



NEW WEIGHTING FACTORS IN CONSTRUCTION COST INDEX FOR MULTI-DWELLING BUILDING AND COLLECTIVELY BUILT ONE- OR TWO- DWELLING BUILDINGS

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1. Introduction

1.1. Background

The Construction Cost Index measures price development for the production factors, material, labour, machinery, transport, fuel, electric power, costs of entrepreneurs and investors, that occur with new production of dwellings and agricultural buildings. The index measures the price change with the individual production factors and ways these together according to a set weight system. The index does not take consideration to changes in building technology or changes in the different production factors that occur over time. The Construction Cost Index reflects the increase in costs that the entrepreneur has during new production of multidwelling buildings, collectively built one or two dwelling buildings and agricultural buildings.

Construction Cost Index is produced for:

- Housing: multi-dwelling buildings and collectively built one- or two-dwelling buildings excluding wage drift and VAT, monthly
- Housing: multi-dwelling buildings and collectively built one- or two-dwelling buildings including wage drift and excluding VAT, quarterly
- Housing: multi-dwelling buildings and collectively built one- or two-dwelling buildings including wage drift and VAT, quarterly
- Agricultural buildings excluding wage drift and VAT, monthly

For a presentation of the current weight system at the 10 000 sub-level, see each Construction Cost Index model (multidwelling buildings, collectively built one- or two-dwelling buildings) see appendix 1.

1.1.1. Index model for Construction Cost Index

The Laspeyres fixed base index is used for the Construction Cost Index (see appendix 2 Index models). This means that the weights are permanent until a decision has been made to change the weights. The most recent review of the weights of the Construction Cost Index was in 2004. The construction and its basic conditions have since then been changed by e.g.

- changed construction rules for housing construction
- changes in the government subsidies system for housing construction
- changes in the economic situation in Sweden.
- technical development in the construction industry.

These changes can have influenced the cost structure of the construction project, which means that the weight system in the Construction Cost Index should be reviewed. Comments have also been received from the EU proposing a review of the weight system in the Construction Cost Index to be made at least every fifth year¹.

1.1.2. Areas of use for the Construction Cost Index

The Construction Cost Index excluding wage drift is used in the calculation of ongoing prices in the Building Price Index.

The National Accounts at Statistics Sweden use the Construction Cost Index excluding and including wage drift for deflating, reflatting and calculation of building investments in the national accounts.

EU: Reporting of information on the Construction Cost Index To EU's Short Term Statistics.

Other uses of the Construction Cost Index are for price and cost analyses, production and investment analyses, contract negotiations, adjustments, etc.

1.2. Purpose

The purpose of the review is to:

- revise the weight system for the Construction Cost Index
- update price collection with new goods
- formulate a strategy about how to conduct regular reviews.

We will measure that which best describes the actual cost for the entrepreneur, installation work and the investor.

1.3. Delimitations

In this review we will update the weight system in the Construction Cost Index for multi-dwelling buildings and collectively built one- or two-dwelling buildings. We will not update the weight system in the Construction Cost Index for agricultural buildings. However, the question still exists of the need of the Construction Cost Index for agricultural buildings; this matter should be discussed separately with those concerned. If the need still exists, a review should be done. Otherwise Statistics Sweden should cease production of this series.

¹The base years are years that end in 0 or 5.

A review of the production system will be done but it will not be done at the same time as this review. The goal with this review is that we should have a more secure and flexible production system.

2. Index model

The index formula used in Construction Cost Index is the Laspeyres index formula. The reason for using this formula for the Construction Cost Index is because it is not possible to use formulas according to Paasche or a chain index since updating of the weighting factors can only occur with a few years delay. These factors must be based on calculations that refer to completed projects. For the Construction Cost Index to be current, an index according to Laspeyre is a suitable solution.

When choosing an index model, the model must fulfil reasonable economic and mathematic requirements in relation to the purpose for which the index calculation will be made. In addition, the practical measuring problems must be possible to solve, i.e. it should be possible to conduct the calculations within an acceptable time frame.

A problem with the fixed base models is that the weights can be incorrect after a few years, due to changes that affect new production of dwellings. If weight revisions are made more often, for instance every fifth year, this problem would be reduced.

It is important that collection of data and calculation of the Construction Cost Index does not take too much time. The current Construction Cost Index only has one month's delay².

Appendix 2 presents the two most common index models, namely the index models of Paasche and Laspeyres.

We have decided to use the fixed base index model of Laspeyres for the Construction Cost Index.

3. Revision of the weights in the Construction Cost Index

Upon a review of the Contract by tender index (Sw. Entreprenadindex), we received comprehensive information and support via questionnaires, cost calculations and general knowledge

²Data collection today takes place on the 15th in the measurement month and is presented on the 15th of the following month.

from the construction sector. This work was done in 2011. Because the information for the Construction Cost Index largely comes from the Contract Index, we have tended to use this information for revising the Construction Cost Index on types of costs level. This applies to the following types of costs:

Material
Wages and salaries
Machinery
Transport
Electric power and fuel
Other costs

The reason for this is because the work with the review of the Contract Index was done not so long ago (2011). Our experience of the construction sector is that it is quite conservative when it comes to construction technology. The leading contracting companies assisted Statistics Sweden with considerable work on the Contract Index Review. It is doubtful that the same companies would be able to do so much work only a few years later.

We saw that the possibility to use the calculation basis we received from the sector in 2011 covered much of what we needed, but not everything.

The supplementary information needed to be carried out via a questionnaire survey to the four leading contracting companies (see section 3.1).

The information we could not receive from the Contract Index Review was the distribution of:

- ground work
- construction work
- installation work
- contracting costs

Another stage of the review work was also to investigate if the content of material in the review work is consistent with the material that is used today when building multi-dwelling buildings and collectively built one- or two-dwelling buildings (see section 3.2).

The design of the review work this time has been a combination of methods. All in all, we believe that this proposal gives a good picture of today's building of multi-dwelling buildings and collectively built one- or two-dwelling buildings, and should not have a negative effect

on the estimations. This was also a method that required considerably less work from Statistics Swede and the construction industry.

According to the EU, a review is recommended every five years. However, the above plan is a method that can only be used for individual reviews. It is necessary to periodically collect the completed calculations of the project from the industry, in order to capture the actual information about current cost structure, construction technology and choice of materials.

It is also important to continuously monitor the situation. By doing so, we can gain knowledge about changes in the area of construction, for example, changes in legislation and changes that affect this area. Changes in construction technology and choice of materials do not occur quickly, so it may be a good idea to make a collection of new building projects during certain weight revisions, and use this method in between.

3.1. Questionnaire survey

Regarding the ground work, we thought that a questionnaire survey should be able to reveal the distribution of the different types of ground work. Such a survey could also reveal the distribution of installation work concerning heating and sanitation, ventilation and electricity.

The information we could not receive from the Contract Index Review was the distribution of:

- ground work
- construction work
- installation work
- contracting costs

Appendix 8 shows the design of the questionnaire survey that was sent to 11 contractors for multi-dwelling buildings and 10 contractors for collectively built one- or two-dwelling buildings. The response rate was 100 percent.

3.2. Current content of materials

Regarding the types of materials in today's Construction Cost Index, 92 construction materials are used for multi-dwelling buildings and 80 construction materials are used for collectively built one- or two-dwelling buildings. The industry was given a chance to give their viewpoints on these materials. Of course the industry should continuously be able to comment if some materials should be

discontinued or added to the models for multi-dwelling buildings and collectively built one- or two-dwelling buildings. A regular investigation by Statistics Sweden with our respondents (manufacturers, wholesalers and retailers of construction materials) should give us a current picture for the price collection.

3.3. Model for price updating

Regarding the revision for a new weight structure on the level of materials groups, it is difficult to conduct without collecting the cost calculations from the objects for multi-dwelling buildings and collectively built one- or two dwelling buildings. We have mentioned above that such a project would be very time-consuming. There is also an uncertainty in "coding" all material correctly from the cost calculations to the nearly hundred or so groups of materials we have for multi-dwelling buildings and collectively built one- or two-dwelling buildings. In addition, the contractors themselves have said there can be sources of error in these calculations at the low level. The contractors may have simply booked these costs incorrectly. In the 2004 review of the Construction Cost Index, the consulting company Bygganalys was used at a considerably high cost.

An alternative solution to updating the weight structure on the level of material groups that we chose this time was to use the price updating model. This means that index development is calculated for each separate material group, from the base year 2004 that is 100 up until the chosen time for revision. Based on this index development, it is possible to calculate new material weights. That is, if material A had a higher cost development during the chosen period than material B, material A will have a relatively higher weight after the review. It is important to point out that the price updating model should be combined with an active dialogue with the industry to capture their expertise about any changes in the types of materials and individual materials. The alternative to updating the weight structure with the price updating model should in coming reviews at least be alternatively replaced with the method to collect the actual cost calculations. This is to capture changed construction technology and changed choice of materials over time.

4. Working group

The working group has comprised the project leader Stefan Pettersson and Jana Kaarto. Martin Ribe has been consulted as methods expert. Head of Unit Kamala Krishnan has also been partly involved during the project.

5. Strategy for a future review of the Construction Cost Index

This chapter mentions a few strategies to collect information that can be used the next time a review of the weight system will be done. A construction project is complicated because so many parties are involved and many tasks are to be done. It is not possible to gather all information for a construction project from one data source. It is possible to find out the total construction and production cost from one respondent. But in case detailed cost information is needed, several respondents must be consulted.

5.1. Population and sample

First of all, a population needs to be defined and then it is suitable to use statistics on new construction costs as the population. A sample is drawn from this population. We can then begin to rank the population in terms of size by construction costs in Swedish kronor per square meter, total primary utility floor space and remove the most extreme projects (projects with extremely low or high costs, etc.). When this is done, we can make systematic samples to get a sample group that are most consistent with the total population. As an alternative, it is possible to make a proportional sample where the larger projects have a higher probability to be a part of the sample. It is important that several large construction projects are a part of the sample.

5.2. Data sources

We have identified four main suppliers of information and they are construction consultants, contracting companies, trade organisations and the construction material industry including retailers.

5.2.1. Strategy no. 1 Construction consultant

One possibility is to use a construction consultant as the main supplier of information. The documents listed in table 3.1 can be collected and information can be compiled on each project in the statistics on new construction. Then the documents and compilations can be sent anonymised to a construction consultant who produces calculations based on this information. Based on these calculations, new weights can be made for the Construction Cost Index.

A construction consultant can calculate the total costs for a project. Certain items will be defined as tasks of sub-contractors, and then it is important to find out the items that are defined as tasks of sub-contractors. For the sub-contractors, the cost will be presented as a

total cost, that is, these costs will not be broken down by material, wages, machinery, transport and expenses that are needed to calculate the weights in the Construction Cost Index. It is possible to request that the consultant breaks down the costs of the sub-contractor, since the consultant often cooperates with other consultants. Another alternative is to try to break down the costs of the sub-contractor by asking different sub-contractors, consultants, trade organisations etc.

5.2.2.Strategy no. 2 Contracting companies

Another possibility is to use one or more contracting companies as the main suppliers of information. It is possible to try to collect the calculations from contracting companies. It can difficult to collect the calculations from contracting companies. One alternative is to send a file with the old weights at the 10 000 level and ask the contractor to update these weights. With this type of update, the contractor is requested to add new material that was not included and remove the old material that is no longer used. In this case, all costs are usually not broken down by material, wages, machinery, transport and expenses, since some stages are carried out by sub-contractors. To receive the contractor's costs broken down, supplementary surveys need to be done. The most optimal situation would be to receive a list from the main contractor who informed which sub-contractors were involved in the project. Then these sub-contractors could be contacted. If it is not possible to get this type of a list, some of the larger sub-contractors could be contacted and asked if they have any similar projects that they could provide information on costs.

5.3. Checking

When the information is collected from a number of different data sources, the work of checking is complicated and extensive. The information does not have a consistent code structure so much of the checking must be done manually. The information is more or less comprehensive, depending on the source that the material is collected from.

5.4. Weight calculations

When the checking is done, the work to sort the material under appropriate headings begins. When this is done, after a verification with the Construction Index Board, new weights for the Construction Cost Index have been produced.