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Innovations on price index of the output of freight transport on road

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PRODUCER PRICE INDEX SESSION

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Introduction

The National Institutes of Statistics of the main industrialised countries are currently engaged in a discussion on the theoretical and concrete possibilities of pricing the production of services. The lack of direct surveys on the production price of service activities has brought to the current practice adopted in leading countries of using consumer price indices as deflators for the output of services. The consumer price index is not a suitable deflator for the production of service activities devoted to private households, and also to enterprises. For this reason, national accountants in Italy have made a great effort in the last few years, to construct and improve price indicators for the production of services, focusing on the outputs given by services for intermediate consumption. The calculation of a price index for freight road transport falls within this context and is built to deflate the production of the sector involved, in the national economic accounts.

The paper develops as follows: in the first chapter, a description is given of the Italian freight road transport market with a structural analysis and a definition of its relevance in national economic accounts. In the second chapter, a description is given of the methodology adopted to calculate the price of the production of the freight road transport sector, that is used in the deflation scheme in Italy. Finally, a few conclusions are drawn.

1. The Italian market of freight transport on road

1.1 Evolution of the road haulage market

The transport sector is a complex system articulated in several modes of transport (rail, road, sea and coastal water, inland water, airlines and pipelines) which present highly differing physical characteristics.
The choice of the means of transport is not only influenced by the destination of the products, but also by the structural qualities of the goods transported, concerning their economic nature, but also other features such as weight, dimensions, value and whether they are perishable or not.
The widespread preference that industrial enterprises give to road transport, particularly in the national context, is supported by a variety of factors, the foremost of which is the speed of delivery of the goods to their destination. Enterprises explain that the time required to complete a delivery using road transport is not more than two days[1]. As a consequence, freight road transport, an important sector of national economy, represents the transport mode that better meets the requirements of modern freight logistics.
Enterprises on their part are becoming more and more aware of the need to dedicate more attention to the quality of services in this sector, by adopting the so-called “just in time” techniques that reduce the period of storage of goods in warehouses, and by guaranteeing time of delivery, the integrity of goods delivered and the possibility of issuing immediate tracking information on the state of the goods.
Today with the growing demand for transport and for quality of services delivered, transport operating companies offer an increasing variety of services for which they tend to adopt a high prices policy.
In the last few years the demand for transport has grown in higher measure compared to the gross domestic product (GDP), and this is due both to the globalisation of markets, which has allowed the

[1] CONFETRA 2001

sector to develop on a world-wide scale, and to European economic integration, which has pushed transport enterprises to expand their activities more and more in the European market.
New services related to transport such as the handling and manipulation of goods, loading and unloading operations, storage, unbundling and re-bundling of loads, etc, are in some cases combined with, and in other cases complementary to the transfer of goods itself, thus making the identification of a price for freight transport more and more complicated.
The evolution of pricing in the market examined can be kept under control only by making a targeted survey on what prices the road hauliers apply.
At the moment, there being no direct survey on freight transport prices, the method adopted is to use indirect estimates.

1.2 Structural analysis of the freight road transport service

The definition of freight road transport service used by ISTAT for the structural analysis is based on the Italian version of the classification of economic activities (ATECO91[2]) that can be traced back to the NACE rev.1, where for the 60.25 group it is stated: "*freight transport by road: timber, cars, bulk products, transport of chilled and frozen goods and heavy goods; transport of furniture; hire of lorries with driver; freight transport with animal trailers*". From the data of the structural reviews[3] in 1996 ISTAT calculated a turnover of about 49,674 billion lire with an overall total of 275,774 employees for the 60.25 group of the ATECO91. A further source of information for the sector we are examining is represented by the Integrated Statistical Archives of Active Enterprises (Italian acronym ASIA[4]). The latter provides an updated situation of the Italian structure of production in terms of enterprises involved and is the result of the integration of various statistical sources. This archive reveals that in 1996 the enterprises that were registered as actively operating were about 111,421. These enterprises consist in a large number of small companies, and in fact the structure of production of the road haulage sector is made up of several small enterprises presenting a high percentage of self-employed workers.
The analysis of a few indicators, such as the average number of employees per enterprise and the ratio between employees and the total number of people working in the sector, reveals that the sector of freight transport by road has an extremely fragmented productive structure with an average number of 2.4 employees per enterprise, with 52% of the people working in the sector consisting in self-employed workers. The company organisation is of course influenced by the dimension of the enterprise and, in fact, these freight road transport companies are generally run by one-man units.
The 1996 intermediate industry and services census identified many more small companies that had not emerged in the previous census. In fact an increase of 30% was registered in the number of companies that were surveyed between the industry and services census of 1991 and the intermediate census of 1996, and this growth was almost totally due to an increase in number of freight road transport enterprises registered.
Another source of information for this universe of reference is given by the third party freight road hauliers' register, where registration is compulsory for all companies intending to carry out their activity. For the year 2000, 186,815 companies were registered as operating a freight transport activity. Until April 1998, the enterprises that were running their activity exclusively with articulates weighing no more than 6 tonnes (t) were not compelled by law to make an entry in the register. In the year 2000, when it was compulsory, and their overall incidence was of almost 44%[5] .

[2] Istat (1991).
[3] The surveys of the accounts of enterprises that ISTAT carries out on a yearly basis on the small, medium and large enterprises takes the enterprise as the unit of survey and its economic activity as the field of observation.
[4] The statistical archive of active enterprises is built on the integration of different sources such as the tax register of the Ministry for Finance, the enterprise register of the Chambers of Commerce, the INPS archive, the INAIL archive, the ENEL archives of subscribers for electrical power services, and lastly the ISTAT archives.
[5] Source: Road Hauliers Register.

1.3 Relevance of the sector in national economic accounts

The first distinction to be made, when carrying out a market analysis of the freight road hauliers sector from the viewpoint of National Accounts, is to see under what categories of transport their activity can be operated.
The offering of freight transport by road develops according to two segments: own account, carried out by the companies owning the goods, with company-owned vehicles and drivers; third party transport carried out by enterprises operating as road hauliers under hire or reward. These two segments generate different problems according to whether the transport operated is under own account or hired. The national accounts analysis considers only freight transport services that are carried out by third party or hired hauliers[6]. All transport services that are carried out by the same units that produce the goods on their own account, are to be found in the sectors in which the production units are classified.
In the National economic accounts, freight transport by road covers a branch of production which is coincident with the 60.25 group classification given for economic activities[7].

An initial economic indicator highlighting the importance of the sector, in terms of growth in Italian economy, is represented by the share of added value over Gross Domestic Product (GDP), at constant prices generated by the sector taken into consideration. This share was equal to 2.1% in the year 2000.
Table 1 shows the data of the National Account for production at market prices with the changes in trends that were registered in the various years. In the year 2000, production at current prices increased by 7.6% while at constant prices the increase was of 2.4%. Added value at market prices registered a similar growth of 2.4% in real terms.

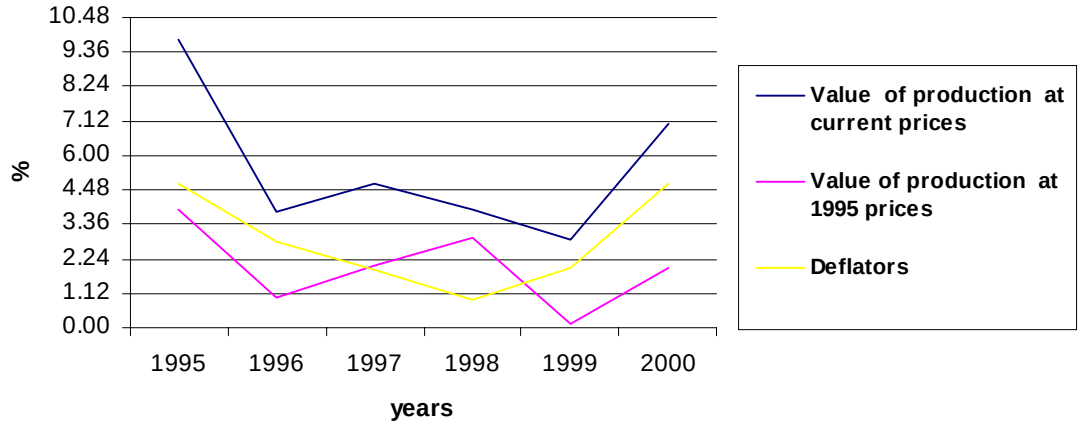
TAB 1 - Annual growth rates of production at market prices and of deflators of freight transport on road

Years	Value of production at current prices	Value of production at 1995 prices	Deflators
1995	10.2	4.8	5.2
1996	4.2	1.2	3.0
1997	5.2	2.8	2.3
1998	4.8	3.8	1.0
1999	3.3	0.9	2.4
2000	7.6	2.4	5.1

The annual variations imputed to the deflator of the sector, and relating to the inflationary trends of freight transport by road can be seen in table 1 and the changes in trends in graf.1.

[6] Furthermore the compulsory tariff system is referred solely to third party freight transport.
[7] With the introduction of the new European System of Economic Accounts, also the Italian Accounting System has absorbed the new European classification NACE rev.1.

GRAF. 1 - Annual growth rates of production at market prices and of deflators of freight transport on road



Up to 1997 the sector contributes to the price increase of the whole economy, starting from a more marked variation in 1995, signing a rise of 5.2% for the deflator. Starting from 1996 the deflator shows a downturn which reaches 1.0% in 1998. In 1999 enterprises start adopting tariff increase strategies, thus determining a 5.1% price increase in the year 2000.

2 Volume and price measures in freight transport by road

2.1 General aspects

Currently in Italy there are no available enquiries focused specifically on prices relating to the outputs of freight transport services activities, since it is very difficult to construct a price index for this sector. Generally there are no overall unified tariffs but a variety of tariffs diversified according to the type of goods carried. The price of the freight transport service may depend on a multiplicity of factors: tariff distance, if the journey refers to a national and international route, if the journey involves many loading and unloading points, if it regards intermodal transport, if the type of transport has specific characteristics or if other ancillary services to transport are included.
The price can therefore depend on the weight of the goods and on the type of product transported, which in turn may necessitate special and expensive equipment, as in the case of the transport of live animals, dangerous goods (arms or munitions), chemical products, etc.. For this reason prices tend to differ from the various tariffs applied.
In such cases the method suggested by Eurostat is to survey the price index by recurring to "model pricing". "This is where a model product is specified in some detail (usually based on real past products), then the contributory elements are repriced in successive time periods".[8] For example a hypothesis could be the use of a series of representative standard trips taken by the carrier. Another possibility could be to adopt a "hedonic approach", in which the price of each day of travel is based on the characteristics of the goods. In both these cases, the characteristics "weight of the goods" and "distance travelled" would be included in the analysis. Both approaches mentioned offer the possibility to consider other aspects of these standard trips.
A more or less direct approximation to the volume of product can be given by indicators of volume such as tonnes-kilometre. Nevertheless, these indicators take account only of the weight and distance travelled by the goods and do not consider other aspects such as changes in quality and differences in the types of goods. Currently production price indices (PPIs) for freight transport are

[8] EUROSTAT "Handbook on price and volume measures in National Accounts" April 2001 (Draft)

not easily available, and this is probably due to the problems of measurement mentioned. Nevertheless, data on quantities relating to tonnes-kilometre per type of goods transported can be obtained and also distinguished per type of transport.

2.2 A B C Methods

A Commission Decision[9] specified three main principles that price and volume measurement should follow[10]:

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

The most appropriate method (method A) is to deflate the output with an appropriate representative price of the output that takes into account changes of quality [11].
For freight transport, the level of breakdown of the analysis should be per product, identified separately for each type of transport. This can give a significant contribution to the output, particularly for:
⇒ Transport via Rail
⇒ Transport by road
⇒ Transport via pipelines
⇒ Sea and Inland water transport
⇒ Air transport
If this distinction per type of transport is not attainable, then any method is a C method.
Data breakdowns at current prices are required as weights for price and volume indices. If such breakdowns of products at current prices are not available at the level mentioned above, other indicators can be used as weights. These indicators will need to be distinguished according to different types of transport and should approximate current prices as much as possible.
The use of appropriate PPIs, possibly based on the "model pricing" approach, could be considered as an A method, while based on an indicator of volume such as tonne/kilometre transported, it would be a B method.
Any other methods are C methods, including indicators of volume if based only on number of tonnes transported.

2.3 The production price of freight road transport services used in the deflation scheme in Italy

In harmony with ESA95, Italy has adopted the method of double deflation using the structure of the input-output table, assuming 1995 as base year. More appropriate price indices are used in the deflation scheme for the valuation of output at constant price.
Like most other institutes of statistics, ISTAT does not carry out any specific survey on prices at service production (PPIs) and therefore the consumer price index is generally used. The use of the consumer price index, which is known to cover services devoted to private households, can be accepted when the price dynamics of services, bought both by enterprises and by private

[9] Commission Decision 98/715
[10] European Communities (1998).
[11] For further information: Maresca S. Montella M. " *Telecommunications: the sector structure, its representation in the Italian national economic accounts and price dynamics", paper submitted at the* 15TH MEETING OF THE VOORBURG GROUP, Madrid, 18-22 September 2000.

households, evolves in a similar manner, or when the share of production devoted to intermediate consumption is insignificant..

In the specific case of freight transport by road, it is not absolutely possible to resort to a consumer price index, since the share of production of the sector is entirely devoted to intermediate consumption.

For this reason National Accountants have felt the need to build a producer price index specifically for this sector, respecting the rules suggested by Eurostat as much as possible.

These considerations have had a strong impact on the choice of the producer price index for the freight road transport sector in Italy. In fact, since the enterprises of the sector adopt diversified tariff policies according to type of goods, type of journey, time taken for the journey, weight of goods and special equipment for special goods, it is not advisable to use the consumer price index to deflate the output for intermediate consumption. In Italy, the "model pricing" method has been adopted both due to the absence of an official PPI and to the fact that an exclusive use of the consumer price index (CPI) would be inadequate.

The statistical sources used to estimate prices of the output of freight transport by road are, on one hand, the sample survey on freight transport by road and, on the other, the tariffs set by the Ministry of Transport and Navigation. Starting from 1995, the sample survey on freight transport by road[12], relative to vehicles of a carrying capacity equal to or above 35 quintals, was restructured using the vehicles in the archive of the traffic control authority, "*Motorizzazione Civile*", as the universe of reference. The vehicles are classified according to the type of transport they carry out: own account or third party, domestic or international. The main variables studied by the survey, regarding domestic third party freight transport, and used for this paper are: tonne/kilometre, classes of distance travelled distinguished according to groups of goods (from the statistical classification of traffic (SCT)[13]), the average number of kilometres that the vehicles covered[14] during the reference week examined. The tonne/kilometre were chosen as an indicator of volume, since it is important to take account of transport relating both to large amounts of bulk raw materials and to small or fragmented loads. In this respect, the tonne/kilometre represent the unit of measure of the product of the tonnes transported times the number of kilometres of the routes covered.

TAB 2 – Tonne kilometre per group of goods SCT/24 and class of distance travelled - Year 1997 (thousands)

CLASSES OF DISTANCE TRAVELLED	Groups of Goods 1[15]	2	3	4	5	6	7	8
Up to 50 Kms	193,844	67,896	151,113	103,072	54,490	406,313	19,463	8,420
51-100 Kms	566,492	127,680	266,539	177,392	115,717	1,207,829	29,589	32,279
101-150 Kms	538,801	136,166	167,137	270,782	154,159	1,717,976	75,724	25,042
151-200 Kms	512,076	313,250	296,454	324,549	186,245	2,360,838	66,486	18,562
201-300 Kms	1,149,132	660,922	213,502	620,465	408,446	3,872,185	138,252	58,733
301-400 Kms	687,818	481,526	72,560	650,725	389,904	2,558,363	150,370	33,328
401-500 Kms	454,387	435,619	70,280	462,003	308,477	1,624,307	128,381	7,633
over 500 Kms	1,631,629	4,930,865	542,563	2,020,543	1,058,052	9,615,001	445,826	41,054
TOTAL	**5,734,178**	**7,153,925**	**1,780,149**	**4,629,533**	**2,675,491**	**23,362,814**	**1,054,090**	**225,052**
CLASSES OF DISTANCE TRAVELLED	**Groups of Goods 9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Up to a 50 Kms	6,307	171,860	53,595	498	400,455	2,058,054	1,833,785	32,297
51-100 Kms	10,665	664,164	87,166	19,189	935,838	1,905,968	2,189,871	77,329
101-150 Kms	919	853,648	107,600	8,427	1,192,165	1,815,780	1,671,503	140,081

[12] ISTAT "*Trasporto merci su strada*", Collana d'informazione n°74, various years , Rome.

[13] The SCTu293 consists in 293 codes of product aggregated into 52 goods definitions and 24 groups.

[14] Necessary to make price estimates.

[15] See table 2

151-200 Kms	20,203	832,736	95,282	17,216	1,498,320	1,302,850	1,376,679	184,800
201-300 Kms	22,051	1,273,194	184,640	17,668	2,885,146	1,586,978	2,248,374	311,483
301-400 Kms	0	631,655	137,954	20,897	2,291,065	1,103,877	1,113,845	260,584
401-500 Kms	0	254,139	87,786	5,607	1,288,400	386,686	488,552	200,643
over 500 Kms	3,048	459,063	684,925	126,753	8,401,918	1,255,593	2,521,194	388,162
TOTAL	**63,194**	**5,140460**	**1,438,948**	**216,254**	**18,893,308**	**11,415,787**	**13,443,803**	**1,595,379**
CLASSES OF DISTANCE TRAVELLED				**Groups of Goods**				
	17	**18**	**19**	**20**	**21**	**22**	**23**	**24**
Up to 50 Kms	145,797	134,474	35,485	105,359	37,455	88,779	134,046	172,565
51-100 Kms	181,248	472,544	81,197	188,903	107,612	126,272	277,735	449,355
101-150 Kms	180,543	552,502	176,436	357,944	106,225	202,667	405,403	627,401
151-200 Kms	246,479	704,365	228,615	355,271	102,165	318,526	437,315	922,438
201-300 Kms	425,748	1,462,013	391,693	597,651	224,077	474,760	941,251	1,716,441
301-400 Kms	159,090	1,242,492	438,130	619,044	156,613	493,728	1,087,492	1,532,247
401-500 Kms	167.098	907,645	234,349	356,942	98,750	318,407	629,042	1,227,439
oltre 500 Kms	277.327	5,006,517	1,364,910	3,496,350	610,148	2,403,438	4,659,607	6,147,413
TOTALE	**1,783,329**	**10,482,552**	**2,950,814**	**6,077,464**	**1,443,044**	**4,426,578**	**8,571,892**	**12,795,299**

Source: Sample survey on freight transport on road

The average kilometres are defined as the number of kilometres that a tonne of goods covers in average. The average kilometres represent a synthetic measure of the length of the journey of a tonne of goods. Two important factors emerge from the study of the average number of kilometres travelled by the goods, for the series of years 95-98: the average kilometres up to 50kms turn out to be, more or less, equal to 25 kilometres covered by the goods in average; whilst the average kilometres over and beyond 500kms turn out to be, more or less, equal to 850 kilometres in average. These two important results have made it possible to identify the average number of kilometres to be used in the selection of tariffs in crescendo, since the survey data up to 50kms and over 500kms represent open classes for the distance travelled by goods.

TAB 3 – Average kilometres covered by goods on domestic routes per class of distance travelled - Years 1995 -1998

Classes of distance travelled	**1995**	**1996**	**1997**	**1998**
Up to 50 Kms	23	24	24	25
51-100 Kms	77	77	76	74
101-150 Kms	128	128	128	125
151-200 Kms	180	179	179	175
201-300 Kms	252	252	251	246
301-400 Kms	350	351	353	345
401-500 Kms	452	452	453	448
over 500 Kms	883	899	859	741

Source: Sample survey on freight transport on road

The average price[16], related to transport on road, has been estimated starting from the tariffs issued by the Ministry of Transport and Navigation traffic control authority, said "*Motorizzazione Civile*" *(Italian acronym M.C.T.C.).* On June 6, 1974, the Italian Law 298 established the first system of tariffs so called "in crescendo" ("*a forcella*" in Italian version) for third party freight transport on road, and its provisions are compulsory for the definition of prices and conditions of transport.
The regulations of the aforementioned law apply to transport carried out on the domestic territory. If, on the contrary, the carrier takes consignments out of the domestic territory, this transport is not subject to compulsory regulatory tariffs. In the end it is the transport contract that turns out to be the

[16] See also "*Alcune innovazioni sugli indici di prezzo dell'output dei servizi*" Maresca S. e Montella M.

essential element that determines whether the carriage of goods is national or international, since there may be cases in which the first section of the journey is effected within the national territory, while the following part is completed beyond national boundaries. Domestic transport is to be intended as the transport carried out according to a contract that establishes the loading and unloading of goods within the national territory.
Though it does not bring great changes to the authorising system of the Ministry, that legitimates the professional character of the transport activity, this system intends to define a new figure among road carriers, by creating a national register of natural and juridical persons engaged in third party road haulage.
The tariffs are determined by considering the average cost of the corresponding transport services. This cost has been determined by taking as a model a well run company, managed with its own means, considering the market situation. These calculations also contemplate and include an adequate reward for the company taken into consideration.
The tariff system came into effect with the Ministerial Decree M.D. 18.11.1982[17], which establishes the necessary general provisions for the application of the crescendo tariffs starting from January 1st 1983. The tariffs have been successively updated with further decrees of adjustment on a more or less yearly basis, as appears in the following exhibit.

Table 1 – Decrees of adjustment of crescendo tariffs and corresponding rates of variation.

MINISTERIAL DECREES – TARIFF ADJUSTMENT	DATE OF APPLICATION AND RATES
M.D. 7 December 1983:	+ 12.0% from 1st January '84
" " 22 February '85:	+ 9.0% from 1st March '85
" " 11 March '86:	+ 7.5% from 16 March '86
" " 23 April '87:	+ 10.0% from 1st May '87
" " 30 December '87:	+ 5.0% from 1st January '88
" " 28 October '88:	+ 2.0% from 9 November '88
" " 28 June '89:	+ 7.0% from 4 July 1989
" " 9 March '90:	+ 6.0% from 12 March 1990
" " 27 November '91:	+ 7.5% from 1stDecember 1991
" " 27 July '93:	+ 3.5% from 1st August 1993
and further	+ 2.5% from 1stJanuary 1994
" " 24 March '95:	+ 2.5% from 30 March 1995
" " 26 June '95:	+ 2% from 1st July 1995
" "18 September 1996 e 1997	+ 4% from 23 September 1996
" "20 June 2001 in G. U. n°77 del 30-6-2000	+ 2.5% from 1st July 2000
" "27 March 2001 in G. U. n°77 del 2-4-2001	+2.5% from 3 April 2001

Currently, the concept of compulsory tariffs derives mainly from the prohibition to stipulate contracts out of the minimum and maximum range limit established by the crescendo tariff, unless other regulatory exceptions intervene. The tariff system provides the tariffs that road hauliers[18] are obliged to apply, diversified per kilometres and weight in quintals, subdivided in 3 tariff classes[19], according to the different types of goods. The system provides for an increase of 5.26% for goods of the second class, while for goods belonging to the first class of goods, the increase is of 10.53%. The goods that the price list refers to are classified per product with a breakdown of up to 493 product codes of the SCT.

[17] The D.P.R. 9.1.1978 n°56 makes provision for the norms of implementation relative to the title III of Law 298/74.
[18] Road hauliers are obliged by law to respect this tariff list; in case of non abidance to the tariff system, the Law 298/74 establishes an administrative penalty ranging from 100,000 to 300,000 lire, applicable both to the carrier and to the hirer.
[19] The classification of goods is distinguished according to: SCT position (statistical classification of traffic), designation of the goods and tariff class.

The freight road transport survey, instead, classifies freight according to 24 groups of goods. Therefore this has created the need to define a methodology that allows the percentage increase to be applied to a group of goods rather than to every single product. The methodology adopted is based on the definition of the classes (III – II – I) for every product code. A calculation was made to find out the number of times each product code falls into the class it belongs to (the analysis was carried out on 493 codes); after which the percentage shares of frequency, that indicate how many times that type of product falls in the classes III – II – I are determined, as appears in the following exhibit.

When 100% of product is present in one class, the tariff relative to that group of products is applied to the whole class; the other percentage of product indicate by what percentage, within a certain group of goods, the tariff should be increased.

It should be noted that the law makes provision for a tariff increase only in the case of goods that can be classified as belonging to the second and first goods category. For example, if we consider group 6 foodstuffs, 37.9% of the products that fall in code 6 of the 24 group SCT belong to class III, and therefore no increase is applicable. While 44.9% of products fall into class II and therefore a 5.26% increase can be applied, 17.2% of the products belong to class I and therefore the tariff increase to be applied is of 10.53%.

Unladen return journeys are not rewarded, unless a different agreement among parties has been subscribed through free negotiation. Furthermore, five classes of weight have been provided for, each with an indication of the minimum and maximum values in lire/quintals per kilometre, for every distance travelled in kilometres. This is determined according to the general principle of the decreasing cost per unit of product transported, considering the incidence of weight in the consignments.

Table 2 – Percentage increase per classification of goods and SCT position classified in 24 groups of goods

Code SCT/24	**Groups of Goods**	**CLASS III**	**II**	**I**
			Increase	
		-	**5,26%**	**10,53%**
1	Cereals	100%	0%	0%
2	Potatoes, other fresh or frozen vegetables and fruits	50%	50%	0%
3	Live animals, sugar beet	100%	0%	0%
4	Wood and cork	100%	0%	0%
5	Textiles and waste, other raw animal and vegetable materials	62.5%	37.5%	0%
6	Foodstuffs and animal fodder	37.9%	44.9%	17.2%
7	Oil seeds and oleaginous fruits and fats	100%	0%	0%
8	Solid mineral fuels	100%	0%	0%
9	Crude petroleum	100%	0%	0%
10	Petroleum products	21.4%	50%	28.6%
11	Iron ore, iron and steel waste and blast furnace dust	100%	0%	0%
12	Non-ferrous ores and waste	100%	0%	0%
13	Metal products	100%	0%	0%
14	Cement, lime, manufactured building materials	69.2%	30.8%	0%
15	Crude and manufactured minerals	66.7%	33.3%	0%
16	Natural and chemical fertilisers	47.4%	52.6%	0%
17	Coals, chemicals, tar	0%	100%	0%
18	Chemicals other than coal, chemicals, tar-munitions	38.9%	44.4%	16.7%
19	Paper pulp and waste paper	50%	50%	0%
20	Vehicles and transport equipment	0%	100%	0%
21	Manufactures of metal	0%	100%	0%

22	Glass, glassware, ceramic products	12.5%	25%	62.5%
23	Leather, textiles, clothing, other manufactured articles	0%	100%	0%
24	Miscellaneous articles	11.1%	77.8%	11.1%

The identification of the average value of the tariff was made by taking the hypothesis of an average consignment, being the range of the interval of the tariff based on a minimum and maximum value, which changes according to kilometres covered by the goods transported and to class of weight they belonged to. The data available was elaborated referring to an average consignment, determined with the sample survey on freight transport by road, and taking two tariffs into consideration, one with a minimum and the other with a maximum value[20] divided into class of goods and into class of average weight: 50 quintals; 100 quintals; 200 quintals; 230 quintals; and 280 quintals.

Classes of average distance travelled were identified, and an aid came from the data regarding kilometres covered by the goods, as was relieved from the sample survey on freight transport by road. The classes of average distance travelled that were identified are: up to 50 kms (**25** kms), 51-100 kms (**75** kms), 101-150 kms (**125** kms) 151 - 200 kms (**175** kms), 201 - 300 kms (**250** kms), 301 - 400 kms (**350** kms), 401 - 500 kms (**450** kms), over 500 kms (**850** kms).

After this the classes of average weight were identified: from 51 to 100 quintals (**75** quintals); from 101 to 200 quintals (**150** quintals); from 201 to 230 quintals (**215** quintals); from 231 to 280 quintals (**255** quintals), from 281 quintals and over (**320** quintals). An average class was selected for each class of weight. The elementary tariffs distinguished according to weight and to minimum and maximum tariff were aggregated starting from the hypothesis that:

$$T_{media} = \frac{\sum_{i=1}^{5} w_i T_i}{\sum_{i=1}^{5} w_i}$$

where:

$T_{media} = T_{average}$

T_i = tariff per class of weight

w_i = average weight (75 - 150 - 215 - 255 - 320)

i = 1 to 5

TAB 4 – Compulsory crescendo tariffs in lire /tonnes per class of distance run and Group of goods. Year 1997

CLASSES OF DISTANCE TRAVELLED	Group of goods 1	2	3	4	5	6	7	8
25 kms	113	116	113	113	115	117	113	113
75 kms	233	239	233	233	237	243	233	233
125 kms	311	319	311	311	317	323	311	311
175 kms	363	372	363	363	370	378	363	363
250 kms	430	441	430	430	439	448	430	430
350 kms	527	541	527	527	537	549	527	527
450 kms	625	641	625	625	637	651	625	625
850 kms	1,022	1,048	1,022	1,022	1,042	1,064	1,022	1,022
CLASSES OF DISTANCE TRAVELLED	**Group of goods 9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
25 kms	113	119	113	113	113	114	115	116

[20] Equivalent to third class (III).

75 kms	233	246	233	233	233	237	237	239
125 kms	311	328	311	311	311	316	316	319
175 kms	363	383	363	363	363	369	369	373
250 kms	430	454	430	430	430	437	438	442
350 kms	527	556	527	527	527	535	536	541
450 kms	625	660	625	625	625	635	636	642
850 kms	1,022	1,079	1,022	1,022	1,022	1,038	1,040	1,050
CLASSES OF				**Group of goods**				
DISTANCE	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
TRAVELLED								
25 kms	119	117	116	119	119	122	119	119
75 kms	245	242	239	245	245	251	245	245
125 kms	327	323	319	327	327	335	327	327
175 kms	382	378	372	382	382	391	382	382
250 kms	453	448	441	453	453	464	453	453
350 kms	554	548	541	554	554	568	554	554
450 kms	658	650	641	658	658	674	658	658
850 kms	1,075	1,063	1,048	1,075	1,075	1,102	1,075	1,075

Source: Elaboration on crescendo tariffs effective from 24/9/96 - D.M. 18/9/96 and successive updating decrees of adjustment.

Finally, the average weighted tariff per class of distance travelled thus obtained was distinguished per SCT/24group of goods. The distinction was made by applying the corresponding increases as presented in table 2. In table 3 the compulsory crescendo tariffs are evidenced in lire per every tonne of freight transported, divided per average class of distance travelled.
These tariffs, appropriately selected per class of distance travelled of goods and corresponding weight, aided the calculation of the average price for the transport by road for every single SCT/24 product code and class of distance travelled.
Since the tariffs available were referred to the year 1997, to build the series 1992-1999, the updating decrees of adjustment of the crescendo tariffs were used, applying the variations provided by the Ministry of Transport and Navigation traffic control authority, "*Motorizzazione Civile*" (see table 1), issued during the last few years and updated. The series 1992 –1999 of prices (or tariffs) of freight road transport, was thus reconstructed by using the rate of variation of the tariffs. From the data elaboration, the series of indices with base 1992=100 was built, taking into proper consideration the variations which were applied in the course of the years to the compulsory tariffs of the years 1992-1999; the base year of the index calculated was shifted to 1995, in coherence with the evaluations at constant prices of National Accounts.

To understand the elaboration which was carried out, it is necessary to highlight the composition of the production price of freight transport by road, based on the distinction of the outputs as in Table 2. The methodology adopted, which can be lead back to the method of “model pricing”, is based on information relating to tariffs per class of distance travelled and class of weight, increased according to the percentages of increase corresponding to every group of goods, as provided for in the M.D. 18/9/96 and successive decrees of adjustment (indicator of price), to tonnes-kilometre, distinguished according to class of distance travelled and to groups of goods (indicator of volume) collected yearly.
The data are elaborated in matrices where the rows define the classes of distance travelled and the columns carry the groups of goods.
The values of elementary indices are aggregated with year t weights: the weights are based on the tonnes-kilometre of freight transported per 24 groups of goods classified according to SCT.
In this sense the index obtained for the SCT/24 groups is in compliance with a fixed base price index of the Paasche type.

$$I_{p}^{P} = \frac{\sum_{i=1}^{24} P_{it} Q_{it}}{\sum_{i=1}^{24} P_{ib} Q_{it}}$$

where:

i = SCT groups of goods 1 to 24

P_{it} = price for every group of goods in time t

P_{ib} = price for every group of goods in base time

Q_{it} = tonnes-kilometre per group of goods in time t

In the Paasche price index, the structure of the weights varies in time, therefore, while collecting current prices to build this index, it is also necessary to collect the quantity of goods and services transacted. The complex price index given before expresses an arithmetic mean of elementary price indices, weighted with a value obtained by multiplying the quantities of goods and services transacted in time t times the corresponding prices registered in time t and time b.

This calculation of price index for road haulage is based on the hypothesis that the operators of the sector diligently apply the provisions set by the ministerial authorisation system on tariff adjustment. It is known that in the sector considered, price is established on the basis of factors that are multi-dimensional and referred to the specific service offered.

For this reason, next to the index calculated, an indication is also given of the index of the consumer price of diesel fuel for traction, since this index absorbs the price variations for fuel as an actual cost supported by the hauliers.

The following table shows the series of indices obtained using tariffs and the series of indices of diesel for traction. Finally, in the same table there is the price index of freight road transport, obtained from the weighted average of the two indices with 1995=100 as base.

TAB 5 – New series of price index of freight transport on road. Years 1992-1999

Years	Price Diesel for traction base 1995=100	Tariffs of the motorizzazione base 1995=100	Weighted average base 1995=100
1992	84.3	92.6	90.1
1993	91.2	93.9	93.1
1994	92.5	96.3	95.1
1995	100.0	100.0	100.0
1996	106.1	102.6	103.6
1997	107.3	106.4	106.7
1998	103.3	109.1	107.4
1999	109.9	109.7	109.7

Final remarks

This paper presented the methodology for the calculation of the price index of production of freight transport on road, that the Central Department for National Accounts and Economic Activity, of the National Institute of Statistics in Italy (ISTAT), adopts to make estimates at constant prices.

This document represents an initial innovative approach for the calculation of the producer price index of the sector in harmony with the suggestions given by Eurostat at the Community level.

According to the Decisions of the Commission, the method used in Italy, based on model pricing, is considered among the most appropriate methods to be used, when PPIs for the said sector are not attainable.
The A method is the most appropriate but it implies a direct statistical survey to determine a coherent PPI, which is currently non attainable.
Since a direct survey on PPIs of freight transport is not available, National Accountants have been deeply engaged in constructing and improving price indices of production of services, focusing on the production offered for services of intermediate consumption.
Currently, the level of breakdown that underlies the calculation of the price index of freight haulage is limited to the statistical sources available.
The construction of the index has involved a great effort both in terms of procuring sources and harmonising them and in terms of processing data available.
The methodology adopted is based on information relative to prices applied by road hauliers and to tonnes-kilometre of goods transported, distinguished according to groups of goods classified with the Statistical Nomenclature of Traffic (SCT), taking into proper account the weight, the tariff class and the class of distance travelled.
Regarding the construction of a producer price index for freight transport services, the calculation of a producer price index could be experimented by carrying out a survey on the enterprises that sustain the cost of freight transport, since, as is shown by this paper, the freight transport market is so highly fragmented that it is difficult to construct a price index of production by carrying out a direct survey on the carriers that supply the service, instead.
The tariff policies tend towards an increase in tariffs due to the demand for new transport services, such as for example the handling and manipulation of goods, loading and unloading operations, storage of freight, unbundling and bundling of loads, etc., therefore collecting prices at production level (considering also the amount of services offered) would heavily burden the enquiry, since it is not so easy to investigate into the prices fixed by all the enterprises in the sector.

Bibliography

ALVARO G.(1999) - "*Contabilità Nazionale e Statistica economica*", terza edizione Cacucci editore, Bari.
CONFETRA (2001) - "*Profilo dell'autotrasporto di cose in Italia*" a cura del centro studi di Confetra quaderno n°87/4.
CONFETRA – (1997) "*Tariffe a forcella per i trasporti di merci su strada*" a cura del centro studi Confetra, quaderno n°93/1;
CONFETRA – 1996 "*Profilo dell'autotrasporto di cose in Italia*" a cura del centro studi Confetra quaderno n°87/2;
CONFETRA – 1996 "*Mercato dei servizi logistici e di trasporto merci in Italia*" a cura del centro studi Confetra quaderno n°91;
CONFETRA – 1996 "*Flussi di traffico merci, infrastrutture ed imprese di trasporto*" a cura del centro studi Confetra quaderno n°99;
EUROPEAN COMMUNITIES (1998), "*Measurement of prices and volumes according to the production approach*", in *Official Journal of the European Communities, Part II*.
EUROSTAT - "Handbook on price and volume measures in national accounts" April 2001, draft;
EUROSTAT (1996) European System of Accounts, ESA 95, Luxembourg.
ISTAT - (1992) "*Matrice regionale origine-destinazione dei beni trasportati"*, Collana d'informazione n°13, anno 1989, Roma;
ISTAT - (1998) "*Trasporto merci su strada*", Collana d'informazione anni 95-96 n°74, Roma;

ISTAT - (1991) "*Classificazione delle attività economiche*", Metodi e norme, Serie C, n° 11, edizione 1991;
ISTAT - (1994) "*Processo produttivo e analisi di qualità delle stime del valore aggiunto nel settore dei servizi vendibili. Servizi alle imprese e trasporto su strada di merci*", Note e Relazioni, n°2, Roma;
ISTAT –(1999) "*Statistiche dei trasporti*" Annuario n°1, Roma, 2001.
ISTAT – *Conti economici nazionali*, anni 92 – 99, Roma.
MINISTERO DEI TRASPORTI E DELLA NAVIGAZIONE, MINISTERO DEI LAVORI PUBBLICI, MINISTERO DELL'AMBIENTE, "*Il nuovo Piano Generale dei Trasporti"*, Roma 1999.
MARESCA S., MONTELLA M.(2000), "*Alcune innovazioni sugli indici di prezzo dell'output dei servizi", in "La deflazione degli aggregati dell'offerta*", documento presentato alla conferenza *La Nuova Contabilità Nazionale*, January , 12-13 January 2000, Istat, Roma.
MONTELLA M.(2000), "*Le matrici dei margini di trasporto*" documento presentato alla conferenza *La Nuova Contabilità Nazionale*, January , 12-13 January 2000, Istat, Roma.
PICOZZI L., PISANI S. – "*Misure e dinamica della produttività del terziario*", Quaderno di ricerca n°15/1994, Istat, Roma;
PISANI S. (2000), "*La deflazione degli aggregati dell'offerta*", documento presentato alla conferenza su "*La Nuova Contabilità Nazionale*, 12-13 January 2000, Istat, Roma.
SEVERI L.- MONTANARO V. (1988-89) "*Autotrasporto di merci*" V edizione Buffetti editore, Roma;
SEVERI L.- MONTANARO V. (1988-89) "*Le tariffe d'autotrasporto*" IV edizione Buffetti editore, Roma;
U.N., EUROSTAT, IMF, OECD, WORLD BANK (1993), *System of National Accounts 1993*, Brussels/Luxembourg, New York, Paris, Washington, D.C.