series of employment in FTE, are added up to achieve the total compensation of employees of these sectors.

For the P sector only (private households with employed persons), the index of wholesale and retail trade sector (G) is used to disaggregate per-capita wages and salaries. This sector is used as a proxy of the income received by persons providing many different services to households (housekeepers, gardeners, chauffeurs,...).

The wage index from collective agreements is calculated on the basis of national labour agreements and, for the agricultural (AB) and construction (F) sectors, from the relevant provincial labour agreements. Contrary to OROS indices, this survey does not consider the effective amount of time worked by employees (overtime, night work, etc.) and other exceptional payments not covered by the contract. Such problems make this information less suited in the context of NA: nevertheless, it represents the unique source for some sectors of the economy. Bearing this in mind, the wage index per employee is used to disaggregate the annual per-capita wages and salaries of the following sectors: agriculture (A), fishing (B), construction (F), private education (M, only market), health and social work (N, only market) and other community, social and personal service activities (O, only market). The levels of the series are again obtained by multiplying the quarterly per-capita series with the number of estimated employees in FTE.

A further problem of this index is related to the seasonal component: in fact, it does not show any seasonal fluctuation. This might be nonsense for agriculture and construction sectors, where the lack of seasonality for income aggregates would be compared with the strongly seasonal estimates arising from production and expenditure sides. For this reason an appropriate seasonal pattern is added to the original wage index of these sectors such that the resulting raw series are more coherent with the rest of the accounts.

For sectors A-B-F, the estimated levels of wages and salaries are the indicator series used to disaggregate the compensation of employees. In fact, quarterly information on social contributions is not available from the official statistical system. With this practice we implicitly make the assumption that the other income costs follow the same dynamics provided by wages and salaries during the current year. This hypothesis is not too much hasty, provided that the legal framework on labour costs does not change during the year.

The estimate of compensation of employees for non-market activities is carried out in different stages by involving quarterly construction of time series for General Government (GG)¹⁰ main bodies, i.e. the State, the Health Sector and the other local authorities.

The source used for the State compensation of employees consists in the data processing system managing the payment of wages and salaries; in the case of the Health Sector the source are profit and loss accounts compiled by the units belonging to Public Health Sector. Finally for all the other local authorities cash flows data are used. These data are based on the staff expenditure and are made available quarterly by the General Accounts Department (MEF) through the quarterly cash accounts report. All these pieces of information are collected on a raw basis, then they are seasonally adjusted before the quarterly disaggregation procedure.

¹⁰ No information is available for Non Profit Institutions Serving Households (NPISH) on a infra-annual basis. Since GG and the NPISH together comprise the macro sector of non-market services, the quarterly figures for these two sectors have been jointly calculated.

Concerning the State, the indicator for wages and salaries (D11), available since 1998, is built up from the monthly series of remuneration paid to the State employees. For the previous quarters the indicator was retroplated using the wage index from collective agreements [2]. These indices need to be supplemented by information coming from other sources to find the non-routine components of remuneration (e.g. arrears paid on renewals of contract) excluded from the indices by construction.

Actual social contributions, split into health and social security charges from 1997, are calculated according to a system of actual deductions applied to remuneration on the basis of the structure of legal coefficients. Imputed social contributions, negligible since 1996¹¹, are disaggregated on the basis of expenditure on pensions directly charged by the State and, in the case of other imputed benefits, on the basis of the trend of annual per capita figures multiplied by quarterly employment. The quarterly series of compensation of State employees is then obtained by aggregating the individual components.

Regarding the Social Health Sector, accrual data on total compensation of employees are available from 2003 and from 1980 to 1995. To cover the gap period between the two series quarterly data from the cash accounts report were used.

Compensation of employees of other part of local government is calculated from the quarterly series on staff expenditure provided by the MEF. These data account for the expenditure incurred by local bodies, without any distinction between remuneration and social contributions.

For bodies belonging to local government the total compensation is disaggregated as a whole; the components are obtained by means of a system of coefficients derived from annual data series, which are corrected whenever modifications occur during the year.

As a final step, the quarterly series obtained are aggregated and used as an indicator for the quarterly disaggregation of the overall GG compensation of employees.

Starting from GG compensation of employees it is possible to estimate quarterly series on D1 and D11 split by NACE activities: L (Public administration and defence; compulsory social security); M (Education); N (Health and Social work) and O (Other community, social and personal service activities). The row data for NACE L, M, N, O are estimated following different procedure because no direct information is available at infra-annual level.

The raw figures at quarterly level for L (non-market and market activity) and M (non-market activity) are calculated on the basis of a weights system derived from the annual data broken down by NACE activities. The quarterly weights are calculated by disaggregating the annual weights on the basis of a linear trend. The obtained information (ratio) permit to assign the part of quarterly GG compensation to employees to NACE L and M. This result is used as a proxy in the disaggregation procedure. Quarterly estimate for N data (related to non-market activity) is done using as indicator the quarterly row data (D1 and D11) of Local Public Health Units.

No direct information is available at quarterly level for D1 and D11 on NACE O (non-market activity). Then per capita data for D1 and D11 are estimated by NACE activity and the per capita figures on NACE O are used as an indicator in quarterly disaggregation.

The seasonal adjusted data by NACE activity are obtained with the same procedure used for raw data, namely by using seasonally adjusted compensation of employees of GG.

¹¹ There were noticeable changes between 1996 and 1998, which reflected modifications as a result of the reforms of the tax and pension systems. The 1996 reform concerned the changeover from administering the social welfare system for government employees on an imputed basis to a system based on actual charges, with changes to the structure of social contributions charged by the State. The 1998 reform switched health funding to general taxation, eliminating from the compensation of employees the share of health contributions paid by employers.

6.2 Taxes less subsidies on production

Taxes on production and imports are divided into Taxes on products (D21) and other taxes on production (D29). The estimation of taxes on products (D21) is described in section 4.3. The data on taxes on production are collected by the Fiscal Policy Department of the Ministry of Economy and Finance. They are provided on a monthly basis, on an assessment and on a cash basis and with the breakdown by type. The basic data on an assessment basis are rectified with time adjustments to obtain consistency with ESA 95 concepts. The indicators so obtained are seasonally adjusted (not calendar adjusted) and used in temporal disaggregation. Only data at current price are estimated.

Subsidies on production have the same characteristics of subsidies on product (see section 4.3). The data are collected by the Ministry of Economy and Finance. The consistency between the annual and the quarterly data is carried out with method Chow-Lin. The items are estimated at current price and they have no need of working day correction.

6.3 Gross operating surplus & mixed income

The balancing item Gross operating surplus and Mixed income ($B2^*G + B3^*G$) is the last item which can be calculated for the industries, the institutional sectors, and the total economy. It is derived as the residual of the generation of income account (ESA table 103). We calculate this item as the difference between GDP ($B.1^*G$) and the sum of compensation of employees (D1) and the total amount of taxes less subsidies on production and imports (D2-D3). The same practice is used in annual accounts, due to the lack of reliable sources. A positive outcome of this practice is that it is not necessary to adjust the operating surplus (independently derived) to offset extraordinary payments to employees in special months (such as 13th month's payment); in fact "where operating surplus is derived as a residual, the impact of the increased income will be implicitly taken into account" (QNA Handbook, § 3.113).

7 Population and employment

7.1 Population

The estimation of population in QNA is based on data from the Demographic Balance of resident population, collected by ISTAT through a survey from Italian municipalities.

In QNA, monthly population data are calculated as the average between the beginning and the end of each month: the quarterly indicator is obtained as a mean of the corresponding three monthly averages. Since information are available only after 180 days the end of year, the data are provisional for the most recent quarters.

7.2 Employment: persons

ISTAT produces different measures of employment as established by the ESA95 transmission programme: employed persons, hours worked, jobs and full-time equivalents.

The quarterly employment estimates, coherently with the annual ones, meet the exhaustiveness criteria. The principle of exhaustiveness is a direct extension of definitions adopted in SNA93 and ESA95. According to both systems, underground, informal and illegal productions are included within the production limit (though illegal production is currently not included in the accounts of the European Union's member countries).

Statistical sources on unregistered employment are lacking on a quarterly basis. Because of the importance of the unregistered component in the NA employment concept, the method adopted in QNA provides estimates for some specific types of the above kind of work.

The production process of employment data is done at the same level of detail of production and income components, both for employees and self-employed (see chapter two, table 2.2). Several statistical surveys and administrative sources are used as inputs of the process, which are briefly summarised below.

Labour force survey [\[S19\]](#)

The Labour Force Survey (LFS) represents the main source for the quarterly estimation of resident employed persons. The LFS has been considerably modified in 2005. The survey is now continuous, that is conducted on every weeks of the year, and no longer on a specific week of each quarter; moreover, some definitional changes has been introduced in the new version (definition of employees, questions on hours worked, etc.). These changes have led to statistical breaks in the historical time series, therefore a back-recalculation of employed persons and hours worked have been necessary up to the first quarter of 1980, in order to enable the temporal disaggregation of ANA employment data with the required length. The LFS covers a considerable part of the NA employment: the registered first jobs and a share of unregistered employed persons (i.e. who are not registered by the company or not visible to the welfare and tax institutions).

Wages, other labour costs and total labour cost in industry and services (OROS) [\[S21\]](#)

Since 2003, ISTAT publishes quarterly indices on wages, social contributions and total labour cost for industrial and service activities (with only market production). The indices are obtained from the integration of administrative monthly data collected from the INPS (Welfare Institute) and the monthly survey on employment in large firms [\[S20\]](#).

In QNA, the OROS data are used for disaggregating the annual employment of the manufacturing industries. For this sector this source is considered as more exhaustive than the LFS, even though it only refers to the registered component of the employment.

Other specific informative sources

Bank of Italy provides specific indicators on the employment in the financial intermediation sector. Concerning the General Government sector, information is indirectly drawn from the annual forecasts made by the government in the Economic and Financial Planning Document and other official policy documents.

The workers in the Wage Guarantee Fund (WGF) are estimated on the basis of the number of hours authorized by INPS to enterprises that require it for extraordinary and ordinary management of production in the industry and service sectors, as well as for special management in the construction sector.

Quarterly information on part-time employees is collected from INPS database, on the basis of payments of compulsory social contributions. These data are used to disaggregate the part-time component of the employment.

The sources mentioned above are used to estimate employment in persons, jobs and full-time equivalents.

Persons and jobs

Employed persons are calculated according to the concept of domestic employment, which differs from the concept of national employment used, for example, in the LFS. Indeed, the definition used in NA excludes residents who work for non-resident productive units, but includes the following types of employed persons not considered by the LFS: a) conscription soldiers; b) non-residents who work in resident productive units; c) employed persons living permanently in institutions; d) residents who work but whose age is not considered in the labour force.

The quarterly disaggregation of total employment is done combining the results from two different estimation processes:

- disaggregation of employed residents (registered and unregistered);
- disaggregation of non-resident and unregistered foreign workers.

Indicators from the LFS are used for agriculture, construction and service activities (8 industries), while employment indices from the OROS survey are used for manufacturing and energy branches (18 industries). Specific indicators are used for financial intermediation, public administration and education (see above).

The results obtained from this process are finally validated at an upper level of detail (NACE A6 classification), in order to verify possible mismatches with the LFS data: in fact, from this source it is possible to detect potential movements of unregistered employment, while OROS survey only includes registered subordinate jobs. The quarterly estimates are generally revised according to the above macro analysis by industry in order to preserve the economic trends coming from the LFS data as much as possible.

To obtain the final estimation of the employed residents, it is necessary to estimate non-resident and unregistered foreign workers not observed from the LFS. This estimation is done with specific data from the LFS.

Once the estimation of employed residents is completed, it is possible to obtain an estimation of the quarterly jobs by summing first and second job positions. Second jobs are disaggregated according to their employment status:

- 1) second job positions of employees in the industrial sector are mainly registered, then the OROS indicator is used;
- 2) subordinate second job positions in hotels and restaurants, transport, business services and employed persons by private households, being mainly unregistered, are disaggregated with data from the LFS relative to the number of employed persons who carry out a second activity;

- 3) for subordinate second jobs in the financial intermediation sector, the indicator provided by the Bank of Italy on subordinate employment is used as a proxy;
- 4) second jobs of self-employed are estimated according to the whole LFS trend.

Full-time equivalents

Employment in full-time equivalents (FTE) measures the quantity of work obtained transforming the total number of job positions into full-time working activities. Separate disaggregation processes of annual FTE are done for registered and unregistered employment, employees in WGF, part-time workers and second jobs.

Full-time equivalents are obtained as the sum of registered and unregistered components, multiple job positions and non-resident and unregistered foreign workers. Part-time jobs are removed from this group and replaced with their transformation into full-time work units. Full time equivalents within the WGF are excluded because they do not take part of the income production process.

7.3 Employment: total hours worked

Hours worked include the hours actually worked, whether paid or non-paid, in any employment status (employees or self-employed), provided that their output is within the production boundary. According to ESA95, total hours worked is the preferred measure of labour inputs in National Accounts. In addition, they represent the indicator most suitable for analysing labour productivity.

To obtain such total hours worked, an estimate of per-capita average hours (for both principal and secondary activities) is multiplied by the corresponding number of job positions. Annual per-capita hours worked is disaggregated with the available indicators from the LFS and from the monthly survey on large firms. The temporal disaggregation of annual job positions are done with the same practice describe in section 7.2.

The short length of the LFS indicator on hours worked has required a back-calculation of the series from 1992Q4 to 2003Q4 because of the break in the survey in 2004Q1. A model-based approach has been used to this purpose, distinguished by type of employment. Then, per-capita hours worked in principal activity have been back calculated for the period 1980Q1 to 1992Q3 with information drawn from the previous survey; concerning the secondary positions, the trend resulting from the ratio between quarterly FTE and job positions are employed. Total hours actually worked, for employees and self-employed, have been obtained by summing hours worked for principal and secondary jobs. The final estimated indicators present very good fit with the annual data. For manufacturing and energy sectors a composite indicator is used: hours worked from the LFS and an index of hours worked collected by the survey on large firms are weighted with the number of full-time equivalents relative to medium-small firms (1-499 employees) and large firms (500 and more employees), respectively.

Hours worked are seasonally and calendar adjusted, with the same methodology used for any other QNA aggregate. It is the unique labour measure which is adjusted for calendar effects, due to the highly significant results of regression coefficients in many industries.

8 From GDP to net lending/borrowing

8.1 Primary income from/to the ROW (D.1 to D.4), gross national income

Gross national income (B.5g) is calculated adding to gross domestic product the net flow of primary income with the Rest of the World (ROW). Quarterly primary income is estimated by each component as follows:

8.1.1 Compensation of employees (D.1)

Information on compensation of employees from/to the ROW is available from the BOP on a quarterly basis. There are not conceptual or methodological differences in the compilation of this aggregate between National Accounts and BOP, thus the sum of the BOP quarterly figures match exactly the annual NA values and no further benchmarking is required.

8.1.2 Taxes on production and imports (D.2)

Information on taxes on production and imports paid to the ROW is available from the BOP on a quarterly basis. There are not conceptual or methodological differences in the compilation of this aggregate between National Accounts and BOP, thus the sum of the BOP quarterly figures match exactly the annual NA values and no further benchmarking is required.

8.1.3 Subsidies (D.3)

Information on subsidies received from the ROW is available from the BOP on a quarterly basis. There are not conceptual or methodological differences in the compilation of this aggregate between National Accounts and BOP, thus the sum of the BOP quarterly figures match exactly the annual NA values and no further benchmarking is required.

8.1.4 Property income (D.4)

Property income is evaluated differently in Italian National Accounts and in BOP. It follows that quarterly data from the BOP are adjusted to meet NA concepts. The first adjustment concerns the undistributed earnings by the collective investment institutions that are not included in BOP. This flow is estimated in NA on annual basis and quarterly values are obtained by benchmarking using the BOP figures as indicator. The second adjustment is on interest flows that in BOP are evaluated gross of FISIM. These flows are corrected on the basis of the values of imported and exported FISIM separately for deposits and loans. Finally, the share of construction services reclassified as property income (see paragraph 5.5) is added.

8.2 Consumption of fixed capital (K.1), net national income, acq. less disp. of non-financial non produced assets (K.2)

Net national income (B.5n) is obtained subtracting the consumption of fixed capital (K.1) from gross national income (B.5g).

No infra-annual information is available for capital stock then the quarterly estimate of consumption of fixed capital is obtained using as indicators the quarterly total gross fixed capital formation series. The quarterly disaggregation is done both at current prices and in volume terms, with the deflator calculated implicitly.

Information on acquisition less disposal of non financial non produced assets (K.2) is available from the BOP on a quarterly basis. There are not conceptual or methodological differences in the compilation of this aggregate between National Accounts and BOP, thus the sum of the BOP quarterly figures match exactly the annual NA values and no further benchmarking is required.

8.3 Current transfer from/to the ROW (D.5 to D:7), net national disposable income (B.6n)

Information on current transfers from/to the ROW is available from the BOP on a quarterly basis. There are not conceptual or methodological differences in the compilation of this aggregate between National Accounts and BOP, thus the sum of the BOP quarterly figures match exactly the annual NA values and no further benchmarking is required.

Net national disposable income (B.6n) is obtained subtracting net current transfers from net national income (B.5n).

8.4 Adjustment for the change in net equity (D.8), net saving (B.8)

Net saving (B.8n) is derived subtracting consumption expenditures (P.3) from net disposable income (B.6n).

8.5 Capital transfers (D.9), net lending/borrowing (B.9)

Net lending/borrowing is obtained adjusting net saving (B.8n) by net capital transfers (D.9), net acquisition of non financial non produced assets (K.2) and net capital formation, that is gross capital formation less consumption of fixed capital (k.1).

Information on capital transfers (D.9) and from/to the ROW is available from the BOP on a quarterly basis. There are not conceptual or methodological differences in the compilation of this aggregate between National Accounts and BOP, thus the sum of the BOP quarterly figures match exactly the annual NA values and no further benchmarking is required.

9 Flash estimates

9.1 Flash GDP estimate

A preliminary estimate of QNA is produced after about 45 days from the end of the reference quarter. The methodology used for producing the preliminary estimate is the same used in the regular estimation. The preliminary estimation is based on incomplete information, therefore a greater use of forecasting techniques is made. Forecasts are generally obtained by using Autoregressive Distributed Lag (ADL) regressions with explanatory variables or univariate ARIMA models. The program TRAMO is used in the latter case. Missing indicators are forecasted at the monthly frequency: in this way it is possible to exploit one or two months of the quarter that were possibly available and predict the remaining information.

Flash estimates are based on incomplete information and, consequently, are less accurate than regular estimates. The loss of accuracy can be somehow related to the amount of information used in the two estimation processes. The following table shows the coverage of sources (in %) at 45 days and at 70 days for the main GDP components (delays at which preliminary and regular estimates are currently published). The percentages in the table indicate the coverage in the two occasions with respect to the complete information (only indicators are considered, not the annual NA aggregates). The first column shows the components' weights with respect to total GDP. These weights allow the calculation of the same percentages for GDP. At 45 days, the coverage of sources from the production side is wider with respect to the expenditure side (63.0% against 35.6%). This is rather usual for short-term statistics, since production statistics are generally available earlier than other statistics. This aspect reinforces the choice of compiling the quarterly GDP estimate prevalently from the output side.

Table 9.1 Amount of short-term information between flash and regular estimates

Value added	Weight	% of coverage	
	2000	t+45	t+70
Agriculture and Fishing	2.3%	75.0%	85.0%
Industry, including energy	28.9%	91.9%	98.4%
Construction	4.6%	60.0%	90.0%
Wholesale and retail trade; hotels restaurants; transport; communication	21.3%	51.0%	87.8%
Financial intermediation, real-estate, renting and business activities	22.8%	63.0%	90.4%
Other service activities	18.4%	28.3%	80.8%
Taxes less subsidies	6.2%	70.0%	90.0%
GDP production-side	100.0%	63.0%	90.3%
Expenditure components		t+45	t+70
Households consumption	61.3%	33.8%	80.3%
Public consumption (including NPISH)	17.5%	0.0%	80.0%
Gross fixed capital formation	20.6%	69.7%	90.4%
Exports	27.5%	60.0%	90.0%
Imports (-)	26.9%	60.0%	90.0%
GDP expenditure-side	100.0%	35.3%	82.1%

Though estimates are made for all QNA on the expenditure side and the production side regularly published, the only information made available to users for the preliminary estimate is the total GDP expressed in chained values in seasonally adjusted form. Eurostat has access to some greater details, but it cannot disseminate the information to users. The GDP preliminary

estimate of Italy is taken into account by Eurostat, along with those coming from other European countries, to produce the flash estimate for the EU and the Euro area.

A typical tool to analyse the accuracy of preliminary estimates is the analysis of revisions, i.e. the comparison of flash estimates to the first regular release of QNA. Recently, an empirical study on the revisions of flash estimates produced by ISTAT during the period 2000-2005 has been done. The table below shows the mean revision (MR) and the mean absolute revision (MAR) (in terms of growth percentage rates) between the preliminary and regular estimates relative to GDP and value added of the six main economic sectors. The MR statistic indicates if preliminary estimates are biased, while MAR denotes the average amount of revision. The table confirms that revisions of GDP in the above mentioned period have been very limited. Flash estimates of components have been more subject to revisions, especially regarding the agriculture, construction and financial intermediation sectors. These results confirm that, at the moment, only the estimate of GDP is sufficiently reliable to be published to the users, while for the other components more efforts are required to achieve an acceptable level of reliability.

Table 9.2 Revision measures of GDP flash estimates and production components. Period: 2000q1-2005q4.

GDP and production components	Mean Revision	Mean Absolute Revision
GDP	-0.02%	0.04%
- Agriculture and Fishing	-0.12%	0.37%
- Industry, including energy	-0.01%	0.13%
- Construction	-0.20%	0.62%
- Wholesale and retail trade; hotels and restaurants; transport; comunic.; etc.	0.00%	0.23%
- Financial int., real-estate, renting and business activities	0.05%	0.35%
- Other service activities	-0.04%	0.24%

9.2 Flash employment estimate

A preliminary estimate of employment data is currently not calculated by ISTAT. The first QNA estimates of employment are released after 70 days, along with the complete set of ESA accounts. The indicators used to estimate QNA employment data are available too late to permit an earlier estimate: variables from the LFS and the OROS surveys are never received before 65 days the end of the quarter.

In 2006 the project "A preliminary estimate of QNA employment data through an econometric approach" was undertaken by ISTAT¹². The project was granted by Eurostat to make a feasibility study for a preliminary estimation of employment data in QNA. An econometric model was formulated to predict quarterly employment of six economic sectors and total economy. Monthly data from LFS was acquired to this purpose, trying to exploit one or two months and predict the remaining information of the quarter with *ad-hoc* forecasting models. The results obtained were not satisfactory, and the project concluded that with this situation it is not possible to publish early estimates of employment with an appreciable level of quality.

9.3 Other existing flash estimate, if any

¹² Eurostat Grant Agreement n. 01400.2005.003-2005.643

10 Main data sources used

Volume indicators

[S1] Industrial production survey	
Type of source	Survey
Periodicity	Monthly
Main variables used	Industrial production index
QNA aggregates estimated	Production and value added of industrial sectors (18 manufacturing sectors, from CA to EE)
Timeliness	40 days
Further adjustments	Seasonal and calendar adjustment
Organisation	Istat
Link to European surveys	In accordance with the EU Reg. n. 1165/98 concerning short-term statistics

[S2] Production index in the construction sector	
Type of source	Indirect method (production function)
Periodicity	Monthly (published quarterly)
Main variables used	Production index
QNA aggregates estimated	Investment, production and value added of construction activity (FF)
Timeliness	70 days (65 for internal use)
Further adjustments	Seasonal and calendar adjustment
Organisation	Istat
Link to European surveys	In accordance with the EU Reg. n. 1165/98 concerning short-term statistics

[S3] Quantity of fishery products landed in national ports	
Type of source	Survey
Periodicity	Monthly
Main variables used	Total weight of fishery products
QNA aggregates estimated	Production and value added of Fishing (BB)
Timeliness	180 days
Further adjustments	Seasonal adjustment
Organisation	Irepa, Istat and Mipa
Link to European surveys	-

[S4] Car registrations	
Type of source	Administrative
Periodicity	Monthly
Main variables used	
QNA aggregates estimated	Purchases of vehicles for consumption and investment
Timeliness	
Further adjustments	Seasonal and calendar adjustment
Organisation	Minister of Transport, ANFIA, UNRAE
Link to European surveys	-

[S5] Overnight stays in hotels and other structures	
Type of source	Administrative
Periodicity	Monthly
Main variables used	Overnight stays spent by residents and non residents in hotels and other structures
QNA aggregates estimated	Consumption of hotels and restaurants
Timeliness	120 days
Further adjustments	Seasonal and calendar adjustment
Organisation	Istat
Link to European surveys	-

[S6] Motorway traffic	
Type of source	Administrative
Periodicity	Monthly
Main variables used	Number of trucks and light vehicles passed through motorways
QNA aggregates estimated	Production and value added of transport (II1), consumption of transport services
Timeliness	120
Further adjustments	Seasonal and calendar adjustment
Organisation	AISCAT
Link to European surveys	-

[S7] Railway traffic	
Type of source	Administrative
Periodicity	Monthly
Main variables used	Number of passengers by kilometres, tons of goods by kilometres
QNA aggregates estimated	Production and value added of transport (II1), consumption of transport services
Timeliness	70
Further adjustments	Seasonal and calendar adjustment
Organisation	FS
Link to European surveys	-

Value indicators

[S8] Turnover index in other services	
Type of source	Survey
Periodicity	Quarterly
Main variables used	Turnover indices
QNA aggregates estimated	Production and value added of transport and storage (II1), communication (II2),
Timeliness	80 days (65 days for internal use)
Further adjustments	Seasonal and calendar adjustment
Organisation	Istat
Link to European surveys	In accordance with the EU Reg. n. 1165/98 concerning short-term statistics

[S9] Foreign trade	
Type of source	Survey
Periodicity	Monthly
Main variables used	Current values and unit values of imports and exports
QNA aggregates estimated	Imports and Exports (current values and prices) Input and output price system
Timeliness	70 days
Further adjustments	Seasonal and calendar adjustment
Organisation	Istat
Link to European surveys	In accordance with the EU Reg. n. 3330/91 and successive modifications

[S10] Retail trade	
Type of source	Survey
Periodicity	Monthly
Main variables used	Retail trade index
QNA aggregates estimated	Consumption of food and household goods
Timeliness	50 days
Further adjustments	Seasonal and calendar adjustment
Organisation	Istat
Link to European surveys	In accordance with the EU Reg. n. 1165/98 concerning short-term statistics

[S11] Households Budget	
Type of source	Survey
Periodicity	Quarterly
Main variables used	Consumption
QNA aggregates estimated	Consumption of food, alcoholic beverages, repairs of clothing, energy, hospital services, accessories for personal transport equipment, fuel, equipment for entertainment, services of entertainment, education, other services
Timeliness	70 days (65 for internal use)
Further adjustments	Seasonal and calendar adjustment
Organisation	Istat
Link to European surveys	-

[S12] Industrial turnover and orders	
Type of source	Survey
Periodicity	Monthly
Main variables used	Domestic and non domestic turnover
QNA aggregates estimated	Consumption of alcoholic beverages, clothing, furniture, household goods, durable medical products, telephone equipments, equipment for entertainments, other services (commodity flow approach)
Timeliness	80 days (65 days for internal use)
Further adjustments	Seasonal and calendar adjustment
Organisation	Istat
Link to European surveys	In accordance with the EU Reg. n. 1165/98 concerning short-term statistics

[S13] Medical products	
Type of source	Administrative
Periodicity	Monthly
Main variables used	Purchasing of medical products with prescription charges
QNA aggregates estimated	Consumption of medical and pharmaceutical products
Timeliness	70
Further adjustments	Seasonal and calendar adjustment
Organisation	FederFarma
Link to European surveys	-

[S14] Accounts matrix	
Type of source	Administrative
Periodicity	Quarterly
Main variables used	Interbanking flows and stocks on deposits and loans, interest rates
QNA aggregates estimated	Production and value added of financial intermediation (JJ)
Timeliness	40 days (stocks) and 160 days (flows)
Further adjustments	Seasonal and calendar adjustment
Organisation	Bank of Italy
Link to European surveys	-

Price indicators

[S15] Consumer prices	
Type of source	Survey
Periodicity	Monthly
Main variables used	Consumer price indices for the whole nation
QNA aggregates estimated	Price indices for consumption functions; Output prices of service activities
Timeliness	30 days
Further adjustments	Seasonal adjustment
Organisation	Istat
Link to European surveys	-

[S16] Production prices of industrial products	
Type of source	Survey
Periodicity	Monthly
Main variables used	Indices of producer prices for industrial products
QNA aggregates estimated	Input and output price indices of industrial sectors
Timeliness	30 days
Further adjustments	Seasonal adjustment
Organisation	Istat
Link to European surveys	-

[S17] Production prices of agriculture products	
Type of source	Survey
Periodicity	Monthly
Main variables used	Indices of producer prices for the agriculture sector Indices of means of production prices for the agriculture sector
QNA aggregates estimated	Input and output price indices of agriculture sector (AA)
Timeliness	45 days
Further adjustments	Seasonal adjustment
Organisation	Istat
Link to European surveys	-

[S18] Construction costs of a residential building	
Type of source	Survey
Periodicity	Monthly
Main variables used	Indices of construction costs of a residential building distinguished by materials, labour and transport costs
QNA aggregates estimated	Input and output price indices of construction sector (FF)
Timeliness	90 days
Further adjustments	Seasonal adjustment
Organisation	Istat
Link to European surveys	In accordance with the EU Reg. n. 1165/98 concerning short-term statistics

Income and employment

[S19] Labour force survey	
Type of source	Survey
Periodicity	Quarterly
Main variables used	Employment by economic activities
QNA aggregates estimated	Employment in full-time equivalents
Timeliness	80 days (65 days for internal use)
Further adjustments	Seasonal adjustment
Organisation	Istat
Link to European surveys	In accordance with the EU Reg. n. 577/98

[S20] Large firms in industry and services: labour indicators	
Type of source	Survey
Periodicity	Monthly
Main variables used	Indices of employees
QNA aggregates estimated	Employment in large firms
Timeliness	55 days
Further adjustments	Seasonal adjustment
Organisation	Istat
Link to European surveys	In accordance with the EU Reg. n. 1165/98 concerning short-term statistics

[S21] Wages, other labour cost and total labour cost in industry and services (OROS survey)	
Type of source	Survey
Periodicity	Quarterly
Main variables used	Indices of labour costs for economic activities
QNA aggregates estimated	Compensation of employees and wages for all economic sectors (excluding agriculture and fishing (AA-BB), public sector (LL-MM) and private household with employed persons (PP))
Timeliness	80 days (65 for internal use)
Further adjustments	Seasonal adjustment
Organisation	Istat
Link to European surveys	In accordance with the EU Reg. n. 1165/98 concerning short-term statistics

[S22] Wages according to collective agreements	
Type of source	Survey
Periodicity	Monthly
Main variables used	Indices of wages according to collective agreements
QNA aggregates estimated	Compensation of employees and wages for agriculture and fishing (AA-BB), public sector (LL-MM) and private household with employed persons (PP)
Timeliness	30 days
Further adjustments	Seasonal adjustment
Organisation	Istat
Link to European surveys	-

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