NA-086

Volume measurement of government output; the Dutch practice since revision 1987

Brugt Kazemier

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Division Presentation and Integration
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Verklaring der tekens

.	= gegevens ontbreken
*	= voorlopig cijfer
x	= geheim
-	= nihil
-	= (indien voorkomend tussen twee getallen) tot en met
0 (00)	= het getal is minder dan de helft van de gekozen eenheid
niets (blank)	= een cijfer kan op logische gronden niet voorkomen
1996-1997	= 1996 tot en met 1997
1996/1997	= het gemiddelde over de jaren 1996 tot en met 1997
1996/'97	= oogstjaar boekjaar schooljaar enz. beginnend in 1996 en eindigend in 1997
1986/'87-1996/'97	= boekjaar enz. 1986/'87 tot en met 1996/'97

In geval van afronding kan het voorkomen dat de totalen niet geheel overeenstemmen met de som der opgetelde getallen.
Verbeterde cijfers in staten en tabellen zijn niet als zodanig gekenmerkt.

Explanation of symbols

	= data not available
*	= provisional figure
x	= publication prohibited (confidential figure)
-	= nil
-	= (between two figures) inclusive
0 (00)	= less than half of unit employed
a blank	= category not applicable
1996-1997	= 1996 to 1997 inclusive
1996/1997	= average for the years 1996 up to and including 1997
1996/'97	= crop year financial year school year etc. beginning in 1996 and terminating in 1997
1986/'87-1996/'97	= book year etc. 1986/'87 up to and including 1996/'97

Detailed items in tables do not necessarily add to totals because of rounding.
Revised figures are not marked as such.

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Abstract

In 1992, Statistics Netherlands published the first results of a major revision of national accounts statistics. Part of this revision was the introduction of an alternative method to estimate the volume change of government output. This paper briefly describes this alternative method and the results of the revision with respect to the volume change of government services.

Keywords: Government, Volume change, National accounts

Table of Contents

1. Introduction

In 1992 Statistics Netherlands published the first results of a major revision of the national accounts (CBS, 1992). Part of the revision was the implementation of an alternative estimate of the production volume change of government services. In Kazemier (1991) three alternative methods are described: the output indicator method, the structural determinants method and the deflator method. In the output indicator method the government output volume is estimated from production indicators like the number of fires extinguished, number of crimes resolved and the number of people on social benefits. The structural determinants method is an econometric method in which a Cobb-Douglas production function is estimated. It is assumed that the variables that affect the parameters of the Cobb-Douglas production function are sector independent and that differences in labour productivity between sectors can be explained by differences in the mix of those variables. The deflator method is described in the next section. It turned out that all three methods yielded almost the same results. The last method was adopted and a slightly modified deflator method was implemented.

When implementing this method, some practical problems became evident. Firstly, in compiling estimates of the production volume change of government services, one can not dispose of all data required.

Another complication arises, when government is split up into more than one service category. In that case, separate estimates for all categories distinguished not necessarily sum up to the estimates arrived at without disaggregation. The differences can be significant. Further, the volume growth of social charges no longer need to be equal to the volume growth of salaries and wages. This seems a contradiction with the 'rules' of the deflator method, but that is not the case. These topics, and the topic mentioned in the paragraph above are the subjects of section 3. Section 4 summarises the main conclusions.

2. The deflator method

The gross value added (factor costs) of government services can be split into (1) wages and salaries, (2) social charges and (3) consumption of fixed capital. To compute the volume growth of value added of government services, each component has to be deflated. The deflator method described below applies to the first two categories. A more detailed description of this method can be found in Kazemier (1991).

Founded on Kendrick (1985), who refers to the service sector, it is assumed that in government services as well, labour income and wages rise in line with labour productivity. In that case, the **long run** wage rate change per full-time worker equivalent can be divided into (1) compensation for inflation and (2) compensation for productivity changes. The latter part also includes changes in the wages and salaries due to changes in the composition of labour, for example because of changes in the average level of education or the average number of years of experience. These kind of changes are assumed to affect labour productivity.

A proxy for the compensation for inflation is the change in the index of basic wage rates according to collective agreements (CAO-wages). However, sometimes changes in CAO-wages are also meant to compensate for increased labour productivity. On the other hand, one may question whether the difference between the actual wage rate changes per full-time worker equivalent and the CAO-wage rate changes is only caused by increased labour productivity. Nevertheless, the CAO-wage rate is considered as a valid deflator of government wages and salaries. The same proxy, multiplied with an index for changes in social security premiums, can also be used to deflate the total amount of social charges, paid by the government.

In short, it is assumed that the change of the total amount of wages and salaries paid by government can be decomposed into three factors: a change in the number of employees, changes due to collective agreements as a proxy for the compensation for inflation, and changes due to changes in labour productivity:

$$L_t = A_t \times C_t \times P_t \qquad [1]$$

L_t : Chain-index (/100) of the total amount of wages and salaries in year *t*

A_t : Chain-index (/100) of paid employment in year *t*

C_t : Chain-index (/100) of CAO-wage rates in year *t*

P_t : Chain-index (/100) of labour productivity in year *t*.

Before introducing this alternative estimation method, the main users of the national accounts statistics were consulted. Their general opinion was in favour of the suggested alternative. They advised, however, to modify the method in such a way that the resulting labour productivity change component of the annual wage rate change equals the three-years moving average of the original (unmodified) estimate of this component. So they advised to use a deflator $\overline{C_t}$, such that

$$L_t = A_t \times \overline{C_t} \times \overline{P_t} \qquad [2]$$

with $$\overline{P_t} = \frac{\left(P_{t-1} + P_t + P_{t+1}\right)}{3} \qquad [3]$$

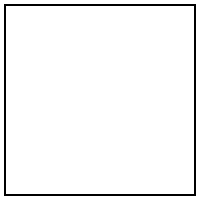
Rearranging [2] and replacing $\overline{P_t}$ by [3] gives

$$\overline{C_t} = \frac{L_t}{A_t} \times \frac{3}{(P_{t-1} + P_t + P_{t+1})} \qquad [4]$$

From [1] it can be derived that

$$P_t = \frac{L_t}{A_t} \times \frac{1}{C_t} \qquad [5]$$

Now, by replacing P_{t-1}, P_t and P_{t+1} in [4] by expression [5] the new deflator $\overline{C_t}$ can be written as a kind of 'weighted harmonic moving average' of the original deflator:



[6]

3. The implementation

As in many countries, the final estimates of the national accounts in the Netherlands are published several years later. In the Netherlands, the gap is about 2½ year. In the meantime, provisional accounts are compiled. The first provisional national accounts become available after about six months, revised but still provisional national accounts after 1½ year. So, each year *t*, provisional accounts of year *t–1*, revised provisional accounts of year *t–2* and final national accounts of year *t–3* are published.

The compilation of national accounts statistics is organised in three stages. First, the final accounts of year *t–3* are compiled. They are part of the input in the production of the revised provisional accounts of year *t–2*, which are subsequently compiled. The latter on their turn are input for the provisional accounts of year *t–1*. As soon as a stage is finished, the results are not altered any more. In general, this order of compilation does not raise any problems. However, for the alternative volume measurement of government output it does. Table 1 shows the availability of data at the moment that the final and (revised) provisional accounts are constructed.

Table 1. The availability of data at different stages in the compilation process of national accounts statistics in the Netherlands

	At the compilation of the accounts of:		
	t–3	***t–2***	***t–1***
Year	**Final**	**Revised provisional**	**Provisional**
t–4	Final	Final	Final
t–3	×	Final	Final
t–2	Provisional	×	Revised provisional
t–1	-	-	×
t	-	-	-

Note: *t* is the current year

Due to the rather complicated deflator of government wages and salaries (see equation [6] in section 2), for each year under consideration one needs data for the previous **and** the next year. However, as illustrated in columns 2 and 3 of table 1, for the provisional and revised provisional accounts, data on the next year are not available. There are two solutions. The first solution is to construct a price deflator for government services, such that the resulting labour productivity growth equals the **two-years** moving average of the unmodified annual growth of labour productivity: years *t–3* and *t–2* for the revised provisional accounts, and *t–2* and *t–1* for the provisional accounts. The second solution is to assume that the unknown unmodified labour productivity change equals the known unmodified labour productivity change of the year before. The second solution has been chosen.

During the compilation of the final national accounts of year *t–3* one can not dispose of the revised provisional estimates of government labour volume and the amount of wages and salaries paid by the government in year *t–2*, not to mention the final estimates for that year. Only provisional data are available. As a consequence, the final estimate of government labour productivity change does not necessarily equal the average of the final unmodified labour productivity change of years *t*–4, *t–3* and *t–2*.

In equation [6] it is assumed that the production activity government services is not subdivided, or more precisely, that a shift in the shares of each of the government services distinguished, does not affect the overall average price change of government services. However, in fact it does. Therefore, it will be no surprise that results arrived after disaggregating government services and treating each category separately, differ from those arrived without disaggregation. If a shift occurs from categories with ‘lower’ price changes to

categories with 'higher' price changes, disaggregation leads to a lower average price deflator of wages and salaries, and consequently to a higher estimate of total labour input volume change. A shift to categories with lower price changes leads to a higher deflator and lower labour input volume change.
Since the major revision of the national accounts, referred to in the introduction, government services are split into four subcategories: 'General administration', 'Defense', 'Education' and 'Other government services'. Table 2 shows estimates for 1993 with and without disaggregation. Estimates for the governments services as a whole, based on separate calculations for each of the four service categories are placed in column 1. Estimates without disaggregation are put in column 2.

Table 2. The volume of gross value added of government services in 1993

			After disaggregation (1)	Without disaggregation (2)	Differe (2) – ((3)
1.	**Wages 1992**		45888	45888	
2.	**Wages 1993**		47726	47726	
3.	**Wages growth (index)**	(L)	104.00	104.00	
4.	**Modified price deflator (index)**	$(\overline{C})$	***102.52***	***102.64***	***0.12***
5.	**Labour input volume growth (index)**	$(L / \overline{C})$	***101.45***	***101.33***	***-0.12***
6.	**Labour productivity growth (index)**	$(\overline{P})$	***101.42***	***101.30***	***-0.12***
7.	**Employment growth (index)**	(A)	100.03	100.03	
8.	**Wages 1993 (prices 1992)**		***46552***	***46497***	***-55***
9.	**Social charges 1992**		10311	10311	
10.	**Social charges 1993**		10896	10896	
11.	**Social charges 1993 (prices 1992)**		***10425***	***10448***	***22***
12.	**Social charges volume growth (index)**		***101.11***	***101.33***	***0.22***
13.	**Consumption of fixed capital 1993 (prices 1992)**		4755	4755	
14.	**Gross value added of government services 1993 (prices 1992)**		***61732***	***61699***	***-33***

Although the differences between both estimates are small in absolute terms, the relative differences can be quite substantial. The effect of the small changes in the relative shares from 'Education' (price-index = 102,00) and ' Defense' (price-index = 101,36) to 'General administration' (price-index = 102.38) and 'Other government services' (price-index = 108,35), on the average price-index of wages and salaries is 0.12. [1]
According to the description of the deflator method, one might expect that the volume growth rates of wages and salaries (line 5 in table 2) and social charges (line 12) are the same. This, however, is not the case, although the differences are small. They can be explained by the same shifts that caused the differences discussed in the paragraphs above, as the ratio between wages and social charges differ among the government service categories distinguished. Table 3 presents the new estimates of the annual volume growth of gross value added of government services in the Netherlands.

[1] In 1992 the shares of 'General administration', ' Defense', 'Education' and 'Other government services' in total government wages and salaries were 47.1, 10.9, 35.9 and 6.1 percent respectively. In 1993 these shares were 47.3, 10.4, 35.5 and 6.8 percent.

Table 3. Annual volume growth rates of gross value added of government services and the change of government labour volume and labour productivity 1988-1995

	Wages and Salaries	Social charges	Consumption of fixed capital	Gross value added	Employment	Labo produc
1988	0.9%	0.9%	2.3%	1.0%	-0.5%	1.3%
1989	0.8%	0.8%	2.5%	0.9%	-0.5%	1.3%
1990	1.0%	0.9%	2.9%	1.1%	-0.4%	1.4%
1991	0.8%	0.4%	3.2%	0.9%	-0.7%	1.5%
1992	1.4%	1.1%	3.2%	1.5%	-0.6%	2.0%
1993	1.4%	1.1%	4.1%	1.6%	0.0%	1.4%
1994*	1.0%	0.3%	1.1%	0.9%	0.1%	0.9%
1995*	0.0%	-0.1%	3.1%	0.2%	-1.0%	1.0%

*) Provisional

If the volume measurement of government value added had not been altered, the estimates of government labour productivity would have been almost zero and the average annual growth of government value added would have been – 0.4 percent. Time series of government value added growth rates, calculated using the pre-revision method, the simple deflator method and the currently used modified deflator method are presented in figure 1.

Figure 1 Government gross value added growth according to three different deflation methodes, 1988-1995

1988 1989 1990 1991 1992 1993 1994 1995

4. Conclusions

Since the major revision of 1987 of the national accounts (CBS, 1992), a new method is used to estimate the volume change of the value added of government services. The price deflator for government wages and salaries is based on the change in the index of basic wage rates according to collective agreements (CAO-wages). The same deflator multiplied with the index for changes in the social security premium rates is used to deflate the social charges paid by the government.

The overall price change of wages and salaries paid by the government is affected not only by changes in CAO-wages and labour productivity growth, but also by changes in the composition of government services. To account for the effects of such changes, government services should be split into several categories. In the Netherlands these categories are 'General administration', 'Defense', 'Education' and 'Other government services'. The effects of compositional changes are small, although, if growth rates are low, the effects may be quite substantial in relative terms.

The introduction of the deflator method had a large impact on the estimated annual volume growth rates of government value added. If the deflator method had not been applied, the average annual growth rate would have been estimated at –0.4 percent. According to the revised method, the average annual growth rate was +1.0 percent.

Literature

CBS, 1992, Nationale rekeningen 1991, band 2 *[National Accounts 1991, volume 2]*. (SDU/Uitgeverij/ CBS-publikaties, The Hague).

Kazemier, B., 1991, *Volume Measurement of Government Output in the Netherlands; Some Alternatives* . Occasional Papers no. NA-45 (CBS, Voorburg).

Kendrick, J.W., 1985, Measurement of Output and Productivity in the Service Sector, *in* Inman, R.P. (ed), 1985, *Managing the Service Economy; Prospects and Problems.* (Cambridge University Press; Cambridge, etc.), pp. 111-123.
Modern theories

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List of occasional papers

The list below will give an impression of the subjects covered in previously published Occasional papers. A complete list of all available Occasional papers can be obtained from the National accounts information desk (telephone 31 70 337 58 76; fax 31 70 337 59 81; e-mail infopni@cbs.nl).

NA/45 **Volume measurement of government output in the Netherlands; some alternatives**, Kazemier, Brugt (1991).
This paper discusses three alternative methods for the measurement of the production volume of government. All methods yield almost similar results: the average annual increase in the last two decades of government labour productivity is about 0.7 percent per full-time worker equivalent. The implementation of either one of these methods would have led to circa 0.1 percentage points higher estimates of economic growth in the Netherlands.

NA/79 **The NAMEA experience. An interim evaluation of the Netherlands' integrated accounts and indicators for the environment and the economy**, Keuning, Steven J. (1996).
The national accounts publication in the Netherlands contains not only the conventional economic accounts and indicators, but also an integrated system of environmental and economic accounts, the NAMEA (National Accounting Matrix including Environmental Accounts). This paper reports on the present status of the NAMEA-approach and gives a concise summary of this approach. It reviews the present applications of this framework in the Netherlands and, finally, a comparison with the SEEA is made and various common misunderstandings regarding Green National Income are set out.

NA/80 **What's in a NAMEA? Recent results of the NAMEA-approach to environmental accounting**, Keuning, Steven J. and Mark de Haan (1996).
The National Accounting Matrix including Environmental Accounts (NAMEA) shows environmental pressures in physical units that are consistent with the monetary figures in the national accounts. This paper introduces the NAMEA-concept, provides some illustrative analyses of the recently completed NAMEA time-series, and demonstrates that social accounts and social indicators can easily be integrated. This results in a fairly broad, multi-purpose statistical information system.

NA/81 **Balance sheet valuation: produced intangible assets and non-produced assets**, Pommée, Marcel and Willem Baris (1996).
This paper deals with the estimation of opening and closing stocks of produced intangible assets such as mineral exploration, computer software and artistic originals and non-produced assets such as land, subsoil assets, patented entities and purchased goodwill. The first section elaborates on the main conceptual issues related to the compilation of stock data such as the asset boundary, the relation between flows and stocks and principles of valuation. The following sections discuss each of the asset categories in detail.

NA/82 **Micro-meso-macro linkage for labour in The Netherlands**, Leunis, Wim P. and Jolanda G. Timmerman (1996).
This paper describes recent developments in the area of labour market statistics and shows the advantages of integrating these data in the system of Labour accounts and in Social Accounting Matrices. The benefits of such integrated information surpasses the sum of the benefits of various source data. A subsequent effort to adjust the micro data and aggregate figures increases the possible uses of statistics even further.

NA/83 **The interaction between national accounts and socio-economic policy**, Keuning, Steven J. (1996).
This paper addresses the interaction between national accounts and socio-economic policy formulation. In the Netherlands, this interaction mainly occurs through the widespread application of formal economic modelling. Lately, however, the domestic use of national accounts figures swells because of their growing relevance to policy-making and because the Netherlands' national accounts incorporate all kinds of social and environmental data.

NA/84 **The future of the national accounts**, Bos, Frits (1996).
This paper investigates the consequences of globalisation, European unification, automation and more market-oriented government for the national accounts as a central international overview-statistic on national economies. The perspective on the future is a mixture of exploiting present and new potentials and coping well with dangers.

NA/85 **Accounting for the use of financial capital as an input in produ ction; with an application to multi-factor productivity change estimation** , Keuning, Steven J. and Ted Reininga (1997).
It is increasingly acknowledged that the financial structure of a firm is an important determinant of its economic activity. Therefore, the use of financial capital should be seen as a separate input in the production process. This paper attempts to operationalize a meso-economic measurement of financial capital inputs in production and shows the consequences for the estimation of multi-factor productivity change. This approach esta blishes a much closer relationship of macro-economic accounting and analysis to business economics