STATISTICS DENMARK

Documentation of statistics for Construction cost index for residential buildings 2021

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1 Introduction

The purpose of the construction cost index for residential buildings is to measure the change in construction costs. The index is used, among other things, to regulate contracts. The primary users of this index are construction firms, entrepreneurs, housing developer, solicitors, public institutions and the EU.

The construction cost index is published from the first quarter 2003 and replaces the former construction cost index.

2 Statistical presentation

The construction cost index for residential buildings is produced each quarter to follow the change in construction costs for residential buildings in Denmark. The index is published for a one-family house and a multi-family house, in addition to all residential buildings which is based on a weighting of the two indices. All indices are further more broken down into eight sub-indices by profession and six sub-indices by building parts. Both the total indices and the sub-indices are divided into material costs and labour costs.

2.1 Data description

The construction cost index for residential buildings is a quarterly index delineated by labour costs, material costs and equipment costs for a typical residential building in Denmark, and, therefore, do not illuminate the actual cost level. The index is delineated for a one-family house and a multi-family house, in addition to an index for the total. The index is further delineated into eight sub-indices by profession and six sub-indices by building parts as well as material costs and labour costs.

The index encompasses costs incurred when raising a residential building, i.e. costs of labour, equipment and materials, for the entrepreneur, however, costs associated with the plot, architect, etc. are not included the computation of the construction cost index.

The index shows a quarterly change in construction costs for residential buildings and is calculated on the basis of a fixed basket of commodities. Thus, the construction costs are associated with the same type of residential building. The composition of the index is based on an analysis of constructing a residential building, a one-family or multi-family house, primarily from information obtained from Dwelling- and Housingregister (BBR).

The construction cost index for residential buildings is a Laspeyres index with fixed weights. The index shows the costs for the entrepreneur when constructing a residential building excluding profit margins, costs to the architect and engineers, as well as value added tax and costs associated with the plot of land.

The weights used in the construction cost index for residential buildings are based on business accounts from three actual residential buildings: a one-family house, a terraced house and a multi-family house. The business accounts are collected from three entrepreneurs of different sizes and geographic location. The processing and interpretation of this data, an engineer specialised in pricing of residential buildings have been consulted. The collected information is processed so that each construction part, e.g. the mounting of a concrete wall element, is specified by materials, in this case concrete, by equipment, e.g. building crane, and by type of labour, e.g. concrete element work, that is required, and the associated costs.

Approximately every fifth year the three types of residential buildings are assessed on the basis of their relevance as representing the typical residential building in question. The weights were last updated as of the 1st quarter 2016 where both the weighting- and reference period were altered to

2015.

Labour costs: cover wages and salaries, in addition to other social benefits covered by the employer. In the construction cost index for residential buildings, labour costs cover the compensation of employees that constitute the total earnings of employees.

The total earnings includes the employee's wages and salaries paid by the employer including pension contributions by the employee and the employer to the employee.

The remaining parts of the labour costs include those costs associated with the employee-employer relation, which does not have the character of direct earnings for the employee, i.e. social contributions from public funds, education costs, voluntary personnel costs, etc.

Materials: Cover all costs from materials and equipment. Up to April 2004 material and equipment costs were calculated on the basis of actual prices paid by producers/ importers excl. VAT. This means that the prices used were net of discounts of the actual sale of the materials or equipment. As of April 2004, the prices collected are the importers' purchasing price c.i.f. (i.e. including cost, insurance and freight) excl. taxes and fees, instead of the final sales prices that were collected previously.

The division into construction components is based on the Danish classification of building elements; SfB Bygningsdeltavlen.

The division into profession components is based on the different costs associated with the respective building trades.

2.2 Classification system

The construction cost index for residential buildings can be grouped by housing types, professions, building parts as well as material and labour costs.

The index can be subdivided by housing types: one-family houses; multi-family houses; all houses

The index can be subdivided by professions: Civil engineering works; Concrete element works; Masonry; Carpentry and joinery; Paintwork; Heating, ventilation and sanitation engineering; Electronic works.

The division of professions are based on the relevant profession that are included in the labour costs and are classified by DISCO-08. The industries that information are collected from are determined by the industry code DB07.

The index can be subdivided by building parts: Subsurface; Shell construction; Construction completion; Surfaces; Heating, ventilation and sanitation engineering; Electric and mechanical engineering.

Labour costs and material costs are not subdivided further.

2.3 Sector coverage

The construction sector.

2.4 Statistical concepts and definitions

Labor Costs: The price concept of labor costs is the actual earnings plus other labor costs, including employers' payments of social contributions. Only the labor costs of persons directly involved in the construction process are included.

Material prices: The concept of material prices for imported commodities is actual transaction prices c.i.f. excluding all duties and taxes on the goods. For commodities for the home market the concept of material prices is actual transaction prices ex producer, excluding VAT and excise duties, and taking both general and specific discounts into consideration

2.5 Statistical unit

Costs.

2.6 Statistical population

The indices represent the construction of residential buildings in all of Denmark.

2.7 Reference area

Denmark.

2.8 Time coverage

2003-

2.9 Base period

2015=100.

2.10 Unit of measure

Index values and percentage change.

2.11 Reference period

The quarter at which the residential buildings is complete.

2.12 Frequency of dissemination

Quarterly.

2.13 Legal acts and other agreements

Act concerning Statistics Denmark § 8, as subsequently amended (most recently by Act no. 599 of 22 June, 2000). Council Regulation (EC) No 1165/98 of 19th May 1998 about business cycle statistics and the Commission Regulation (EC) No 588/2001.

2.14 Cost and burden

There is a miniscule direct response burden since the majority of the data used in production are obtained from other statistics in Statistics Denmark.

2.15 Comment

Further information on the construction cost index for residential buildings can be found on the subject page or can be obtained by contacting Statistics Denmark, Prices and Consumption.

3 Statistical processing

The Construction cost index i based in three actual constructions. The constructions are typical for the construction of residential building in Denmark and are selected on the basis of an analysis of the current construction. The costs of the three constructions forms the weights of the indices. These weights are used to weigh together the prices of the cost components. For the construction cost index price data that has already been collected by others in Statistics Denmark is used.

3.1 Source data

The construction cost index is based on eight concrete buildings:

- One one-family house
- One semi-detached house
- One multi-family houses

The data for the three types of buildings are obtained from contractors of different size and geographic location. Prices for materials and equipment are mainly collected from the Price Index for Domestic Supply. The prices are collected every month and are collected from producers and importers, cf the declaration of contents for Price Index for Domestic Supply. The prices for the total labour costs are mainly collected from the Indices of Average Earnings for the Private Sector. The prices are collected each quarter and refer to the second month of the quarter, cf the declaration of contents for Indices of Average Earnings for Private Sector.

3.2 Frequency of data collection

Quarterly.

3.3 Data collection

Material prices are collected for the Danish Producer Price Index. The Construction Cost Index uses PPI-prices belonging to NACE Rev. 2 Section F. There are about 1200 material prices forming about 160 representative material goods. Labor Costs are collected for the Danish indices for average earnings in the private sector. The Construction Cost Index uses earnings for NACE Rev. 2 Section F.

3.4 Data validation

The data validation is handled by the Price Index for Domestic Supply and Indices of Average Earnings for the Private Sector. The first validation of price data happens when prices arrive. Here they are tested for unusual changes. The prices that do not pass the threshold value will be checked manually by the staff and accepted only if the firms can verify the change. When all prices are received, the system generates a list that includes all price changes and a measure of how these affects the elementary aggregates. The last validation is a visual inspection of all index tables.

3.5 Data compilation

The construction cost index is based on three concrete buildings:

- One one-family houses
- One semi-detached house
- One multi-family houses

The data for the three types of buildings are obtained from three different contractors of different size and geographic location. Prices for materials and equipment are mainly collected from the Price Index for Domestic Supply. The prices are collected every month and are collected from producers and importers, cf the declaration of contents for Price Index for Domestic Supply. The prices for the total labour costs are mainly collected from the Indices of Average Earnings for the Private Sector. The prices are collected each quarter and refer to the second month of the quarter, cf the declaration of contents for Indices of Average Earnings for Private Sector.

3.6 Adjustment

No corrections are made.

4 Relevance

The index is used for contract regulation and to follow the economic development in construction costs. The users of the construction cost index are construction organisations, contractors, building owners, lawyers, public authorities and the EU.

4.1 User Needs

The construction cost index has two primary purposes. The index is used for contract regulation and to follow the economic development in construction costs. The users of the construction cost index are construction organisations, contractors, building owners, lawyers, public authorities and the EU.

4.2 User Satisfaction

No information is collected on user satisfaction.

4.3 Data completeness rate

The statistics fulfill the demands set by Eurostat.

5 Accuracy and reliability

The construction cost index for residential buildings covers the typical house building in Denmark. The concrete buildings have been chosen on the basis of an analysis of the typical house building from the Central Register of Buildings and Dwellings (BBR). Prices for materials and equipment are mainly collected from the Price Index for Domestic Supply. The prices for the total labour costs are mainly collected from the Indices of Average Earnings for the Private Sector. All prices are collected by questionnaires. Measures on accuracy are not available.

5.1 Overall accuracy

The index is based on the development of about 200 representative goods which cover about 20 work functions, about 52 material groups and about 10 equipment groups. To each representative goods a number of prices/goods are attached. The representative goods are chosen from the building accounts for the eight buildings and are chosen according to a principle of importance and representatively.

5.2 Sampling error

Not relevant for these statistics.

5.3 Non-sampling error

Not relevant for these statistics.

5.4 Quality management

Statistics Denmark follows the recommendations on organisation and management of quality given in the Code of Practice for European Statistics (CoP) and the implementation guidelines given in the Quality Assurance Framework of the European Statistical System (QAF). A Working Group on Quality and a central quality assurance function have been established to continuously carry through control of products and processes.

5.5 Quality assurance

Statistics Denmark follows the principles in the Code of Practice for European Statistics (CoP) and uses the Quality Assurance Framework of the European Statistical System (QAF) for the implementation of the principles. This involves continuous decentralized and central control of products and processes based on documentation following international standards. The central quality assurance function reports to the Working Group on Quality. Reports include suggestions for improvement that are assessed, decided and subsequently implemented.

5.6 Quality assessment

Overall the Construction Cost index for residential buildings is assessed to be of good quality.

5.7 Data revision - policy

Statistics Denmark revises published figures in accordance with the Revision Policy for Statistics Denmark. The common procedures and principles of the Revision Policy are for some statistics supplemented by a specific revision practice.

5.8 Data revision practice

Only final statistics are calculated.

6 Timeliness and punctuality

The Statistic is quarterly, primo march (Q¤4), medio June (Q1), primo September (Q2) and primo December (Q3).

6.1 Timeliness and time lag - final results

The construction cost index for residential buildings is published quarterly at the beginning of March (4th quarter), the end of June (1st quarter), the beginning of September (2nd quarter) and the beginning of December (3rd quarter).

6.2 Punctuality

The statistics are generally published without delay in relation to the scheduled publication date.

7 Comparability

See "Comparability over time (QPI/CC for U)".

7.1 Comparability - geographical

Construction Costs Indices for Residential Buildings is regulated by the EU, thus, all EU countries must transmit indices to Eurostat. The Construction Costs Indices for Residential Buildings is directly comparable to the indices produced by other EU-countries for this statistic.

7.2 Comparability over time

It is possible to chain and compare the new construction cost index for residential buildings with the former construction cost index. However, when comparing the two indices it should be borne in mind that it is not the development of prices for similar buildings that are compared but different kinds of buildings that are constructed using different techniques, materials and in periods with different legal demands. This means that not only the weighting scheme but also the methods for collecting prices and calculating the indices are different.

There have been changes the following years:

The first construction cost index was published in *1920* and was an *index for smallholding* (indeks for husmandsbrug). The index had base year in 1914. The house was not very well described. Only that it contained 3 rooms, kitchen, laundry and stable. Because of that there were great inequalities in the data reported by the cost surveyors.

In *1926* a new collection of information about a specific type of house was started. By that means it was possible to follow the price development independent of any improvements of the furniture in the house. This index was revised in *1959* when it was decided to use a farmhouse and a farm building from a type book of the ministry of agriculture. 1959 was base year. Calculation of this index was finished in 1970.

In *1940* a new monthly index for a block of flats was published. This index should measure the development in the costs of residential construction. Base year for this index was 1939. This index was replaced in *1955* by a quarterly index. The weighting scheme of the quarterly index was established on an index house. This index house was a residential construction in 3 storys with 6 staircases and 36 apartments. In this index 1955 was base year. It was still calculated in 1972 for the sake of long-term contracts even if new indices were published from

1969 and *1971*. These two new indices were construction cost indices for one-family houses and a block of flats. As a new concept there were calculated indices by profession and by building parts. The former construction cost index replaced the two indices for one-family houses and a block of flats in *1989*. 1987 is base year. The change from two to one index was made because there was no longer any significant difference between the method in construction and choice of materials.

The present construction cost index is once again divided into an index for one-family houses and one for multi-family houses and thus meets the demands from the users of the index. 2003 is base year.

Differences in classification: As mentioned above only one total construction cost index was published until the publication of the two indices for one-family houses and a block of flats in 1969 and 1971. Hereafter, indices were calculated by profession and by building parts.

Differences in the concept of price: The monthly construction cost index published from 1939 to 1955 was calculated on the basis of information from the Wholesale price index about 20 of the most important construction materials. The labour costs were calculated on the basis of changes in the collective agreed wages in the construction industry. The index included in this way the direct expenses and excluded cost of engineers and architects. In 1955 the concept of price was changed. After this Statistics Denmark collected prices for 132 of the most important or most representative materials. The collected prices were net prices i.e. the invoice prices the master had to pay the supplier of materials excluding general discounts and any profits and including any given duty (i.e. including purchase tax (oms) per 1.8.1962 and VAT per 3.7.1967). The labour costs were calculated on the basis of the current price list in the provinces. The price list was based on collective agreements including social contributions among other things allowance for public holiday.

In the two indices published from 1969 to 1989 a larger number of representative goods were used than in the earlier indices. The material cost index was calculated on the basis of gross prices excluding VAT. The material costs excluded masters fee and other profits. The labour cost index was calculated on the basis of price lists in the different construction trades.

The material cost index in the former construction cost index from 1987 was calculated on the basis of list prices and gathered information on producer prices deducted general discounts. The calculation of labour costs was made on the basis of collective agreement wages including compulsory employers' contributions. The former index is comparable with the indices from 1968 and because of the parallel calculation of the indices in the period from 1987 to 1989 it is possible to regulate contracts back to 1968.

In 2003 the Construction Cost Index for residential buildings was established. The material cost index in this index is calculated on the basis of prices collected from the Price Index for Domestic Supply where both general and specific discounts are deducted. The labour cost index is calculated on the basis of the Indices of Average Earnings for the Private Sector which contains information on each employees earnings etc.

In 2016 the weights for the Construction Cost Index was updated so that 2015=100. The index still follows the same principles as the index in 2003.

7.3 Coherence - cross domain

Methodologically, the calculations of the labour cost indices are now more similar to the calculation of the indices of average earnings, also performed by Statistics Denmark, than previously. I.e., the wage indices are now calculated across all types of employments in the construction industry and not just employments linked directly to the construction process. This makes the indices more comparable to the index of average earnings for the construction sector than previously. As with the index of average earnings for the construction sector the wage indices for the Construction cost index are now calculated at company level rather than employee level, as was the case up until now. This makes the indices more robust to changes in employments.

Furthermore, the basis for calculation is more comparable between the labour cost indices and the indices of average earnings, as they now apply the same data editing procedures.

Moreover, Statistics Denmark has gained access to a new data source, making it possible to include more of the smaller construction companies into the sample. This makes the sample more representative.

Data collection

As mentioned above, for the Construction cost index a range of wage indices is calculated to serve as input for calculations of all sub-indices and total indices. Input wage indices are being calculated for the following groups:

• Bricklaying • Carpentry and joinery, buildings • Roofing • Flooring and tiling • Insulation • Plumbing • Painting • Smithing • Electrical works • Earth and sewage works • Concrete works

Data for the calculation of the wage indices is collected quarterly for a range of companies in the sub-industries to the construction industry, where the groups listed above are employed. Data from the following industries is applied:

• Construction of buildings • Construction of roads and motorways • Construction of railways and underground railways • Construction of utility projects for fluids • Construction of utility projects for electricity and telecommunications • Construction of other civil engineering projects • Site preparation • Electrical installation • Plumbing, heat and air-conditioning installation • Other construction installation • Joinery installation • Floor and wall covering • Painting • Roofing activities • Bricklayers • Other specialized construction activities

The collected data exclusively stems from the companies' and organisations' own IT-systems for administering payments of the employees.

Data validation

The received data is validated on several levels through the steps in the production process. Already at the receipt of the data, a rough search for errors is per-formed, for example of whether the period of the payroll is as expected and whether the general format is adhered to. If this is not the case, the

person or company responsible for the transmission is contacted either by mail or phone and asked to correct the error and retransmit. During the actual production of statistics, the data is validated more thoroughly. This is done both on the individual level, where for example it is checked whether there are missing values on hours worked and wage, and on firm level where for example average pay per hour and number of employees are compared to data transmitted for previous quarters.

Compiling wage indices

The quarterly rate of increase in wages is calculated as the mean wage per hour worked in one quarter compared to the mean wage per hour worked in the previous quarter. This is done for every group of industry. Since the data is based on a stratified sample, the first step that is done is to calculate the correct aver-age wage per hour for each industry in both quarters. The average wage per hour for a group of industry is calculated as the weighted average of the hourly wages for the different size of employment classes 10-19, 20-49, 50-99 and 100+.

In the calculations, only enterprises that have transmitted data for the two consecutive quarters are included. After having calculated the average wage per hour for each size class in an industry, the average wage per hour is calculated for the industry as a whole by weighting the different size classes after the number of workers in each of them for a certain quarter. The difference between the average wages per hour in the two consecutive quarters is then added to the sub-index of the industry. The sub-indices are then aggregated from the 36-class of industry to the 21- or 10-class of industry.

The industry indices are weighted together to form the indices for the groups necessary for the calculation of the Construction cost index. As an example, the index for flooring and tiling is calculated using indices from the industry indices for joinery installation and floor and wall covering, as these are the industries that employ floorers and tilers.

Compiling labour cost indices

During the calculation of the Construction cost index the wage indices are gathered into labour cost indices for the different processes and components of construction, i.e.:

- Earth and concrete work
- Concrete slab work
- Bricklaying
- Carpentry and joinery
- Painting
- Heating and sanitary engineering
- Electrical works
- Subgrade
- Raw buildings
- Completion of building
- Surfaces
- Heating and sanitary installations
- Electrical and mechanical installations

Thus, for the most cases several wage indices goes into one labour cost index. E.g. the labour cost index for bricklaying contains wage indices for bricklaying, flooring and tiling, concrete works and carpentry and joinery.

7.4 Coherence - internal

Not relevant for these statistics.

8 Accessibility and clarity

The statistics are published in *Nyt fra Danmarks Statistik* (News from Statistics Denmark) and in *Byggeri og boligforhold* (Construction and housing) which appears in *Konjunkturstatistik* (Main indicators).

Yearly publications: *Statistical Yearbook* and *Statistical ten-year review*

Statistics are available from Statbank Denmark at: (http://www.Statbank.dk): Byg42 and Byg52.

Furthermore, it is possible to subscribe to the construction index by postcards.

8.1 Release calendar

The publication date appears in the release calendar. The date is confirmed in the weeks before.

8.2 Release calendar access

The Release Calender can be accessed on our English website: Release Calender.

8.3 User access

Statistics are always published at 8:00 a.m. at the day announced in the release calendar. No one outside of Statistics Denmark can access the statistics before they are published.

8.4 News release

News release for construction cost index for residential buildings.

8.5 Publications

The statistics are published in *Nyt fra Danmarks Statistik* (News from Statistics Denmark) and in *Byggeri og boligforhold* (Construction and housing) which appears in *Konjunkturstatistik* (Main indicators).

Yearly publications: *Statistical Yearbook* and *Statistical ten-year review*

Statistics are available from Statbank Denmark at: (http://www.Statbank.dk):Byg42 and Byg52.

Furthermore, it is possible to subscribe to the construction index by postcards.

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8.6 On-line database

The statistics are published in the StatBank under the subject Construction cost index for residential buildings in the following tables:

- BYG42: Construction cost index for residential buildings by main index, sub index, kind, unit and time
- BYG52: Construction cost index for residential buildings by main index, sub index, kind, unit and time

8.7 Micro-data access

Basis material is stored in a register. The system for calculating the indices is constructed so that it is possible to produce special indices. The basis in the system is the BC/SfB-Building Board, and within the framework of this Board there are vast opportunities of constructing special customised indices: Examples are:

- Index for a specific building part
- Index for one of the three buildings
- Index for other kinds of buildings, i.e. office buildings and universities

8.8 Other

The Construction Cost Index for Residential Buildings is transmitted to Eurostat on a quarterly basis in accordance with regulations 1165/98 and 588/2001.

8.9 Confidentiality - policy

All statistics in Statistics Denmark follow the data confidentiality protocol of Statistics Denmark. For the construction cost index for residential buildings only aggregated indices are published, thus discretion does not apply to this statistic.

8.10 Confidentiality - data treatment

All statistics in Statistics Denmark follow the data confidentiality protocol of Statistics Denmark. For the construction cost index for residential buildings only aggregated indices are published, thus discretion does not apply to this statistic.

8.11 Documentation on methodology

A further description of the method used is available in: The publication *Bygge- og anlægsvirksomhed* (Construction industry) which appears in the series *Statistiske Efterretninger* (Statistical News) no: *2003:33.*

8.12 Quality documentation

Results from the quality evaluation of products and selected processes are available in detail for each statistics and in summary reports for the Working Group on Quality.

9 Contact

The administrative placement of this statistic is in the division of Prices and Consumption. The person responsible is André Pedersen Ystehede, tel. +45 39 17 31 63, e-mail: apy@dst.dk

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Statistics Denmark

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