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Warehousing and Storage (ISIC 52.10)

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Table of contents

Introduction[1]

This document describes the Warehousing and Storage producer price index calculated by Istat, the Italian National Statistical Institute. The index comes from quarterly survey data and is one of the first indices produced.

The document is set out as follows: Paragraph 1 describes the industry according to different classifications, explains the Italian market conditions and gives details on the characteristics of the industry. Paragraph 2 deals with the pricing method. Paragraph 3 concludes with a short measurement evaluation.

1. Description and characteristics of the industry

1.1 Definition of the industry

Warehousing and storage is a group (3-digit) of the division *Warehousing and support activities for transportation* (2-digit) contained in section *H*, *Transportation and Storage*, of ATECO 2007, the Italian Classification of Economic Activities. This section includes the services related to all the types of transportation, together with other services that are part of the logistics chain (cargo handling, warehousing and storage, etc.), as well as postal and courier activities.

The *Warehousing and storage* group refers to operation of storage and warehouse facilities for all kinds of goods: operation of grain silos, general merchandise warehouses, refrigerated warehouses, storage tanks, etc. It also includes storage of goods in foreign trade zones and blast freezing.

From 2-digit to 4-digit levels, ATECO 2007 (Table 1) has the same structure both of NACE Rev. 2 (Table 2), the Classification of Economic Activities used in the European Union and ISIC Rev. 4, the International Standard Industrial Classification of All Economic Activities (Table 3). The difference is that, under the ATECO class 5210, there is one more level including two categories: Refrigerated and non-Refrigerated warehousing.

Table 1 – ATECO 2007 structure

Structure	*Ateco 2007*	*Definition*
Section	H	Transportation and Storage
Division	52	Warehousing and support activities for transportation
Group	521	Warehousing and storage
Class	5210	Warehousing and storage
Category	52101	Warehousing and storage for third parties
Category	52102	Refrigerated warehousing for third parties

[1] The views expressed in this paper are those of the author only and do not necessarily represent the position of Istat.

Table 2 – NACE Rev. 2 structure

Structure	*NACE Rev. 2*	*Definition*
Section	H	Transportation and Storage
Division	52	Warehousing and support activities for transportation
Group	521	Warehousing and storage
Class	5210	Warehousing and storage

Table 3 – ISIC Rev. 4 structure (2008)

Structure	*ISIC Rev. 4*	*Definition*
Section	H	Transportation and Storage
Division	52	Warehousing and support activities for transportation
Group	521	Warehousing and storage
Class	5210	Warehousing and storage

NAICS 2017, the North American Industry Classification System, corresponds to ISIC and NACE down to 4-digits; at a lower level (5-digit), it is divided into four industries (Table 4) that distinguish warehousing by type of commodity: general, refrigerated, farm and other.

ANZSIC 2006, the Australian and New Zealand Standard Industrial Classification, has fewer levels, in fact its 3-digit level corresponds to the 4-digit level of the other classifications (Table 5). Moreover, its lower level (4-digit) distinguishes storage between grain and other.

Table 4 – NAICS 2017 structure

Structure	*NAICS 2017*	*Definition*
Section	48-49	Transportation and Warehousing
Subsection	493	Warehousing and Storage
Group	4931	Warehousing and Storage
Industry	49311	General Warehousing and Storage
Industry	49312	Refrigerated Warehousing and Storage
Industry	49313	Farm Product Warehousing and Storage
Industry	49319	Other Warehousing and Storage

Table 5 – ANZSIC 2006 Rev. 2 structure

Structure	ANZSIC 2006 Rev. 2	Definition
Division	I	Division I Transport, Postal and Warehousing
Subdivision	53	Warehousing and Storage Services
Group	530	Warehousing and Storage Services
Class	5301	Grain Storage Services
Class	5309	Other Warehousing and Storage Services

1.2 Market conditions and constraints

In Italy, *Warehousing and Storage (521)* is the smallest part of the *Warehousing and support activities for transportation* division *(52)* in terms of number of enterprises, turnover and number of employees in fact, each of them represent around 7% of it (Table 6). On the contrary, the only other group *(522)* in the same division, related to *Support activities for transportation*, covering more than 90%, is composed by five classes representing activities referring to land, water and air transport of passengers or freight, such as operation of parts of the transport infrastructure or activities related to handling freight. The evident diversification in the activities covered by group *522* makes it prevalent compared to group *521*, within the same division.

Moreover, inside the *Transportation and Storage* section *H*, the *Warehousing and Storage* group represents respectively 1.4%, 2.0% and 2.3% in terms of number of enterprises, number of employees and turnover. However, together with the *Support activities for transportation* group, it reaches the following coverage percentages: 18.2%, 32.2% and 35.1% respectively for the same three variables listed before (Source: SBS - http://dati.istat.it/).

Table 6 - Percentage of Enterprises, Employees, Turnover by ATECO code, year 2017 (Source: SBS - http://dati.istat.it/)

ATECO 2007	% Enterprises	% Employees	% Turnover
521 - Warehousing and storage	7.5	6.3	6.6
522 - Support activities for transportation	92.5	93.7	93.4
52 - Warehousing and support activities for transportation	100.0	100.0	100.0

From 2008 to 2017, the number of enterprises is enough constant for the entire period. During the years 2011-2016, the trend of the employees rate of change increases and in 2017 suddenly decreases: even if the rate is still positive its value is smaller than the previous two years. Instead, during the whole period, turnover rate of change has a discontinuous trend (Table 7 and Figure 1).

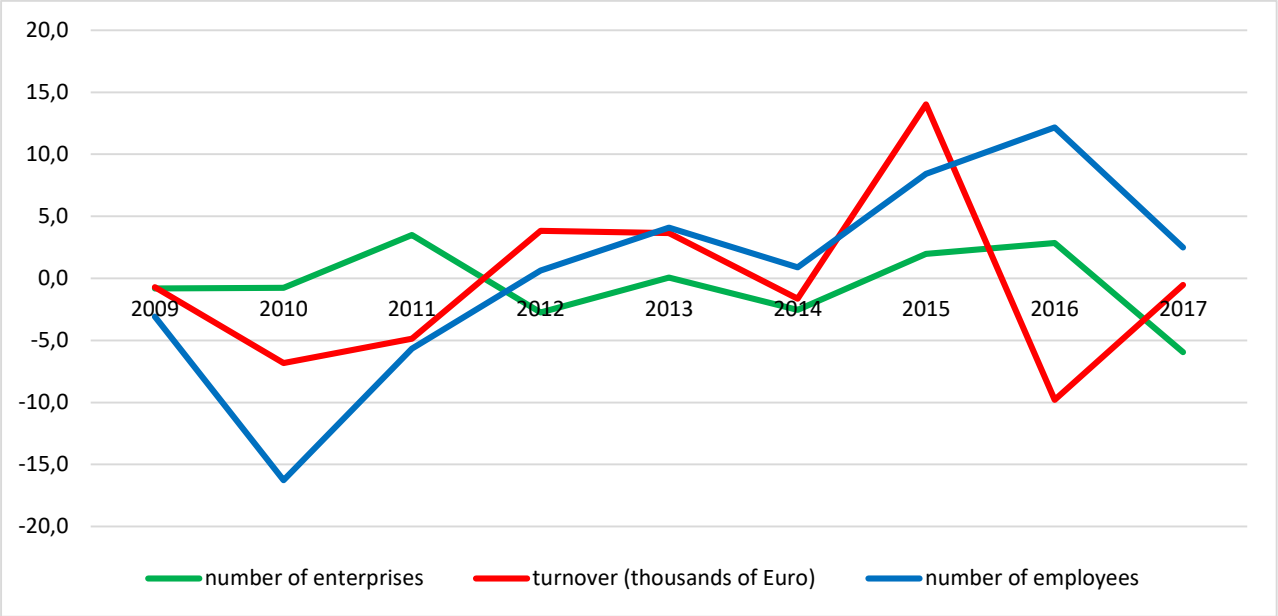
It seems that the Warehousing and Storage industry has managed to continue providing services and hiring employees even during the years characterized by the economic crisis.

Table 7 – The Warehousing and Storage (521) time series 2008-2017: number of Enterprises, Turnover, number of Employees (Source: SBS - http://dati.istat.it/)

level	***year***									
	2008	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*
n. enterprises	1,742	1,728	1,715	1,775	1,726	1,727	1,683	1,716	1,765	1,660
turnover (*)	3,810,282	3,783,077	3,524,505	3,353,385	3,482,227	3,609,086	3,549,464	4,046,790	3,650,427	3,630,868
n. employees	23,170	22,453	18,797	17,733	17.844	18,574	18,738	20,318	22,788	23,358

(*) thousands of Euro

Figure 1 – The Warehousing and Storage (521): annual rate of change 2009-2017 for Enterprises, Turnover and Employees (Source: SBS - http://dati.istat.it/)



Most enterprises (78.4%) in the Warehousing and Storage group have fewer than 9 employees, generate 15.9% of total turnover and cover 14.7% of total employees. According to SBS, this industry is characterised by many small enterprises producing a negligible amount of turnover. Enterprises with more than 10 employees are 21.6% of the universe (359/1660), however their turnover is not negligible at all, in fact it is 84.1%, about five times the turnover of small enterprises, as well as the percentage of employees they have (85.3%) - (Table 8).

The high concentration of this industry, in term of employees and turnover, allow statistician to observe a relatively small sample of enterprises to collect data for computing the corresponding producer price index. In particular, 189 enterprises have more than 20 employees and cover 74% of the turnover of the sector; only 85 of them have more than 50 employees and cover 57% of the turnover and, among them, there are 10 enterprises with more than 250 employees and 13% of the total turnover.

Table 8 – The Warehousing and Storage (521) industry by classes of employees, year 2017, (Source: SBS - http://dati.istat.it/)

Employees	% Enterprises	% Employees	% Turnover
0-9	78.4	14.7	15.9
>10	21.6	85.3	84.1
Total	100.0	100.0	100.0

1.3 Specific characteristics of the industry

Warehousing and Storage activities are part of the logistic process that allows planning and controlling the flow and storage of raw materials, semi-finished and finished products from the origin point to the consumption one.

The warehouse is the primary protagonist of these logistics activities.

Nowadays warehouses are dynamic structures that allow companies to receive, store and sort goods by means of different complex processes. They can be classified according to common characteristics depending, for example, on the nature of the goods stored, the type of building, the flow of materials, the location on the territory and the degree of automation, as follows:

- *type of building*: outdoor areas, sheds, basements, silos, refrigerated storage rooms, self-supporting warehouses (in which shelving constitute the supporting structure of the buildings);
- *location*: warehouses classified into central, suburban and transit hubs;
- *product type*: warehouses specialized in coils, flammable products, metal profiles, small products, spare parts, perishable products, general goods, etc.;
- *distribution line*: warehouses used for raw materials, components, semi-finished products, finished products;
- *degree of automation*:
  (i) traditional warehouses (where the work is done manually by the operators);
  (ii) semi-automated warehouses (technologically more advanced than traditional ones, they use a warehouse management software but still need manpower);
  (iii) automated warehouses (where processes and activities are fully automated: their logistic flows are based on the 'goods-to-man approach' namely the products move towards the operators thanks to a combination of automatic systems).

The management and organization of a warehouse is made of different and complex activities that can be classified into three macro activities:

1. *Management and storage*
   (i) Freight entry: unloading and delivery of goods, packaging and raw materials; goods quality control; sorting of goods towards storage and warehousing areas; maintenance, consolidation, breaking of packages, mixing of goods;
   (ii) Freight exit: picking of packages, products or other products from larger units (i.e. pallets) often by automated machines; co-manufacturing; co-packing; kitting; issuing of transport documents;
   (iii) Wrapping packages and products and shipping to customers.
2. *Documents management*

Managing of incoming and outgoing documents such as purchase orders, invoices, reordering plans, catalogues, etc.

3. *Returns management*

Managing the so called 'reverse logistics' is a complex activity because returns must be manages according to well-defined rules, checked, eventually reallocated in warehouse and then reused - if possible - or discarded. This happens when customers send back goods to the warehouse for several reasons, such as delivery errors or defects in the product.

According to these activities, it follows that the management and organization of a warehouse needs three distinct physical zones:

- a *reception area* where goods are received and sorted towards the storage area and documentation is checked;
- a *storage area* where the quality control of goods is carried out, goods are placed on dedicated shelves and stocks are managed;
- a *shipping area* where goods are packed to be shipped to customers.

As time goes on, in the supply chain the warehouse is the element for undergoing the deeper transformation. In fact, due to globalisation, the need for faster and more efficient logistic solutions already became to change the face of the traditional warehouse.

The concept of warehouse as an extension of a plant is destined to become marginal. A modern warehouse is taking place: the Warehouse as a Service. The warehouse is increasing its sphere of competence and is becoming the frontend between manufacturers, freight forwarders and customers by managing in outsourcing tasks that go beyond the mere storing, preserving and handling of goods. For example, co-manufacturing, co-packing, kitting, fixing are some of the core businesses of a warehouse, on a par with the management of goods.

From the observation of the Warehousing and Storage market arises that the storage of goods, the handling of goods, and the value added services (VAS) make up the industry output. These services are delivered by means of a contract between the storage company/operator and the customer, which outlines the type of service being provided.

The contract lists the provision of integrated logistics services such as reception, quantity control, storage, handling and shipping of goods or of other services that the customer needs. All the obligations borne by the operator and the customer are well specified:

- for the storage company the contract specifies: needed means, tools, facilities, equipment, resources as well as the operative procedure agreed with the customer;
- for the client the contract details: the type, the characteristics and the quantities of the goods the type of packaging, the lists of dispatch orders complete with the identification details of the addressees, the additional required services, the means of arrival and delivery of the goods

A dedicated section of the contract contains the reference volumes for determining the economic values of the deal. The volumes usually refers to the monthly handling and the average monthly handling (both in tonnes), the in/out daily handling (in percentage), the average stock, the package size, the composition and type of the average shipping order, the type of goods identification (for example: bar codes, etc.).

The location and the type of the warehouse are other two determinant factors contained in the contract.

Moreover, special sections of the contract detail:

- the handling of goods: in and out of the warehouse, as well as inside the warehouse, including handling restrictions (for example: stack ability, applicable pressures, etc.);
- the storage of goods: according to the type of goods and identification, including storing restrictions (for example: temperature, humidity, etc.);
- the entry and delivery arrangements; goods control; returns management; stocktaking;
- the fees by type of activity;

- the contract lifespan.

2. Measurement of SPPI

2.1 General framework

The Italian Warehousing and Storage producer price index was published for the first time in 2014 with data going back to the first quarter 2010.

This index is used as deflator in the National Accounts. Other potential users include anyone with an interest in this market and, among them, mainly analysts and media.

2.2 Measurement issues

The Warehousing and Storage SPPI is produced with prices collected by a quarterly survey and is released at national level with the same frequency.

The questionnaire is online and asks enterprises (units) data referring both to business to business turnover and prices, by eight commodity groups: Automotive, Clothing, Publishing, Electronics/Telecommunications, Pharmaceutical, Mass-market products, Industrial products, Other. The total turnover and the turnover by commodity group, both referred to the previous year, are collected once a year while prices are quarterly for each enterprise.

Enterprises are sampled from the Italian Business Register, with a cut-off method by turnover.

The price index is an industry based Laspeyres type index, chained on the last quarter of each year, with reference period 2015=100. The basket of services, the sample of units and the weights are annually updated.

2.3 Description of pricing method

Based on the specific characteristics of the industry described in paragraph 1.3, the contract price method is used to capture movement in prices for three services, representative of the business to business market: the storage of goods, the handling of goods and the related value added services. The outsourcing is excluded.

Service 1: The storage of goods means storing and preserving products in warehouses for future selling or treatments.

Service 2: The handling of goods concerns movements into and out of the warehouse, as well as movements inside the warehouse itself.

Service 3: Value added services (VAS) refer to additional services provided to customers; the ones related to transport activities are excluded. For example, among them: *co-manufacturing* (assembling and packaging semi-finished products); *packing* (packaging or restyling goods in place of the manufacturing company); *kitting* (kit composition adding accessories to the product); *quality control* (checking the quality of goods); *labeling* (application of labels on products and/or on packaging); *reverse logistic management* (management of returns and receipts).

Each enterprise has to provide its three main Contracts (*Contract 1-3*), in terms of turnover, for each commodity group that characterizes its market, among the eight groups asked in the

questionnaire (*Commodity group 1-8*: Automotive, Clothing and footwear, Publishing, Electronics or Telecommunications, Pharmaceutical, Mass-market products, Industrial products, Other). Besides, for each contract the respondent gives a quarterly price for each of the three services listed above (*Service 1-3*).

The respondent unit is required to describe contracts with a list of characteristics that allow unique recognition over time: client code, contract lifespan, product type, warehouse location, warehouse type, VAS fully description, unit of measure of the price.

The index is derived through five steps, for each of them a top-down description is given:

In each enterprise:

1. inside each Commodity group (1-8), for each Contract (1-3), an elementary price index is calculated (EPI) for each Service (1-3);
2. for each Commodity group (1-8), a geometric mean of EPIs, for the same type of Service (1-3) among Contracts (1-3), is calculated: three indices per each Commodity group are obtained (the storage index, the handling index, the VAS index);
3. for each Commodity group a weighted arithmetic mean of the storage index, the handling index and the VAS index is computed, obtaining at most eight Commodity group indices;
4. Commodity group indices are aggregated by weighted arithmetic mean in order to obtain the enterprise index.

At national level:

5. Enterprise indices are aggregated by weighted arithmetic mean obtaining the overall national index.

At the beginning of each year, the questionnaire directly collects business to business turnovers, referred to the previous year, used as weights in steps 3-5, respectively at: Service, Commodity group level and Enterprise level.

The index estimation procedure treats missing prices with the carry-forward method. This method, even with the risk of giving an inappropriate amount of stability into the index, fits well for this industry characterized by a moderate volatility in the storage and in the handling prices, even if it is less appropriate for the dynamic prices of VAS.

In order to take account of pure price change and quality change, quality adjustments are planned for each contract when the change of contract terms or the contract replacement occur. In this case, the overlap method is used.

3 Evaluation of measurement

Meetings with company associations and with big enterprises have helped statisticians to identify the pricing method that best represents the price mechanism of the Warehousing and Storage market. In fact, data collection itself confirms that the contract method is a good choice to represent this industry in Italy. Companies have no difficulty in filling questionnaires because they asks information easily derived from contracts with customers.

Only a methodological observation can be given referring to the quality adjustment tool: it is used enough frequently for VAS. Storage companies allow their customers to make significant changes to their products directly in the warehouse, thus saving time and costs. Doing so, the

goods are available in stock and ready for delivery. Customers are increasingly asking for this type of services that, although part of the contract, are tailored to the specific needs of the moment. Consequently, a more frequent use of quality adjustment takes place for VAS, therefore more attention is needed in checking and validating this type of data.

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