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Integrated constant-price calculation of domestic supply and use of annual chained price indices in the Swedish National Accounts

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Integrated constant-price calculation of domestic supply

An integrated constant-price calculation is carried out within the system of supply and use tables (SUTs). In this way, supply and use are deflated in a consistent manner so that no residual items arise as a result of fixed-price calculations. In this connection, account is also taken of margins and product-linked taxes and subsidies. One can also distinguish between various types of market, e.g. domestic industry, final domestic use and the export market, and operate with different trading and transport margins for different product groups. The calculation procedure is as follows:

1 Output

Data on industry's output of goods and services are generally found, or calculated, in current prices for the approximately 400 product groups which make up the most detailed level of the SUTs. Output here refers to gross output and not to value added. The output value at current prices is deflated using the relevant price indices. For some product groups, volume extrapolation is carried out using volume indicators, and current prices are obtained by reflating. This applies, for example, for electricity and district heating.

For detailed HS (Harmonised System) headings, industrial output is deflated to t-1 prices using data from the Producer Price Indices (PPI). In the national accounts, these data are aggregated to product group level and chained price indices are computed with the aid of calculations from the previous year. The output value for each product group at year t-1's price is then obtained by deflating with the chained price index the particular product group. Other output is deflated at product group level, using for example the Consumer Price Index (CPI) or wages index.

Construction output is calculated in the national accounts from the use side at current and constant prices. This means that output is deflated as the sum of building investment and repairs.

Services are deflated per product group, using various indices. Products used mainly for private consumption purposes are deflated using a partial index from the CPI. For those areas where a Services Producer Price Index (SPPI) exists, this is used. For many transport services, the factor price index is used, while for some others volume data are drawn on. Other services are deflated applying the wages index. The wages indices used are based on structural wages. Wage indices are not adjusted for any assumed changes in productivity.

For **foreign trade** in goods, the Import Price Indices (IMPI) and Export Price Indices (EXPI) are used to deflate foreign trade by Combine Nomenclature (CN) heading to (t-1) prices. CN headings are linked to Swedish Industry Classification (SNI) product groups. For services, the PPI, SPPI, CPI and wages indices are used among others.

General government sales of market products are included in supply in the SUTs. These sales are deflated using, *inter alia*, the CPI and wages index.

2 National Accounts' Domestic Supply Index

After the calculation at current and constant prices of overall supply in the form of output, imports (including customs duties and agricultural levies) and sales by public authorities, as well as export use, a Domestic Supply Index (DSI) is derived for each product group. The index is computed as shown in the example below.

Current prices: industrial output + general government sales + imports – exports

Constant prices: industrial output + general government sales + imports – exports

Example, product group 33101, medical equipment and instruments:

	SEK Current Prices	SEK Constant Prices
Industrial output	8596	8879
General government sales	216	215
Imports	6431	6220
Customs duties and agricultural levies	2	2
Exports	9420	9723

$$\frac{8596+216+6431+2-9420}{8879+215+6220+2-9723} * 100 = 104{,}1$$

The index is adjusted for any changes in rates of taxes on products.

The Domestic Supply Index is used to deflate on a product-by-product basis **intermediate consumption** in industry and general government, as well as gross investment. The DSI is used where no other specific index information is available.
As a result, intermediate consumption and gross investment in every branch is deflated using an index that is calculated for the products, which are used in the particular branch concerned.

In the case of some consumption, the branch and product group are known. In such cases a constant price can be calculated using a suitable Domestic Supply Price Index from the PPI system (DSPI). For some types of energy, volume extrapolation using quantities may also be carried out. Other consumption, where the product group is not known, is extrapolated from the previous year's consumption values at constant prices for the respective product groups

and branches by applying the branch output volume trend (this means that we start by assuming an unchanged input coefficient). Current prices are then calculated by reflating with the product group's Domestic Supply Index.

Household consumption. This is deflated using various partial indices from the CPI. The DSI is also used for some product groups (e.g. wearing apparel), as well as volume extrapolation and reflating for owner-occupied houses, for example.

General government consumption. Consumption which is known in terms of purpose and product group is deflated using a suitable price index, e.g. DSPI (domestic supply price index from the PPI system) or factor price indices (for building repairs). Unknown consumption is broken down by product group using standard models and deflated using the Domestic Supply Index for the respective product group.

General government consumption, compensation of employees and consumption of fixed capital

These calculations are carried out separately from input-output calculations. Wages are extrapolated from the trend in the number of hours worked. Consumption of fixed capital is calculated at constant prices in a separate system using the same indices as for investment.

Gross investment. Investments whose product group is known (e.g. transport equipment and buildings) are deflated using a suitable DSPI, SPPI or, for example, the construction price index. Unknown consumption is broken down by product group and deflated using the Domestic Supply Index.

Inventories. The PPI is used.

3 Taxes and subsidies on products

When calculating taxes and subsidies at constant prices, the rate of tax that applied for the constant-price year has to be used. In the Swedish national accounts, the tax rates that applied in the previous year are therefore used. The effect of this is that, in the year in which a new tax is introduced, e.g. if VAT is extended to encompass new products, there will be a tax amount in current prices whereas the amount in constant prices is zero.

The expenditure side is the main approach in the Swedish national accounts

In order to provide an insight into how constant prices are presented in the national accounts system, a summary description is given here of the calculation procedure.
GDP as measured from the production side and use side is calculated, compiled and balanced in the product accounts section of the national accounts system. The annual calculation of the product accounts is balanced in a system of supply and use tables (SUTs). Balancing is carried out over 400 product groups for 134 industries. Services are classified according to 120 product groups, with goods accounting for the rest. The 140 purposes of household consumption according to COICOP are broken down further into 258 product groups. Consumption expenditure of departments and agencies of government is broken down partly by sector and partly by purpose according to COFOG . Investment breaks down over 55 product groups in around 75 industries and 10 purposes within the sectors of general government. SUTs are based on the principle that supply must balance with use for each

product group. This means that Swedish output + imports (supply) must be equal to intermediate consumption + final consumption + investment + exports (use).

First of all, all output, imports, customs duties and exports, together with sales by departments and agencies of government and non-profit institutions (NPIs) at basic prices are entered into a database. All values are calculated at both current and constant, prior-year (t-1) prices. The degree of detail varies, and both industry output and foreign trade in goods are calculated at 8-digit CN level. The price indices used for conversion from current to constant prices are the producer, export and import price indices, as well as the unit value index. This is followed by aggregation to the product groups listed in Annex 1. Output of services is broken down directly over around 120 product groups.

Chain price indices are used

Annual chaining

In the production cycle for Sweden's annual national accounts, first preliminary figures are based on the sum of four quarters. These figures are calculated in March t+1. In November t+1 the first annual calculation is published and in November t+2 final figures based on more comprehensive material are published.

In 1999 when the calculation methods for constant prices were changed, it was discussed whether the actual periods should be calculated with weights from t-2 (last final year) or whether the t-1 (preliminary annual calculation) with less "final" values were sufficient for the first preliminary data based on the sum of the four quarters. It was finally decided to use the latest year as base-year for chaining. Even if figures for t-2 could be expected to be more reliable, one had to admit that t-1 figures were the best estimate for the weights that should be used at the end. Another advantage is that one does not have to use indices with t-1 and t-2 in the same system. Having constant prices always in last year's prices also turned out to be an advantage when having to change reference year for publication purposes.

In practice, values are stored in current prices (t prices) and in t-1 prices so that it is possible to add figures at detailed levels to aggregates. Three formulas are used for chaining. In the examples below, the reference year is 1995 = COP95.
(1)

For reference year	95COP95=95t
	(2)
For later years	96cop95= 95COP95*96t-1/95t
	97cop95= 96COP95*97t-1/96t
	(3)
For earlier years	94COP95=95COP95*94t/95t-1
	93COP95=94COP95*93t/94t-1

These formulas are used on transactions and aggregates with constant positive or negative signs. For items that change signs over time, other methods have to be used.

As changes in inventories cannot be calculated in a "normal" way, other alternatives had to be found. It was decided to present inventories in reference year prices with the same share of GDP as in t-1 prices.

For external balance of goods and services both exports and imports are presented in reference year prices and the net amount can be subtracted.

The item trading gains or losses is more difficult, so no value is presented in reference year prices at all. However, the effect of trading gains or losses is of course included in the chaining of GNI. Another item where reference year prices are not presented is the residual between GDP by the expenditure approach and by the production approach.

Quarterly chaining

Comparison of quarterly growth rates in Sweden has by tradition mostly been the annual link between a quarter and the equivalent quarter the year before. If these periods are to be compared, they need to be expressed at the same price-level. After calculation of the fourth quarter we recalculate t prices for the quarters from t-1 prices by using the current prices over the year divided by t-1 prices over the year.

95Q1t=95Q1t-1*Sum95QnCUP/SumQnt-1

The annual value in current prices and in t prices is the same and any discrepancies due to rounding are added to the fourth quarter.

This means that for every period a value is expressed at four price levels:
Current prices; t prices; t-1 prices and reference prices. The reference prices are then calculated the same way as the annual series and any discrepancies due to rounding between the annual figure and the sum of quarterly reference prices is added to the fourth quarter.

In the 3 examples below, the reference year is 1995 = COP95.

	(1)
For reference year	95Q1COP95=95Q1t
	(2)
For later years	96Q1cop95= 95Q1COP95*96Q1t-1/95Q1t
	97Q1cop95= 96Q1COP95*97Q1t-1/96Q1t
	(3)
For earlier years	94Q1COP95=95Q1COP95*94Q1t/95Q1t-1
	93Q1COP95=94Q1COP95*93Q1t/94Q1t-1

The same exceptions to this rule occur for quarterly reference prices as for annual prices. They are inventories, trading gains or loss, residuals and other net amounts.