STATISTICS NETHERLANDS

Department for National accounts

NATIONAL ACCOUNTS IN THE NETHERLANDS:

DEFLATION OF VALUE ADDED IN SERVICE INDUSTRIES

Authors: F. Drost
A. in't Veld
P. Verbiest

july 1995

National accounts: Deflation of value added in service industries

1. Introduction

The National accounts (NA) present a complete and consistent picture of the economy of a certain country. This means, among others, that all relevant transactions find their place in this system. In the Netherlands, part of the NA-system consists of the so called supply and use tables. This set of tables gives full information on production and use of goods and services. The supply table gives a detailed overview of production detailed to commodities of all branches of industry. The supply table also includes the imports. The inputs in the production process are registered in the use table. Besides the inputs of goods and services, the primary inputs, like wages, operating surplus etc. are part of the use table. And last but not least, final expenditure (a.o. exports, household consumption and fixed capital formation) is included in the use table. Together the supply and use tables give full information on the commodity markets, for both goods and services.
From the balanced supply and use tables several macro economic indicators can be derived, like gross national product, household consumption etc.. The economic indicators should be presented in current prices as well as constant prices, as to be able to make a breakdown into volume and price changes.
In order to make good estimates in current and constant prices, in the Netherlands the supply and the use table are simultaneously compiled in current prices and in prices of the previous year.

This paper follows the Dutch practice so that when mention is made of constant prices this always means prices of the previous year.

The supply and the use tables are balanced at a rather detailed level. The commodity classification consists of about 800 goods and services. The industry classification consists of 260 branches of industry. Filling this system with data in current prices as well as in prices of the previous year requires a lot of information on price changes and/or volume changes. As far as goods are concerned there are no overwhelming problems in observing price and/or volume changes. In most cases reliable data are available. On the other hand the observation of price and volume changes concerning services is very difficult. Both conceptual and practical problems arise. These problems will not be discussed in this paper.

This paper is focussed on the use of indicators of price and volume changes in the supply and use table. Because of the completeness of the system of national accounts it is necessary to estimate all transactions both in current prices and in prices of the previous year. So in one way or another, estimates on price and volume changes concerning services must be made. This paper presents an overview of the indicators used to make this breakdown

Table 1 illustrates the relevance of those estimates.

Table 1. Value added at basic prices

Branch of industry	1986 billion Dfl.	1992 billion Dfl.	1986 Percentage of total	1992 Percentage of total
Agriculture and manufacturing	**147121**	**168789**	**35.4**	**31.6**
of which:				
Agriculture and fishery	18338	20613	4.4	3.9
Mining and quarrying	23217	15990	5.6	3.0
Manufacturing	76770	94364	18.4	17.6
Public utilities	7708	9193	1.9	1.7
Construction	21088	28629	5.1	5.4
Services	**269240**	**366015**	**64.6**	**68.4**
of which:				
Trade	50087	65551	12.0	12.3
Restaurants etc.	6694	10493	1.6	2.0
Repair	5049	6546	1.2	1.2
Transport and communication	30692	40776	7.4	7.6
Banking and insurance	20264	25651	4.9	4.8
Housing	37943	56320	9.1	10.5
Business services	23013	40921	5.5	7.7
Government	48600	57332	11.7	10.7
Health care	22210	29135	5.3	5.4
Other services	24688	33290	5.9	6.2
Total	**416361**	**534804**	**100.0**	**100.0**

Table 1 shows that in 1992 more than 68 percent of GNP was generated by the service industries. It also shows that the importance of services is growing. The share in GNP increases from 64.6 percent in 1986 to 68.4 percent in 1992. This means that the deflation of value added in the service industries has a large influence on the GNP-estimates in constant prices, and thus on the real growth rates.

The contents of this paper is as follows:
Section 2 gives an overview of the methods that exists to deflate or to extrapolate the value added in the service industries. In section 3 the Dutch practice in this field is summarized. Section 4 contains some concluding remarks.

2. Methods for compiling constant price data

In the system of national accounts value added is defined as the difference between output and input of goods and services. This definition holds for data in current prices as well as for data in constant prices:

(1) $VA(t/j) = OUTPUT(t/j) - IC(t/j)$

where:

VA(t/j)	= value added in year t valued at prices of year j
OUTPUT(t/j)	= output of goods and services in year t valued at prices of year j
IC(t/j)	= total intermediate consumption of goods and services in year t valued at prices of year j

Value added can be split up in wages (including social contributions), consumption of fixed capital and net operating surplus.

(2) $VA(t/j) = WAGES(t/j) + CFC(t/j) + OS(t/j)$

where:

WAGES(t/j)	= wages (incl. social contribution) in year t valued at prices of year j
CFC(t/j)	= consumption of fixed capital in year t valued at prices of year j
OS(t/j)	= net operating surplus in year t valued at prices of year j

The changes in the value of output, input and value added from one year to another can be broken down into a volume change and a price change. From the point of view of the national accounts the volume changes include changes in quality of the commodity in question. A special case is the change in labour productivity.

Presumed that it is impossible to estimate reliable volume or price indicators for the operating surplus, the following scheme can be made:

value t-1		volume changes	value t in pr of t-1		price changes	value t
OUTPUT(t-1/t-1)	*	*VI+QI* =>	*OUTPUT(t/t-1)*	*	*PI* =>	*OUTPUT(t/t)*
IC(t-1/t-1)	*	*VI+QI* =>	*IC(t/t-1)*	*	*PI* =>	*IC(t/t)*
VA(t-1/t-1)			*VA(t/t-1)*		=>	*VA(t/t)*

of which:

WAGES(t-1/t-1)	*	*VI+LP* =>	*WAGES(t/t-1)*	*	*PI* =>	*WAGES(t/t)*
CFC(t-1/t-1)	*	*VI* =>	*CFC(t/t-1)*	*	*PI* =>	*CFC(t/t)*
OS(t-1/t-1)			*OS(t/t-1)*		=>	*OS(t/t)*

where:

VI = quantity index of the item in question (excl. quality changes)
QI = quality index of the item in question
PI = price index of the item in question (adjusted for changes in quality)
LP = change in labour quality (skill / level of education)

This scheme illustrates that in the case of full information total value added can only be derived as the difference between output and input. The reason is that for the moment net operating surplus can only be estimated as a residual.

A conclusion from this scheme is that in general the most preferable method for estimating value added in constant prices, is a method where this is calculated as the difference between output and input in constant prices. These estimates can be established if the right volume or price indicators are available. This often means that adjustments must be made for changes in quality.

A second conclusion from the scheme is that only in cases where both intermediate consumption and gross operating surplus are zero or nearly zero, wage rate (price) or labour input (volume) indicator adjusted for changes in labour productivity give correct estimates of value added in constant prices. This requirements will seldom be met.

With the above scheme in mind and using a draft paper by the OECD, we give an overview of the most important methods for estimating value added in constant prices.
A distinction can be made between methods which use two indicators, like double deflation, and methods which use only one indicator. Another way of looking at the methods is whether value added is deflated (price) or extrapolated (volume) Within the class of single indicator methods it is relevant to make a distinction between the type of indicator used. For example, is the indicator based on output data, input data or wage rates?

As was stated in the introduction, all price and volume indicators in the formulas below have the previous year as their base year.

Double indicator methods

Double indicator methods are characterized by the fact that value added is compiled as the difference
between output and input, both valued at last years' prices.

There are two possible extremes within the group of double indicator methods, double deflation on the one hand and double extrapolation on the other. Of course mixed forms of deflation and extrapolation can also be used.

Double deflation

Using the method of double deflation, both production and input of goods and services are deflated with price indices. Value added in prices of last year equals the difference between deflated output and deflated input.

$$(3) \quad VA_i(t/t-1) = \sum_{k=1}^{I} OUTPUT_{i,k}(t/t)/PI\_output_k - \sum_{j=1}^{J} IC_{i,j}(t/t)/PI\_ic_j$$

where:

$VA_i(t/t-1)$	= value added of industry i of year t in prices of t-1
$OUTPUT_{i,k}(t/t)$	= output of by industry i of commodity k in year t in current prices
PI_output_k	= output price index of commodity k
$IC_{i,j}(t/t)$	= intermediate consumption by industry i of commodity j of year t in current prices
PI_ic_j	= input price index of commodity j

If the right price indices are not available, approximate indices can be used. In the case of the service industries this is often done for the output side. For example if an industry has a relatively large labour input, a wage rate index is used.

Double extrapolation

In case that price indices or current price estimates are not available, volume indices may be of help. Value added is then compiled as the difference between extrapolated production of t-1 and extrapolated input of t-1.

$$(4) \quad VA_i(t/t-1) = \sum_{k=1}^{I} OUTPUT_{i,k}(t-1/t-1)*VI\_output_{i,k} - \sum_{j=1}^{J} IC_{i,j}(t-1/t-)*/VI\_ic_{i,j}$$

where:

$VI\_output_{i,k}$	= volume index of the output of commodity k by industry i
$VI\_ic_{i,j}$	= volume index of the intermediate consumption by industry i of commodity j

As in the case of double deflation, proxy indicators are used if the right ones are not available. Physical quantity indices or volume changes of labour input are often mentioned in this regard.

Mixed form

The mixed form consists of combinations of deflation and extrapolation. There are two options:

a) the output is deflated and the intermediate is extrapolated by means of a volume indicator;

b) the output is extrapolated by means of a volume indicator and intermediate consumption is deflated.

Single indicator methods

The single indicator methods are characterized by a direct deflation or extrapolation of value added. These methods must be used if double deflation is impossible for lack of indicators.
If a single indicator method is used, this indicator is typically also used to estimate the price and volume changes of total production.

Direct deflation

Using the method of direct deflation, value added is deflated with a price index.

(5) $VA(t/t\text{-}1) = VA(t/t) / PI\_x$

where:

PI_x = a useful price index to deflate value added

In case that net operating surplus differs significantly from zero price indices for value added are not available and proxy indicators must be used. There are many possibilities to solve this problem. Often wage rates or output price changes are useful indicators.

Direct extrapolation

Direct extrapolation means that the value added is extrapolated by a volume index

(6) $VA(t/t\text{-}1) = VA(t\text{-}1/t\text{-}1) * VI\_x$

where:

VI_x = a useful volume index to extrapolate value added

What holds for price indicators, also holds, mutatis mutandis, for volume indicators. Approximate indicators are necessary. Useful volume indicators are for example: volume changes of output (physical

quantities), volume change of labour input, volume change of intermediate consumption etc..

Generally speaking, double indicator methods are superior to single indicator methods. However, the reliability of the estimates of value added in constant prices depends, not only the method used, but also on the reliability of the indicators used. It is required that the indicators take all quality changes (output, input and labour) into account.

3. Summary of methods applied in the Netherlands

In the Netherlands 260 branches of industry are distinguished in the supply and use tables. Services, including government, account for 99 branches. A detailed overview of the methods used to calculate constant price value added in services is presented in Annex 1, including a description of the price and volume indicators used for deflating and extrapolating.

Before looking at the overview some remarks must be made:

- the output price and volume indicators relate to the primary activity of the branch concerned. In practice indices for secondary activities are also used, but they are not given in the Annex.

- during the final balancing of the constant price supply and use tables, the initial price and volume changes are sometimes adjusted. This is not elaborated here.

- In this paper the methods used are evaluated according to is based on a strict interpretation of their contents. This means that in the case above the method is called "double deflation"

- if intermediate consumption is deflated within the framework of supply and use tables, then the deflation is considered to be correct and reliable.

The methods are summarized in Tables 2 - 5

Table 2. Methods used for deflating gross value added in services

	number of branches	% of total
Double deflation	46	46.5
Double extrapolation	2	2.0
Mixed form	21	21.2
Single deflation	13	13.1
single extrapolation	17	17.1
Total	99	100.0

In 70 % of the branches a double indicator method is used. The most preferable method is thus used most of the time. Table 3 gives an overview of the value added involved.

Table 3. Methods used for deflating gross value added in services
Gross value added 1992 (billion Dfl.)

	Gross value added	% of total
Double deflation	201.4	55.0
Double extrapolation	5.4	1.4
Mixed form	49.2	13.4
Single deflation	54.8	15.0
Single extrapolation	55.2	15.1
Total	365.8	100.0

Table 3 shows that almost 70 % of constant price value added prices is compiled with help of double indicator methods; double deflation method alone already accounts for 55 % .

The reliability of the results of double deflator methods of course largely depends on the quality of the price and volume indicators used. If the right indicators are used double indicator methods are superior to single indicator methods. When proxy indicators must be used the reliability of the results decreases.

Table 4 gives an overview of the indicators used in the double indicator methods. A distinction is made between "correct" indicators and "proxy" indicators. In this context "correct" means "conceptually right". It does not necessarily mean that the indicators ar of good quality.

Table 4. Use of indicators in double indicator methods

indicators output	input	number of branches	Value added involved (1992)
correct	correct	33	114.2
right	proxy	3	10.4
proxy	correct	28	126.1
correct	proxy	5	5.3
Total		69	256.0

As can be seen from table 4 45 % of total service value added in constant prices is estimated using the right indicators.

Concerning the proxy approximate indicators, in the majority of cases a wage rate index (price) or labour input (volume) is used. On the output side a wage rate index is used in 14 cases, and of these only 5 times an adjustment is made for labour productivity. In case of the extrapolation method labour input is used in 4 cases and of these 2 times an adjustment is made for labour productivity.
For the estimation of constant price intermediate consumption labour input is used as an approximate volume indicator in 3 cases.

The use of single indicator methods is only correct in cases where both intermediate consumption and gross operating surplus are zero or nearly zero. However, in cases where gross operating surplus consists for the main part of consumption of fixed capital, single indicator methods, may also yield an acceptable approximation.
Table 5 gives an overview of value added by branch in case of the use of single indicator methods. It is also judged whether the application of these methods is acceptable.

Table 5. Value added in single indicator methods

branch	value added billion Dfl. (1992)	percentage of total	judgement
Banking	19.1	17.4	incorrect
Insurance	6.6	6.0	incorrect
Government	57.4	52.2	acceptable
Intra-mural health services	18.4	16.7	acceptable
Welfare organizations	3.4	3.1	acceptable
Recreational services	1.7	1.5	incorrect
Household services	1.8	1.6	acceptable
Other	1.6	1.5	incorrect
Total	110.0	100.0	

For almost 75 percent of the value added involved, an acceptable method for estimating constant price values is used. The main problem is the adjustment for changes in labour productivity. Only in the case of government this is done on a regular basis (cf. Kazemier, 1992).

To summarize this section it is concluded that 92 percent of total services value added is deflated using a fairly method.
However, this positive conclusion is not the full story. It should be remarked that:

1) in practice the quality of the correct indicators used is not always up to standard,

2) proxy indicators do not necessarily imply bad estimates

4) Concluding remarks

This paper has listed a number of possibilities to compute constant price value added in services.

Based on the characteristics of every separate service industry in the supply and use tables, the right "deflation-method" can be chosen. Each "deflation-method" needs a different set of indicators. In some branches only data on labour input and changes in labour productivity are needed while in other branches price information on all outputs and inputs are required, including changes in quality.

It appeared that in the Netherlands 92 % of constant price services value added is computed by means of method which is in principle (nearly) correct.
However, this picture is less favorable when it comes to the quality of the indicators used. So our future research will be focussed on this aspect.

References

Kazemier, B, 1992, "Volume measurement of government output in the Netherlands.
In: Papers and final report of the sixth meeting on services of the Voorburggroup, October 1991 (Helsinki, Finland).

OECD, The measurement of annual value added at constant prices in service activities in OECD countries.
STD/SERV(94)10, august 1994

Annex 1

In this annex per branch of industry data are presented about the way the value added in prices of last year is estimated.

In the table the following codes are used:

Methods

2ID	Double deflation
2IE	Double extrapolation
2IM	Mixed form
1ID	Direct deflation
1IE	Direct extrapolation

Indicators

DR	Correct deflator
DA	Proxy deflator
ER	Correct volume indicator
EA	Proxy volume indicator

	Service Branch	Method	Output indicator	Description	Input indicator	Description	Other indicators	Description
61000	Whole sale trade	2ID	DA	price index margins	DR	prices from usetable		
62901	Recycling	2ID	DA	price index margins	DR	prices from usetable		
65000	Retail trade	2ID	DA	price index margins	DR	prices from usetable		
67100	Catering services	2IE	DR	Consumer price index	DR	prices from usetable		
67200	Bar services	2ID	DR	Consumer price index	DR	prices from usetable		
67300	Other catering services	2ID	DR	Consumer price index	DR	prices from usetable		
67410	Hotels	2ID	DR	Consumer price index	DR	prices from usetable		
67420	Pensions	2ID	DR	Consumer price index	DR	prices from usetable		
67500	Other accomodation services	2ID	DR	Consumer price index	DR	prices from usetable		
68100	Shoe repair services	2ID	DR	Consumer price index	DR	prices from usetable		
68200	Car repair services	2ID	DR	Consumer price index	DR	prices from usetable		
68300	Cycle repair services	2ID	DR	Consumer price index	DR	prices from usetable		
68490	Other repair services	2ID	DR	Consumer price index	DR	prices from usetable		
71000	Railways	2IM	ER	Passengers/freight k	DR	prices from usetable		
72110	Tram and bus transportation	2IM	ER	Passenger kilometres	DR	prices from usetable		
72122	Touring busses	2ID	DR	Consumer price index	DR	prices from usetable		
72210	Taxis	2IM	EA	number of taxis	DR	prices from usetable		
72300	Freight transportation	2IM	ER	freight kilometers	DR	prices from usetable		
72412	Road transport handling	2ID	DA	several prices	DR	prices from usetable		
72430	Pipeline transportation	2IM	ER	freight kilometers	DR	prices from usetable		
73100	Sea going trade	2IM	ER	freight kilometers	DR	prices from usetable		
73200	Short-haul trade	2ID	DR	unit value of frght	DR	prices from usetable		
73300	Sea going cargo handling	2IM	EA	quant. load & discha	DR	prices from usetable		
74100	Inland shipping	2IM	ER	freight/passengers	DR	prices from usetable		
74200	Inland shipping cargo handling	2ID	DA	wage rate index	DR	prices from usetable		
75100	Airlines	2IM	ER	passengers/freight	DR	prices from usetable		
75200	Airports	2IM	EA	passengers/aircrafts	DR	prices from usetable		
76100	Travel agencies	2IM	EA	passenger by air/lnd	DR	prices from usetable		
76200	Ship-broker services	2ID	EA	quant. for harbourst	DR	prices from usetable		
76300	Storage and warehousing services	2ID	DA	wage rate index	DR	prices from usetable		
77000	Telecommunications	2ID	ER	quant. letters/telep	DR	prices from usetable		
81000	Banking	1IE					EA	labor input

	Service Branch	Method	Output indicator	Description	Input indicator	Description	Other indicators	Description
82000	Insurance	1IE					EA	labor input
83110	Operation of dwellings	2ID	DR	Consumer price index	DR	prices from usetable		
83120	Operation of business and industrial property	2IM	DR	Price index hh cons.	EA	Volume index of outp		
83200	Real estate agents	2IE	ER	external source	EA	external source		
84100	Legal services	2ID	DA	wage rate index+ CPI	DR	prices from usetable		
84200	Accounting	2ID	DA	wage rate index	DR	prices from usetable		
84300	Computer services	2ID	DA	wage rate index	DR	prices from usetable		
84400	Engineering and architectural Services	2ID	DA	wage rate index	DR	prices from usetable		
84500	Market and advertising services	2ID	DA	wage rate index	DR	prices from usetable		
84600	Business consultancy services	2ID	DA	wage rate index	DR	prices from usetable		
84790	Other management services	2ID	DA	wage rate index	DR	prices from usetable		
84800	Manpower recruitment services	2ID	DA	information on tarif	DR	prices from usetable		
85000	Leasing and rental services of movable property	2ID	DA	output price + CPI	DR	prices from usetable		
86000	Management services (establishment trade)	2IM	EA	VI of business serv.	DR	prices from usetable		
90112	Civil government	1ID					DA	wage rate + laborprd
90113	Municipalities	1ID					DA	wage rate + laborprd
90114	Government institutions	1ID					DA	wage rate + laborprd
90115	Provinces	1ID					DA	wage rate + laborprd
90116	District water board	1ID					DA	wage rate + laborprd
90117	Semi-governmental insitutions	1ID					DA	wage rate + laborprd
90600	Social security	1ID					DA	wage rate + laborprd
90700	Government, military	1ID					DA	wage rate + laborprd
91000	Religious organizations	1ID					EA	N of employees
92009	State education	1IE					DA	wage rate + laborprd
92010	University education	1IE					DA	wage rate + laborprd
92011	Private eduction, denominational education	1IE					DA	wage rate + laborprd
92012	Municipal education	1IE					DA	wage rate + laborprd
92013	Government institutions, educational	1IE					DA	wage rate + laborprd
92910	Driving schools	2ID	DR	Consumer price index	DR	prices from usetable		
92990	Other private education	1IE					EA	N of participants
93100	Hospitals	1ID					EA	Wage rate + laborinp
93200	Psychiatric institutes	1ID					EA	Wage rate + laborinp
93300	Institutions for the mentally handicapt	1ID					EA	Wage rate + laborinp
93400	Nursing homes	1ID					EA	Wage rate + laborinp
93510	General practioners	2ID	DR	Consumer price index	DR	prices from usetable		
93520	Medical specialists	2ID	DR	Consumer price index	DR	prices from usetable		
93600	Dentists	2ID	DR	Consumer price index	DR	prices from usetable		
93780	Paramedical services	2ID	DR	Consumer price index	DR	prices from usetable		
93810	Home nursing services and maternity services	2ID	DR	Consumer price index	DR	prices from usetable		
93890	Other medical services	2ID	DR	Consumer price index	DR	prices from usetable		
93900	Veterinary surgeons	2ID	DR	Consumer price index	DR	prices from usetable		
94123	Old people's homes	2IM	EA	N of empl + laborprd	DR	prices from usetable		
94800	Other welfare services	2ID	EA	N of empl + laborprd	DR	prices from usetable		
95139	Welfare services for youth	1IE					EA	N of empl + laborprd
95400	Libraries and museums	2IM	DR	Consumer price index	EA	N of employees		
95500	Broadcasting corporations	2IM	DA	N of empl + CPI	EA	N of employees		
95613	Movie corporations	1IE					EA	N of employees
95640	Cinema's	2ID	DR	CPI + extra data	DR	prices from usetable		
95690	Videotheques	2ID	DA	CPI + N of employees	DR	prices from usetable		

	Service Branch	Method	Output indicator	Description	Input indicator	Description	Other indicators	Description
95700	Theatres	1IE					EA	N of performances
95800	Theatre companies and artists	1IE					EA	N of performances
96130	Sports organizations	2IM	EA	N of employees	EA	N of members		
96140	Sports clubs	2IM	EA	N of employees	EA	N of members		
96210	Sports and recreational services	2IM	DA	wage rate + laborprd	DR	prices from usetable		
96220	Recreational parks	1IE					EA	
96230	Gambling and betting	2ID	DA	wage rate + laborprd	DR	prices from usetable		
97109	Industrial organizations	2ID	DA	wage rate + laborprd	DR	prices from usetable		
97204	Employers' organizations	1IE					EA	N of members
97500	Research	2IM	DA	wage rate + laborprd	EA	N of employees		
98110	Private sanitation services	2IM	EA	Population + waste	EA	waste + N of employs		
98120	Government sanitation services	2ID	DA	wage rate + laborprd	DR	prices from usetable		
98200	Cleaning services	2ID	DR	Consumer price index	DR	prices from usetable		
98300	Laundries	2ID	DR	Consumer price index	DR	prices from usetable		
98400	Hairdressers	2ID	DR	Consumer price index	DR	prices from usetable		
98500	Photo ateliers	1IE					EA	N of employees
98900	Other personal services	1IE					EA	N of employees
99000	Household services	1IE					DR	Consumer price index