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Index of Service Production (ISP) - An extract

SESSION ON TURNOVER/OUTPUT FOR WHOLESALE TRADE

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1. Background

The experimental monthly index for service industries, called the Index of Service Production (ISP) from here on, has been created to be a current indicator of production growth in the service industries, measured in constant prices. The new ISP will also be an indicator for quarterly calculations of production of service within the National Accounts.

In the beginning, the ISP will be published for all the service industries and six activity aggregates

- Trade (motor trade, wholesale trade and retail trade) NACE 50-52
- Hotels and restaurants NACE 55
- Transport, storage and communication NACE 60-64
- Business services NACE 70-74
- Education and training, medical services NACE 80-85
- Other services NACE 90-93

The index will only include the private service sector with the exception of production within credit institutes and insurance companies are excluded.

This documentation explains the method behind the calculation of the ISP. A review is done of each activity where the sources for deflating and output for each activity are presented.

The main part of the documentation is aimed at explaining how the ISP is constructed.

2. The theory behind the Index of Service Production

The Index of Service Production (ISO) has the same conceptual basis as the production based measurement of GDP, it is designed to be a short-term indicator for measuring Value Added (VA).

2.1 The theory for measuring the value added in the Index of Service Production

The level of value added is defined in the European System of Accounts (ESA) for each activity in constant prices, such as the following:

VA = production ***minus*** consumption

or in greater detail, one might write

VA = Turnover ***minus*** consumption purchases
plus changes to inventory
plus capital formation by the service producer

GDP is measured at market prices and is the sum of all the industries' taxed value added, plus product taxes (value added tax, alcohol tax, etc.) minus product subsidies.

The Index of Service Production is based on each activity's value added. For example, the production value of road transport activity includes the value of fuel and insurance policies needed to maintain the vehicle and other consumption. The value of these goods and services is deduced to determine their value added.

2.2 Using indicators

The Index of Service Production is calculated in constant prices and as an index. Above all, it is necessary to decide a base year for which prices shall be related to. Then the value added for each activity is estimated in constant prices by converting production and consumption to constant prices, where the latter is deducted from the former. This method, known as double deflation, is very difficult to apply in practice. This requires high quality information regarding value and prices for both production and consumption. Double deflation is also especially uncertain when the value added is small in relation to the production.

There is more information available in practice for production than for consumption, so changes in the production are frequently used as an approximate indicator in order to measure changes in value added.

Even if the relationship between production and consumption is not always stable in separate industries, stability in aggregates of all industries will be higher. For example, if a products or service is transferred from one activity to another, then it not certain whether such changes the total sum of work preformed. If a production indicator overestimates the change in value added in the one activity, the error will go in the opposite direction via an underestimate of value added in the other. In any case, the use of production as an indicator is only as a proxy for what is best used according to the theory.

Below is a list of indicators in order of preference, according to ESA.

1) The indicator that ESA prefers is an output indicator that measures deflated gross output (or turnover) for an activity. This requires an appropriate deflator to cleanse out price alterations.

2) The use of volume indicators is also acceptable according to the ESA ordinance. This requires no deflation but will naturally miss changes in quality or changes in production.

3) Other kinds of indicators measuring input to an activity that is not approved except for certain industries, this is the only available short-term indicator. The most commonly used is employment.

Indicators are selected for the Index of Service Production that can estimate short-term changes according to the following.

- Activity inclusiveness
- Consistency over time
- Reliability and timeliness

Indicators selected for current prices also depend on whether or not there is a suitable deflator.

2.3 Activity classification and weighting

The nomenclature for classifying industries in the Index of Service Production is the Swedish version of the latest activity classification nomenclature titles SIC 2002. Activity indicators are weighed together through the industries' relative contributions to GDP for the service sector based on an activity's value added. The weights in the form of value added in current prices are collected on a broad activity level from the National Accounts (NA) and on a more detailed level from the Structural Business Statistics survey (SBS). The weights will be updated annually but with a delay of about two years. This means that when the index of service production surveys reference year 2007, then the information for National Accounts will refer to 2006 and the Structural Business Statistics survey will refer to 2005.

2.4 Preparatory treatment

All input data for the index of service production must meet certain standards and thus must be prepared in order to follow a given established structure. Because input data comes in many varying forms, the preparatory treatment is unique to the index serving as input in the system.

The price index used by the system is redone such that the price index is explicitly the change, towards some average, from last year's price level. Such recalculations are done for all price indexes.

In the majority of cases, information for output is collected from turnover statistics from the service sector. Information about turnover is expressed with current prices.

3. Mathematical formulation of the Index of Service Production

3.1 What is an index?

An index is used to make it easier to see changes over time for a given variable. An index series starts with a base or a given point in time indicated as a base to which all other figures in the time series refer. An index has the advantage that different types of data can be combined into a consistent base, such as deflated turnover with volume data.

3.2 Index of Service Production

The purpose of the Index of Service Production is to provide a reliable indicator of short-term changes in value added in the private service sector of the economy. An index is the best means to communicate that.

Direct measurement of value added is possible if both output and input can be measured. Such is generally impossible so assumptions are made that changes in gross output represent changes in the value added. The Index of Service Production is thus designed for measuring the volume in output.

Current prices measure the value Current prices show the value or goods and services precisely as they are at a given point in time. Uncorrected turnover data is data in current prices.

value = price * quantity

Constant prices are used to show how the quantity or volume of goods and services changes. As result they are often called volume measures. The Index of Service Production is a volume index in constant prices.

quantity = value / price

The output volume can thus be measured by dividing turnover in current prices by a sound price indicator. This process is called deflation.

Direct volume measures are used in an activity of the Index of Service Production instead of the deflated turnover. All these measurement alternatives can be assumed to employ the same mathematical formula as the one for the deflated turnover, where a price component has a value of 100.

3.3 Mathematical deduction of the Index of Service Production

One of the most common ways of showing volume measures is to express them as constant prices with a set base year. The formula for this can be mathematically expressed as:

$$KP_t = P_0 * Q_t$$

where KP_t is the value in period t expressed as constant prices P_0 of the base period 0 and Q_t is the quantity in period t.

An advantage in expressing them in this manner is that resulting values can be aggregated in the same way as values in current prices. They can also be easily understood as the cost of present purchases in the base year.

There are three methods to calculate constant prices: revaluation, deflation and volume extrapolation and each is suitable under given circumstances.

3.3.1 Revaluation

The simplest and most direct method for obtaining value in constant prices for a specific product or service is to multiply physical quantity produced in the present period by the unit price for the base year. This method has the advantage of not needing a value for any other period than the base year. In any case, it is not used for the Index of Service Production because it requires data about physical quantities for a large number of services. This would be difficult, costly and time intensive and would unnecessarily burden companies in an unacceptable manner.

3.3.2 Deflation

Collecting prices for each kind of service would not be feasible, so in practice Statistics Sweden collects data for a reduced number of representative goods and services that indicate the general price movements. These price movements can be used to construct a price index $(P_t / P_0) * 100$. Earlier, we stated the following:

value = price * quantity

$$CP_t = P_t * Q_t.$$

Thus, by dividing by the price index and then multiplying by 100, a constant price series can be obtained.

$$((P_T * {}_T)((P_T / P_0) * 100)) *100$$

$$= (P_0 * {}_T / 100) * 100$$

$$= P_0 * Q_t = KP_t \text{ which is the value in constant prices.}$$

This is the most common method used in the Index of Service Production, for services with the turnover in current prices and suitable deflators (such as the Retail Trade Price Index and the Service Producer Price Index) are available.

3.3.3 Volume extrapolation

The last method updates the base year's values by using a suitable volume index. This method is regarded by Eurostat as being inferior for providing deflated turnover as a measure of value added, but it is used in absence of deflated turnover.

3.4 Index and weighting

It is possible to obtain values in constant prices with very sparse information. Because the Index of Service Production uses growth as output in order to approximate growth in value added, so this only shows output, volume figures, as an index, relating value to a point in time "t" to the average value in the base year, which is equal to 100, then

$$(P_0 * Q_t) / (P_0 * Q_0) * 100.$$

This gives a volume index for each of the goods and services and the Index Service Production composed of many different services. It is thus necessary to construct an index that gives consideration to the relative weight of each individual service and this is accomplished with weights. To find a suitable weighting system is a key problem in the construction of a Index of Service Production.

There are a number of advantages associated with this method. It is easily understood and usually quite easy to use in order to collect the information. The weights are constant for all future periods. In times of rapid change, these can quickly become out of date. The base year weights are calculated based on the sub-sectors' percentage of the service sector's total value added.

The following results from applying the base year weights to the formula.

$$S_t = \frac{\sum_{i \in S} (w_i (\frac{Q_{it} P_{i0}}{Q_{i0} P_{i0}}) * 100)}{\sum_{i \in S} w_i}$$

Where S_t is the index value at time t
w_i is the weight of component i for the index.

This formula assumes complete knowledge of prices, quantities and weights. One needs in practice to estimate all these elements. This leads to deviations between the calculated index, in comparison to the true index that presumes complete information.

A detailed description of how the weight index is calculated for the Index of Service Production is provided in section 7.3.

4. Surveys

4.1 Service sector turnover statistics (Turn)

The purpose of these statistics is to measure the turnover development on a monthly basis for trade and other service industries. Turnover statistics form I source used as a proxy for output measurement in almost all industries. Information used from the turnover statistics is expressed in current prices. The deflation of the turnover is done within the framework for the Index of Service Production, which makes it distinct from that done in the turnover statistics. The estimation procedure for turnover statistics is described in section 7.1.

4.2 Turnover statistics calculated from VAT fees

The VAT register contains information about exacted Value Added Tax (VAT) for all companies declaring VAT in a special VAT declaration. The register is built on VAT information from the National Tax Board. The number of companies declaring monthly VAT figures reaches approximately 350 000 companies. The purpose of VAT is primarily to measure the turnover development on a monthly basis for all sectors. Information from VAT is used to a few industries, not surveyed by turnover statistics, as a proxy for the output measurement. The information used for VAT is turnover information in current prices. The deflation of turnover is done within the framework of the Index of Service Production.

4.3 Producer price index, domestic

The producer and import price index present the average price trends in producer and import costs for different sectors and goods categories. Prices are measured in the first phase of distribution when the goods are delivered from Swedish producers as well as to primary purchasers, when goods are brought into Sweden. This price index shows the price trends for domestic supply price development. Information from this price index is used as a deflator for wholesale trade and other service industries where is sound service price index has been lacking.

4.4 Service Producer Price Index (SPPI), producer price index for services

The Service Producer Price Index - SPPI - measures the development of prices in industries that provide business services. The SPPI is primarily used by the Swedish national accounts to calculate the production value of services at fixed prices on a product group level. The index measures the average development of prices of transactions during one quarter. Information from SPPI is used as a deflator for a number of service activities such as hotels, transport, computer consultantcy and business services.

4.5 Consumer Price Index (CPI)

The Consumer Price Index is the most commonly used measure of price development and is used as a measure of inflation during labour contract negotiations. CPI refers to how average consumer prices develop for the entire private domestic consumption, that is, those prices consumers actually pay.

A number of different CPIs are used as deflators for the Index of Service Production. For such things as retail trade, information is used from the Retail Trade Price Index (RTPI), which is a collective weighting of different goods categories in the CPI that also belongs to a given activity.

4.6 Factor price index (FPI)

The factor price index is an index measuring the price development for production factors used in the construction activity, such as building, heating, ventilation and air conditioning, electrical work, salaries, machines, transport, fuel, electrical power and projects, etc. The Index of Service Production uses price information from the factor index for transport that is deflators for some other industries within the transport sector.

4.7 Wages and salaries for the private sector

The survey mainly aims to illuminate the development of salary level development within the private sector. Statistics are mainly used as a basis for economic analysis and business cycles evaluations.
In the Index of Service Production, salary indexes are used as deflators for a number of services insures that presently lack a sound service price index.

5. Timeliness and periodicity

The timeliness and periodicity of output indicators and deflators used for calculations of the Index of Service Production are reported on in the table below.

Survey	Periodicity	Timeliness
Service sector turnover statistics	Monthly	T+28 for retail trade. T+35 for the other service sector.
Turnover statistics (calculated from VAT fees)	Monthly	T+70 for all industries.
Producer price index for domestic supply.	Monthly	T+25
Service Producer Price Index (SPPI), producer price index for services	Quarterly	T+45
Consumer Price Index (CPI)	Monthly	T+15
Factor Price Index (FPI)	Monthly	T+8
Wages and salaries for the private sector	Monthly	T+45. (Preliminary after T+45 and definitive after T+60. January and February are reported together.)

* Where T stands for the day in the reference period.

The time plan for the monthly Index of Service Production and the production of the turnover statistics is in accordance with the following.

Activity	**Point in time**
Mailing the turnover questionnaires, month T	T-1
Reviewing questionnaire information, (month T-1)	T+0
Preliminary reminder (month T)	T+10
Last day to submit (month T)	T+15
Telephone reminder (month T)	T+16
Final telephone reminder (month T)	T+19
Reviewing questionnaire information, (month T)	T+25
Applying the deflators	T+45
Preliminary results ready (month T) and Definitive (month T-1)	T+45 – T+50

6. Data sources

The Index Service Production uses a number of different data sources. The sources used as output indicators and deflators are described in this chapter activity by activity, service sector by service sector. The weights used to aggregate activity sector data on the lower level, to generate a series on the higher level, are shown as a percentage of the service industries' total value added.

6.2 Wholesale trade

SIC division 51 includes company activities that are intermediaries in retail trade, e.g. where purchasers buy directly from producers and sell to retailers. The sector includes sales agents that sell on commission without owning the given goods. Service sector turnover statistics are the only source Statistics Sweden has for *wholesale trade* turnover.

Turnover in current prices from Turnover statistics is deflated by means of collectively weighted the producer price index for domestic supply, which shows the price changes in production for Swedish industrial producers.

Index of Service Production: Sources, indicators, weights and deflators

SIC code	Description	Source	Indicator	Weight wholesale trade (Index of Service Production =1000)	Deflator
Division 51 Wholesale and commission trade, except for motor vehicles				**132.6**	
51.1	Commission trade except for motor vehicles	Turn	Turnover in current prices		1. Producer price index for domestic supply Machinery and tools
					2. Producer price index for domestic supply Household appliances
				6.5	3. Producer price index for domestic supply Other
51.2	Wholesale trade in agricultural products and livestock	Turn	Turnover in current prices		1. Producer price index for domestic supply Agricultural products
					2. Producer price index for domestic supply Textiles
				2.4	3. Producer price index for domestic supply
51.3	Wholesale trade in foodstuffs, beverages and tobacco	Turn	Turnover in current prices		1. Producer price index for domestic supply Food
				17.3	2. Producer price

					index for domestic supply Retail trade in alcoholic beverages 3. Producer price index for domestic supply Other everyday commodities
51.41- 51.42	Wholesale trade in textiles, clothing and shoes	Turn	Turnover in current prices		1. Producer price index for domestic supply Textiles and textile products 2. Producer price index for domestic supply Household appliances 3. Producer price index for domestic supply Other
51.43; 51.44 51.47	Wholesale trade in household appliances, glassware, porcelain, and other household goods	Turn	Turnover in current prices	4.8	1. Producer price index for domestic supply Building materials 2. Producer price index for domestic supply Household appliances 3. Producer price index for domestic supply Watches, gold and leisure items
51.45- 51.46	Wholesale trade in perfume, cosmetics, medical equipment and pharmaceuticals	Turn	Turnover in current prices	19.4	1. Producer price index for domestic supply Machinery 2. Producer price index for domestic supply Other everyday commodities 3. Pharmaceuticals
51.51	Wholesale trade in fuels	Turn	Turnover in current prices	12.3	1. Producer price index for domestic supply Fuel
51.52	Wholesale trade in metals and metal ores	Turn	Turnover in current prices	4.6	1. Producer price index for domestic supply Metal, scrap, etc. 2. Producer price index for domestic supply Watches,
				2.7	

					gold and leisure items
					3. Producer price index for domestic supply Other
51.53	Wholesale trade in wood, other building materials and sanitation products	Turn	Turnover in current prices		1. Producer price index for domestic supply Building materials
				9.2	2. Producer price index for domestic supply Household appliances
51.54	Wholesale trade in hardware and heating, ventilation and air conditioning equipment	Turn	Turnover in current prices		1. Producer price index for domestic supply Metal, scrap, etc.
					2. Producer price index for domestic supply Machinery, tools
				6.8	3. Producer price index for domestic supply Building materials
51.55	Wholesale trade in chemical products	Turn	Turnover in current prices		1. Producer price index for domestic supply Agricultural products
					2. Machinery, tools
				3.5	3. Producer price index for domestic supply Other
51.56	Wholesale trade in intermediary goods	Turn	Turnover in current prices		1. Producer price index for domestic supply Textiles
					2. Producer price index for domestic supply. Machinery, tools
				5.5	3. Producer price index for domestic supply: Other
51.57	Wholesale trade in waste products and scrap	Turn	Turnover in current prices		1. Producer price index for domestic supply: Textiles
				1.8	2. Producer price index for domestic supply: Metals,

					scrap
					3 Producer price index for domestic supply: Other
51.8	Wholesale trade with machinery and equip-ment	Turn	Turnover in current prices		1. Producer price index for domestic supply Machinery, tools
					2. Producer price index for domestic supply Household appliances
				34.9	3. Producer price index for domestic supply Other
51.9	Other wholesale trade	Turn	Turnover in current prices		1. Producer price index for domestic supply Machinery, tools
				0.9	2. Producer price index for domestic supply Other

Producer price index for domestic supply Producer price index for domestic supply

7. Estimation procedure for Index of Service Production

7.1. Estimation procedure for monthly turnover

This section will describe the estimation procedure in turnover statistics. This is described in greater detail because it is the most important output source for the Index of Service Production. It has been extremely important to make note of the burden placed upon business respondents in designing the survey.

The first variable selected is turnover in current prices in the respective activity group for a period of a specific year ($Y_{b,k,c}^{Lop}$). $Y_{b,k,c}^{Lop}$ estimated using the estimator:

Turnover in current prices in each activity group for a month in a specific year ($Y_{b,k,c}^{Lop}$). $Y_{b,k,c}^{Lop}$ estimated using the estimator:

$$\hat{Y}_{b,k,c}^{Lop} = \sum_{h=1}^{H} \frac{N_h}{n_h} \sum_{i=1}^{n_s} y_i * \frac{X_b}{\sum_{h=1}^{H} \frac{N_h}{n_h} \sum_{i=1}^{n_s} x_i}$$

where

y_i = Turnover for enterprise (i)
N_h = Number of enterprises in sampling frame for stratum h
H = Number of strata in the ordinary sample
n_h = Number of respondents in stratum h
b = Activity group
k = Month
Lop = Current prices
c = Year

Auxiliary information from VAT Register

X_b = Total turnover for an activity group (b) according to the VAT Register regarding the most recent 12-month period

x_i = Turnover for enterprises (i) according to the VAT Register regarding the most recent 12-month period

Non-response

Non-response in the size categories in the sample survey is dealt with using compensation weighting in both the supplementary and ordinary sample. Compensation weighting is used

both in the numerator and the denominator in the ordinary sample, this also includes the VAT data that exists for all enterprises. Size categories not included in the sample survey are handled by manual imputation.

7.2. Monthly deflation

7.2.1 Deflators' periodicity

To see how well deflators function in the monthly Index of Service Production, we will first study which periodicity applies to the deflators involved.

The periodicity of the deflators in the quarterly Index of Service Production

Period	Percentage of value added	Number of deflators
Quarter	32.4	14
Month	44.9	80
Month and quarter	15.8	9
Annual	6.9	1
Total	**100%**	**104**

In the table above we can see the monthly deflators for 80 sub-sectors. These deflators are used to deflate approximately 45 percent of the value added. There are quarterly deflators for 14 sub-sectors which make up 32 percent of the value added.

In the table below we will study which quality the deflators have. The deflators have become divided into the following three categories.

A - An output deflator designed for the given activity
B - An out put deflator not wholly designed for the given activity
C - An input deflator or inferior output deflator

The quality of the deflators used in Index of Service Production

Quality of deflator	Percentage of value added	Number of deflators
A	48	23
B	48	72
C	8	9
Total	**100 %**	**104**

In the table above we can see that 23 deflators maintain the highest quality in the quarterly Index of Service Production. These 23 deflators are used to deflate approximately 48 percent of the value added.
Only 9 of the 104 deflators maintained the lowest quality. These deflators are, in most cases, forms of an input deflator and most often a salaries index. These deflators are used to deflate approximately 8 percent of the value added. For 14 deflators there is only quarterly data and for 9 deflators there are both monthly and quarterly data.

The following applies to Service Producer Price Indexes.

- During April, one has only one instance of information for the first quarter's price development. A regression model named *exponential smoothing* estimates other instances of quarterly price information. This model is described in greater detail in section 7.2.2 below. The estimated information about other quarter's price development is then used for April, May and June until new information comes from the service producer price index.

7.2.2 Projection according to the exponential smoothing method with a multiplicative seasonal component (Winter's method)

Assume that x_t can be described according to the model

$$x_t = (\alpha + \beta) \times s(t) + \varepsilon_t$$

where $\alpha \; och \; \beta$ are the model's parameters and $s(t)$ is the model's seasonal component and ε_t is the random error term.

Assume that we estimate the values for the above variables for period t+1 at period t.

This estimate can be written as

$$x_{t+1} = (a_t + b_t) \times s_t(t+1)$$

where $a_t \; och \; b_t$ are estimates of the model's intercept and slope and $s_t(t+1)$ is the estimated seasonal component for period t+1 at period t.

a_t is given by

$$a_t = w_1 \frac{x_t}{s_{t-1}(t)} + (1 - w_1)(a_{t-1} + b_{t-1})$$

And b_t is given by

$$b_t = w_2(a_t - a_{t-1}) + (1 - w_2)b_{t-1}$$

The seasonal component is calculated as

$$s_t(t-1) = w_3 \frac{a_{t-1}}{x_{t-1}} + (1 - w_3)s_{t-1}(t-1)$$

for a specific period when season and interval data agree.

7.3. Calculation of index in Index of Service Production and calendar adjustment

7.3.1. Short introduction about the index at Statistics Sweden and the selection of index

Volume index calculations are done in different ways at Statistics Sweden. A chain index is used for National Accounts (NA), the Index of Industrial Production (IIP) and foreign trade statistics. This means that the base period weight is always the previous year. So, constant price calculations are based on current prices from the previous year's prices. The Activity Price Index and foreign trade statistics use an "annual overlap" for index calculations. National Accounts uses "over the year" at least for the activity.[1] The index should have an annual adjustment when using "over the year". The Index of Service Production will be calculated in the same way as the Index of Industrial Production with an "annual overlap" and no annual adjustments are needed.

7.3.2. Calculating the volume index

7.3.2.1 Price index

The basis for the price index calculations are the following.

Retail Trade Price Index (RTPI)
Consumer Price Index per goods category (CPI)
Wages and salaries Index (SI)
Services Producer Price Index (SPPI)
Prices for domestic supply (PPI)
Factor Price Index (FPI)

7.3.2.1.1 Price index expressed as an average of previous year's prices

$PI_{(y,m)}^{\Pr Bas(y-1)}$ = price change for month m in year y relative to whole year y-1.

7.3.2.1.2 Price index expressed as an average of present year's prices

$$PI_{(y,m)}^{\Pr Bas(y)} = \frac{PI_{(y,m)}^{\Pr Bas(y-1)}}{\sum_{m=1}^{12} PI_{(y,m)}^{\Pr Bas(y-1)}} * 1200$$

= price change for month m in year y relative to whole year y

[1] ”Quarterly overlap”

7.3.2.2 Constant price calculations

Let $O_{(y,m)}$ be turnover for time period t in current prices

Let $O_{y,m}^{\Pr Bas(r)}$ = be Turnover expressed in terms of the prices of reference period *r*

Recalculation to constant prices is done in two ways, in part expressed in terms of the present year's prices and in part in the previous year's prices.

7.3.2.2.1 Turnover expressed as an average of present year's prices

$O_{(y,m)}^{\Pr Bas(y)} = \frac{O_{(y,m)}}{PI_{(y,m)}^{\Pr Bas(y)}} * 100$ = turnover in constant prices expressed as an average of the present year's prices.

7.3.2.2.2 Turnover expressed as an average of previous year's prices

$O_{(y,m)}^{\Pr Bas(y-1)} = \frac{O_{(y,m)}}{PI_{(y,m)}^{\Pr Bas(y-1)}} * 100$ = turnover in constant prices expressed as an average of the previous year's prices.

7.3.2.3 Calculation of annual and monthly links

A calculation of annual and monthly links (VI) are necessary for the "annual overlap" method.

The lowest activity level
On the lowest activity level, it is calculated in the following manner.

$$VI_{y,m,(y-1=100)} = 1200 * \frac{O_{(y,m)}^{\Pr Bas(y-1)}}{\sum_{m=1}^{12} O_{(y-1,m)}^{\Pr Bas(y-1)}}$$

Aggregate activity level
The weights used for calculating the Index of Service Production are the value added values. The value added values are collected from the National Accounts on a broad activity level and further detailed information is taken from Structural Business Statistics Survey. The value added are expressed in current prices. For the Index of Service Production period (y,m), the value added expressed in terms of the annual values of year y-2.

Let $w_{b,y}$ = Value added for activity *b* during year *y*. Even if things are expressed in the following manner,

$w_{b,y-2} = w_{b,y}$ we shall continue to express things as $VA_{b,y}$

$$VI_{B,y,m,(y-1=100)} = \frac{\sum_{b \in B} w_{b,y} * VI_{b,y,m,(y-1=100)}}{\sum_{b \in B} w_{b,y}}$$

7.3.2.4 Calculating the index from annual and monthly links

Based on all annual and monthly links $VI_{y,m,(y-1=100)}$ The Index of Service Production is calculated according to the following schematic:

1) Calculate annual links
2) Calculate annual index
3) Calculate Index of Service Production

Calculate annual links

$$VI_{y,(y-1=100)} = \frac{\sum_{m=1}^{12} VI_{y,m,(y-1=100)}}{12}$$

Calculate annual index

Here the annual index is calculated with the reference period is the year y. Index year y = 100.

$$TjPI_{y,(y=100)} = 100;$$
$$TjPI_{y+1,(y=100)} = TjPI_{y,(y=100)} * VI_{y+1,(y=100)} / 100;$$
$$TjPI_{y+2,(y=100)} = TjPI_{y+1,(y=100)} * VI_{y+2,(y+1=100)} / 100;$$
$$TjPI_{y+3,(y=100)} = TjPI_{y+2,(y=100)} * VI_{y+3,(y+2=100)} / 100 \text{ etc.}$$

Calculate Index of Service Production

Individual activity

The Index of Service Production, for the first year *y*, is calculated as follows. The Index of Service Production is equal to 100 for the first year.

$$TjPI_{y,m,(y=100)} = \frac{O_{(y,m)}^{\Pr Bas(y)}}{\sum_{m=1}^{12} O_{(y,m)}^{\Pr Bas(y)}} * 1200;$$

The Index of Service Production is then calculated in the following way.

$$TjPI_{y+1,m,(y=100)} = TjPI_{y,(y=100)} * VI_{y+1,m,(y=100)} / 100;$$

Aggregated activity

The Index of Service Production for aggregated activity in the first year y is calculated as follows.

$$TjPI_{B,y,m,(y=100)} = \frac{\sum_{b \in B} w_{b,y} * TjPI_{b,y,m,(y=100)}}{\sum_{b \in B} w_{b,y}};$$

The Index of Service Production for aggregated activity in the second year*y* is calculated in the same way as for an individual activity.

7.3.2.5 Calculating annual development

The growth figure index shows the development for an activity group for a period of a given year as compared with the same period of the previous year.

$$IU_{y,m,b} = \frac{TjPI_{y,m,b}}{TjPI_{y-1,m,b}} * 100$$

7.3.2.6 Calculation of Index of Service Production in current prices

The Index of Service Production in current prices for *individual activity* is calculated in such a manner that the reference period is y (2005), which means that the average is equal to 100.

$$TjPI^{Löp}_{B,y,m,(y=100)} = \frac{O_{y,m,b}}{\sum_{m=1}^{12} O_{y,m,b,(y=2005)}}$$

Aggregated activity level

$$TjPI^{Löp}_{B,y,m,(y=100)} = \frac{\sum_{b \in B} w_{b,y} * TjPI^{Löp}_{(y,m,b)}(y)}{\sum_{b \in B} w_{b,y}}$$

7.3.2.7 Calculating annual development

The growth figure index shows the development for an activity group for a period of a given year as compared with the same period of the previous year.

$$IU^{Löp}_{(y,m),b} = \frac{TjPI^{Löp}_{y,m,b}}{TjPI^{Löp}_{y-1,m,b}} * 100$$

7.3.2.8 Calendar adjustment

A calendar adjustment index has been calculated by means of different methods. There is a yearly review of the day weights conducted for SIC 52.11 together with the larger supermarket chains. Remaining categories such as SIC 50 and SIC 52, SIC 55, SIC 92 and SIC 93 use day weights in accordance with a survey conducted during earlier. No calendar adjustment is conducted for industries SIC 73, SIC 80, SIC 85, and SIC 91. Remaining industries use calendar adjustment, estimated from turnover data in X11-Arima.

The calendar adjustment index is re-calculated so that all periods of the base year are equal to 100. A calendar adjustment index compares the calendar of the base years.

Turnover in current prices is divided by the calendar adjustment index CI.

$$O^{Kal}_{y,m} = \frac{O_{(y,m)}}{KI_{(y,m)}}$$

Then operations described in sections 7.3.2.2 - 7.3.2.7 are done again, although with turnover in current prices.

7.3.2.9 Calculation of a quarterly and annual Index of Service Production

This section shall describe the calculation of the quarterly Index of Service Production. One does the same when calculating the an annual or accumulated Index of Service Production.

$$TjPI_{y,q,b,(y=100)} = \frac{\sum_{m=1}^{3} TjPI_{y,m,b}}{3}$$

The calculation of the Index of Service Production in constant prices is described above. One does the same when calculating the Index of Service Production in current prices, constant and calendar adjusted prices.
See sections 7.3.2.5 and 7.3.2.7 for the calculation of annual development.

7.4. Seasonal adjustment and trend calculation

This shall not be initially applied to the index because data is needed for a number of years before before it becomes relevant.

Appendix 1

Value added 2004 within the private service sector (SIC 50 - 93)

Activity	Value added	Proportion, percentage, share
50	35 556	4.5
51	114 353	14.4
52	78 509	9.9
55	27 566	3.5
60	48 676	6.1
61	7 676	1.0
62	8 752	1.1
63	26 439	3.3
64	48 372	6.1
70	109 000	13.7
71	12 347	1.6
72	54 603	6.9
73	3 915	0.5
74	128 136	16.1
80	12 966	1.6
85	42 751	5.4
90	6 374	0.8
91	1 243	0.2
92	21 919	2.8
93	6 955	0.9
Total	**796 108**	**100.0**

Source: Structural Business Statistics 2004