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**Mini-presentation on SPPI for:**

**Engineering Services  
(ISIC 71)**

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## Introduction<sup>1</sup>

This paper provides an overview of the Architectural and Engineering activities producer price index compiled and published by the Italian National Statistical Institute (Istat). The index is computed with quarterly collected survey data and is one of the newest indices planned and produced.

Paragraph 1 describes the industry and the market conditions and compares different classifications; Paragraph 2 presents the pricing measure; Paragraph 3 concludes with a brief measurement evaluation.

## 1. Description and characteristics of the industry

### 1.1 Definition of the industry

The Architectural and Engineering activities sector is an important part of professional, scientific and technical activities and is made of disciplines that, applying physics, chemistry and mathematics knowledge, provide technological responses to different customers' needs. The services are provided in many fields, for example, from construction to industry as well as management, biomedicine, transportation, environment, etc. and they usually are custom made.

*Architectural and engineering activities; technical testing* is a division (2-digit level) of *Professional, scientific and technical activities*, sector M, of ATECO 2007, the Italian Classification of Economic Activities. This division includes the provision of both architectural services - such as consulting, design, drafting services, town planning - and engineering services - such as engineering design and implementation, geophysical, geological and seismic surveying, mapping services. The architectural and technical services sector also includes the performance of physical, chemical and other analytical testing services of materials and products, including, for example, testing activities in the field of food hygiene, reliability testing, testing and measuring of environmental indicators and the certification of products such as transport equipment.

From 2-digit to 4-digit levels, ATECO 2007 has the same structure of NACE Rev. 2, the Classification of Economic Activities used in the European Union; in addition, in the ATECO classification classes split across one or more categories (Table 1 and Table 2).

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<sup>1</sup> Attributions to the authors: to C. Cecconi paragraphs 1.3, 2, 3, to S. Cavallaro paragraphs 1.1 and 1.2.

The views expressed in this paper are those of the authors only and do not necessarily represent the position of Istat.

**Table 1 – ATECO 2007 structure**

<i>Structure</i>	<i>Ateco 2007</i>	<i>Definition</i>
Sector	M	Professional, scientific and technical activities
Division	71	Architectural and engineering activities; technical testing and analysis
Group	711	Architectural and engineering activities and related technical consultancy
Class	7111	Architectural activities
Category	71110	Architectural activities
Class	7112	Engineering activities and related technical consultancy
Category	71121	Engineering activities
Category	71122	Integrated engineering design services
Category	71123	Technical activities carried out by geometers
Category	71124	Cartography and aero-fotogrammetry activities
Category	71125	Geological studies and geological survey activities
Group	712	Technical testing and analysis
Class	7120	Technical testing and analysis
Category	71201	Technical testing and analysis of products
Category	71202	Quality control and certification of products, processes and systems

**Table 2 – NACE Rev. 2 structure**

<i>Structure</i>	<i>NACE Rev. 2</i>	<i>Definition</i>
Sector	M	Professional, scientific and technical activities
Division	71	Architectural and engineering activities; technical testing and analysis
Group	711	Architectural and engineering activities and related technical consultancy
Class	7111	Architectural activities
Class	7112	Engineering activities and related technical consultancy
Group	712	Technical testing and analysis
Class	7120	Technical testing and analysis

ATECO, NACE and ISIC Rev. 4 (International Standard Industrial Classification of All Economic Activities) are aligned except for group 711, *Architectural and engineering activities and related technical consultancy*, that for ATECO and NACE is split across two classes 7111 and 7112, instead for ISIC it has only one class (Table 3).

**Table 3 – ISIC Rev. 4 structure**

<i>Structure</i>	<i>ISIC Rev.4</i>	<i>Definition</i>
Sector	M	Professional, scientific and technical activities
Division	71	Architectural and engineering activities; technical testing and analysis
Group	711	Architectural and engineering activities and related technical consultancy
Class	7110	Architectural and engineering activities and related technical consultancy
Group	712	Technical testing and analysis
Class	7120	Technical testing and analysis

NAICS 2017 (North American Industry Classification System) corresponds to ISIC and NACE down to 4-digits; at lower levels it is subdivided into eight industries (Table 4).

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

**Table 4 – NAICS 2017 structure**

<i>Structure</i>	<i>NAICS 2017</i>	<i>Definition</i>
Sector	54	Professional, scientific and technical services
Subsector	541	Professional, scientific and technical services
Group	5413	Architectural, engineering, and related services
Industry	54131	Architectural services
Industry	54132	Landscape architectural services
Industry	54133	Engineering services
Industry	54134	Drafting services
Industry	54135	Building inspection services
Industry	54136	Geophysical surveying and mapping services
Industry	54137	Surveying and mapping (except geophysical) services
Industry	54138	Testing laboratories

**Table 5 – ANZSIC 2006 structure**

<i>Structure</i>	<i>ANZSIC 2006</i>	<i>Definition</i>
Division	M	Professional, scientific and technical services
Subdivision	69	Professional, scientific and technical services
Group	692	Architectural, engineering and technical services
Class	6921	Architectural services
Class	6922	Surveying and mapping services
Class	6923	Engineering design and engineering consulting services
Class	6924	Other specialized design services
Class	6925	Scientific testing and analysis services

## 1.2 Market conditions and constraints

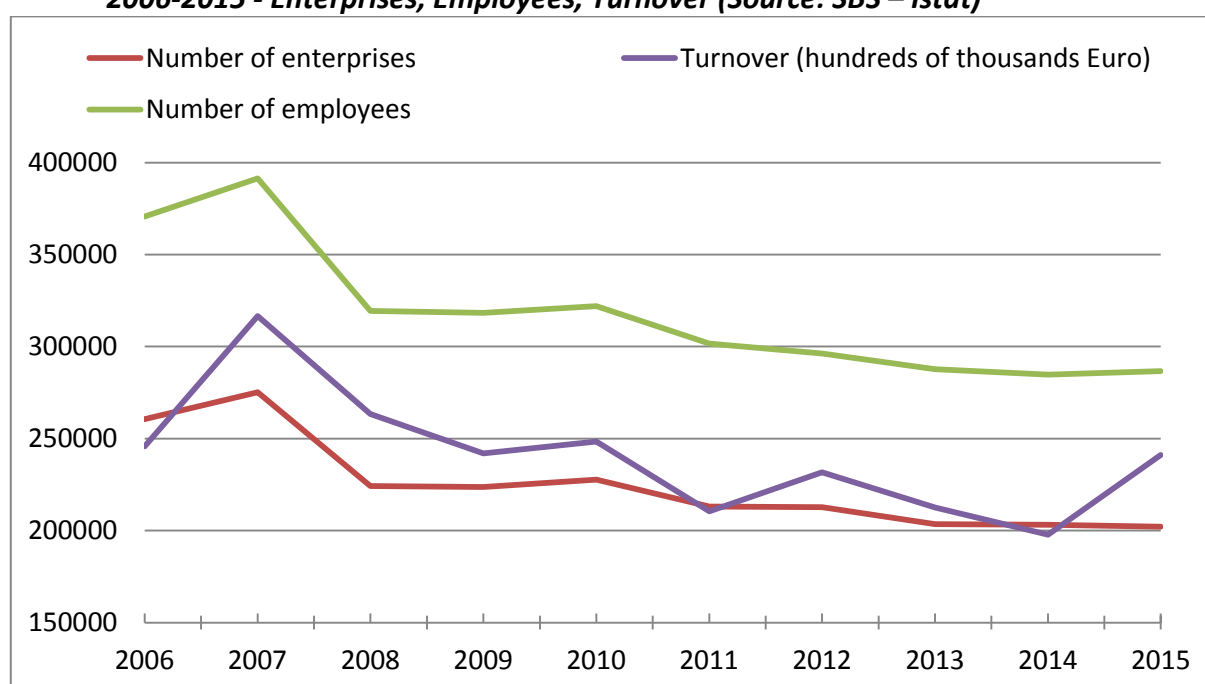
In Italy, according to Structural Business Statistics (SBS), industry 71 *Architectural and engineering activities; technical testing and analysis* is dominated by class 7112, *Engineering activities*, in terms of enterprises, employees and turnover. Class 7120, *Technical testing and analysis*, has the least share, however this type of activities is carried out by enterprises belonging to the other two classes too. Together *Architectural and Engineering activities* (7111 and 7112) cover around 90% of the industry for each of the three variables, exactly 95.5% for enterprises, 87.7% for employees and for 84.2% for turnover. Table 6 below summarizes the breakdown of the industry by market share and employment size.

**Table 6 - Percentage of Enterprises, Employees, Turnover by ATECO code, year 2015, (Source: SBS – Istat)**

ATECO 2007	% Enterprises	% Employees	% Turnover
7111 - Architectural activities	30.3	23.7	10.9
7112 - Engineering activities	65.2	64.0	73.3
7120 - Technical testing and analysis	4.4	12.2	15.8
Total	100.0	100.0	100.0

From 2006 to 2015 the trend of the industry decreases, as shown in Figure 1. In 2007 and 2010 enterprises, employees and turnover have positive variations and only in 2015 employees and turnover increase again. The crisis of the sector is self-evident and durable but SBS data begin to give the first signs of recovery.

**Figure 1 - Architectural and engineering activities; technical testing and analysis (71): Time series 2006-2015 - Enterprises, Employees, Turnover (Source: SBS – Istat)**

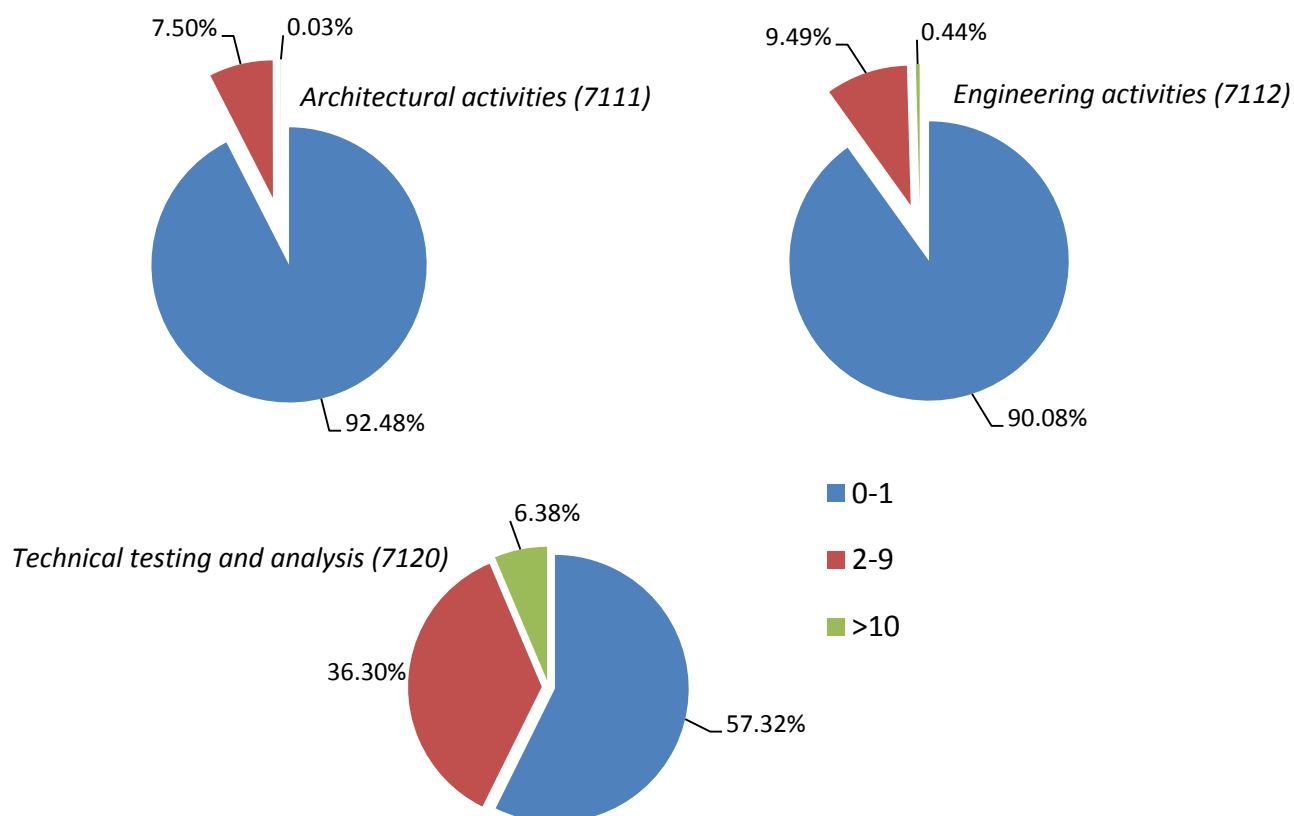


The vast majority (89.4%) of the enterprises operating in this industry have fewer than 2 employees and generate about 61% of total turnover. Large enterprises represent less than 1%, however their turnover is not negligible and it is about one third of the small enterprises turnover (Table 7). The high fragmentation of this industry means that there are fewer but important big units. The percentage of enterprises with few employees is higher for class codes 7111, *Architectural activities*, and 7112, *Engineering activities*, and it is smaller for class 7120, *Technical testing and analysis*, where the market is more fragmented (Figure 2).

**Table 7 –Enterprises classified to ATECO code 71, by number of employees, year 2015, (Source: SBS – Istat)**

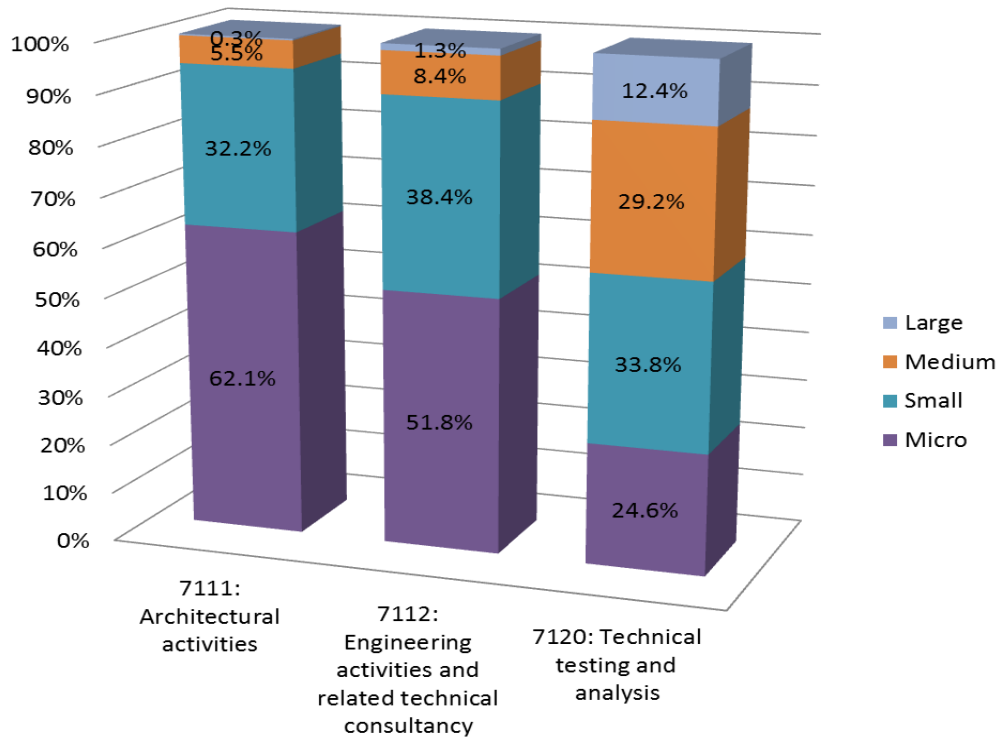
Employees	% Enterprises	% Turnover
0-1	89.4	61.8
2-9	10.1	20.2
>10	0.6	18.0
Total	100.0	100.0

**Figure 2 - Percentage of enterprises by ATECO code and number of employees, year 2015 (Source: SBS - Istat)**



Lastly, Figure 3 shows the distribution of enterprises by ATECO code and dimension, where dimensions are identified according to a double criterion: number of employees and turnover, and it confirms the analysis made above.

**Figure 3 - Percentage of enterprises by ATECO code and dimension, year 2015 (Source: SBS – Istat)**



### 1.3 Specific characteristics of the industry

The development of the Engineering Services index was done with the help of the Research Centre of the Italian National Engineering Council, the national organization of institutional representation of the professional category of engineers. The help of this association was useful to understand the market as well as to identify the services and the pricing mechanism for deriving the most appropriate price method.

The most important features of the Italian market can be summarized as follows:

- there isn't a net distinction between architectural and engineering services;
- there is a distinction between integrated engineering and traditional engineering. Integrated engineering works with bundles of services that usually concern the sub sector of plant engineering and refer to different activities (from planning and design, to preparation of the plant, to closing of the works);
- an Italian law has abolished the compulsory charging previously used in the market;
- technical testing and analysis activities are done by multidisciplinary engineering companies;



- business architectural and engineering services are unique and custom based. In the public market they are usually sold by public procurements, in the private one the customer directly chooses the service producer;
- public procurements are integrated, namely, are given to pools of companies. Bigger enterprises usually win the most important contracts. Public procurements impose the parameters to determine the total cost of the project;
- for both public and private market, the price of the service is percentage of the total cost of the work.

According to recent data from a periodical survey of OICE<sup>2</sup>, the Association representing engineering companies belonging to Confindustria<sup>3</sup>, there are good signs of recovery for Italian engineering companies. In fact, during 2016 the value of production increased of 11% respect to the previous year, fully recovering the decline of 2015, and for the current year it is expected a further increase. Besides, last year there was an increase of 2% of employees too. In response to the change in international demand, positive data of export of services contribute to these results too, with estimates growing in 2017 (+22%). These positive results drive the Association planning to reach international markets, re-launching investments in innovation.

Undoubtedly the positive market picture emerging from OICE data will have to be monitored to capture changes in pricing mechanisms as soon as possible.

## 2. Measurement of SPPI

### 2.1 General framework

The Italian Engineering Services producer price index was developed in 2014 and it is one of the last indices produced. It is compiled according to NACE Rev. 2, therefore it covers Industry 71 that includes both architectural and engineering activities as well as technical testing and analysis.

The National Accounts Division began to use it last February to compute annual and quarterly national accounts benchmark, with time series from 2014.

### 2.2 Measurement issues

The Engineering Services SPPI is compiled with prices collected by a quarterly business survey and its structure is industry based. The questionnaire is electronic and contains data referring both to business to business turnover and prices of enterprises.

A stratified sample of enterprises by turnover is used, with PPS<sup>4</sup> sampling in each stratum. Large companies are integrally sampled.

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<sup>2</sup> OICE. 2017. *Le società di ingegneria crescono del 22% all'estero* [http://www.edilportale.com/news/2017/07/mercati/oice-le-societ%C3%A0-di-ingegneria-crescono-del-22-all-estero\\_59213\\_13.html](http://www.edilportale.com/news/2017/07/mercati/oice-le-societ%C3%A0-di-ingegneria-crescono-del-22-all-estero_59213_13.html)

<sup>3</sup> Confindustria is the leading association of manufacturing and service companies in Italy.

<sup>4</sup> Population Proportional to Size.

The price index is a chained Laspeyres one; this means that the basket of services, the sample of units and the weights are annually updated. The index structure is simple and is made up of four levels. At the first level elementary price indices are computed as ratio between the individual price of a representative service of the current period (quarter) and the corresponding price of the base period (fourth quarter of the previous year). At the second level, elementary indices are aggregated by simple geometric mean in order to obtain the enterprise index. At the third level, enterprises indices are aggregated by weighted arithmetic means into strata indices that, finally, are weighted into the 2 digit NACE Rev. 2 national index.

Enterprises included in the sample provide business to business turnover used to weigh enterprises indices (third level); weights used at the last level, to synthesize strata indices, come from Istat turnover data of the universe.

### **2.3 Description of pricing method**

The model price method is used to capture movement in prices for engineering services. According to the *Methodological guide for developing producer price indices (2005)* “The model price method is an appropriate alternative to be used for industries where service outputs are predominantly unique. The method requires the respondent to quote in each period a price for a standard service whose specifications are held constant. A model can either be a service that has never been observed as such or it can be a service that has been observed in the past, but not during the pricing period”.

In the first compilation of the questionnaire each enterprise has to provide the description of three different projects for architecture and engineering services. Projects can be hypothetical or based on real transactions made in recent past. The second option is preferable because (i) a model based on actual data is more realistic; (ii) it is easier for respondents to estimate prices; (iii) the representativeness of the service is better satisfied.

Each project, identified both by descriptive variables and a short description, stands for a type model that must be kept constant for a period of time sufficient to ensure the observation of the quarterly prices of a representative service among the following five types:

1. *Design/Execution*: feasibility and pre-feasibility studies. Public and private design services. Design services for recovery, restoration and repairs. Urban planning services. Management, assistance and accounting. Structural calculation. Testing and security management activities.
2. *Legal advice*: legal advisory activities such as: conciliation, arbitration, technical office advice, contentious activities and technical advice.
3. *Consulting services*: consultancy. Environmental and strategic assessment. Detailed estimates and other expertise. Participation in board and committees.
4. *Collaborations with other professional firms*: jobs for other professional studies or structures. Co-operations activities between professional studies.
5. *Topographic surveys and other activities*: Topographic works with GPS equipment and other instruments. Digital graphics.

The variables that identify the model are the following:

- customer type: public customer or company, enterprise, private customer;
- market type: domestic and non-domestic;
- service life span: months and/or days;
- reference cost: the total cost of the work for design/execution services; the reference cost for other types of services;
- category of work: building; structures; installations; mobility infrastructures; hydraulics; landscape and environment; territory and urban planning;
- functional destination: tourism and commerce; mobility services; health, education, research; existing buildings and artifacts; industrial plants; ordinary viability; productive settlements in agriculture-industry; etc.;
- work identification: ID of the work, according to the Italian law;
- type of activity: planning and programming; feasibility studies; estimates and evaluations; surveys, studies and analysis; economic plans; preparatory, final and executive design; direction of the work; testing; monitoring; design security; executive security.

The questionnaire also asks a short but accurate description of each project that allows unique recognition over time.

For each quarter and for each model/project, every enterprise provides the estimated price of the described service, namely the total remuneration received from the enterprise for selling the service to a hypothetical customer (enterprise or P.A.). The price includes costs, contributions, subsidies as well as discounts, promotions and bonuses applicable to the buyer; it excludes VAT and all taxes on the goods and services invoiced by the enterprise.

## **2.4 Evaluation of comparability of price data with output data**

Both quarterly price data and output data are collected from stratified samples of enterprises coming from the same universe. The sampling methods are different and in Istat the responsibility of the two surveys belongs to different organizational structures. Quarterly turnover is not used as weight for SPPIs. Besides, at present, the turnover survey collects total turnover, namely business to all turnover; the service producer price survey collects only business to business prices and therefore it represents a subset of the service market. In future the two surveys could be made more homogeneous so that data could be directly comparable and prices could be a better deflator for turnover itself.

### 3 Evaluation of measurement

The model price method is undoubtedly a good choice when services are unique and custom based and therefore it is impossible to collect over time the same identical service to measure its price evolution. However, some practical problems arise:

- it is difficult to explain the method to respondents;
- prices remain unchanged for several periods when respondents do not answer seriously to the questionnaire;
- estimating prices is hard even if the model is based on a service recently provided by the enterprise itself;
- quality adjustment treatment needs when some enterprises do not keep the model constant;
- contacts with respondents need to be more frequent to ensure that the prices reflect the market.

Despite everything, the engineering sector fits well to the model price even if it needs to be improved in the quality adjustments treatment.

### Bibliography

- Australian Bureau of Statistics. 2006. *Australian and New Zealand Standard Industrial Classification 2006 (Revision 2.0)*. <http://www.abs.gov.au/ausstats/abs@.nsf/mf/1292.0>
- Eurostat. 2015. *Statistics Explained*, [http://ec.europa.eu/eurostat/statistics-explained/index.php/Archive:Architectural,\\_engineering,\\_technical\\_testing\\_and\\_analysis\\_services\\_statistics\\_-\\_NACE\\_Rev.\\_2](http://ec.europa.eu/eurostat/statistics-explained/index.php/Archive:Architectural,_engineering,_technical_testing_and_analysis_services_statistics_-_NACE_Rev._2)
- Eurostat . 2008. *Statistical Classification of Economic Activities in the European Community, Rev. 2*. [http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=LST\\_NOM\\_DTL&StrNom=NACE\\_REV2&StrLanguageCode=EN](http://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=LST_NOM_DTL&StrNom=NACE_REV2&StrLanguageCode=EN)
- Istat. 2009. *Classificazione delle attività economiche Ateco 2007*. Metodi e Norme n. 40. <https://www.istat.it/it/strumenti/definizioni-e-classificazioni/ateco-2007>
- Istat. 2017. *Prezzi alla produzione dell'industria e dei servizi*. 28 June 2017
- OECD, Eurostat. 2005. *Methodological guide for developing producer price indices*. 2005 Edition. Luxembourg: Office for Official Publications of the European Communities
- OICE. 2017. *Le società di ingegneria crescono del 22% all'estero* [http://www.edilportale.com/news/2017/07/mercati/oice-le-societ%C3%A0-di-ingegneria-crescono-del-22-all-estero\\_59213\\_13.html](http://www.edilportale.com/news/2017/07/mercati/oice-le-societ%C3%A0-di-ingegneria-crescono-del-22-all-estero_59213_13.html)
- United States Census Bureau. 2017. *North American Industry Classification System 2017*. <https://www.census.gov/eos/www/naics/>