Production in construction

Introduction and regulatory framework

The monthly Index of Production in Construction (IPC) measures all construction activities, referring both to the production of new manufactured products and the maintenance of existing products (section F of the Nace Rev. 2 economic activity classification). The index is constructed on a fixed basis and uses 2015 as the reference year.

Regulation (EC) no. 1165/2008 of the European Council, successively amended by Regulation (EC) no. 1158/2005 of the European Parliament and of the Council, establishes the level of detail, the methodology and the frequency with which the IPC and the other short-term economic indicators must be produced and transmitted to Eurostat.

According to the above mentioned Regulation, Istat monthly submits to Eurostat also confidential estimates on production for items CC1 ('Building construction') and CC2 ('Civil engeneering works') of the 'Construction Classification.

The processing of the index is also provided for by the current Italian National Statistical Programme.

Calculation source and methodology

The production function

IPC is calculated applying an indirect method: the trend of the output is estimated using indices of the productive inputs (hours worked, intermediate inputs and physical capital), aggregated through the coefficients of the production function of the sector, referenced to the base year and estimated using a constant return to scale Cobb-Douglas formula.

The estimate of the production function has been obtained on the basis of elementary business data, deriving from the annual SBS data referring to year 2015. In particular, for the purposes of the estimation of the production, the following variables have been used: the value of the production, the cost for the purchase of intermediate inputs (raw, subsidiary and consumer materials), the total hours worked and the value of the tangible fixed assets that represent a *proxy* of the physical capital. In the case of small and medium-sized companies, the data relating to the fixed assets has been derived from the statutory financial statements of the construction sector companies, to integrate the data on firms with less than 100 workers, whose balance sheets do not report this kind of information. The Cobb-Douglas specification, linearised through the logarithmic transformation, has led to the following estimated regression model:

$$\log Y = 0{,}454 \log L + 0{,}448 \log ACQ + 0{,}098 \log K$$

where, in aggregated terms, Y is the value of the production, L indicates the number of hours worked, ACQ is the value of the purchases of intermediate goods and, finally, K approximates the volume of the material capital used.

The parameters have been estimated adopting the ordinary least squares method.

Monthly update of input variables

For each reference month, the level of the IPC is obtained by applying the coefficients of the production function (estimated for base year 2015) to the monthly indices relating to the input.

The monthly trend of the input variables is calculated using different information sources. Data on hours worked is provided by Building Institutes Building Workers Welfare Funds (BWWF), bodies in charge, at a territorial level, of the management of several contractual terms and the resulting data collection on the ordinary hours effectively worked by workers and apprentices. Through a census survey based on the 98 provincial BWWF, Istat monthly gathers information on the hours worked, the number of workers and the amount of companies to which the hours refer. The collected data are currently subject to checks aimed at ensuring the quality. In addition, comparisons with other Istat surveys have shown that the data from the BWWF sufficiently approximate the trend of the labour input of the sector.

The intermediate inputs are measured through an indicator constructed on data relating to monthly turnover of industrial products, deflated by the production price indices for the internal market. Starting from the national turnover indices at a group and class level (3 and 4 digits of the Ateco 2007 classification, derived from Nace rev.2), 7 types of economic activity have been selected, corresponding to the most used intermediate goods in the construction sector: production of cement, lime and plaster; manufacture of articles of concrete, cement and

plaster; manufacture of clay building materials; manufacture of structural metal products; manufacture of builders carpentry and joinery; manufacture of builders' ware of plastic; cutting, shaping and finishing of stone. Calculating the aggregate index of intermediate goods (or purchase index) results in implementing a two level weighting structure: the single elementary indices, corresponding to the previously mentioned economic activities, are multiplied by the weights of the turnover index and provide the branch indices; these latter are then aggregated with the coefficients derived from the intermediate cost matrix of the symmetrical table of the resources and uses of year 2014, the latest available among those produced by the National Accounting at the time of the 2015 rebasing.

With regard to the index referring to capital, the monthly estimate of the evolution of the capital stock is obtained from the annual estimates of National Accounting relating to the capital stock by ownership branch. Also taking into account the substantial inactivity of this aggregate, the monthly transformation of the annual data is performed hypothesizing uniform growth of the aggregate between one month and another, and then extrapolating the trend registered in the last year for which data are available. However, given the relatively reduced weight that the capital stock assumes in the production function, these approximations are expected to have a very limited influence on the estimation of the IPC pattern.

Seasonal adjustment

The production in construction index is transmitted to Eurostat monthly, and it is issued in three versions: the "raw" index, which results from the calculation performed on original data, the calendar adjusted index and the seasonally adjusted index, both calculated through the TRAMO-SEATS software program.

In order to issue a set of indices with a common base and to allow Eurostat to carry out the necessary operations to construct the European aggregates more easily, the monthly indices, corrected for the calendar effect, are recalculated so as to take on a value of 100 in the base year and leave the series profile unaltered. The seasonal adjustment method used by TRAMO-SEATS is founded on the assumption that a monthly or quarterly time series may be represented as a combination (sum or product) of different, not directly observable components: a long term component, called 'trend-cycle', a seasonal component that captures periodic movements of the observed phenomenon, and an irregular component due to erratic factors. The IPC is seasonally adjusted using a multiplicative decomposition.

The seasonal adjustment model is reviewed at the time of base recalculation and every year, contemporaneously to the annual IPC revision. The model currently in use provides for the presence of four outliers (three additive and one temporary change) and 'leap year' effect.

Finally, since the addition of new monthly information allows a better evaluation of the different components of the series, each month the seasonally adjusted series are recalculated.

Timeliness

The production of statistics related to the IPC must take into account the availability of the sources used for the measurement of the inputs. In fact, the monthly turnover indices are available at approximately 40 days past the reference month (the production prices approximately 30 days past the reference month), while the measure of the hours worked is updated monthly and made definitive only at the closure of the annual financial statement of the BWWF. Moreover, estimates of the gross fixed capital and the capital stock are released once a year by the National Accounting, usually 10-12 months past the reference year.

Istat processes a provisional estimate of the monthly value of the IPC 45 days past the end of the reference month and transmits it confidentially to Eurostat which uses the indices for the calculation of the European aggregates. Provisional estimates are then issued at national level approximately 48-50 days past the end of the reference month and reviewed 30 days later.

Coverage and territorial detail

The data are available only for the entire national territory.

Revisions

In addition to the periodic update of the reference base, the value of the IPC, is periodically reviewed to keep inputs measures updated. The first revision, carried out in the month following the month of first issue, incorporates the belatedly received information on hours worked. The second revision, generally at the end of the year, is contemporaneous with the release of the National Accounts estimate of gross capital by ownership branch. Currently, Istat processes a provisional estimate of the monthly value of the IPC 45 days past the end of the reference month and transmits it confidentially to Eurostat which uses the indices for the calculation of the

European aggregates. Provisional estimates are then issued at national level approximately 48-50 days past the end of the reference month and reviewed 30 days later. In conjunction with the update of the indicator concerning capital input, definitive data are also acquired concerning hours worked, monthly turnover indices and producer price indices.

Issue

The indices are issued through the joint press releases "Production in construction and construction costs", available on the Istat website at http://www.istat.it/en/archive/construction+costs+and+production.

The series of the updated indices are published on the Istat data warehouse (http://dati.istat.it/?lang=en) within the theme of Industry and Construction - Production, sub-theme – Index of production in construction.

Construction costs

Significance of the indices, general reference and regulatory framework

The construction cost indices measure cost changes in residential building and civil engineering. The indices are tailored to a specific building type and to a specific road segment type, monitoring separately the cost of each factor. Therefore, costs of the land, design and work management are not included, nor is the profit margin of the construction company. The observation field, respectively for residential building and road segments, concerns the economic activity of Ateco 2007 Divisions 41 'Construction of buildings' and 42 'Civil engineering', in particular, Group 41.2 'Construction of residential and non-residential buildings' and Class 42.11 'Constructions of roads and highways'. The elementary cost items do not include costs for safety, which are part of a separate work specification.

Typical features of residential building refer to an *typical residential* type: the sizes of the building (i.e. the number of floors, the average surface of the housing units) are defined according to the *Monthly Survey on Construction Permits* relating to residential building. These features are used to develop a project of residential building , upon which the index weighting system is constructed.

The new project of *residential building* was developed by the Department of *Civil Engineering and Mechanics* of the University of Cassino and Southern Lazio[5]. The road segment type project was built up by Anas Spa[5].

The construction cost indices of a general residential building, of the labour and of the materials are transmitted to Eurostat monthly, as required by the Regulation on short-term statistics no. 1165/1998, amended by Regulation no. 1158/2005.

Data source

For the group of *materials* cost, the series of prices are acquired from the *Monthly Survey of Prices to the Production of Industrial Products (PPI)*, and for road segments, price series were issued by *Anas Spa*.

Costs for elementary inputs referred to *transportation* and *freight* groups are collected by Inter-regional Superintendence of Public Works (Lombardy-Emilia Romagna, Tuscany-Umbria-Marches, Lazio-Abruzzo-Sardinia). With regard to several elementary cost items in the *freight* group, the data also come from the price lists of the Chambers of Commerce of Milan, Modena, Bologna, Florence and from data collected by Anas Spa.

The *transport* and *freight* costs are defined '*at the moment'*, because they both include cost of the driving force (electrical energy and/or fuel) and the labour cost.

With regard to the *labour* group, the costs are derived from the *Monthly Survey on Contractual Wages*, considering as reference variable the hourly cost of labour in the building sector.

Index calculation methodology and weighting structure

The base of the residential building indices and the road segments is updated annually with regard to monthly changes and uses year 2015 as reference year. The elementary cost items are summarised in simple geometric mean. The summarised indices are aggregated in weighted arithmetic mean (Laspeyres).

Starting from January 2018, the indices are constructed using December 2017 as a base for calculation. The indices are obtained in the 2015 base by chain linking. The incidence of the elementary cost items are fixed by the metric calculations of the single residential building and road segment projects, respectively provided by the University of Cassino and Anas Spa.

The new December 2017 calculation base maintains a similar structure to the previous base: for the residential building 4 cost groups and 59 products are considered. Comparing with the previous year, the elementary price series up from 426 to 428, of which 4 are for *labour*, 390 for *materials*, 11 for *transport* and 23 for *freight*.

Regarding road segments, the December 2017 base calculation structure is the same as the previous year and includes - for roads with tunnels - the following classes concerning road engineering work with tunnel section: 4 cost groups, 22 products and 88 elementary price series, of which are 3 for *labour*, 53 for *materials*, 8 for *transport* and 24 for *freight*. With regard to road engineering work without tunnel section, the weighting system is classified as follows: 4 cost groups, 24 products and 136 elementary price series, of which 3 are for *labour*, 97 for *materials*, 8 for *transport* and 28 for *freight*.

Timeliness

Provisional monthly indicies are released at 50 days, final data at 80 days from the reference month.

Revisions

The indexes are reviewed on a monthly basis between provisional and definitive data.

Coverage and territorial detail

The data are available only for the entire national territory.

Issue

The indices of residential buildings and road segments are issued each month at a national level for the 4 cost groups: *labour, materials, transport and freight.*

The indices are issued through the joint press releases “Production in construction and construction costs”, available on the Istat website at http://www.istat.it/en/archive/construction+costs+and+production.

Alongside the issue of the provisional indices, definitive indices from the previous month are also released.

The series of the updated indices are published, together with the issue of the press release, on the Istat data warehouse (http://dati.istat.it/?lang=en) within the theme of Prices, sub-theme - Construction costs index.