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Non-Market Health Care Service in Denmark - Empirical Studies of A, B and C Methods

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Abstract

This paper proposes different methods to calculate non-market output for health care services in Denmark. The Commission Decision of December 2002 has suggested three ways to measure the prices and volumes, namely the input based method (C-method), which is currently used in Denmark, the output based method (B-method) and the output based method *with quality adjustment* (A-method). Since the C method is not internationally approved and Denmark has to convert to the output based method no later than year 2012, has The Danish National Account published a pilot study based on the B method, and this paper will for the first time in Denmark present an A-method.

The study shows that a shift from C method to the B method implies significantly higher output and higher real growth rate in the non-market health care service, and the same apply for output based method *with* quality adjustment (i.e. switching from B to A method), but the effects here are minor. Switching from C method to A method indicate a significantly higher output; the differences between C and A methods end up at almost 7 billions DKK in 2005. The output based methods has also positive effects on the labour productivity for the entire non-market economy, where a shift from C to B method improve the productivity by 0.5 percent on average and a shift from B to A improve the productivity by further 0,1 percent.

Further effect of switching from input based method to an output based method is that the gross value added (GVA) increases approximately by 0.2 percent and the quality adjustment has also visible positive effects on the gross value added.

1. Introduction

National accounting figures for the non-market economy form often the basis policy decisions and are intensively used by the media and analysts. Therefore measuring the non-market economy in National Accounts in a correct and internationally comparable way has been discussed in many years. Rarely available prices for the non-market production make it difficult to measure the output in an appropriate way, because the lack of prices makes it difficult to estimate which part of expenditure growth is due to volume change and which part is due to price change.

Recent years growing interest in the non-market output has also resulted in increased interest in finding the best optimal method to measure the output non-market economy.

In the Commission Decision of December 2002 methods used to measure prices and volumes are classified into three groups A, B and C according to their suitability. The best practice or optimal methods are classified as A-method, the acceptable but not optimal methods are B-method and the not acceptable methods are labelled as C-method.

Box A. Classification of methods

A methods: Most appropriate methods
B methods: Those methods which can be used in case an A method cannot be applied
C methods: Those methods which shall not be used

This paper will demonstrate examples of C, B and A methods.

Figures calculated according to the C-method (input based) are not useful for productivity analyses. The new guidelines have been developed to take the aspect of productivity into account securing value for money for taxpayers. The European Commission Decision of December 2002 implies that only deflators which describe price or volume growth from the output-side are approved from 2006 onwards (A- and B-methods). Denmark is the only EU country with derogation until 2012 with regard to the non-market services.

The aim of this paper is to contribute to the intense theoretical and practical debate with some empirical results from Denmark. The study illustrates the effect on output dependent on method applied. We present the output of non-market health services using the three below mentioned methods:

- A traditional input deflated compilation
- An output based compilation *without* quality adjustment
- An output based compilation *with* quality adjustment

The main results in this paper are as follows; the output based methods both with quality adjustment and without quality adjustment have positive significant effects on the non-market output, the gross value added and the labour productivity.

The paper is organised as follows; Chapter 1 gives a brief introduction to the subject. Chapter 2 describes the context in which non-market services in general and health services in specific are operating in Denmark. Chapter 3 has its focus on the input based method starting with a general description of the cost elements and how these are deflated. Chapter 4 starts with a description of the output method in general followed by a description of the health care services split up into groups. The chapter also describes how the health care services are compiled with the output based method. Chapter 5 compares the results from the input- and output based methods. Chapter 6 begins with an introduction of quality adjustment in health care in general and afterwards quality adjusts the output based results from chapter 5. Chapter 7 compares the results from the three methods, while chapter 8 gives a brief analysis of the impacts on the economy, when the different calculation methods are applied to compile the Danish health care output. Finally chapter 9 concludes on the results.

2. Non-market health services in Danish national accounts

The division between market and non-market output in Denmark is approximately 83-17 percent, i.e. 17 percent of the total Danish output is non-market. As regards to consumption the split is 65-35 percent due to non-market con-

sumption of market produced output provided by namely general practitioners. The non-market consumption is divided in individual and collective consumption by 70-30 percent (figure 1a). If we focus on only individual consumption expenditure and how it is split by function (figure 1b) we see how health services make up 34 percent of this.

Figure 1a

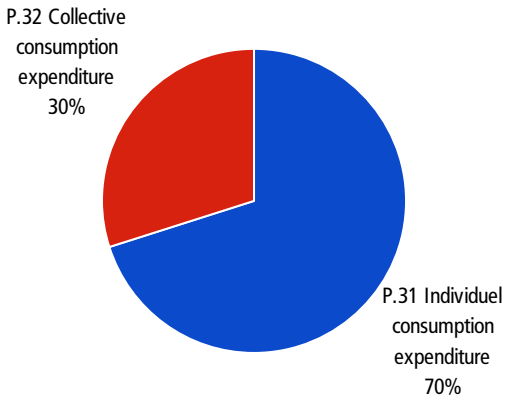
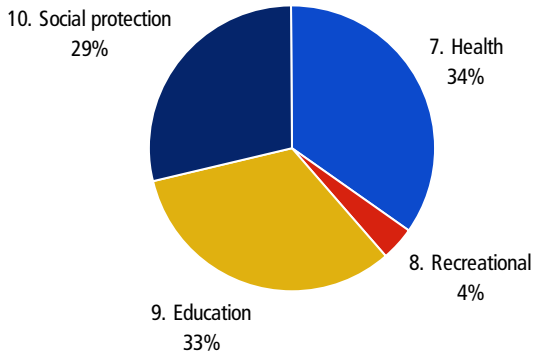


Figure 1b



In the Danish National Accounts the most detailed level for sectors is a 130-grouping in conformity with NACE rev. 2. The sectors producing non-market services are especially within NACE O (Public administration), P (Education) and Q (Health and social activities).

With the focus on non-market health services the activities in Denmark are recorded to be produced in the following three sectors:

- 851100 Hospitals
- 851209 Doctors, dentists, veterinarians
- 853209 Social institutions for adults

Non-market output from hospital services is placed in the sector *851100 Hospital activities*. Output in this sector is almost exclusively non-market in Denmark; hence only 1 percent of the output is generated from market producers, which in this case are private hospitals. In 2002, the output of this sector was over DKK 52 billion (current prices).

Box B. 851100 Hospital activities

Output in current prices in 2002 was approx. DKK 52 billion

99 percent of output is non-market

Hospital services make up 40 percent of all health services

Non-market output from hospital services makes up almost 15 percent of the total non-market output

In the sector *851209 Doctors, dentists, veterinarians* output mainly consists of market output. Less than a quarter of the total output in this sector is generated by non-market producers. The non-market output is primarily derived from dental treatment and is associated with general government dental services for children. General practitioners and veterinary surgeons are considered to be market-based.

Box C. 851209 Doctors, dentists, veterinarians

Output in current prices in 2002 was approx. DKK 25 billion

22 percent of output is non-market

General practitioners produce only market based services

Dentists produce primarily market based services

Only general government dental services for children are defined as non-market

The sector *853209 Social institutions etc. for adults* consists of care of the elderly, which is classified as a health services. The total output value in 2002 was over DKK 55 billion. More than 90 percent of the output in the sector is non-market output and primarily consists of health services for the elderly.

Box D. 853209 Social institutions for adults

Output in current prices in 2002 was approx. DKK 55 billion

More than 90 percent of output is non-market

Output consists almost exclusively of health services for the elderly

3. Input method

In this chapter follows a description of the input method traditionally used when compiling the non-market output. As mentioned previously the input method is still the applied method in the Danish National Accounts, since Denmark as the only European country has a derogation until 2012, where output volume measurement are planned to be applied to compile output of individual non-market services.

3.1 Current prices

In Denmark, the national accounts are compiled based on an analysis and reconciliation of statistical data for the economy as a whole in what is called a product balancing system; i.e. all data is classified according to the national accounting products to which the individual statistical data refer. The most detailed, harmonised data is found in the product and sector[1]-distributed supply and use matrix for the individual year.

In Statistics Denmark, the accounts of general government agencies are included in a joint system labelled the *Database of Integrated General Government Accounts (DIOR).* In the national accounts, this database is distributed and processed in two parts. One part is on data for general government, non-market activity and one part is for social services in kind.

In the national accounts, non-market units refer to those whose sales income represents less than 50 percent of the output costs[2]. This is because general government units often have their own income which cannot be considered as tax, but instead as user's fee or actual sales income, which make these units relevant as well. Sales income in non-market units is logged under a separate product number. These are classified as non-market output in a local kind of activity unit.

Non-market output is traditionally calculated as the sum of the following four production costs for each of the relevant non-market producers (ESA 95, chapter 3.53); *Intermediate consumption*, *Compensation of employees*, *Consumption of fixed capital* and *Other taxes on production less other subsidies on production*

When recording non-market output in a general government, non-market unit that also has sales income, the overall output of the unit is calculated according to the above convention, after which this is divided into two parts. One part is paid by the users and the other, under general government consumption, is paid

[1] This is a highly simplified formulation, since in this context "sector*" contains "sector, duties and import" on the supply side and "sector, consumption group, investment, stock transactions and export" on the use side.

[2] See the manual documentation in the central Eurostat publication, "The European System of Accounts: ESA 95" (abbreviated to ESA 95) chapters 3.17-3.45 for a detailed description of the classification of non-market and related units.

by the general government. The amounts obtained are entered under the relevant product numbers.

The value of the overall non-market output can be determined from the non-market unit output by deducting all sales income, deducting the value of own-produced software and adding social services in kind.

Box E: Government output and consumption

The sum of the four cost elements = Non-market output
Deduct sales income, value of own-produced software
Add social services in kind
The result is General government consumption expenditure

3.2 Constant prices

This section provides a brief outline of the way in which general government activity in fixed prices is calculated in the national accounts.

As mentioned above, general government activity is recorded at current prices in the Danish national accounts by summing the before mentioned associated costs:

- Intermediate consumption
- Compensation of employees
- Consumption of fixed capital
- Other taxes on production less other subsidies on production

Measurement in constant prices is made by deflating each of the four cost elements separately and summing these. In other words the volume is measured from the input side. The deflation method for each of the four cost elements is explained below. Finally this section shows the non-market output of health services as it is calculated in the national accounts.

Intermediate consumption

Intermediate consumption in general government is deflated using a sector-specific price index.

The majority of products are purchased in sectors that only cover non-market activity. Where sectors involve both non-market and private activities, it is assumed that, for intermediate consumption in production, the price growth in the non-market part of the relevant sectors follows the price growth in the relevant sectors as a whole.

Implicit price indices for the purchase of products in the respective sectors are therefore calculated on the basis of the harmonised product balances, and these are used to deflate intermediate consumption in general government.

Compensation of employees

When determining the cost of compensation of employees for an activity, the calculation should ideally include all the employer's costs that are associated with the appointment of employees. In other words, the calculations include not only the salary paid to the employee, but also other employer costs such as the employer's pension and social security contributions.

The earnings index used in deflation of remuneration should consequently cover the same concepts plus changes in the employer's costs e.g. employer trainee reimbursement and similar.

In the context of the national accounts, each rise in the average cost of compensation of employees is not considered to represent a wage increase. A distinction is made between changes in remuneration that are due to a change in the quality of the labour input, and situations in which there is a clear rise in the average wage to ensure availability of a continuous workforce volume and quality.

In the context of the national accounts the earnings index should ideally represent exclusively the amount by which the average compensation of employees has increased to ensure availability of a continuous labour input with regard to volume and quality (the price component).

Based on this principle, it is relatively clear that general earnings increases, collectively agreed and implemented, including e.g. the Danish Regulation Order, should culminate in increases in the earnings index. This also entails that changes e.g. in average hours worked without a decrease or increase in compensation of employees should result in a change in the wage index.

Working overtime often causes extraordinary remuneration. Changes in the average wage arising from this extraordinary remuneration should result in changes in the earnings index. On the other hand, for the purpose of the national accounts, changes in the average wage arising in consequence of changes in the age and functional composition of the workforce, in regard to classifications, should not result in changes in the earnings index. These reflect changes in the quality of the workforce and should therefore be expressed in a change in the volume of the non-market activity (the volume component).

Consumption of fixed capital

Consumption of fixed capital in general government is deflated according to a price index for consumption of fixed capital goods in general government. *Consumption of fixed capital goods* refers to the physical and financial deterioration of capital equipment, i.e. machinery, vehicles, constructions and so on, during the period. Capital equipment is an integral part of the national accounts, and provides the source of the price index for deflation.

Other taxes less subsidies on production

In constant prices, other taxes less subsidies on production should ideally grow in line with volume growth for the products that are subject to taxation or subsidisation.

In Denmark the production taxes with the greatest effect on general government are property/land tax and vehicle tax.

However, no data exist allowing us to determine neither government land ownership nor sector specific vehicle fleet. For this reason, in connection with the deflation of other taxes less subsidies on production, we work on the assumption that in the individual sectors the holdings of products that are subject to taxation and subsidisation are unchanged.

In other words, the other taxes less subsidies on production distributed by sector are kept constant in relation to the base year.

4. Output deflation without quality adjustments

This chapter describes how output in constant prices is calculated via the output method *without* quality adjustments. The used methods are based on Eurostats guidelines[3], but since the results are not quality adjusted the method is classified as a B method. The method differs from the input method described in chapter 3, where no direct deflation of output is made; instead the cost components in constant prices are totalled.

Box F. Difference between input and output methods in practise

Input deflation

Output in constant prices =

Intermediate consumption in constant prices

+ Consumption of fixed capital in constant prices

+ Compensation of employees in constant prices

+ Other taxes less subsidies on production in constant prices

- A separate price index is NOT used for the output.

Output based volume measurement

Output in constant prices =

Output using prices for the year/the relevant price index

- Output in constant prices is calculated WITHOUT knowing the costs in constant prices.

The aim is that the part of the non-market output that is calculated using the output based method should be analogous to the method used for the market

[3] Commission Decision of 17 December 2002. Official Journal of the European Union 20.12.2002

economy. To do this, information regarding prices and volumes in two consecutive periods is required[4].

The calculation of the prices for the year for the period t can be understood as the multiplication of the prices, P, and volumes, M, for the period. This gives us the value V_t^Y for j products:

$$V_t^Y = \sum_j P_t * M_t \qquad .1$$

To calculate chained values we need to know the volume in the period t measured during the period t-1 prices. The value listed in the prices for the previous year, V_t^D, is calculated as the volume in the period t multiplied by the prices in the period t-1 for j products:

$$V_t^D = \sum_j P_{t-1} * M_t \qquad .2$$

After this, bilateral Laspeyres volume indices, $I_{t-1,t}^B$, between periods t-1 and t, can be calculated as:

$$I_{t-1,t}^B = \frac{\sum_j P_{t-1} * M_t}{\sum_j P_{t-1} * M_{t-1}} \qquad .3$$

When calculating the chain index, a specific year should be used as a reference, i.e. the prices for the year and fixed prices should be identical. If period t is chosen as the base year, the formula for the Laspeyres chain index between period's t and t+1 will be as follows:

$$V_{t,t+1}^K = \frac{\sum_j P_t * M_{t+1}}{\sum_j P_t * M_t} * V_t^Y \qquad .4$$

While the formula for the following year is:

$$V_{t+1,t+2}^K = \frac{\sum_j P_{t+1} * M_{t+2}}{\sum_j P_{t+1} * M_{t+1}} * V_{t,t+1}^K \qquad .5$$

4 In this study the top index refers to the price leves. Y is for current prices; D is for prices in previous year and K is for chained values.

4. 2. Health - break down by function

As described earlier, health services in the national accounts are placed in three sectors covering widely differing aspects of health services. However, it is not just between sectors that services vary. Although the national accounting supply and use matrix contains around 2,350 products, this level of detail is not always comprehensive enough to set up a price index.

Sector *85110 Hospitals* contains only one product number for the output of non-market hospital services. The new fixed price regulation involves requirements for special deflation of somatic and psychiatric hospitals. It is therefore necessary to draw on more information in order to perform a fixed price calculation which takes into account the price growth for both somatic and psychiatric hospitals.

The database for non-market accounts provides the source data for calculating the non-market output in the national accounts. However, this data is aggregated in the national accounts and needs to be distributed in more detail. Table 4.1 shows an extract from the database regarding the services classified as health-related according to COFOG, the international classifications registry (Classification of the Functions of Government).

According to the international classification documentation, the following three COFOG groups are included in the non-market product number for hospitals:

- 0731 Somatic hospital services
- 0732 Specialised hospital services
- 0734 Nursing and convalescent home services

While the entire output of somatic and specialised hospitals is included, only a very small proportion of the total output of *0734 Nursing and convalescent home services* is included.

Table 4.1 Non-market output of health services 2002

		DKK million	Percent
0711	Pharmaceutical products	12	0
0713	Therapeutic appliances and equipment	0	0
0721	Somatic medical services	123	0
0722	Specialised medical services	13	0
0723	Dental services	1 800	2
0724	Paramedical services	1 904	2
0731	Somatic hospital services	46 757	59
0732	Specialised hospital services	5 425	7
0733	Somatic medical services	293	0
0734	Nursing and convalescent home services	19 245	24
0740	Public health services	1 034	1
0750	R& D health	1 672	2
0760	Health n.e.c.	1 220	2
070	**Total health**	**79 499**	**100**

This information provides basis for deflating the product number for hospitals via two indices: one for somatic hospitals, and one for specialised ones. These two indices are weighted with their respective outputs from the COFOG classifications.

Non-market output in sector *851209 Doctors, dentists, veterinarians* is deflated via two indices: one which measures the price growth for non-market dental services, and one for somatic hospital services. The dental services index is used to deflate the product number for non-market dental treatment, which is largely identical to the output for COFOG classification 0723 Dental services. One other non-market product number is included in this sector. This contains somatic health services and is deflated using the price index for somatic hospitals.

853209 Social institutions for adults include two non-market product numbers; one for nursing homes, day centres and so on, and one for social institutions for adults. Among other things, the former consists of the entirety of *0734 Nursing and convalescent home services, and other services* which are not classified as health services. A weighted price index for nursing homes etc. is therefore used to deflate this product. A product number for residential institutions for disabled adults is also deflated using the index for nursing homes etc.

The following section describes the price index which was used to deflate the individual health services. These sections provide a detailed description of how the price indices are calculated. The price indices are as follows:

- Price index for hospitals
- Price index for psychiatric hospitals
- Price index for non-market dental services
- Price index for residential and day care places for the elderly

Price index for somatic hospitals

The price index for somatic hospitals is the individual index which is used to deflate the largest value among health services. In 2002, it was used to convert the outputs for approximately DKK 50 billion[5]. The price index thus has a decisive influence on the price and volume growth for the non-market economy. In fact, this index is given so much weight that a major change in the deflator is directly reflected in overall financial growth.

The price index for somatic hospitals is calculated on the basis of the Danish National Board of Health's Diagnosis Related Group database (DRG). In Denmark, this system is used as a tool for calculating fees to settle the accounts of patients treated in a different municipal area from the one in which they reside. The central health authorities and hospital owners also use the system to assess the correlation between activity and costs in hospital services. Finally, it is increasingly used for budgeting and particularly as a tool for developing new methods of premises planning and management in administration and hospitals.

[5] Various less valuable health services were also deflated using this index, taking the total value to over DKK 50 billion

The DRG system contains information about the number of treatments and the associated fees for around 800 different types of treatment[6]. All data contains information about prices (the fee) and volumes (the number of treatments) for each individual type of treatment. Starting with this available data, which provides information about prices and volumes, it is possible to calculate a price index for somatic hospitals.
Based on this data, price indices are calculated according to the method outlined earlier. Since all treatments, *i*, cannot be compared between periods, partly as a consequence of new treatments, only those prices and volumes, i, that are comparable are used. When equation 6 is applied

$$P^{B}_{t,t+1} = \frac{\sum_{i} P_{t+1} * M_{t+1}}{\sum_{i} P_{t} * M_{t+1}} \qquad 6.$$

to DRG data, a price index for the period 2004 to 2005 can be calculated as:

$$P^{B}_{2004,2005} = \frac{42{,}757{,}521}{42{,}053{,}361} = 1.017 \qquad 7.$$

The price growth for somatic hospital treatments between 2004 and 2005 was thus 1.7 percent.

Table 4.2 shows the price index for the periods 2000 to 2005 calculated according to the above method using the DRG data which is comparable between two consecutive periods. The table shows that in three out of five years, it was cheaper to perform an equivalent treatment in the following year, while in two of the five years there was a price rise of just over 2 percent.

Table 4.2 Price index somatic hospitals

	2001	2002	2003	2004	2005
	previous year = 100				
Price index for somatic hospitals	99.8	99.6	101.3	98.5	101.7

Price index for psychiatric hospitals

The price index for psychiatric hospitals is used to deflate the part of the hospital services associated with psychiatric hospitals. In 2002, it was used to convert hospital services for over DKK 5 billion.

[6] Appendix A shows an excerpt from the existing data on the level of the Major Disease Category (MDC). In this case, the data is distributed according to a range of established main categories.

The psychiatric sector is not currently an integral part of the Danish National Board of Health's DRG system, but work is ongoing to implement DRG calculations for psychiatry. Since there is no integral psychiatric system with both prices and volumes for the periods 2000-2005, it has been necessary to draw on other sources.

The Danish National Board of Health's National Register of Patients contains details of the number of discharges distributed according to diagnosis group and age. At the current time, these figures cover the period up to 2004, but the Danish Psychiatric Central Research Register, which was produced by the Centre for Psychiatric Research, has the figures for 2005.

The DRG groups also include a diagnosis code which makes it possible to connect the DRG fees to the diagnosis groups in the National Register of Patients. Since psychiatric DRG fees are only available for 2005, it was necessary to perform further calculations back to 2000. For this purpose, the annual output per discharge was calculated. This is calculated as the output per discharge for COFOG group 0732 specialised hospital services. The DRG fees for 2005 are therefore recorded retrospectively implementing the growth in these series. In practice, this means that it is tacitly assumed that the price growth in the individual diagnosis groups is uniform, while the level is disparate. The psychiatric DRG fees for 2005 will thereby function as a weight for the volume growth between 2000 and 2005.

The method used in the previous section for somatic hospitals is used to calculate the price indices. Table 4.3 shows the price index calculated for 2000 to 2005. The table demonstrates that the implicitly calculated prices for treatment in psychiatric hospitals during this period increased with between 1.3 percent and 7.0 percent annually.

Table 4.3 Price index psychiatric hospitals

	2001	2002	2003	2004	2005
	previous year = 100				
Price index for psychiatric hospitals	101.9	101.3	104.6	107.0	102.2

Price index for non-market dental services

Non-market dental services are the smallest sector where a direct price index is calculated. In 2002, non-market output from dental services totalled approximately DKK 2 billion.

A specific dataset from the Danish Social Resource Statistics[7] provides details concerning the number of people receiving treatment. The number of people receiving treatment is distributed across dental services and orthodontic treat-

[7] Published by Statistics Denmark

ment. The data also indicates whether the treatment was provided as a non-market dental service or by a practising dentist. The costs for these treatments are registered in an internal database regarding governmental non-market activities (OIMA). The detailed COFOG code *0723 Dental services* includes costs for non-market dental treatments.

The OIMA dataset does not specify whether the costs are associated with dental treatment or orthodontic treatment. This is problematic, in that orthodontic treatment requires more resources than dental care. The share of resources devoted to the two types of treatment has been estimated using accounts from two Danish municipalities[8]. The study shows that two thirds of the costs are associated with the dental care, while the rest concerns the orthodontic treatment. Using this information the total costs were distributed across dental care and orthodontic treatment respectively.
Information about costs at the detailed level makes it is possible to calculate a fee for the dental care and the orthodontic treatment. The detailed costs divided by the number of treatments imply the fee for the year.

The price and volume observations make it possible to calculate a price index for non-market output of dental services. This method is similar to the previously outlined method, and the price indices are presented in table 4.4. From 2000 to 2001 the implicit prices of dental treatment fell slightly, while subsequently prices increased between 0.4 percent and 5.5 percent annually.

Table 4.4 Price indices for dental treatment

	2001	2002	2003	2004	2005
	previous year = 100				
Price index for dental treatment	99.7	105.5	100.4	100.9	102.5

Price index for residential and day care for the elderly

Sector *853209 Social institutions for adults* consists of both non-market care for the elderly and other non-market services for the elderly, e.g. non-nursing residences and so on. The part considered as "care" is classified as a health service in COFOG, and should therefore be included in the calculations of volume indicators for health. The price index for nursing and day care places for the elderly is very important, since the output for nursing and convalescent homes in 2002 was over DKK 20 billion; cf. table 4.5.

The Social Resource Statistics provide details concerning the number of elderly people who have a place in a nursing home, and the type of care is involved. During this period, there was a steady drop in the number of nursing home places[9].

[8] Helsingør and Stevns

[9] This is as a result of reprioritising; some nursing home places have been converted to some special homes for the elderly, which belong to a different sector than health and are not included in these calculations.

Table 4.5 No. of residential and day care places for the elderly

	2001	2002	2003	2004	2005
Residential places			quantity		
Nursing homes	27 635	25 802	23 740	21 121	17 819
Sheltered housing	2 973	4 105	3 566	3 309	3 016
Other housing for the elderly	20 186	19 875	18 338	17 157	15 866
Day care places					
Day centres	28 209	29 156	24 936	26 192	25 476
Social centres	4 322	4 330	4 472	4 406	3 722

Data from the municipality of Copenhagen was used as the source of prices for individual residences. These accounts show the realised unit costs for each type of residence. Because it is currently not possible to retrieve unit costs from other municipalities, the price growth in the municipality of Copenhagen has been assumed to be representative for the entire country. Table 4.6 shows the unit prices distributed according to the type of care place between 2000 and 2005. Copenhagen City first began to present their actual realised unit costs in the 2001 accounting year. For this reason, the unit costs for this year are based on retrospective calculations based on the overall growth.

Table 4.6 Unit prices for residential and day care places for the elderly

	2000	2001	2002	2003	2004	2005
				unit prices		
Nursing homes/residences	321 714	329 000	338 000	340 000	346 820	361 549
Sheltered housing	126 143	129 000	132 000	132 000	134 215	139 375
Day centres	39 114	40 000	41 000	41 000	41 942	43 555
Social centres	157 435	161 000	165 000	165 000	167 768	174 218

Starting with the prices and volumes, it is now possible to perform a price index calculation cf. table 4.7. The method is analogous to the one used above. The price growth for residential and day care places for the elderly rose by between 0.5 percent and 4.1 percent between 2000 and 2005.

Table 4.7 Price index for residential and day care places for the elderly

	2001	2002	2003	2004	2005
			previous year = 100		
Price index for res. and day care places for the elderly	102.3	102.7	100.5	102.0	104.1

5. Comparison of the results from B and C methods

This chapter compares the results between the input based and output based methods.

5.1 Comparison of price indices

This section introduces a comparison of B- and C-method indices. Table 5.1 provides an overview of the input based and output based price indices.

From the table, we can see that the input based four price indices are all identical for 2004 and 2005. This is because the national accounts calculation for these years were still not finalised at the time where the pilot study was made. Since the calculations are preliminary, detailed product balances were not available and detailed deflation are not applied. For the preliminary years, the same deflator was used for all non-market services, for that reason the price indices are identical. The Danish national accounts are not finalised until three years after the end of a calendar year. In the case of somatic and psychiatric hospitals, the input based price indices are also identical. This is because there is only one product for hospital services, as previously stated. Therefore it is not possible to show separate price indices for these two types of services.

In the case of hospitals; the results point out that the input based price index implies a higher growth rate in prices than the output based price index do in all years except 2003. All else being equal, this means that if the output based price index is used in the national accounts, the volume growth will be higher.

The price index for psychiatric hospitals varies more extensively. During the first two years, the current calculations demonstrate a stronger price growth, while the reverse is true from 2003 to 2005. A similar picture emerges in the case of the price index for non-market dental services; though it is not possible to identify any clear trend.

In the case of residential and day care places for the elderly, the output based price index is lower during the first four years, while the last period demonstrates substantial price growth.

Based on the price indices for health care services, it is possible to conclude that the output based price index demonstrates more uneven price growth rates than in the case with the input based price index.

Table 5.1 Input based and output based price indices for health care

	2001	2002	2003	2004	2005
	previous year = 100				
Somatic hospitals					
Input based (C method)	103.3	103.7	101.5	102.9	102.0
Output based (B method)	99.8	99.6	101.3	98.5	101.7
Psychiatric hospitals					
Input based (C method)	103.3	103.7	101.5	102.9	102.0
Output based (B method)	101.9	101.3	104.6	107.0	102.2
Non-market dental services					
Input based (C method)	105.0	103.0	100.7	102.9	102.0
Output based (B method)	99.7	105.5	100.4	100.9	102.5
Residential and day care places for the elderly					
Input based (C method)	103.5	103.2	102.4	102.9	102.0
Output based (B method)	102.3	102.7	100.5	102.0	104.1

5.2 Comparison of output

Based on supply and use tables from the national accounts and the output based price index, it is possible to perform calculations in a national account context which clarifies the impact of switching from input to output deflation. Chained values are then calculated based on the formulas from chapter 4, starting with 2000 as reference year. Table 5.2 shows the results of these two methods.

Table 5.2 Output calculated with C and B methods

	2000	2001	2002	2003	2004*	2005*
	2000 prices, chained values, DKK million					
851100 Hospitals						
Input based (C method)	45 679	47 480	48 963	50 885	52 363	54 669
Output based (B method)	45 679	49 024	52 542	54 554	58 125	60 906
Difference		*1 544*	*3 579*	*3 669*	*5 762*	*6 237*
851209 Doctors, dentists, veterinarians						
Input based (C method)	22 326	22 876	23 095	23 503	23 563	23 725
Output based (B method)	22 326	23 121	23 412	23 835	24 047	24 218
Difference		*246*	*317*	*332*	*484*	*493*
853209 Social institutions for adults						
Input based (C method)	48 366	50 378	51 906	52 416	49 114	46 905
Output based (B method)	48 366	50 623	52 255	53 133	49 956	47 351
Difference		*245*	*349*	*717*	*842*	*446*
Total						
Input based (C method)	116 371	120 733	123 963	126 806	125 033	125 281
Output based (B method)	116 371	122 768	128 173	131 447	131 854	131 959
Difference		*2 035*	*4 210*	*4 642*	*6 821*	*6 678*

As described in the previous section, the results from years 2004 and 2005 are preliminary in the context of the national accounts, which means that:

- The current price index used to deflate the non-market economy is a somatic price index

- There are no calculations for the most detailed sectors in the national accounts; figures are distributed based on separate calculations.

While the results should be interpreted with a certain amount of caution, the distribution across sectors in particular is based on the sources that in future will be used for the final national accounts calculations. The relevant level is thus solidly based on reliable data source. As already stated, the price index is a somatic one, and at present it is not possible to evaluate its reliability.

The calculation for *851100 Hospitals* shows that the output based calculation has an output level that is higher than the input based calculations in all periods. Similarly, the real growth rate is higher in all periods except for the years 2002 to 2003, where the input based calculation indicates stronger growth. The calculations clearly show that if the output based price index is used, the growth in prices is more moderate, and the real growth rate is higher. In 2005, the output is over DKK 6 billion higher when the output based method is applied.

In the case of *851209 Doctors, dentists, veterinarians*, the changes are much more moderate than for *851100 Hospitals*. This is due to two factors; more consistent price indices and the fact that the non-market services constitute less than a quarter of the sector's total output. This means that more than three quarters of the calculation by definition remains unchanged.

In the case of *853209 Social institutions for adults*, the situation is the same as that for *851209 Doctors, dentists, veterinarians*. Only a small part of the output is affected by the calculations, and the price indices show good consistency over time. This means that in this category we undertook only a modest revision of the output in chained values.

6. Output method with quality adjustment

This section describes how output in constant prices is calculated via the output method *with* quality adjustment. According to Eurostat's guidelines this is an A method and therefore the most appropriate method. In this section output is defined as:

Quantity x *Quality* = *Output*

6.1 Measuring the change in quality of health care

The *Eurostat Handbook on price and volume measures in national accounts* (Eurostat 2001) and *Commission Decision of 17 December 2002* recommend that public service output should be measured in a way that adjusts for quality changes. Thus this section discusses definitions of quality in health care and proposes a conceptual model to be used in this paper. The quality measures in this paper reflect only one dimension of quality; saving lives and thereby extending life span. For the present the main available health outcomes data are for mortality rate.

There are a wide number of literatures defining the aspects of health care quality, where York/NIESR (2005) research defines the quality of treatment *as "the level of the characteristics valued by patients and changes in quality are measured as the rate of change of these characteristics"*.

The studies have extended a set of quality domains, where the most discussed key domains of quality are *health gain* (which includes safety and effectiveness) and *patient experience* (which includes aspects of responsiveness, user focus, acceptability, access and timeliness). Most commentators feel that dimensions of quality based on health gain e.g. saving lives and mitigating effects of illness are more important quality aspect than patient experience. Therefore in practice the most focused domain of quality is *health gain*.

Health gain
Health gain is the pattern of health status over the rest of the patient's life, compared with health status if the treatment had not been given. Health gain can be achieved even if patients do not get better, since for some conditions the best that can be expected, even with good treatment, is further decline in health status towards unavoidable death. However, healthcare can relieve pain and other symptoms and extend life.

Patient experience
Patient experience is usually measured through surveys. Survey questions are often grouped into different domains, including better information, more choice possibilities and safe, coordinated, high quality care. Surveys measure different areas of the health care service, for example; hospital inpatients, mental health, and primary care. The weight given to patient experience is assumed

to vary across areas. Patient experience is assumed to be relatively more important for primary care and for mental health services than for hospital inpatient, outpatient and accident and emergency services.

6.2 Quality adjustment indicators

There are a number of desirable characteristics of indicators which could be used for quality adjustment for volume output with the aim to determine the marginal contribution of the health care service to outcome. Since we are interested in health outcome improvements over time, the outcome indicators used for quality adjustment should be consistent over time and if possible updated annually. Quality indicators should reflect all changes in the health service as a whole, i.e., they should reflect areas where the marginal contribution of the health care service is either positive or negative. It is generally suggested that the optimal indicator set should contain both process and outcome measures. Moreover, the indicator set should be based on three main criteria; first, the importance, second, the scientific soundness of the measure and third, the feasibility of obtaining data.

OECD Health Care Quality Indicators

The Health Care Quality Indicators Project (HCQI) is developing a set of indicators that can be used to study health care quality and that can be reliably reported across countries using comparable data. The data set is designed to establish a set of health sector quality indicators that are internationally comparable. The indicator set includes both quality adjustment indicators for in acute hospitals treatment and indicators for quality adjustment in primary care services.

OECD indicator set and other studies (e.g. York/NIESR) are focusing on the same quality aspects as:

- Reduced mortality rates/Survival rate
- Reduced waiting times
- Improved patient experience.

Waiting times

The Atkinson Report recommended developing a quality adjustment based on waiting time for possible treatment, and exploration of data in other areas where patients wait for treatment. The experience of waiting for treatment plays a part in both the health gains and patient experience aspects of quality of healthcare. Waiting times for diagnostic tests and treatment may affect individuals in two ways. First, they may dislike waiting, because waiting may be a bad experience for patients even if they are not in pain, unlikely to have any worse health outcomes as a result of the delay (patient experience). Second, longer waiting time for treatment may reduce health gains; patients defer the benefits of treatment, and may have pain, reduced mobility, concern and other damage to their health status while waiting, and in that way their health gain from treatment will be reduced.

The Health Care Quality Indicators Project (HCQI) uses waiting time for surgery after hip operation as a quality indicator.

Reduced mortality rates/Survival Adjustment
Data on deaths within 30 days of admission, by hospital procedure, is suggested as a quality index. Death from a condition from which a patient should recover is an important indicator of quality (or failure) and it is considered right to seek to use this information. For instance most patients admitted with acute disease as appendicitis survives, but some die; the death rate is considered to be a good quality indicator. Comparisons of death rates have to be adjusted for case mix – age of patient, severity of diagnosis, morbidity and other risk factors.

6.3 Health price index with quality adjustment

This section is continuing the work on the output price index for somatic hospitals. Quality adjustment will be added to the existing index. For the present study the only used quality indicator is the mortality rate, defined as the number of deaths caused by a specific disease divided by the number of patients treated for that kind of disease. For instance, the number of people treated for stroke divided by number of people who died because of stroke. The denominator includes immortal hospital treatments, i.e. even if the disease does not cause death. Mortality rates (9 in all) are weighted with the number of treatments of a specific disease divided by all stationary treatments. In addition, outpatients are not included in the quality indicators. The quality indicator shows changes in mortality rates over time, and any drops in the mortality rates are considered as an improvement in health quality. In this paper only ordinary hospitals treatments will be quality adjusted. The source of data for mortality rates is the Danish Causes of Death Registry and DRG register.

Table 6.1 Quality adjustment of somatic hospitals

	2001	2002	2003	2004	2005
	previous year = 100				
Somatic hospitals					
Output based price index (B method)	99.8	99.6	101.3	98.5	101.7
Mortality rate (index)	100.1	100.8	100.0	98.4	99.2
Output based and qua. adj. price index (A method)	99.9	100.4	101.3	97.0	100.9

Table 6.1 shows the output based price index, the mortality rate and the quality adjusted price index. Since a drop in mortality rates has a positive quality impact on somatic hospital services than an increase in mortality rate leads to a reduction in the price index. The mortality rates have increased in 2001 and 2002 and as a consequence the price indices increased too. In 2004 and 2005 mortality rates are declined and as a result the price index is also decreased.

7. Comparison of the results from A, B and C methods

This chapter compares the output results from all three methods.

7.1 Comparison of price indices

This section compares A, B and C method price indices. Table 7.1 shows price indices from A, B and C methods; from this it appears that the input method measures the highest price change in each period. Price indices compiled according to A, and B standards are more similar and in fact identical in 2003. As mentioned earlier the B method finds the highest price increase in the latter periods, while the A methods has it in the first period.

Table 7.1 Indices for A, B and C methods

Price index for:	2001	2002	2003	2004	2005
	previous year = 100				
Somatic hospitals					
input based (C method)	103.3	103.7	101.5	102.9	102.0
Output based (B method)	99.8	99.6	101.3	98.5	101.7
Output based and quality adjusted (A method)	99.9	100.4	101.3	97.0	100.9

7.2 Comparison of output

Table 7.2 repeat the results from earlier sections. Comparisons of A and C methods reveals that output is significantly higher when the compilation is based on the A method. The difference is nearly 7 billions DKK in 2005.

However a comparison between A and B methods indicate that the differences between the two methods are minor, output is reduced in the first three periods when the A method id applied. In the last two periods the output is increased and the difference ends up at 752 million DKK in 2005.

Results for the total economy are following; The B method results for *851209 Doctors, dentists, veterinarians* and *853209 Social institutions for adults* shows that output is raised by 6.7 billions DKK in 2005 and compilations based on the A/B method adds further 800 million in 2005. In addition applying of volume indicators *with* and *without* quality adjustment leads to higher output.

Table 7.2 Output calculated with A, B and C methods

Output for:	2000	2001	2002	2003	2004*	2005*
	2000 prices, chained values, DKK million					
851100 Hospitals						
Input based (C method)	45 679	47 480	48 963	50 885	52 363	54 669
Output based (B method)	45 679	49 024	52 542	54 554	58 125	60 906
Difference (B to C method)		*1 544*	*3 579*	*3 669*	*5 762*	*6 237*
Output based with quality adj. (A method)	45 679	48 986	52 112	54 100	58 457	61 658
Difference (A to C method)		*1 506*	*3 149*	*3 215*	*6 094*	*6 989*
Difference (A to B method)		*- 38*	*- 430*	*- 454*	*332*	*752*
Total						
input based (C method)	116 371	120 733	123 963	126 806	125 033	125 281
Output based (B method)	116 371	122 768	128 173	131 447	131 854	131 959
Difference (B to C method)		*2 035*	*4 210*	*4 642*	*6 821*	*6 678*
Output based, partly Qal.adj. (A/B[1] method)	116 371	122 755	127 749	131 006	132 251	132 762
Difference (A/B[1] to C method)		*2 022*	*3 786*	*4 200*	*7 218*	*7 481*
Difference (A/B[1] to B method)		*- 13*	*- 424*	*- 441*	*397*	*803*

[1] A/B refers to the fact that only somatic hospitals treatments are quality adjusted.

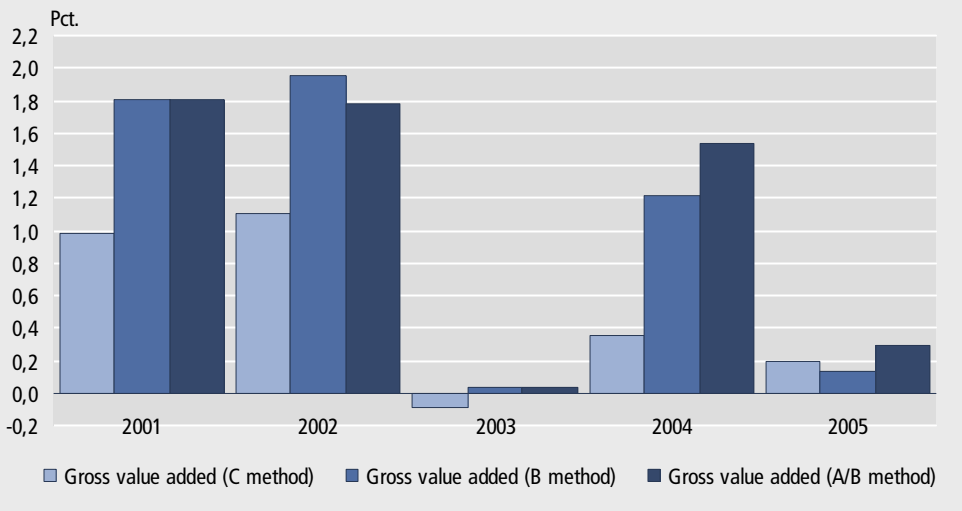
8. Implications

This chapter of the paper applies comprehensive analysis of previous chapters in a more general context.

8.1 Results for health care

Figure 8.1 summarises the differences between the input based and output based calculations with and without quality adjustments for health care services (somatic hospitals).

Figure 8.1 Gross Value Added - growth rates by methods



In the years 2001, 2002 and 2004 the growth rates for the output method differs significantly from growth rates based on the input method, i.e. the output based

method gives higher growth rates. The results for output based method *with* and *without* quality adjustment indicate minor differences, and only in 2004 and 2005 the quality adjustment has positive effects on output. Whereas the effects of quality adjustment in 2002 are negative, while the result for 2001 and 2003 are almost unaffected. To summarise; a shift from input to output methods (C to B) has a significant impact on non-market value added growth rates, while implementation of quality adjustments (B to A) has a minor effect.

Statistics Denmark does not publish productivity calculations for the non-market economy[10], since the output in the non-market economy is calculated on the basis of the input method.

Any input based calculation of productivity for the non-market economy between two periods will, if the composition of the workforce and capital are identical, by definition be zero. This is due to the causality between the concepts; number of hours worked, wages and output growth. The close connection between these is illustrated in the following fact box and demonstrates why the labour productivity tends to be close to zero.

Box G. Facts about labour productivity in government

The impact of an increase in employment in the non-market economy seen in the national accounts.

Step 1:

New employee, more hours worked and an increase in the cost of compensation of employees.

$$Employment \uparrow \Rightarrow Hours \uparrow \Rightarrow Wages \uparrow$$

Step 2:

The compensation of employees rises. The output increases since the cost of compensation of employees is included directly in the calculation. The gross value added increases as well.

$$Wages \uparrow \Rightarrow Output \uparrow \Rightarrow GVA \uparrow$$

Step 3:

Labour productivity, which is defined as the gross value added per hour, is unchanged, since the changes to the gross value added and the hours are the same.

$$\frac{GVA \uparrow}{Hours \uparrow} = Productivity \leftrightarrow$$

Or

If the number of hours is unchanged, all else being equal, the gross value added will also remain unchanged, and labour productivity will by definition be zero.

However, in practice the composition of the workforce and capital will not remain unchanged from period to period, since there are constant changes to the workforce volume and its educational composition, along with investment in new capital equipment. Productivity can therefore be positive or negative, but over a longer period the average will be close to zero.

[10] See e.g. Bonde and Sejerbo Sørensen for a detailed description of Statistics Denmark's calculations.

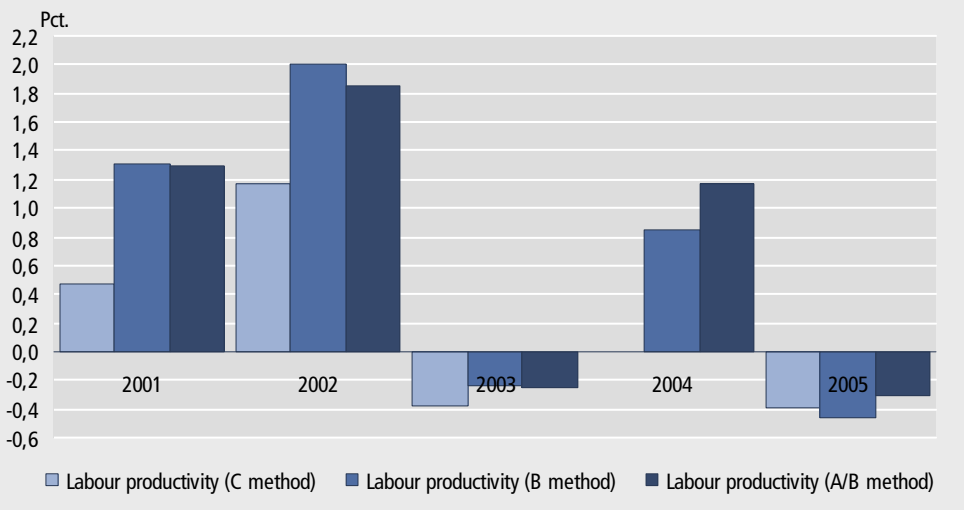
This situation does not apply if the output, and thereby the value added, is calculated according to the output based method. When this method is used, the link between the cost of compensation of employees and the production value is broken; see fact box above.

The output can now both rise and fall regardless of the size of compensation of employees, and thereby the number of hours worked.

The output based method allows us to calculate productivity figures for the non-market economy. Unfortunately, the output based method is not used for the entire non-market economy, but only in health care services, which account for a significant part of the total non-market output.

Figure 8.2 shows the labour productivity for the entire non-market economy. A clear trend according to this chart is that the output based productivity is higher, if the productivity is growing and less negative (except from the B method in 2005) in periods in which productivity is declining. Overall, productivity is slightly higher with the output based B method; on average over the period, productivity is 0.5 percent higher here. While output based A/B method adds 0.1 percent to the average growth over the period.

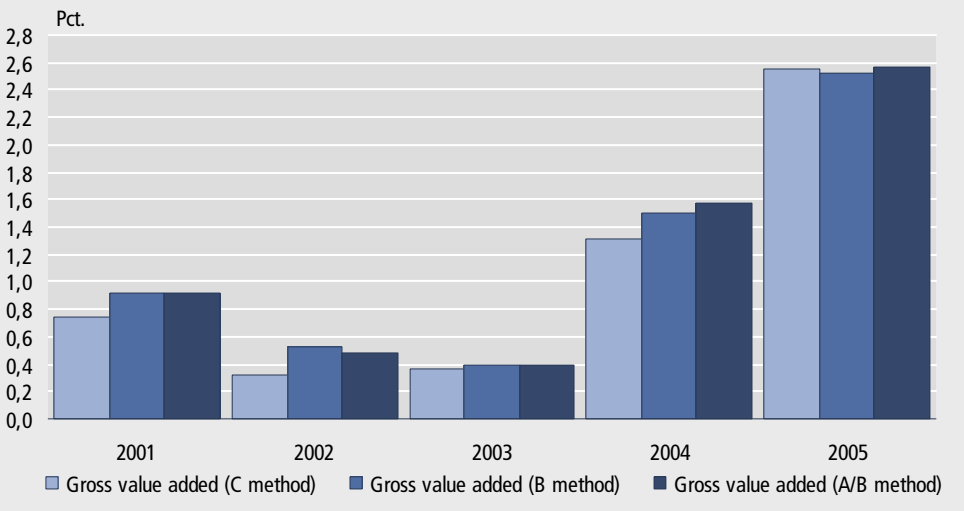
Figure 8.2 Non-market labour productivity



8.2 Results for total economy

The previous chapter quantifies the differences between the tree methods (A, B and C) for general government. Not surprisingly a similar pattern as seen in the previous section is also seen here, cf. figure 8.3. Since the changes are relatively small compared to the total economy the impact is smaller, however the effect is still visible. Again the years 2001, 2002 and 2004 differ most; however the impact is now approximately 0.2 percent between input based and output based methods and the effects of quality adjustments are also slightly.

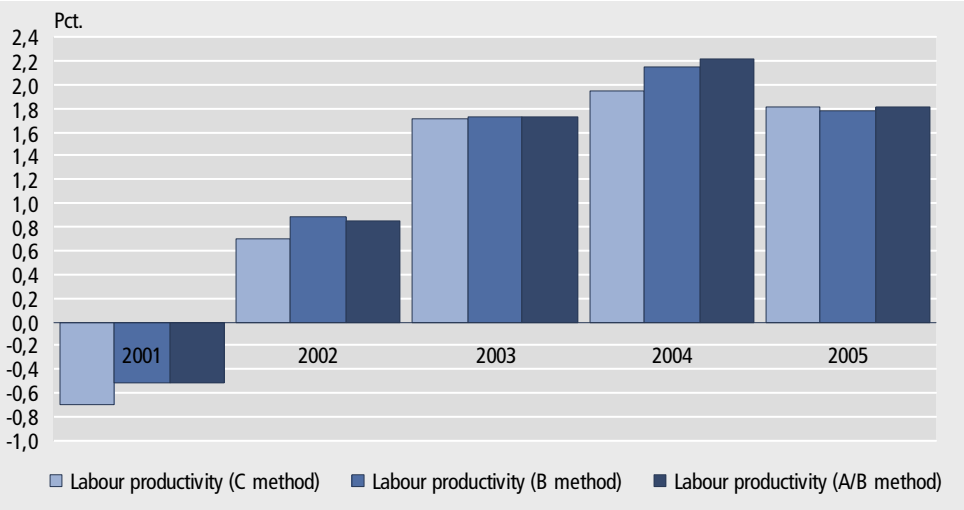
Figure 8.3 Total economy, Gross Value Added



The productivity for the total economy is in general of less interest than the market economy alone, since the general government productivity is close to zero when the C method is applied. In this paper, at least a part of general government is calculated according to the output method and this makes the total economy approach more interesting.

Figure 8.4 shows labour productivity for the total economy. Trends from figure 8.2 general government productivity are also found here but they are less significant. Overall, productivity is slightly higher with the two output based methods. Both methods add 0.1 percent to the average growth during the period 2000 to 2005.

Figure 8.4 Total economy, Labour productivity



9. Discussions and concluding remarks

This paper reports three ways to calculate the output of the Danish health care service. The applied methods to measure prices and volumes are these pointed out in the Commission Decision of December 2002, where they are classified into three groups A, B and C according to their suitability. The present applied method in Danish National Accounts is the C method.

The calculations show that a shift from C method to the B method implies significantly higher output and higher real growth rate. The total output increases by over DDK 6 billion, when output based method is applied. The results for output based method *with* and *without* quality adjustments (switching from B to A method) indicate positive effects on output, but the effects are minor. A comparison of the results from A and C methods indicate a significantly higher output, when the A method is applied; the differences between A and C methods end up at almost 7 billions DKK in 2005.

The choice of output based methods has also significant effects on the labour productivity for the entire non-market economy. The calculations indicate a slightly higher productivity when the B method is applied and the productivity is on average 0.5 percent higher over the period, when switching from C to B method. While the output based A/B method ads further 0.1 percent to the average growth over the period.

The choice of calculation method of the non-market sector has also evident results on the total economy. Switching from input based method to an output based method raise the gross value added (GVA) approximately by 0.2 percent and the quality adjustment has also visible positive effects on the gross value added.

In summarize; a switch from C method to B has positive significant effects on the none-market health care service, the real growth rate and the GVA, while switching from B to A also has positive effects on all the above mentioned three factors, but the effects are minor.

The results of quality adjustment should be considered with caution, because the quality adjustment in this paper is far from perfect. The data/indicator mixes information about diagnosed death causes as a natural end of life with deaths which could have been avoided by better health care. A further source of error is that The Causes of Death Registry also includes deaths that never received any kind of treatment. This can produce an erroneous figure of the mortality rate for specific kinds of disease, because you do not have any information about whether all the deceased have been treated for their disease or not, especially in case of heart stroke, where the probability of quick death is high.

These adjustments constitute only a small part of what would be considered a full adjustment for quality change in health care output. There is still a lack of systematic data on health gain and patient experience.

Any future research regarding quality adjustment can probably be based on OECD Health Care Quality Indicators (HCQI). The data set is designed in a way that it contains the most important health indicators regarding quality adjustment and at the same time, it makes it possible to examine health care quality across countries. Though, one should always be aware of the data quality and the comparability of the sources providing these indicators.

References

Atkinson Review (2005): *Measurement of Government Output and Productivity for the National Accounts*

Bonde and Sejerbo Sørensen (2005): *Productivity Growth in Denmark 1966-2003(in Danish)*, Statistics Denmark 2005.

Commission Decision of 17 December 2002. Official Journal of the European Union 20.12.2002

Department of Health in UK (2005): "*Healthcare Output and Productivity: Accounting for Quality Change*"

ESA (1995):"*The European System of Accounts: ESA 95*", 1996, Luxembourg: Office for Official Publications of the EC.

Mattke, S. et al. (2006): "*Health Care Quality Indicators Project: Initial Indicators Report*", OECD Health Working Papers, No. 22,

Sejerbo Sørensen (2007): *Health and Education. New methodology in the Danish national accounts (in Danish),* Statistics Denmark 2007.

National Board of Health (2007): The Causes of Death Registry

York/NIESR (2005): *Developing new approaches to measuring NHS outputs and productivity*

Appendix A. DRG distributed across MDC groups

MDC codes	2004	2005	2004	2005
	volume		fee	
1 Nervous System	65 303	64 747	24 207	23 933
2 Eye	7 893	7 768	12 839	12 788
3 Ear, Nose, Mouth And Throat	37 193	38 906	13 464	12 886
4 Respiratory System	88 869	87 798	29 768	26 323
5 Circulatory System	134 872	135 927	28 917	27 554
6 Digestive System	109 116	107 381	21 532	20 929
7 Hepatobiliary System And Pancreas	30 723	31 193	29 177	28 831
8 Musculoskeletal System And Connective Tissue	111 540	111 179	30 177	32 044
9 Skin, Subcutaneous Tissue And Breast	39 048	38 614	22 435	23 928
10 Endocrine, Nutritional And Metabolic System	26 673	27 469	25 361	25 071
11 Kidney And Urinary Tract	55 467	56 168	22 491	22 608
12 Male Reproductive System	6 182	6 055	6 998	7 841
13 Female Reproductive System	43 561	43 154	13 735	12 875
14 Pregnancy, Childbirth And Puerperium	74 780	74 960	17 248	17 469
15 Newborn And Other Neonates (Perinatal Period)	22 982	18 916	35 009	43 472
16 Blood and Blood Forming Organs and Imm. Disorders	16 489	17 069	19 813	18 971
17 Myeloproliferative DDs (Poorly Diff. Neoplasms)	22 960	21 758	30 581	34 640
18 Infectious and Parasitic DDs	17 378	18 428	26 059	25 222
19 Mental Diseases and Disorders	4 954	4 955	25 126	25 061
20 Alcohol/Drug Use or Induced Mental Disorders	10 656	10 427	9 583	10 672
21 Injuries, Poison And Toxic Effect of Drugs	18 450	18 464	11 665	11 511
22 Burns	414	418	22 130	33 547
23 Factors Influencing Health Status	55 295	56 348	25 352	27 493
24 Multiple Significant Trauma	624	594	69 837	70 140
25 Human Immunodeficiency Virus Infection	838	710	42 988	43 579
26: Not classified	22 067	28 537	100 200	135 544
27: Not classified	14 394	15 267	41 126	45 718
Ambulant treatment	6 680 125	6 890 125	1 724	1 969
Mixed treatment	538 576	574 654	3 099	3 378
Total	8 257 422	8 507 989	4 878	5 199