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*Telecommunications: the sector structure, its representation in the Italian national economic accounts and price dynamics*

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## **1. Introduction**

The problems connected with the service output price indices are numerous and complex, and for this reason the National Statistics Institutes of the main developed countries, like the international organisations, are currently engaged in the discussion of the theoretical and concrete possibilities for constructing these indices.

Lacking specific surveys on the output prices of the service activities, the current practice, adopted in the main countries, is that of using the consumer price indices as deflators of the service output. The coverage of the consumer price index, as is well known, is limited to just the services provided to the households, and so is inadequate for deflating the output of the activities of the services which are supplied to both households and businesses.

Furthermore it is important to improve the quality of the indicators used to deflate service output because the service industries accounts have a great influence on GDP estimates in constant prices and on estimates of real growth rates and productivity trends.

For this reason, in Italy, the national accountants have been working hard in recent years on constructing and improving the price indicators of the service output, concentrating their attention on the output supplied to businesses. Within this context falls the calculation of the telecommunications price index prepared for the deflation of the sector output within the framework of the national economic accounts.

This document develops as follows: the second chapter describes the telecommunications market in Italy, analysing its structure and importance in the national economic accounts. The third chapter provides an overview of the volume and price measurement problems of the telecommunications services sector and presents the recent Community decisions for constant price evaluations. The fourth chapter describes the methodology followed for calculating the output price for the telecommunications sector used in the deflation scheme in Italy. Lastly, several conclusions are drawn.

## **2. The Italian telecommunications market**

### **2.1 Recent developments**

In the past five years the convergence between telecommunications, informatics and consumer electronics has revolutionised the institutional roles of the companies coming from these sectors, most particularly those of the telecommunications sector. Today, companies identified in the past by a monothematic core business have, by virtue of the convergence between telephone, computer and television, new development possibilities and can play roles which were unthinkable up to a few years ago. A fundamental stage in the telecommunications sector is the start of and by now complete process of deregulation of the telephone service which took place after the legal monopoly was abolished. Since 1996-1997, the telecommunications sector has been undergoing a full transformation following the occurrence of two important phenomena:

- ⇒ the expansion of mobile telephony and the success of new telephony operators after the deregulation of the sector;
- ⇒ a greater reorganisation of the resources by the national telephony operators, the effects of which are evident in the two-year period, 1998-1999.

In fact, in 1998 a series of facts, which were important for the development of the sector, occurred in the telecommunications market. The list of interconnection of the operators to the fixed network was defined. The tariffs rebalancing process continued, with a progressive increase of the local rates to make up for the reduction in the costs of the long-distance and international calls. The right to define the cost of the calls from fixed-network phones to cellular phones was conceded. This right was granted to the fixed network operators, who must pay the mobile operators a price for

interconnection to the cellular network on the basis of the list approved by the communications Watchdog Authority.

1999 marked a fundamental stage in the history of Italian telecommunications. This is the year when the bases for the complete deregulation of the telecommunications services were laid with the opening to the competition of local switched network calls starting on 1 January 2000.

Many transformation processes have affected the TLC sector in Italy in recent years. In particular, the complete sector deregulation process has led to the appearance of new operators on the market, determining substantial changes in the universe of reference and a reduction of the degree of market concentration. The presence of a large number of operators active in diversified ways on the territory has complicated the system of relationships existing among the various market components. Indeed, cross relationships among the national and local operators in both the collection and the transit and terminating of the traffic have been established.

The definition of the various operators active on the Italian market has, in fact, become more complex. The telecommunications systems operators offer connections to the Internet, or transmit data or supply telephony services to closed user groups. According to this logic, the active operators are classified in Italy on the basis of the following criteria:

- the term “infrastructure operators<sup>1</sup>” refers to the ownership and running of telecommunications networks (land, cellular and satellite) in order to provide transmission capacity (shared by “associated” operators) to the operator and to the other service suppliers on the basis of interconnection agreements;
- the term “carrier services<sup>2</sup>” refers to the supply to third parties of switching and transmission services (telephony, data and image) by means of own infrastructure or that owned by the infrastructure operators;
- the term “value added services<sup>3</sup>” refers to the supply to third parties of transmission services (telephony, data and other) enriched with value added components which go beyond mere carriage, by means of own infrastructure or that owned by the infrastructure operators.
- The term “carriage” refers to the supply to third parties of services that envisage the direct creation of informational or entertainment material (thus excluding the sole carriage of material produced by third parties) distributed using own infrastructure or that owned by the infrastructure operators; falling into this category are the operators that carry on at least one of the activities listed above.

## 2.1 Structural analysis of the telecommunications sector

The definition of the telecommunications sector used by ISTAT (National Institute of Statistics in Italy) for the structural analysis is based on the classification of the economic activities (ATECO91<sup>4</sup>), Italian version, referring to the NACE Rev. 1 which includes within group 64.200 the activities of “*transmission of sound, images, data or other information by cable, broadcasting, repeater or satellite: telephone, telegraph and telex communications; network maintenance; transmission of radio and television programmes*”. This group does not include: “*telephone*

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<sup>1</sup> Represent 15.3% of the telecommunications sector turnover.

<sup>2</sup> The carrier services are the most sizeable segment of the telecommunications sector, with a percentage of 69.1% of the total turnover. They are broken down into; fixed network telephony (domestic and international), mobile network telephony (domestic and international), domestic data transmission, and international data transmission.

<sup>3</sup> Represent 3.6% of the turnover and consist of: *Toll-free numbers* (domestic and international), *call center/contact center services* (call center software and applications), *EDI and messaging* (proprietary fax, broadcasting, e-mail), *TLC outsourcing services* (facility management, application support, technical assistance and servicing, etc. (except for basic services), *Internet services* (access/subscriptions, hosting, housing, Web sites, Intranet, portals, etc.), *other services* (calling cards, callback, video communication, satellite services, maintenance and servicing).

<sup>4</sup> ISTAT (1991).

*answering services, production of radio and television programmes connected with the transmission*". Thus, in short, the activities involved concern telephony (fixed, mobile), data transmission, and radio and television broadcasting.

According to the data of the structural surveys<sup>5</sup> in 1996 ISTAT calculated for the ATECO91 group 64.2 a turnover of approximately 38.6 trillion lire and counted a total of 93,200 employees. The average size was 396 employees per company. However, the sector is extremely asymmetrical: 5% of the largest enterprises accounted for 99% of the total turnover, and the first 5 enterprises alone accounted for 98%.

Another source of information concerning the sector being studied is the statistics archives of active enterprises (ASIA<sup>6</sup>). This gives the up-to-date situation of the Italian productive structure in terms of enterprises, and is made up of a combination of various statistics sources. According to these archives, around 365 enterprises were operating in 1997 (again for ATECO 64.200): these are the chief telecommunications operators, numerous local radio and television broadcasters, numerous small firms probably operating in system maintenance and minor broadcasters. Of the 365 firms, only 4 have more than 1,000 employees and absorb 97% of the sector's employment (94,839 employees out of a total of 97,757).

Another source of information on the universe of reference is supplied by the Ministry of Communications. It has archives containing enterprises which have licences<sup>7</sup> as telecommunications operators and network services and satellite communications operators. In May 1999, according to these archives there are 33 enterprises operating in the telecommunications sector and 9 enterprises with licences as services and satellite communications operators. Moreover, there are all those enterprises authorised to supply value added services on the telecommunications networks. These are mainly Internet providers (458 firms), together with 98 enterprises authorised for data transmission and 82 for the supply of telephony services (domestic and international voice telephony to closed user groups).

With regard to just the fixed telephony sector, in May 2000 it results that 108 licences have been granted in Italy for national- and regional-scale fixed telecommunications: 54 national and 54 regional licences.

## **2.2 Importance of the sector in the national economic accounts**

With the adoption of the new European System of Economic Accounts<sup>8</sup>, the Italian Accounts have absorbed the new European classification NACE Rev. 1. The telecommunications sector in the national economic accounts represents a productive branch that coincides with group 64.200 of the classification of economic activities. The branch includes the fixed telephony, mobile telephony, data and programme transmission services (domestic, international and satellite).

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<sup>5</sup> The surveys on the accounts of enterprises that ISTAT makes each year on small, medium-sized and large enterprises have the enterprise as the survey unit and the economic activity as the field of observation.

<sup>6</sup> The statistics archives of the active enterprises are constructed from the combination of various sources, such as the tax records office of the Ministry of Finance, the Register of Companies of the Chambers of Commerce, the INPS (social security) archives, the INAIL (National Insurance Institute for Industrial Accidents) archives, and the archives of ENEL electricity consumers, as well as, obviously, the ISTAT archives.

<sup>7</sup> Any operator, in order to supply any kind of service even under a system of liberalisation, is obliged to possess a special licence which sets its fields of action and limits. The licence permits it to sign interconnection agreements with the infrastructure operators on the basis of lists approved by the Ministry of Communications. <sup>7</sup> There are different kinds of licences: *Licence A+B*: installation of a TLC network for providing a voice telephony service; *Licence A*: supply of the voice telephony service; *Licence B*: installation and supply of TLC networks open to the public; *Licence B\**: installation and supply of TLC networks open to the public through the use of the DECT standard.

<sup>8</sup> Eurostat (1996).

An initial economic indicator that shows in terms of growth the importance of the sector in the Italian economy is the value added percentage on the GDP at constant prices generated by the telecommunications sector. This percentage was 1.9% in 1999.

The national accounting data reveal that the telecommunications sector has achieved excellent results in the past 5 years: between 1995 and 1999 its output increased by more than 60% in nominal terms and 50% in real terms.

In particular, Table 1 shows how these dynamics have appeared in the various years. In 1999, the production at current prices increased by 15.3% and that at constant prices by 18.9%, confirming the positive trend in progress in this sector. The value added to the market prices in real terms also registered a double-digit growth (19.6%), higher than the average yearly increase at current prices (13.5%).

In 1996, the entrance into the telecommunications sector of a new telephony operator<sup>9</sup> justifies the increase in production in real terms by 11.5%.

**Table 1** – Annual growth rates of output of the telecommunications sector at market prices and related deflators

Years	Current values	Values at 1995 prices	Deflators
1995	10.0	8.0	1.8
1996	13.8	11.5	2.1
1997	10.5	6.3	3.9
1998	10.8	6.3	4.2
1999	15.3	18.9	-3.1

The overall growth of the sector is undoubtedly supported and pulled along by the cellular communication services: in 1999 the active numbers<sup>10</sup> totalled 30 million, an increase of 47.8% over the 1998 figure. It is not a coincidence that the fixed network services share is gradually decreasing in favour of the cellular communication networks; today, fixed telephony services amount to slightly less than 60% of the telecommunication services, to the advantage of the cellular telephony with a 40% share. Confirming the results of the national economic accounts, the analysis of other information produced by ISTAT for the telephony sector alone<sup>11</sup> also shows a strong positive trend: during the 1995-99 period, the increase in turnover amounted to 82.3%, while in 1999 alone the increase totalled 12.9% over the previous year.

Also in 1999, the increase in turnover is considerably differentiated depending on the kind of operator. In fact, the main fixed telephony operator (Telecom Italia) registered a 1.4% increase in turnover in 1999. There is a huge gap between it and the turnover trend of the other telephony operators<sup>12</sup>, which register a growth of 93.6% (in 1999), attributable mainly to the effect of the deregulation that has been under way since 1996. Following with 37.0% is mobile telephony which, although it appears to be growing, has reached the maximum levels in terms of variations in 1996 with a growth of 195.7%. But what makes it possible to understand how the sector of telephony alone has really changed is the analysis of the fixed-base indices (1995=100) of the turnover

<sup>9</sup> In 1996 Omnitel gained renown as a new telecommunications operator.

<sup>10</sup> Expressed in mobile network numbers reachable at 31 December 1999 (source: ASSINFORM)

<sup>11</sup> Braca et al. (1999).

<sup>12</sup> Chiefly new telephony operators Tiscali, Albacom, Infostrada and Tele2.

produced during the 1995-1999 period. In the forefront, with 802% turnover growth, stands the mobile telephony sector, followed by the 404.4% of the sector of the other operators.

As for the inflation dynamics characterising the telecommunications sector, Table 1 also shows the yearly variations attributed to the sector deflator. Until 1998 the sector contributed to the increase in prices of the entire economy, reaching the highest variation in 1998, with a deflator increase of 4.2%. During the last year, due to the greater market competitiveness, the enterprises applied price cutting strategies, giving rise to a price reduction of 3.1%.

### **3. Price and volume measures for telecommunications services**

#### **3.1 General aspects**

In accordance with Griliches (1992) we can assert that “services are actually a rather amorphous concept, covering a heterogeneous set of industry”. Furthermore, the service sector is characterised by a huge presence of measurement problems. Difficulties in measuring the output of the services sector have been documented in many studies (among others see the CSLS proceeding, 1997) and these difficulties are mainly related to the determination of the output price.

The measurement problems of the service sector have attracted great attention in the past two decades. From a statistics point of view, one of the most important problems in this field is the definition of the service sector, as confirmed by the new System of National Accounts (SNA93): “Services are heterogeneous outputs produced to order and typically consist of changes in the conditions of the consuming units realised by the activities of producers at the demand of the consumers”.

The determination of prices in the services sector is affected by the main problems related to the construction of price indices: substitution bias, new product bias and quality change bias. In addition, we have a specific problem related to the construction of a set of producer price indices for the services industries. In particular, in many countries there are no a specific surveys on the prices provided to enterprises. The results obtained by a recent survey conducted by the OECD confirms this opinion (Chadeau 1998): “Some services activities [that provided output to enterprises] are well covered by a small number of countries, others are poorly covered or not covered at all”.

The outputs of telecommunications industries are not unique products. The telecommunications services sector is divided into several subsectors, e.g. fixed networks telephony, mobile telephony, Internet, radio and television broadcast. There should, therefore, be no theoretical barriers to the measurement of price indices for the outputs of these industries. The products produced by the telecommunications industry are, however, changing rapidly and technologies are converging (e.g. computing and telecommunications) so that the boundaries are difficult to identify. New telecommunications services are being developed and the quality of existing products can change rapidly. There are, therefore, a number of non-trivial practical problems to be overcome in measuring appropriate price indices for the products of the telecommunications industry.

Among the European Union Member States there is a large variety of different methods used to estimate the real value added of telecommunications services<sup>13</sup>.

A review of the methodologies adopted by the main European countries reveals that there are very few who use a producer price index to obtain their estimates at constant prices. The German and Swedish statistics offices produce a PPI for the sector being studied; this index is limited in

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<sup>13</sup> Within the Eurostat framework a task force has been set up on “Price and Volume for Post and Telecommunications”, with the aim of identifying all possible methods for the construction of estimates at constant prices.

Germany's case to fixed telephony, while in Sweden, starting in 1999, a PPI which has sub-indices for fixed line, mobile telecommunications services and Internet services is calculated<sup>14</sup>.

In the other countries there is a widespread use of the CPI for obtaining the evaluations at constant prices of the telecommunications sector, in spite of the fact that in several cases this does not include the mobile telephony activities and the new services connected with the development of the Internet (France and Ireland are in this situation).

### **3.2 Optimum methods and alternative methods for calculating the output price indices**

The Commission Decision on the principles for measuring prices and volumes<sup>15</sup> sets out the following classification system:

- A methods: most appropriate methods
- B methods: those methods which can be used in case an A method cannot be applied
- C methods: those methods which shall not be used

In the output approach, in principle, using appropriate price indices of production, usually referred to as Producer Price Indices (PPIs), will be the A method.

An appropriate PPI satisfies the following criteria:

- It is an index of the (domestic and export) price(s) of exactly that (group of) product(s),
- It takes account of changes in quality of the product(s),
- It is valued at basic prices,
- Its underlying concepts are consistent with the national accounts concepts.

If an appropriate PPI is not available, several alternative types of indicators exist. For example, the following will usually be B methods:

- a less appropriate PPI, e.g. an index without quality adjustment, or having a smaller or larger coverage than the product heading,
- a Consumer Price Index (CPI),
- output volume indicators.

The use of some other possible indicators, as follows, will usually be a C method:

- input methods (for market output),
- secondary indicators, i.e. indicators not directly related to the output,
- PPIs, CPIs or volume indicators that do not correspond at all to the product(s) in question.

For the telecommunication sector, following the Commission Decision, the different methods to be used for the estimate of the output at constant prices were determined<sup>16</sup>.

The optimum method (A method) is that of deflating the output by an appropriate and representative output price that takes account of quality changes.

For deflation purposes appropriate and representative price indices for the individual components of output are required:

- This means that the statistical basket has to reflect the total production of the respective component, and the selected items for pricing must be representative. The most important price-determining factors have to be included in price monitoring.

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<sup>14</sup> The calculation is facilitated by the fact that in Sweden at present the market is dominated by a sole enterprise for fixed telephony and three operators for mobile telephony.

<sup>15</sup> European Communities (1998).

<sup>16</sup> Eurostat (2000).



- The weighting scheme has to reflect the actual market situation. The broader the variety of products with differing price developments is, the higher the level of detail has to be. Since telecommunications markets are characterised by great variations in company size, the use of company weights is important.
- The selection of enterprises and products depends on their significance in the market segment.
- The prices collected from the enterprises must adequately reflect real transaction conditions. They must notably take into account any discounts granted to the buyer. List prices are only acceptable if they are effectively applied or if the discount rates remain stable over time.

On the other hand, the following approaches may be classified among the alternative methods (B methods):

- Output deflated by an output price that was not appropriate, representative or quality-adjusted,
- Output deflated by a CPI (adjusted to basic prices) for the household part of output,
- Output deflated by a model price,
- Output deflated by unit value indices for homogenous products that are quality-adjusted,
- Volume indicators which are in sufficient detail so as to take structural changes into account and are quality-adjusted.

The methods not to be used (C methods) are the following:

- Output deflated by CPIs (adjusted to basic prices) if used for more than output sold to households,
- Volume measures without a detailed breakdown,
- Any input method.

#### **4. The output price for the telecommunications sector used in the deflation scheme in Italy**

In Italy we derive the constant price evaluation by deflating current year values using appropriate price indices. In accordance with ESA95 we use the double deflation method calculated within the framework of an input-output table, with 1995 as the base year<sup>17</sup>.

According to the GNP Committee's recommendations for measuring prices and volumes, Italy has made an effort in constructing a system of output prices for the services sector with more detailed breakdowns of product<sup>18</sup>.

ISTAT, like many other statistics institutes, does not carry out a specific survey of the producer prices of the services which, therefore, are generally calculated approximately using the consumer price index<sup>19</sup>. The use of the consumer price index which, as is well known, covers services provided to households, may be an accepted operation when the price trend of the services supplied to both businesses and households evolves in a similar manner or when the share of production intended for intermediate uses is negligible.

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<sup>17</sup> In 2003 Italy will leave the fixed-base system in favour of that based on chain indices established by international decision. A description of several chain methodology experiments conducted in Italy can be found in Maresca (1998).

<sup>18</sup> The appendix provides the list of the output price indices of the services used in the deflation scheme of the Italian national economic accounts.

<sup>19</sup> Attachment 1 of the Appendix shows the main characteristics of the consumer price index referring to telephone services.

These considerations have a considerable impact on the choice of the output price index for the telecommunications sector in Italy. In fact, since the sector firms adopt rate strategies that are diversified by user types and the share of production absorbed by the firms as intermediate uses stands at 50% of the total production, the use of the consumer price index as a deflator is not recommended.

Because of the absence of an official PPI and the inadequacy of an exclusive use of the CPI, another method has been found in Italy.

For measuring prices of the telecommunications in Italy we obtain the output price through a composite index of the different kinds of services supplied by the two main enterprises of the sector: Telecom Italia SpA and Telecom Italia Mobile SpA<sup>20</sup>.

The methodology used, which may be traced to the “unitary value method”, is based on information in terms of value and quantity that is collected yearly and published in the annual financial accounts of the two companies mentioned above.

At present the output price of the telecommunications is based on this disaggregation of the output:

Revenue	Unit of output
Fixed payment for fixed telephony	Number of subscribers for fixed telephony
Fixed payment for mobile telephony	Number of subscribers for mobile telephony
Normal call	Minutes of conversation
Long-distance call	Minutes of conversation
International call	Minutes of conversation
Cellular call	Minutes of conversation
Access charge	Minutes of conversation with mobile telephony
New connections	Number of new connections
Other returns	Implicitly obtained volume

For the kinds of services listed above, each year the data on the revenues taken in by the companies and the quantitative data generating them are collected. As can be seen in the table, for several kinds of revenue the identification of the unit of output of reference was an easy operation, as in the case of the two kinds of subscription or the revenues deriving from the telephone service in the strict sense. In the other cases, an attempt has been made to find a unit of output that could be connected with the kind of revenue. As for the item “other returns”, which refers to a mix of services, the unit of output was obtained implicitly by dividing the revenues by the consumer price index for telephone services.

The revenue for a defined telephone service is divided by the output unit number to yield a unit value. The elementary value indices are aggregated in weighted form with 1995 base-year value: the weights are based on the revenues. Categories maintain their weight relative to other categories. In this sense, the resulting index conforms to a fixed weight Laspeyres index.

Beginning with a Laspeyres index formula

$$I_t = \frac{\sum_{i=1}^n P_{it} Q_{ib}}{\sum_{i=1}^n P_{ib} Q_{ib}} \times 100$$

<sup>20</sup> In spite of the deregulation, in 1998 the two companies together produced 86% of the production of the sector.

which may be rewritten as follows:

$$I_t = \frac{\sum_{i=1}^n P_{it} Q_{ib} \frac{P_{ib}}{P_{ib}}}{\sum_{i=1}^n P_{ib} Q_{ib}} \times 100$$

And substituting unit values for  $P_{it}$  and  $P_{ib}$  yields:

$$I_t = \frac{\sum_{i=1}^n \frac{U_{it}}{U_{ib}} P_{ib} Q_{ib}}{\sum_{i=1}^n P_{ib} Q_{ib}} \times 100$$

where:

$$U_{it} = \left( \frac{\sum_{i=1}^n P_{it} Q_{it}}{\sum_{i=1}^n Q_{it}} \right)$$

$$U_{ib} = \left( \frac{\sum_{i=1}^n P_{ib} Q_{ib}}{\sum_{i=1}^n Q_{ib}} \right)$$

are the average unit values of all the individual services  $i$  at time  $t$  and at time  $b$ .

And

$$\frac{P_{ib} Q_{ib}}{\sum_{i=1}^n P_{ib} Q_{ib}}$$

are the weights for each service  $i$  in base period  $b$ .

## Conclusions

Developments in telecommunications have no doubt been aided by the opening up of the market, but it is mainly technical innovation that has led to the development of new services in this area. These technical innovations have produced new methods of communication at a price affordable to the mass market. This had led to significant increases in the availability of telecommunications service and, in turn, to its growing economic importance.

Thus, the document has presented the methodology for calculating the output price index of the telecommunications services that the Department of National Accounts and Economic Analysis of the Statistics Institute in Italy uses for constant price estimates.

According to Commission Decision and the reflections of the Task-Force on price and volume measures for post and telecommunications, in Italy the output price index of the telecommunications, calculated on unitary value, is an alternative method accepted if an appropriate PPI is not available.

In the case of the unit value method, as mentioned in Gorko and Bordé (1999), the index calculation begins with the definition of a unit output at the most detailed level of aggregation: "It is important to have a homogeneous grouping of sub-services that can be re-priced from one period to another. Characteristics of calls at the most detailed level must be nearly identical to expect similar price movement in each category. Substitution inside a group of services should have hardly any impact on the price change of a service at the smallest level of detail if tariffs within the individual category are homogeneous". At the limit, the individual service category should be defined as a single unit of service to be able to capture pure price changes through time<sup>21</sup>.

At present the level of disaggregation underlying the calculation of the price index is bound to the standard of circulation applied by the telephone companies for their annual financial statements.

With regard to the construction of a producer price index for telecommunication services based on the direct observation of the rates, Italy needs a period of study and experimentation of possible methods; in the coming years a calculation of a producer price index could be experimented through co-operation with the chief sector companies, making use of the channels already being used for the calculation of the consumer price index.<sup>22</sup>

Furthermore, the deregulation of the sector is leading to competitive rate policies that, from a standpoint of producer price observation, implies a lightening of the studies since it will not be necessary to investigate the prices set by all the sector's companies, but only those set by the real leaders.

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<sup>21</sup> For a sensitivity analysis on the output prices of the services deriving from the different disaggregation levels used, see Maresca and Pisani (1999).

<sup>22</sup> The experience of the German statistics office demonstrates that the calculation of a producer price index could be fairly easy for certain market segments, such as fixed telephony.

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## Appendix

### Attachment 1 - Telecommunication services in consumer price indices

Starting in January 1999, the National Statistics Institute introduced several important innovations in the production of monthly consumer price indices, completing a methodological revision process that began with the re-basing of the indices to 1995 and the launching, in 1997, of the calculation of the harmonised consumer price index for European Union countries.

The indices are calculated according to the chaining method. The yearly updating of the base of the indices is one of the main innovations of the method of calculating the consumer price indices. The basket of goods and services observed and the weighting structure for the calculation of the indices are updated yearly and kept throughout the entire following year.

The classification adopted for the calculation of the consumer price indices is the COICOP, or Classification of individual consumption by function, in the version Rev. 1. The classification is structured into 12 expense chapters. The telecommunications sector falls within the communications sector, defined as: telephone services. The weight of the telephone services, obtained from the National Accounts estimates concerning the private end consumption, is equal to 1.6% of the entire basket

The breakdown of the weight among the four representative items – fixed telephony services, mobile telephony, public telephony, and Internet subscriptions – is made on the basis of market estimates supplied by the chief operators.

The price observed is that paid by the private end consumer, inclusive of taxes (VAT) and regarding services used throughout the national territory. Generally speaking, the facilities granted to sub-populations in particular socio-economic conditions are not considered.

Prices are observed with reference to the 15<sup>th</sup> of each month. Any variations are observed when the new rates take effect, regardless of the actual consumption or payment of the related bill.

#### *Fixed telephony services*

Fixed telephony services account for slightly less than 60% of the telecommunications services. Since Italy is slowly coming out of a monopoly situation, Telecom Italia still covers almost the totality of the market and is the only unit of observation currently considered.

The index calculation structure is made on the basis of a breakdown of the Telecom turnover into all the possible rate subdivisions that concern residential users. Residential users are considered a proxy of private consumption, even if it is evident that part of the residential traffic is due to business reasons and vice versa..

The fixed telephony services consumed by families consist of two types of expense: costs for access to the service, costs for the actual traffic.

The costs for access to the fixed telephony service consist of the monthly subscription rate and the occasional (start-up, transfer, or cancellation of a number) or continuing (notice of incoming call, call transfer, detailed statement of traffic, etc.) accessory services. The calculation structure takes into account only the monthly subscription, since the other services are of marginal importance.

On the other hand, the monitoring of the traffic is affected by the complexity of the rate structure. The cost of a phone call depends on the following factors:

- receiver (fixed or mobile network);
- distance (local, district, inter-district, international)
- time of call (full or reduced rate);
- length of call.

Among the possible combinations of the above-named variables, the following rates are selected:

1. fixed, local, full, length of up to 15 minutes;

2. fixed, local, full, length of more than 15 minutes;
3. fixed, local, reduced, length of up to 15 minutes;
4. fixed, local, reduced, length of more than 15 minutes;
5. fixed, district, full;
6. fixed, district, reduced;
7. fixed, inter-district, zone 1, full;
8. fixed, inter-district, zone 1, reduced;
9. fixed, inter-district, zone 2, full;
10. fixed, inter-district, zone 2, reduced;
11. fixed, inter-district, zone 3, full;
12. fixed, inter-district, zone 3, reduced;
13. fixed, international, to France;
14. fixed, international, to Germany;
15. fixed, international, to United Kingdom;
16. fixed, international, to United States;
17. mobile, to Telecom Italia Mobile SpA carrier, full;
18. mobile, to Telecom Italia Mobile SpA carrier, reduced;
19. mobile, to Omnitel Pronto Italia SpA carrier, full;
20. mobile, to Omnitel Pronto Italia SpA carrier, reduced.

For each rate the following information is available: average number of calls per month, average length of call, call set-up, price per second, VAT rate.

The average number of calls per month and the average length of the call are updated yearly in order to revise the weight of each item in the total. The call set-up, price per second and tax are recorded monthly.

### *Mobile telephony*

It is since 1996 that mobile telephony services have been included among the basket products used for calculating consumer price indices.<sup>23</sup> They represent slightly less than 40% of the telecommunications services. The mobile telephony market is undergoing a profound evolution and transformation, and it is for this reason that the information available is fragmentary and often contrasting. The two main operators (Tim and Omnitel) represent over 90% of the market and are the two units of observation in the sampling.

The index of mobile telephony services is obtained as a weighted average of the indices of each operator. The weights consist of the estimates of the market breakdown, concerning private users, which, for the year 1999, attribute about 80% to Tim and the remaining 20% to Omnitel.

As for Tim, three different rate plans are considered: one by contract (“Family”) and two by prepaid cards (“Blue”, “Orange”). The costs for access to the service consist of the subscription and government licence fees for the contract-based rates, and the recharging fee for the prepaid cards.

For Omnitel two rate plans are considered, both based on prepaid cards (“Libero”, i.e. “Free”, and “Ricaricabile”, i.e. “Rechargeable”), with rate determination procedures similar to those of Tim.

### *Public telephony*

At the present time, public telephony is a service of little importance. Nevertheless, considering the situation of Telecom Italia’s quasi-monopoly, it was preferred to keep monitoring the rates. The calculation structure is similar to that for fixed telephony, except for the lack of a subscription fee and a calculation mechanism based on units and not on seconds.

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<sup>23</sup> The Bureau of Labour Statistics (BLS) did not know that cellular telephones existed, at least in terms of calculating the Consumer Price Index, until 1998, when they were finally included in the CPI. Omission of cellular telephones from the CPI, for significant periods of time, leads to a major bias in the calculation of the CPI, as stated in Hausman (1999).

### *Internet subscription*

This service has been added recently to the consumer price indices basket. Although the demand is growing strongly, the supply has been recently oriented towards a standard access free of charge to the service. Paid services remain, but are mainly addressed to business clients rather than families. Pending knowledge of the future developments of the sector, the sampling consists of two observation units, which represent the main providers, for each of which the most common package for family users has been chosen

The approach used for these observations, for which a strong need for supplementing the definition of the methodological system with the economic analysis of the TLC sector has been found, does not find an adequate correspondence in the official classification.



**Table 1. Indices used in Italy to derive the output price in services**

ISTAT code	Branches	NACE Code	Description of index
64	Sales of motor vehicles and Sale and maintenance of motorcycles, retail sale of automotive fuel	50.1 50.3-50.5	For sale activity: Implicit output price index obtained by dividing current price gross output index by an output quantity index base on the trade margins For repair activity: consumer price index
65	Maintenance of motor vehicles	50.2	Consumer price index
66	Wholesale on a fee or contract basis	51.1	Average of implicit price of branches: 64, 67, 68, 69 and 70 (ISTAT code).
67	Wholesale trade	51.2-51.7	Implicit output price index obtained by dividing current price gross output index by an output quantity index base on the trade margin
68	Retail trade in non-specialised stores	52.1	Implicit output price index obtained by dividing current price gross output index by an output quantity index base on the trade margin
69	Retail trade of food in non-specialised stores	52.2	Implicit output price index obtained by dividing current price gross output index by an output quantity index base on the trade margin
70	Retail trade of no food in non-specialised stores, repair of personal/households goods	52.3-52.7	For sale activity: Implicit output price index obtained by dividing current price gross output index by an output quantity index base on the trade margins For repair activity: consumer price index
71	Hotels, camping and other short-stay accommodations	55.1-55.2	Consumer price index
72	Restaurants, bars, canteens and catering	55.3-55.5	Consumer price index
73	Transport via railways	60.1	Passenger: consumer price index Freight: implicit price obtained by dividing current price index by a quantity index based on ton-kilometres.
74	Road freight transport, transport via pipelines	60.25 60.30	Output devoted to household consumption: consumer price index Other output: average between gasoline price and road freight transport
75	Other land transport	60.21 60.22 60.23	Consumer price index
76	Sea, coastal and inland water transport	61.0	Passenger: consumer price index Freight: implicit price obtained by dividing current price index by a quantity index based on ton-miles.
77	Air transport	62.0	Passenger: consumer price index Freight: implicit price obtained by dividing current price index by a quantity index based on ton-miles.
78	Activities of travel agencies and tour operators	63.3	Consumer price index
79	Supporting and auxiliary transport activities	63.1, 63.2 63.3	Consumer price index
80	National post and courier activities	64.1	Consumer price index

**Table 1. Indices used in Italy to derive the output price in services (cont'd)**

81	Telecommunications	64.2	Composite index of the different kinds of services supplied.
82	Central banking, monetary and financial intermediation	65.0	FISIM: current year GDP deflator is multiplied by the ratio of indices of the interest margins to the value of intermediation for the current and base year period. Other services: average of a basket of service prices devoted to enterprises.
83	Life and non-life insurance, pension funding	66.0	Implicit output price index obtained by dividing current price index by a quantity index based on number of insurance contracts
84	Activities auxiliary to financial intermediation, insurance and pension funding	67.0	Consumer price index
85	Owner occupied and rented dwellings	70.2	Specific elaboration on consumer price index
86	Other real estate activities	70.1, 70.3	Consumer price index
87	Renting of automobiles, transport equipment, other machinery and equipment, personal and household goods	71.0	Consumer price index
88	Computer and related activities	72.0	Consumer price index
89	Research and development	73.0	Market: consumer price for education Non-market: price index based on input method
90	Professional and technical activities	74.1-74.6 74.8	Consumer price index
91	Industrial cleaning	74.7	Consumer price index
92	Public administration and defence services, compulsory social security services	75.0	Market: Consumer price index Non-market: price index based both on input and on output method
93	Education	80.0	Market: Consumer price index Non-market: price index based on output method
94	Human health activities	85.11	Market: Consumer price index Non-market: price index based on output method
95	Other human health and veterinary activities	85.12-85.14 85.2	Market: Consumer price index Non-market: price index based on input method
96	Social work activities	85.3	Market: Consumer price index Non-market: price index based on input method
97	Sewage and refuse disposal, sanitation and similar activities	90.0	Market: Consumer price index Non-market: price index based on input method
98	Activities of membership organisation n.e.c.	91.0	Market: Consumer price index Non-market: price index based on input method
99	Cultural and recreational activities	92.0	Market: Consumer price index Non-market: price index based on input method
100	Other services activities	93.0	Market: Consumer price index Non-market: price index based on input method
101	Private households with employed persons	95.0	Consumer price index