Productivity and Quality of the Public Sector

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Foreword

The selection of method may have crucial impact on the results. The volume of the non-market services in the Danish National Accounts is measured by equating them to the volume of inputs used to produce these services. Internationally as well as nationally, this input-method is not considered to be the optimal measure, since it does not reflect all the real value of the volume growth and the productivity as well as the quality changes of these services.

Given the weakness of the input-method, the European Commission passed a Resolution changing the international guidelines for calculating national accounts using constant prices, i.e. adjusted for price changes in December 2002. [1]

The new guidelines result in radical changes of the method for calculating the production value of the individual services within the public sector. The new method suggested by the Commission is based on a count of the actual output produced.

This publication, *Productivity and Quality of the Public Sector* covers the main part of the non-market individual services provided by the government and forms the basis for complying with the Commission Resolution and highlights the effects of the new output-based method on the Danish National Accounts.

This publication is the second of a number of planned publications reporting the results of the development of the output-based measures for General Government. The work was performed by Statistics Denmark in collaboration with the Danish Ministry of Finance.

The publication was produced by Statistics Denmark's Division for National Accounts by Nura Nursen Deveci, Head of Section. Henrik Sejerbo Sørensen, Senior Adviser, Kamilla Heurlén, Senior Adviser, have contributed with advises and Jon Folberg Pedersen, Student, has contributed with data collection.

Statistics Denmark, October 2009

Jan Plovsing / Timmi Rølle Graversen

[1] Commission resolution of 17 December 2002. Official Journal of the European Union 20.12.2002

Contents

Explanation of symbols

0 0,0	Less than 0.5 of the unit applied
.	Category not applicable
. .	Data too uncertain
. . .	Data not available
-	Nil

EXECUTIVE SUMMARY

Overview

Background

One of the crucial objectives of the National Accounts is to evaluate the volume growth in every sector of the economy as a whole. The consumption of the general government in Denmark makes up 26 per cent of the whole economy, and it is therefore essential that it is measured in a correct way, reflecting the real volume growth.

In Denmark the government-provided non-market service measures are based on the inputs used to produce these services, instead of the actual outputs produced, and the real market value is not reflected by this input-method. A direct consequence of the current input-based procedure is that part of productivity changes for government-provided services are ignored, because outputs are assumed to follow the same pattern as inputs. Therefore, it is essential to find more accurate measures of the volume growth of public services in the National Accounts in accordance with the resolution passed by the European Commission in December 2002. The resolution laid down the new international guidelines for calculating national accounts, using constant prices, i.e. adjusted for price changes.

Output-based method

The output-based method involves a radical change in how calculations, using constant prices should be performed for these services in the future; the current input-based method rests on a close correlation between costs and production (the total cost measured at constant prices sums up to the production value), while the output-based method involves calculating the production value, using constant prices based on counting the number of representative activities in different categories and then weighting them together, using the unit cost for each activity.

The results in this publication show the extent to which the new guidelines for calculating consumption expenditure of General Government, using constant prices, affect the national account figures. The publication highlights the consequences for key figures, such as production value, gross domestic product (GDP) and labour productivity, as well as describing the measures of the quality of health care and educational services.

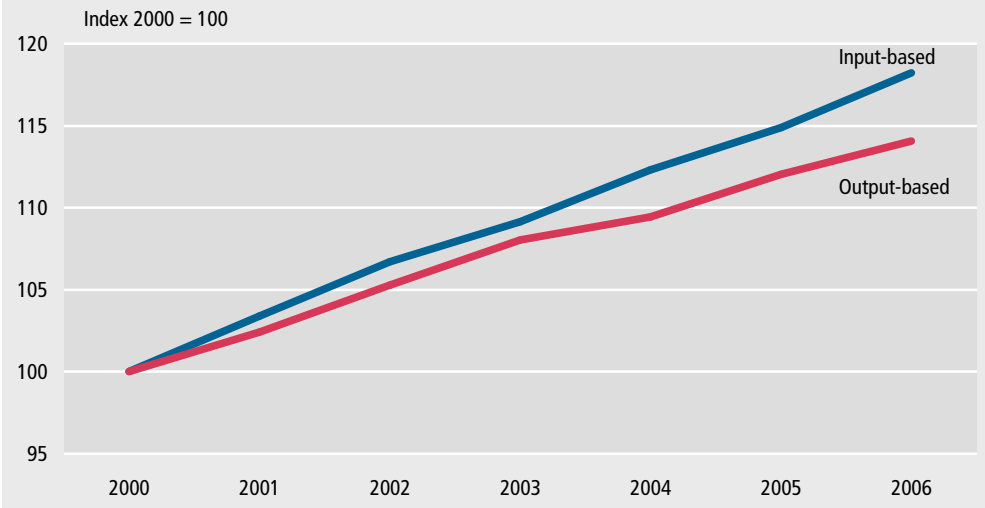
Input- and output-based measures of non-market output in National Accounts

The volume of health care, social protection and educational services is calculated according to the EU guidelines. The results show that changing the compilation method for the national accounts will result in substantial revisions to the Danish national accounts figures. In this publication, figures for 2000 to 2006 are calculated.

Effects on price indices

Figure A shows that output-based prices for the whole non-market services were increasing less rapidly than input-based prices, which implies that real growth of the non-market economy has been underestimated.

Figure A **Price indices for the whole non-market economy**

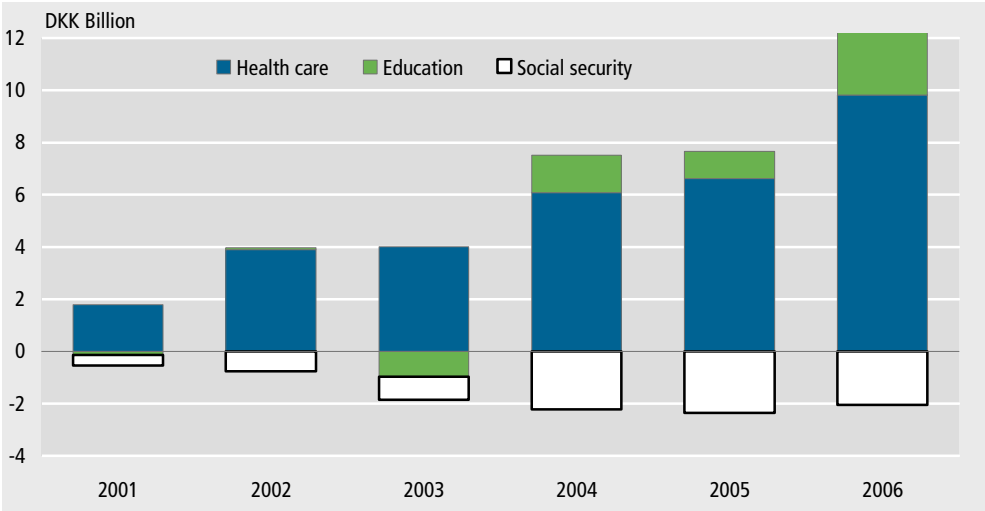


NB: National accounts figures for 2006 are not final.

Effects on production value

For each year the overall production value increases by between DKK 2 and 8 billion annually as a result of using the output-based method. The health care services contribute positively over the entire period, when the new method is applied (figure B). Social services contribute negatively in all periods, indicating that the production value of social protection is overstated when using the input-based method. The output-based method has a generally positive effect on educational production value, where it contributes positively in four out of six periods.

Figure B **Difference in production values distributed according to service type. Chained 2000 values**



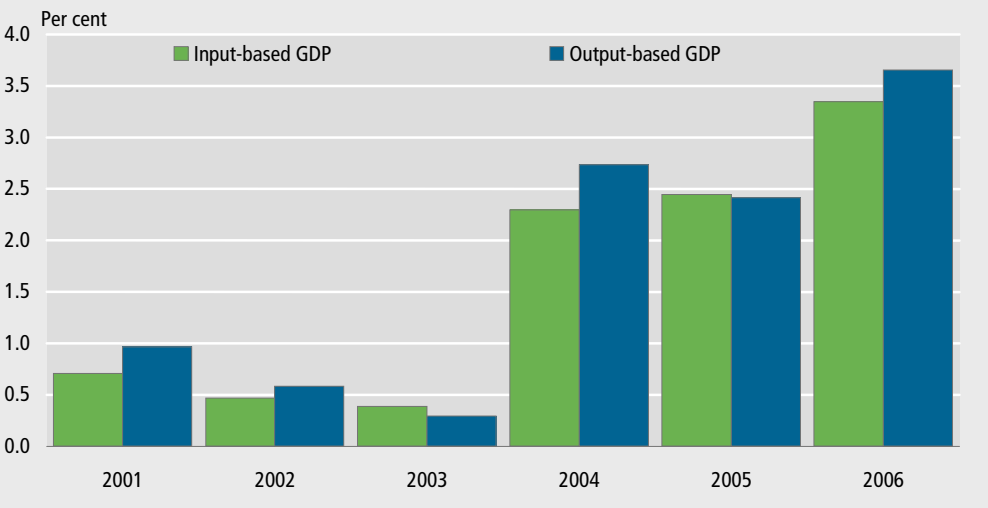
NB: National accounts figures for 2006 are not final.

Effects of the output method on the whole economy

Changes in GDP

The output-based alternative constant price calculation changes the economy's growth rate, i.e. GDP growth. In 2004 (the greatest difference), the volume growth would be 2.7 per cent, whereas the official growth rate is 2.3 per cent. In 2001 and 2006 the difference is 0.3 per cent, while in 2003 and 2005, a minor decrease in GDP growth of 0.1per cent was observed.

Figure C **Growth in gross domestic product distributed according to calculation method**

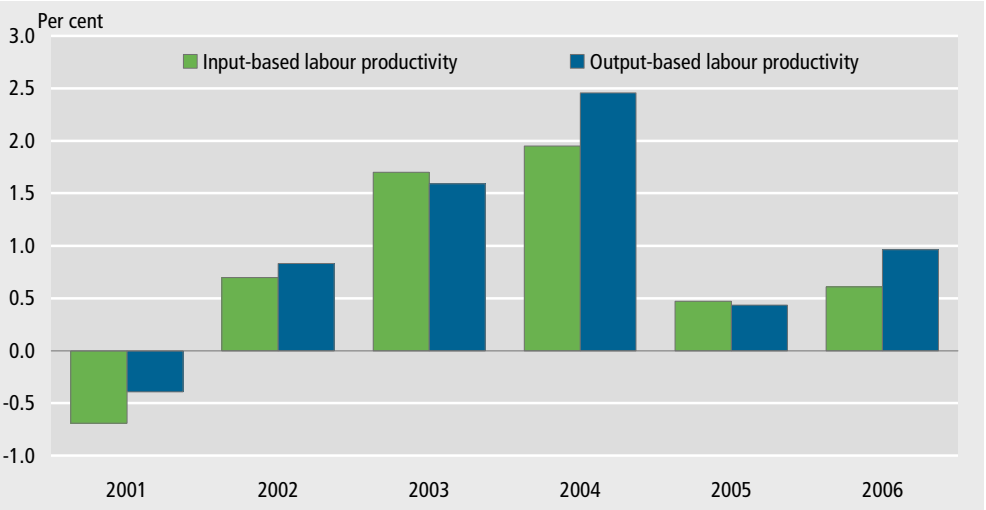


NB: National accounts figures for 2006 are not final.

Productivity increases

If the alternative figures are used for the production value in productivity calculations, an equivalent effect is observed. Productivity is here measured as output per hour worked for the total economy. If productivity figures published by Statistics Denmark are compared with output-based calculations, productivity generally rises more, using the alternative output-based figures. The most visible difference occurs in 2004, where the output-based method produces a productivity increase, which is 0.5 per cent higher than the official calculations. For the period as a whole, the increase in work productivity is 0.8 per cent annually, while the alternative calculations produce an average annual increase of 1 per cent. These calculations show that the average productivity growth for 2000-2006 would be 0.2 per cent higher using the alternative output-based calculations.

Figure D **Output per hours worked distributed according to calculation method**



NB: National accounts figures for 2006 are not final. For interpretation of current data, see fact box: Facts about non-market-related finance and work productivity.

No significant quality effects

The quality adjustment of health care and education has positive but insignificant effects on the production volume growth, compared to the output-based method without quality adjustment. It was very difficult to define and prepare the quality indicators, and therefore it was only possible to prepare them for a few areas. Since only a small part of the non-market production is quality adjusted, the effects are not fully reflected.

Key figures are affected

The results demonstrate that if these calculations, which are based on the new European guidelines, are implemented, this will result in substantial revisions to several of the key figures in the national accounts.

1. Introduction

New method in the National Accounts

In December 2002, the European Commission passed a resolution changing the international guidelines for calculating national accounts, using constant prices, i.e. adjusted for price changes[2]. One of these changes concerns the calculation of the production value for the individual services of General Government.

Background

In Denmark the government-provided non-market service measures are based on the inputs used to produce these services, instead of the outputs produced, i.e., setting input equal to output and the real market value is not reflected by this input-based method. The input-based method neglects changes in productivity and has a tendency to under-/overestimate the contribution of the government output to the growth rate of GDP. The government output in Denmark accounts for a very large fraction of the entire economy (26 per cent), and it is therefore important that output is measured correctly.

The Commission resolution

The resolution implies radical changes in how calculations using constant prices should be performed in the future for the non-market individual services. While the current input-based-method rests on a close correlation between costs and production (total costs using constant prices produce the production value), the new output-based method involves calculating the production value, using constant prices based on the production value for the prices of the year and on information about the volume growth for the actual product. The output-based method also includes explicit quality correction of the government services.

The purpose of this publication is partly to calculate the production value for health care, social protection and education services using constant prices based on the new guidelines, partly to compare these figures with existing ones; and finally to evaluate the quality of the calculated data.

This publication is built on the first pilot project in this area by Henrik Sejerbo Sørensen, Health and Education in 2007 and contains updates of figures and the progress made since then. The calculations are extended by a new area, social protection and also contain the first experiments with explicit quality adjustment for health care services and some educational services.

[2] Commission resolution of 17 December 2002. Official Journal of the European Union 20.12.2002

2. Methods in general and discussion of the quality issue

One of the most important objectives of the National Accounts is to value the production in every sector of the economy as a whole. Production is the transformation of inputs such as labour and capital into outputs in the form of goods and services, which are delivered to other units, for example, a pupil in a school is consuming the production of education services.

Government output

The aim of this chapter is to describe the method applied to measure the government output in Denmark. The government output is generally non-market since it is supplied free of charge or at economically insignificant prices. The price is not economically significant if it covers less than half of the costs of the service.

Individual and collective services

The non-market services are divided into individual and collective services, where the individual services are consumed by the household, while the collective services are provided to society as a whole. The lack of economically significant prices for non-market services implies that it is not possible to value the output of non-market producers in the same way as the output of the market producers. Hence, the value of output of non-market producers in the National Accounts is valued by summing of the total production costs.

Health care, social protection and education

Education, health and social services are the most common kind of government provision free of charge in Denmark or at prices, which are not economically significant. They comprise over 63 per cent of non-market output. In these circumstances, the price paid cannot therefore be the basis for valuing it (as would be the case with market goods and services). Its valuation for the National Accounts is the sum of the costs incurred in its production. That is the sum of the intermediate consumption (the goods and services used in producing the service), compensation of employees (costs of doctors, nurses, teachers, etc.), consumption of fixed capital (depreciation of medical equipment and hospital and school buildings), and other taxes, subsidies on production.

Education, health care and social protection services are the production of the education, health and social protection industries, whether provided on a market or a non-market basis. Producers purchase intermediate inputs (goods and services) from other industries; they employ human resources and they use capital to transform these inputs into services which are then delivered to final consumers, such as pupils, patients or residents in a home for elderly people. The incomes generated in this transformation are the value added of these industries and their contribution to GDP.

Services at market condition

The individual services, e.g. medical practice, which are purchased by the government from market producers are called market services, because the services are sold at economically significant prices, i.e. that the prices and quantities determine the value at which the producers supply and the purchasers buy. These services are not discussed in this theme publication.

GDP and productivity

Setting input equal to output neglects changes in productivity and under normal conditions has a tendency to underestimate the contribution of the government output to the growth rate of GDP. Hence, it is very important that the government output in Denmark is measured correctly, since the public sector accounts for a very large part of the entire economy (26 per cent).

Deflating methods

Since the point of interest is GDP growth at constant prices and the productivity figures, the focus is on government output, which implies that it is necessary to apply a method to deflate expenditures on non-market production in order to measure the output growth of the public services and the productivity, either for individual units or across an industry.

The internationally increasing interest in finding a method for replacement of the approach of equating input to output has inspired more researchers to find a method, providing a better measure of the government activities and the productivity.

Including Atkinson's Review (2005), many researchers have suggested a method directly measuring the volume of government output. The new output measure depends on aggregating a set of volume measures for different types of activities, multiplied by a set of unit costs. The volume measure provides an indicator of the growth rate of the economy and makes it possible to measure the productivity of the government output. Volume is regarded as having dimensions of quantity and quality.

Identification of public production

Identifying the production value of the public services is very complex. The main question to be answered is, what is the public product and how could it be counted? However identifying such indicators is not that simple, it requires distinguishing between output, outcome and activity, where the outcome and activity is influenced by the recipients of the public services, for instance the result of a treatment at hospital is influences both by the health care authorities through drugs etc. and also by the individual him self, e.g. by changing of lifestyle etc. In this publication we will identify relevant quality and quantity indicators for measuring volume of government output.

Quantity

In order to calculate the public output in the new way, a cost-weighted price index is used to replace the input-based measures. A cost-weighted activity index is based on output-indicators (for instance, hospital admissions, outpatients, number of students etc.) and their unit costs. Indices of the number of output-indicators measured in each category are then weighted together, using the cost-share for each activity so that the total of output growth can be calculated.

Quality

To be able to reflect the changes in the real value of services/production, it is important that the calculations of the production values take the quality changes into account. Atkinson Review 2005, Principle B proposes that the public production value has to be measured in a way adjusting for quality changes. When the quality changes are not taken into consideration the economic growth will either be under- or overestimated.

Market vs. non-market production

In the market sector, production is normally constructed from the quantity of different types of goods/service and their prices, where the prices reflect the value of a given product (the market mechanisms ensure that the values are reflected in the prices). Quality is an important part of the products, since, e.g. basic products and luxury goods are priced with respect to their value/contents. When you consider the changes in prices and volume of the market production, it is also necessary to look at the changes in the quality. The same is valid for the non-market-production, but here is some difficulties in measuring the quality, as the final prices on production are absent. Since the prices of the non-market sectors production are missing, the unit costs are used to weight different production values.

Quantity vs. quality

Given that the changes in volume output consist of quantity and quality, where the quantity is defined as the number of units, the quality is defined as the characteristic of different products. Both the changes of quantity and quality have to be taken into consideration in order to measure the correct volume changes in a given product. If the quality changes are not taken into consideration, some of the changes in the measured volume will be missing. Only in the case of completely homogeneous products (e.g. wheat and oil, which do not change characteristic over time) the volume can be calculated based on the quantities alone, i.e. the number of units in the current period multiplied by unit costs in the basic period. Since most public services are heterogeneous and change over time, it is necessary to quality adjust the non-market individual services in order to reflect all changes in the products.

Aspects of quality

The valuation of a product will depend on different aspects of quality, and two aspects that will be treated in this project are:

- The extent to which the non-market service succeed in delivering the intended outcome
- The extent to which the service corresponds to users' requests.

This project will discuss and present some examples of quality indicators in health care service and education, and the above-mentioned aspects will be further developed for each of these services. Quality of social services will be considered in the next publication in 2010.

Outcome vs. output

Measuring quality of the public individual personal services in an optimal way is not easy, given that the individuals receiving the services are themselves both input and output in the process, and they also sometimes take an active part in the process. For instance, measuring the direct outcome of educational services will depend, besides the delivered education service, on several other factors, such as the pupils' ability, socioeconomic background and motivation. For example, measuring the direct outcome of an education service can be conducted in a way that the pupils' level of knowledge can be measured/examined at the beginning of the school year and the same examination could be conducted at the end of the school year, and then the level of transferred knowledge and skills will be measured (keeping the background factors constant, assuming that abilities and socioeconomic background will not change during the school year, the only factor that may vary is the motivation and effort from the pupils' side).

The same measurement problem exists for health care services, how can the contribution of health services be measured? The most optimal way may be measuring the patients' health status before and after a given treatment, keeping everything else constant (lifestyle, age etc.).

But such measures require a vast amount of resources and efforts and the challenge is how to measure the outcomes of the different services contribute to the output?

Identification of quality dimensions

Quality consists of different dimensions, and it is necessary to define the relevant quality dimensions within each area and decide how they should be weighted. For complex areas, e.g. health care the quality consists of many dimensions, for instance the effectiveness of the treatment, patient's experience with the waiting time before treatment is given. An important challenge is to combine the different quality dimensions and weight them by relative importance.

However, measurement of quality is a complex task and is based on subjective assessments and choices, such as:

- Choice of quality indicator(s)
- Choice the weighting of different indicator
- Scaling problem, i.e. how does the changes in the quality indicators affect the level of quality?

The non-market output adjusted for quality is given by;

$$Output = Quantity \text{ x } Quality$$

The characteristic of the quality indicators

Quality indicators have to reflect all of the changes in the public sector output, i.e. they should reflect whether the marginal contributions from the public services are positive or negative. In addition, the indicator set should be based on three main fields: firstly, the importance of the indicator, secondly, the scientific and methodical reliability and thirdly the access to data.

2.1 Productivity

Input-based productivity

One of the weakness of the output-based method is, that it ignores productivity changes for the government output. It assumes that the composition of the workforce and capital is identical and then any calculation of the productivity for the non-market economy between two periods will by definition be close to zero. This is due to the causality between the concepts: number of working hours, salary and gross value added. The close relationship between these is illustrated in the fact box below and shows why work productivity is zero.

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. Work productivity can, therefore, be positive or negative.

Output-based productivity

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

The production value can now both rise and fall, regardless of the amount of money paid out in wages, and thereby the number of hours that are worked.

Facts about non-market-related finance and work productivity

Example of the impact of an increase in employment in the non-market economy when calculating the national accounts.

Stage 1:

New employee, involving more working hours and an increase in the cost of wages.

$$\mathrm{E}mployment \uparrow \Rightarrow \mathrm{H}ours \uparrow \Rightarrow \mathrm{W}ages \uparrow$$

Stage 2:

The cost of wages rises. The production value increases by an equivalent amount, since the cost of wages is included directly in the calculation. The gross value added increases by an equivalent amount.

$$\mathrm{W}ages \uparrow \Rightarrow \text{Production value} \uparrow \Rightarrow \mathrm{G}rossvalueadded \uparrow$$

Stage 3:

Work 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.

$$\mathrm{W}orkproductivity \leftrightarrow = \frac{\mathrm{G}rossvalueadded \uparrow}{\mathrm{H}ours \uparrow}$$

Or

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

3. Individual non-market services in the National Accounts

This chapter will describe education, health care and social protection services in the National Accounts. Furthermore, methods applied to calculate non-market services in the National Accounts at constant prices will be described in detail.

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

At Statistics Denmark, the accounts of General Government (GG) are included in a joint system, known as the Database of Integrated Public Accounts. Data is distributed and processed in two parts: data for public, non-market activity (OIMA) and social services in kind.

Private activity in the health sector is covered in the national accounts by drawing on two sources of accounting statistics: Statistics Denmark's general accounting statistics for private commerce and the more concise, tax-based accounting statistics (SLSE).

Finally, Statistics Denmark's consumer survey is included in establishing the measurements for household consumption of (health-related) products. The national accounts draw upon all these statistics in a more detailed format than that in which they are made public.

3.1 Public production

Delimiting a financial unit upon which the national accounts are based is straightforward for many public institutions, but it can be difficult for some institutions. There are two types of levels in delimiting a unit: both the institutional unit, corresponding to the independent, financial decision-making unit, which may enter into binding legal contracts, and the local technical unit, also known as the workplace, where production (or consumption) takes place.

The concepts of market and non-market occupy a central role in this feature publication. They are linked both to the institution and to the activities of these institutions distributed according to workplace. We thus speak of a (non-)market activity and a (non-)market unit. The definition of the latter follows:

Definition of non-market unit

In the national accounts, "non-market" units refer to those whose sales income represents less than 50 per cent of the production costs. [3]

Since public units have, in many cases, their own income, which cannot be considered as tax, but as user payment or actual sales income, these are also relevant. Sales income in non-market units is logged under a separate product number. They are classified as market production in a workplace under the non-market unit.

Definition of the production value for non-market units

Public non-market production is by convention calculated as the sum of the following production costs (ESA 95, chapter 3.53):

- intermediate consumption
- consumption of fixed capital goods

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

- wages, salaries and employer's contributions
- other production taxes and subsidies

When recording non-market production in a public, non-market unit, which also has sales income, the unit's overall production 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 public consumption, is paid by the public. The amounts obtained are entered under the relevant product number.

The value of the consumption of General Government can be determined from the public non-market unit production by deducting all sales income, deducting the value of software manufactured for internal use and adding social services in kind.

3.2 National accounting products

The Danish national accounts are based on a system of approximately 2,350 detailed product balances. Each product is linked to a unique national accounting product number code. In the national accounts, data supplied by the Office of Public Finance is classified according to product number.

This section provides a brief outline of the way in which public non-market activity using constant prices is calculated in the national accounts. This description is based on documentation of the calculation of the national accounts in (*Inventory of Sources and Methods: Price and Volume Measures in the Danish National Accounts*, Statistics Denmark 2002). (Danish version: *Nationalregnskab, Fastprisberegninger, Kilder og metoder)*.

The public non-market activity is recorded at current prices in the Danish national accounts by totalling the associated costs, i.e. the input to the non-market sector consisting of:

- Compensation of employees
- Intermediate consumption
- Consumption of fixed capital goods
- Other taxes and subsidies on net production

Conversion to constant prices is performed in a similar manner, in that the individual cost elements are deflated separately. In other words, there is a deflation on the input side. The deflation method for each of the four cost elements is explained below.

3.2.1 Compensation of employees

When determining the cost of wages 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's costs such as the employer's pension and social protection contributions.

The wage index used in deflation of compensation should consequently cover the same concepts (plus changes in the employer's costs – e.g. AER contributions (Employer Trainee Reimbursement) and so on).

In the context of the national accounts, each rise in the average cost of wages is not deemed to represent a wage increase. We distinguish between changes in remuneration that are due to a change in the quality of the workforce, and situations in which there is a clear rise in the average wage to ensure availability of a continuous workforce volume and quality.

This, which in the context of the national accounts should ideally be described in the wage index, is exclusively the amount by which the average cost of wages has increased to ensure availability of a continuous workforce volume and quality (the price component).

Based on this principle, it is relatively clear that general wage increases, collectively agreed and implemented, including e.g. the Danish Regulation Order, should result in increases in the wage index. This also means that changes, e.g. to working hours without a decrease or increase in wages should result in a change in the wage index.

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

3.2.2 Intermediate consumption

Intermediate consumption in production in public service and management are deflated using a sector-specific price index.

Sectors involve both public and private activities, and it is assumed that for intermediate consumption in production, the price growth in the public 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 product balances, and these are used to deflate intermediate consumption in General Government.

3.2.3 Consumption of fixed capital goods

Consumption of fixed capital 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.

3.2.4 Other production taxes and subsidies net

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

The production taxes that have the greatest effect on public service and management are property/land tax and vehicle tax. It is generally assumed that this stock remain unchanged over time. In other words, taxes on the other production distributed by sector are kept stable in relation to the base year. Subsidies are deflated by wage index.

3.3 Output-based constant price calculations

For a number of years, questions have been raised about the method by which the national accounts figures for the non-market economy are calculated at constant prices. This is a national, and particularly an international, phenomenon. In almost every country, national accounts figures for the non-market economy are used intensively by politicians, the press, analysts and others. Recent years have seen increasing interest in these calculations. The growing use of these figures has also resulted in increased interest in the method by which the calculations are performed.

Due to the lack of usefulness of figures calculated according to the input method for productivity analyses, new guidelines as to how such calculations should be performed have been prepared. The European Commission Resolution of December 2002 changed the international guidelines for calculating national accounts using constant prices, so that only deflators describing price or volume growth from the output are approved from 2006 onwards[4].

Denmark expressed concern about the short notice provided for such a radical change in calculation principles, and therefore Denmark requested to be exempted, and was consequently granted an exception to this calculation method until 2012. The calculations in this publication meet the new European requirements, but will not be implemented in the official accounts figures. Choosing this method ensures that the time frame for implementing the method is long enough to ensure high, consistent quality for the whole of the affected period.

The next few sections describe the guidelines followed by the output-based figures. We begin with a general description. This is followed by a chapter examining the way in which health-related calculations should be performed, followed by a chapter examining the way in which social protection calculation should be carried out, while the chapter 6 describes the guidelines that apply to the educational sector.

3.4 General information about methods used for constant price calculations

Methods that can be used to measure prices and volumes are classified into three groups according to their suitability. The most suitable are classified as A methods, the next best as B methods and the least suitable as C methods.

Methods classified as A and B methods are considered to be of a quality good enough to be approved, while C methods are not of the quality necessary for approval.

Classification of methods

- A methods: The most suitable methods are internationally approved.
- B methods: Methods of poorer quality which are still internationally approved.
- C methods: Methods of a quality so poor that the guidelines advise against using them. C methods are not internationally approved.

In order to meet the requirements in the 2002 Commission Resolution, either A or B methods must be used.

[4] Commission Resolution of 17 December 2002. Official Journal of the European Union 20.12.2002

3.5 Theory of output-based constant price calculation

This chapter describes how the price and volume growth is calculated from a theoretical point of view using the output-based method.

The difference between input and output deflation

Calculation using constant prices via the input-based method:
Production value using constant prices =
Intermediate consumption in production using constant prices
+ Consumption of fixed capital goods using constant prices
+ Wages, salaries and employer's contributions using constant prices
+ Other production taxes and subsidies using constant prices

In other words, a separate price index is NOT used for the production value.

Calculation using constant prices via the output-based method:
Production value using constant prices = Production value at current prices/the relevant price index

In other words, the production value using constant prices is calculated WITHOUT regard to the costs at constant prices.

The aim of this is that the part of the non-market production calculated, using the output-based method should be analogous to the method used for the market economy. In order to be able to do this, information regarding prices and volumes in two consecutive periods is required.

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

$$V_t^Y = \sum_j P_t * M_t \qquad 3.1$$

To calculate chained values we need to know the volume in the period t measured at 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:

$$V_t^D = \sum_j P_{t-1} * M_t \qquad 3.2$$

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

$$I_{t-1,t}^B = \frac{\sum_j P_{t-1} * M_t}{\sum_j P_{t-1} * M_{t-1}} \qquad 3.3$$

When calculating the chain index, a specific year should be used as a reference, i.e. the prices for the year and constant prices should be identical. If period t is chosen as the base year, the formula for the Laspeyres chain index between periods t and t+1 will be as follows:

$$V^{K}_{t,t+1} = \frac{\sum_{j} P_t * M_{t+1}}{\sum_{j} P_t * M_t} * V^{Y}_{t} \qquad 3.4$$

while the formula for the following year is:

$$V^{K}_{t+1,t+2} = \frac{\sum_{j} P_{t+1} * M_{t+2}}{\sum_{j} P_{t+1} * M_{t+1}} * V^{K}_{t,t+1} \qquad 3.5$$

3.6 Output-based national accounting calculations

Adjustment of national accounts supply-use matrices

The output-based method is used in the national accounts in the same way as that used for the market economy. We will now explain how the new calculations can be incorporated into the detailed series in the national accounts, known as SUT.

Price and volume data exists for *j*, various non-market services which cover a specific area, such as hospitals. Data that can be compared between two periods is used in calculations. It is assumed that *i* treatment types are comparable between two periods. For these *i* treatment types, the value, V, can be calculated in prices for this year and the previous one:

$$V^{Y}_{t+1} = \sum_{i} P_{t+1} * M_{t+1} \qquad 3.6$$

$$V^{D}_{t+1} = \sum_{i} P_t * M_{t+1} \qquad 3.7$$

We can use the above to calculate an implicit price index for the *i* treatment types:

$$P^{B}_{t,t+1} = \frac{\sum_{i} P_{t+1} * M_{t+1}}{\sum_{i} P_t * M_{t+1}} \qquad 3.8$$

It is assumed that the price growth for *i* treatment types is representative of all treatment types *j*. The price index can now be used to deflate the relevant part of production value (PV) in the national accounts incorporating the prices for the year.

Expressed as a formula, this appears as follows:

$$PV^{D}_{t+1} = \frac{1}{P^{B}_{t,t+1}} * PV^{Y}_{t+1} \qquad 3.9$$

This produces PV^{D}_{t+1}, which is the PV for the period t+1 calculated in the prices for the previous year, i.e. t prices. PV's for the national accounts can now be chained to a Laspeyres chain index. To calculate this we use PV^{D}_{t+1} and PV^{Y}_{t}, which is the PV in

the prices for the year in the previous period, t. These two PVs are calculated using the same prices for period t, and the difference between them indicates the volume growth between periods t and t+1. The volume growth is then multiplied by the value for the previous period in chained prices. For the period immediately after the reference year, the following applies:

$$PV_{t+1}^{K} = \frac{PV_{t+1}^{D}}{PV_{t}^{Y}} * PV_{t}^{Y} \qquad 3.10$$

This is because during period t, the reference year is by definition $PV_t^K = PV_t^Y$, while the following period is:

$$PV_{t+2}^{K} = \frac{PV_{t+2}^{D}}{PV_{t+1}^{Y}} * PV_{t,t+1}^{K} \qquad 3.11$$

3.6.1 Output-based price index with quality adjustment

Multiplying equation 3.8 with a function of quality produce a quality adjusted output-based price index.

$$P_{t,t+1}^{B} = \frac{\sum_{i} P_{t+1} * M_{t+1} * F(q_{t+1})}{\sum_{i} P_{t} * M_{t+1} * F(q_{t})} \qquad 3.12$$

F is of function of quality, and quality is supposed to consist by different indicators, which are selected and weighted according to their importance (subjective assessment).

4. Health Care

This chapter provides the method of output-based measure of the volume of health care services and goods in the economy to be used for national accounting purpose.

Danish Healthcare Services

The Public Danish Healthcare Services are extremely extensive and are therefore divided into various subsidiary areas. In this context, the relevant areas are:

- Hospital activity
- Treatment by dentists
- Social provisions with and without institutional care

In practice, this division means that individual indices are calculated for:

- General hospital activity
- Psychiatric hospital activity
- Public dental services
- Residential and day care places for the elderly

General hospital activity

As shown above, we differentiate between two types of hospital activities. This is in order to take into account the varying complexity of the various categories of service.

In the case of patients admitted to general hospitals, deflation using fully quality-adjusted indicators based on the classification of Diagnosis Related Groups (DRG) is counted as an A method. If only changes in the composition of treatment within DRG are covered, and the direct/explicit quality correction is omitted, this is a B method. Use of incomplete production indicators, such as the number of patient prescriptions only, is considered to be a C method.

Psychiatric hospitals

In the case of treatment by psychiatric specialists, deflation using fully quality-adjusted indicators based on the classification of Diagnosis Related Groups (DRG) is also counted as an A method. If only changes in the composition of treatment within DRG are affected, and the quality correction is omitted, this is a B method. A less reliable method, but still classified as a B method, is the number of admittance days according to treatment level weighted with representative cost data. Production methods that do not differentiate between different treatment levels are classified as C methods.

Public dental services

A methods relating to public dental care treatment are named as the quality-adjusted number of treatments distributed according to type of treatment. If the production indicator is not quality-adjusted, the method is classified as a B method. If the number of treatments cannot be distributed according to type, the requirements for a B method are not met; this is classified as a C method.

Residential and day care places for the elderly

In the case of residential and day care places for the elderly, when the number of people receiving care is distributed according to the level of care, this is classified as an A method. If the total number of people receiving care is used but not distributed according to level of care, this is classified as a B method. Where there is no quality adjustment, this is also classified as a B method.

4.1 Non-market production of health care in the National Accounts

Non-market production of health is produced in three sectors, namely:

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

Hospitals

Non-market production from hospital services is placed in sector 851100 Hospitals. Production in this sector is almost exclusively non-market: only 1 per cent of the production value is generated from market producers, in this case private hospitals. In 2005, the sector's total production value was over DKK 62 billion.

851100 Hospitals

- The production value in 2005 was approx. DKK 62 billion measured at current prices
- 99 per cent of production is non-market
- Hospital services make up 40 per cent of all health services
- Non-market production from hospital services makes up almost 15 per cent of the total non-market production.

Doctors, dentists and veterinarians

In sector 851209 Doctors, dentists, veterinarians, production mainly consists of market production. Less than a quarter of the total production value is generated by non-market producers. The non-market production is primarily derived from dental treatment and is associated with public dental services. Practising doctors and veterinarians are considered to be market-based for the purposes of the national accounts.

851209 Doctors, dentists, veterinarians

- The production value in 2005 was approx. DKK 29 billion measured at current prices
- 20 per cent of production is non-market
- Doctors produce only market-based services
- Dentists produce primarily market-based services
- Only public dental services are defined as non-market

Care home places, day centres and home help

Sector 853209 Social institutions etc. for adults shows data for care and social services for the elderly, i.e. this sector consists of two parts; the part that is considered as health care and the part that is considered as social services for adults and the elderly. The total production value in 2005 was over DKK 62 billion. Over 90 per cent of this total production is non-market and over half of the production is made up of health services for the elderly. The part that is considered as health care should therefore be included in the calculations of volume indicators for health care.

853209 Social institutions etc. for adults

- The production value in 2005 was approx. DKK 62 billion measured at current prices
- Over 90 per cent of production is non-market
- Production consists of health and social services for the elderly

4.2 Output-based price index for health

This section will calculate the quantity measurement of the below given equation, that is the price index for the quantity of health care services, which is determined by equation 3.8.

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

Chapter 3 describes how the output-based constant price calculations are performed from a purely theoretical point of view. This chapter describes the sources used to calculate the output-based price index for the health care services, and finally it determines output-based price indices for the health care services in Denmark.

As described above, 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 SUT contain about 2,350 product numbers, this level of detail is not always comprehensive enough to set up a price index.

Deflation of hospitals

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

The internal database for public accounts, provides the source data for calculating the non-market production value 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 internal database regarding the services classified as health-related spending according to COFOG, the international classifications registry (Classification of the Functions of Government).

The following three COFOG groups are included in the non-market product number for hospitals:

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

The entire production of general and specialised hospitals is included, only a very small proportion of the total production value of 0734 Nursing and convalescent home services is included.

Table 4.1 **Non-market production of health services 2005**

COFOG		DKK mill.	per cent share
0711	Pharmaceutical products	0	0
0713	Therapeutic appliances and equipment	0	0
0721	General medical services	174	0
0722	Specialised medical services	29	0
0723	Dental services	1 946	2
0724	Paramedical services	2 143	2
0731	General hospital services	55 042	62
0732	Specialised hospital services	6 063	7
0733	General medical service	237	0
0734	Nursing and convalescent home services	20 543	2
0740	Public health services	1 187	1
0750	R& D health	893	1
0760	Health n.e.c.	1 426	2
070	**Total health**	**89 683**	**100**

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

Public dental services

Non-market production in sector 851209 Doctors, dentists, veterinarians is deflated via two indices: one measuring the price growth for public dental services, and one for general hospital services. The dental services index is used to deflate the product number for non-market dental treatment, which is largely identical to the production

value for COFOG classification 0723 Dental services. One other non-market product number is included in this sector. This contains general health services and is deflated using the price index for general hospitals.

Health care for elderly and handicapped adults

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 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 handicapped adults is also deflated using the index for nursing homes, etc.

The following section describes the price index 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 somatic hospitals
- Price index for psychiatric hospitals
- Price index for public dental services
- Price index for residential and day care places for the elderly

4.2.1 Price index for somatic hospitals

The price index for general hospitals is the individual index used to deflate the largest value among health services. In 2005, it was used to convert the production values for over DKK 60 billion. The price index thus has a decisive influence on the price and volume growth for the non-market economy. In actual fact, this index is given so much weight that a major change in the deflator is directly reflected in economic growth.

The price index for general 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.

The fact box provides a brief outline of the DRG system and what it involves. For a detailed description, please see the Danish National Board of Health's website, www.SST.dk, which contains a vast amount of information about the DRG system.

About DRG – the Danish Casemix System

The Danish National Board of Health is responsible for developing the Danish Casemix System. This system is used in the Danish hospital sector to settle accounts of intra-regional patients at a basic level, present public co-financing, produce the national funds in connection with financing fees, and as a tool for analysing costs and activity in the nation's hospitals.

The Danish Casemix System consists of:

- DkDRG, the Danish DRG system (Diagnosis Related Groups) is used for somatic stationary patients
- DAGS, which is the system used for somatic out-patients.

The Casemix Systems were introduced to Denmark along with the DRG system (Diagnosis Related Groups) in the mid-1990s. The DRG system was adopted as an information system within the hospital services sector. The objective was to improve the assessment basis for the correlation between activity and costs (productivity) in Danish hospitals. The Danish Casemix System is an ongoing project involving close collaboration between hospitals and hospital

owners. The Management Group for DRG work, which brings together representatives from the Danish counties, the Capital Region Hospitals Fellowship, the Association of County Councils in Denmark and the central health authorities, is one body involved in this project.

As the name "DRG" (Diagnosis Related Groups) implies, the diagnosis is of crucial importance to the groups. As a general rule, prescriptions are initially grouped based on the active diagnosis in one of twenty-five main categories (Major Diagnostic Categories, abbreviated MDC). The number of DRG's within each individual MDC varies. Certain categories contain between two and four DRGs, while others contain up to 59 groups. The more extensive classification within each individual MDC into the final DRGs depends on various criteria, e.g. whether an operation or procedure has been carried out, complicating factors and the age of the patient. The VisualDRG tool provides a graphical overview of the classification criteria for each individual MDC.

Source: Danish National Board of Health

The DRG system contains information about the number of treatments and the associated fees for about 800 different types of treatment. Table 4.2 shows an excerpt from the existing data. In this case, the data is distributed according to a range of established main categories, known as MDC classification; cf. the fact box. Data is displayed at this level solely for presentation purposes. All underlying data contains information about prices (the fee) and volumes (the number of treatments) for each individual type of treatment.

Starting with this material, which provides information about prices and volumes, it is possible to calculate a price index for general hospitals.

Table 4.2 **DRG distributed across MDC groups**

MDC codes	2005	2006	2005	2006
	quantity		fee	
1 Nervous System	64 747	65 966	23 933	23 908
2 Eye	7 768	7 325	12 788	11 934
3 Ear, Nose, Mouth And Throat	38 906	37 761	12 886	13 162
4 Respiratory System	87 798	88 336	26 323	24 527
5 Circulatory System	135 927	139 360	27 554	27 831
6 Digestive System	107 381	111 021	20 929	21 367
7 Hepatobiliary System And Pancreas	31 193	31 304	28 831	27 735
8 Musculoskeletal System And Connective Tissue	111 179	111 111	32 044	30 895
9 Skin, Subcutaneous Tissue And Breast	38 614	38 388	23 928	22 175
10 Endocrine, Nutritional And Metabolic System	27 469	29 583	25 071	24 339
11 Kidney And Urinary Tract	56 168	57 464	22 608	21 772
12 Male Reproductive System	6 055	5 791	7 841	7 723
13 Female Reproductive System	43 154	43 012	12 875	13 064
14 Pregnancy, Childbirth And Puerperium	74 960	76 858	17 469	16 563
15 Newborn And Other Neonates (Perinatal Period)	18 916	19 146	43 472	39 800
16 Blood and Blood Forming Organs and Imm. Disorders	17 069	17 513	18 971	18 797
17 Myeloproliferative DDs (Poorly Diff. Neoplasms)	21 758	23 244	34 640	34 830
18 Infectious and Parasitic DDs	18 428	19 354	25 222	25 876
19 Mental Diseases and Disorders	4 955	5 128	25 061	25 696
20 Alcohol/Drug Use or Induced Mental Disorders	10 427	10 566	10 672	10 894
21 Injuries, Poison And Toxic Effect of Drugs	18 464	20 564	11 511	12 383
22 Burns	418	407	33 547	36 652
23 Factors Influencing Health Status	56 348	55 405	27 493	30 861
24 Multiple Significant Trauma	594	604	70 140	77 856
25 Human Immunodeficiency Virus Infection	710	663	43 579	46 103
26: Not classified	28 537	28 750	135 544	116 663
27: Not classified	15 267	16 746	45 718	36 213
Ambulant treatment	6 890 125	9 385 624	1 969	1 629
Mixed treatment	574 654	579 574	3 378	3 368
Total	8 507 989	11 026 568		

Calculating price indices based on DRG data

Based on this data, price indices are calculated according to the method outlined in chapter 3. Since all treatments, *j*, 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 3.8 is applied

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

to DRG data, a price index for the period 2005 to 2006 can be calculated as:

$$P^{B}_{2005,2006} = \frac{42{,}067{,}878}{42{,}994{,}101} = 0.978$$

The price for general hospital treatments between 2005 and 2006 saw a fall of 2.2 per cent.

Table 4.3 shows the price development for the periods 2001 to 2006 calculated according to the above method, using the DRG data, which is comparable between two consecutive periods. The table shows that in four out of six years, it was on average less expensive to perform an equivalent treatment in the following year, while in two of the five years there was a price rise of just under 2 per cent.

Table 4.3 **Price increase for general hospitals**

	2001	2002	2003	2004	2005	2006
	per cent annual growth					
Price increase for general hospitals	-0.2	-0.4	1.9	-1.6	1.7	-2.2

Manual changes to DRG data and data set percentage

The data set percentage is a measurement of the proportion of the data that is comparable between two consecutive years. Data can be either directly comparable or made comparable due to manual changes. In 2001 the data set percentage is thus the value that is included in the calculation for 2001 compared with the total value in 2000. In order to be included in the 2001 calculation, the treatment must exist in both 2000 and 2001. 99.8 per cent means that treatments representing 0.2 per cent of the value in 2001 cannot be retrieved for 2000. Table 4.4 shows an overview of the number of series that are comparable between two consecutive years, and the size of the data set percentage.

Table 4.4 **Comparable DRG data**

	2001	2002	2003	2004	2005	2006
Data set percentage	99.8	97.1	93.1	89.4	96.7	92.5
No. of series	603	627	595	530	660	660

2001 and 2002 have high data set percentages, because the DRG data for 2000, 2001 and 2002 contains the same DRG codes. This implies that it was not necessary to perform manual corrections in calculations between these years.

During 2003 and 2004, the DRG system was subject to an increasingly detailed division of treatments. This improvement to the system, however, has the short-term disadvantage that the numbers of matching groups between two years are reduced. As described later, comprehensive chaining work was performed between these years, which reduced transitional problems. However, both the data set percentage and the number of indices are still lower during these years.

Deleted series

A range of data was deleted in the individual calculation years as a consequence of highly contradictory price indices. Data is omitted during specific years based on the following criteria:

- Major price changes – typically doubling from one year to the next
- Substantial price fluctuations along with substantial variations in volume

In this way, series with substantial price fluctuations (typically up to +/-50 per cent) can still exist if the volume growth is stable. Similarly, series with ongoing major price fluctuations, but for which the volume changes only moderately, may occur.

Sensitivity study

A sensitivity study – in which all remaining indices over 1.5 and below 0.66 are deleted - disclosed the fact that the overall index did not change to the fourth decimal point. Consequently, the remaining extreme index has a very minimal effect on the overall index.

4.2.2 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 2005, it was used to convert hospital services for over DKK 6 billion.

The psychiatric sector is not an integral part of the Danish National Board of Health's DRG system. Danish National Board of Health worked on implementing DRG calculations in psychiatry, but has given up in the meantime, because of the complexity of the area[5]. Since there is no integral psychiatric system with both prices and volumes for the periods 2000-2006, it has been necessary to draw on other sources.

Sources for calculation of price index

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 and 2006.

Each diagnosis group is split up into age groups according to whether patients are over or under 18 years. This is to ensure the appropriate level of detail for prices.

A note from Danish National Board of Health: DRG in psychiatry – final note 2006 is the main source for fees for the individual treatment types. This note includes the work that has been performed to establish a DRG system for psychiatry. Table A.1 in the appendix shows grouping of diagnosis codes system.

DRG fees are only available for 2005 and the fees for the other years are calculated as the production value per prescription for COFOG group 0732 Specialised hospital services. The DRG fees for 2005 are therefore recorded retrospectively implementing the growth in this series. In practice, this means that it is assumed that the price growth in the individual diagnosis groups is uniform, while the level is disparate.

The method used in chapter 3 for general hospitals is used to calculate the price indices. Table 4.5 shows the Growth rate calculated for 2000 to 2006. From the table, we can see that the implicitly calculated prices for treatment in psychiatric hospitals rose by between 1.3 per cent and 7.0 per cent annually during this period.

[5] DRG i psykiatrien – slutnotat 2006. Sundhedsstyrelsen

Table 4.5 **Price increase for psychiatric hospitals**

	2001	2002	2003	2004	2005	2006
	per cent annual growth					
Price increase for psychiatric hospitals	1.9	1.3	4.6	7.0	2.2	6.4

4.2.3 Price index for public dental services

Public dental services are the least valuable sector for which a direct price index is calculated. In 2005, non-market production from dental services totalled DKK 2 billion.

A special extract from the Social Resource Statistics[6] (Den Sociale Ressourcestatistik) provides details concerning the number of people receiving treatment. The number of people receiving treatment is distributed across dental services and orthodontic treatment. The data also indicates whether the treatment was provided as a public dental service or by a practising dentist. Table 4.6 provides an overview of the number of people receiving dental treatment.

Table 4.6 **Number of treatments**

	2000	2001	2002	2003	2004	2005	2006
	quantity						
Public dental clinics	1 017 108	1 029 793	1 047 736	1 056 242	1 064 980	1 069 276	1 076 184
Dental services: practising dentists	160 838	163 238	165 518	169 253	168 258	171 524	171 902
Orthodontic treatment: public clinics	13 579	14 474	14 785	14 974	15 448	15 911	16 389
Orthodontic treatment: practising dentists	2 270	2 506	2 375	2 511	2 721	2 830	2 943
Total	1 193 795	1 210 011	1 230 414	1 242 980	1 251 407	1 259 541	1 267 418

The costs for these treatments are from internal databases. The detailed COFOG code 0723 Dental services include costs for non-market dental treatments.

The internal data does not specify whether the costs are associated with dental treatment or orthodontic treatment. This is problematic as orthodontic treatment requires more resources than dental care. The amount of resources devoted to the two types of treatment has been estimated, using accounts from the municipalities of Helsingør and Stevns. The studies show that two thirds of the costs are associated with dental care, while the rest goes to orthodontic treatment. Using this information, the total costs were distributed across dental care and orthodontic treatment respectively.

Table 4.7 **Costs associated with dental treatments**

	2000	2001	2002	2003	2004	2005	2006
	DKK 1000						
0723 Total dental services	1 632 846	16680 753	1 799 522	1 830 640	1 864 825	1 945 548	2 029 645
Dental care	1 088 564	1 120 502	1 199 681	1 220 427	1 243 217	1 297 032	1 353 097
Orthodontic treatment	544 282	560 251	599 841	610 213	621 608	648 516	676 548

[6] Published by Statistics Denmark

With information about costs at the detailed level, it is possible to calculate a fee for dental care and orthodontic treatment. The detailed costs divided by the number of treatments produce the fee for the year.

Table 4.8 **Calculated fee for dental treatments**

	2000	2001	2002	2003	2004	2005	2006
	DKK per treatment						
Dental care	924	939	989	996	1 008	1 045	1 084
Orthodontic treatment	34 342	32 995	34 956	34 899	34 213	34 604	34 997

By means of the prices in table 4.8 and the volumes in table 4.6, it is possible to calculate a price index for non-market production of dental services. This method is again the same as that outlined in chapter 3. Table 4.9 shows the calculated price index. Between 2000 and 2001, the implicit prices of dental treatment fell slightly, while there were subsequent price increases of between 0.4 per cent and 5.5 per cent annually.

Table 4.9 **Price increase for dental treatment**

	2001	2002	2003	2004	2005	2006
	per cent annual change					
Price increase for dental treatment	-0.3	5.5	0.4	0.9	2.5	2.8

4.2.4 Price index for residential and day care places for the elderly

Sector 853209 Social institutions for adults consist 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 and education. The price index for nursing and day care places for the elderly is very important, since the production value for nursing and convalescent homes in 2005 was over DKK 20 billion; cf. table 4.1.

Calculation of price index

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 involved. During this period, there was a steady drop in the number of nursing home places. This is due to reprioritising, so that nursing home places have been converted or discontinued in favour of homes for the elderly. According to the Danish industry codes[7] homes for the elderly belong to a different sector and are not included in these calculations.

Table 4.10 **Number of residential and day care places for the elderly**

	2001	2002	2003	2004	2005	2006
Residential places	quantity					
Nursing homes	27 635	25 802	23 740	21 121	17 819	15 424
Sheltered housing	2 973	4 105	3 566	3 309	3 016	2 870
Other housing for the elderly	20 186	19 875	18 338	17 157	15 866	14 846
Day care places						
Day centres	28 209	29 156	24 936	26 192	25 476	29 347
Social centres	4 322	4 330	4 472	4 406	3 722	3 766

[7] Dansk Branchekode 2003 (Danish Industry Codes 2003). Statistics Denmark 2002.

Data from Copenhagen City's accounts was used to source the 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 counties, the price growth in Copenhagen City has been assumed to be representative of the entire country. Table 4.11 shows the unit prices distributed according to the type of care place between 2000 and 2006. 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. In 2006 Copenhagen City began to make up the unit costs for individual residence in a new way, which implies that it is not possible to compare unit prices for from 2005 to 2006. For this reason, the unit costs for 2006 are based on retrospective calculations based on the overall growth.

Table 4.11 **Unit prices for residential and day care places for the elderly**

	2000	2001	2002	2003	2004	2005	2006
	unit prices						
Nursing homes/residences	321 714	329 000	338 000	340 000	346 820	361 549	347 618
Sheltered housing	126 143	129 000	132 000	132 000	134 215	139 375	141 466
Social centres	157 435	161 000	165 000	165 000	167 768	174 218	176 831
Day centres	39 114	40 000	41 000	41 000	41 942	43 555	44 208

Starting with the prices and volumes, it is now possible to perform a price index calculation analogous to the one in chapter 3. The price growth for residential and day care places for the elderly varies between -3.9 per cent and 4.1 per cent in the period.

Table 4.12 **Price increases for residential and day care places for the elderly**

	2001	2002	2003	2004	2005	2006
	per cent annual growth					
Price increase for residential and day care places for the elderly ...	2.3	2.7	0.5	2.0	4.2	-3.9

4.3 Quality of health care

This section will consider some important aspect of health care output and propose some indicators and methods to calculate the non-market health care output at constant prices using the output method with quality adjustment. According to Eurostat's present guidelines, this is an A method and therefore the most appropriate method. The focus here will be on determining quality indices for health care and then equation 3.12 will be used to calculating a quality adjusted output-based price index.

$$P^{B}_{t,t+1} = \frac{\sum_{i} P_{t+1} * M_{t+1} * F(q_{t+1})}{\sum_{i} P_{t} * M_{t+1} * F(q_{t})}$$

One of the major difficulties in calculating volume indices is the quality change of the products. In health care services, new treatments and new drugs are constantly introduced where by the outcome and quality of treatments change. An important question arises; how can we compare the quantity of health services produced in a given year with those produced in the preceding year, if some services did not exist in the previous year or have changed?

As pointed out in chapter 2, measuring quality is very complex and depends on many subjective assessments and decisions. In this publication, we will discuss and describe the potential Danish indicators and illustrative quality adjustment figures will be presented.

4.3.1 Measuring the change in quality of health care

Quality indicators

There are a number of desirable characteristics of indicators that could be used for quality adjustment for volume output with the aim to determine the marginal contribution of the health care service to the 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 availability of sufficient data.

This section discusses aspects of quality in health care services and proposes a conceptual model to be used in this theme publication. The focus will be on the following two central quality aspects, i.e.;

1. The extent to which the public services succeed in delivering the intended outcome
2. The extent to which the service corresponds to users' requests.

The following indicators will be considered when looking at the extent to which the public services succeed in delivering the intended outcome;

- Health gain as consequence of hospital treatment
- Reduced mortality rates/ increased survival rate
- Health gain as a result of reduced waiting times
- Preventive arrangements
- Centralization/specializing the hospitals

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 a less rapid decline in health status towards unavoidable death. Furthermore, health care can relieve pain and other symptoms and extend life.

Reduced mortality rates/ survival adjustment

Data on deaths within 30 days of admission, by hospital procedure is generally accepted as a quality measure. Death from a condition from which a patient should recover is an important indicator of quality (or failure). For instance, most patients admitted with acute disease as appendicitis survive, 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.

Waiting times

The experience of waiting for treatment plays a part in both the health gains and patient experience aspects of quality of health care. 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. Hence, a reduced waiting time is considered as health gain.

Preventive arrangements

Health gain from primary medical care is regarded as one of the most important preventive arrangements. The purpose of preventive health care services is to improve the overall health of the population, and it is considered as a very important factor of the health care services. The medical/clinical outcome could be improved by controlling diseases as high blood pressure, hypertension, asthma, cholesterol, stroke and diabetes to avoid premature death. Most of these illnesses are chronic, i.e. long-term and many cannot be cured, but they can be controlled. At primary health care level, the service is primarily based on prevention by informing patients about the benefits of a healthy lifestyle and by drugs.

Danish data on preventative arrangements

Only few data is available for preventive arrangements. The National Board of Health has data about the asthma mortality rates covering the analysis period. The National Board of Health has also started to register the data about the primary care of diabetes, but since this data is new, it does not cover the analysis period of this publication, but may be applied in later publications. The asthma mortality rate is the only quality indicator for preventive treatments that will be applied in this research.

Centralization

Specializing hospitals in a way that concentrates the expertise in central hospitals seems to have a positive effect on health gain. Denmark has experienced a centralization of hospitals, where one of the main goals was to concentrate the expertise in some central hospitals, where for instance the small provincial hospitals no longer were allowed to make complicated surgeries. At the moment, there is no scientific measurement of the effects of the centralization, but the general experience among experts is that it saves lives and results in more health-gain. A disadvantage of this policy is that some patients have a longer distance to the hospital. However, in Denmark we do not have any data for centralization degree yet.

Consumer needs

The other aspect of quality is related to the use of health care services; does the service respond to users needs? The following quality indicators will be included in this theme publication,

- Patient experience
- Waiting time

Patient experience

Patient experience is usually measured through surveys. Survey questions are often grouped into different domains, including better information to the patients and their relatives, more choice, possibilities and safe, coordinated, high quality care. The collaboration between health care system and patients is also considered as an important quality factor. 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.

Waiting times

The knowledge of waiting for treatment plays a part in both the health gains and patient experience aspects of quality of health care. First, they may dislike waiting, because waiting may be a bad experience for patients even if they are not in pain. 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.

4.3.2 Quality indicators for Danish health care services

The quality indicators used to quality adjust the health care volume in this publication are given below

- AMI 30-day mortality rate
- Hemorrhagic stroke 30-day mortality rate
- Ischemic stroke 30-day mortality rate
- Cervical cancer five-year relative survival rate
- Breast cancer five-year relative survival rate
- Colorectal cancer five year relative rate
- Asthma mortality rate
- In-hospital waiting time for hip fracture surgery
- Surveys on patient experience
- Waiting time

The first seven indicators relate to the in-hospital health gain, i.e. the information on success in delivering health gain. Since we only have quality indicators for a very small part of the DRG groups, only the DRG's that has these quality indicators will be quality adjusted, i.e. the effects of quality will not be fully reflected in the health care volume output.

An alternative option is to apply the above indicators as measure for quality in all DRG groups, but in this publication we have applied partial quality adjustment, i.e. only DRG groups with relevant quality indicators are quality adjusted.

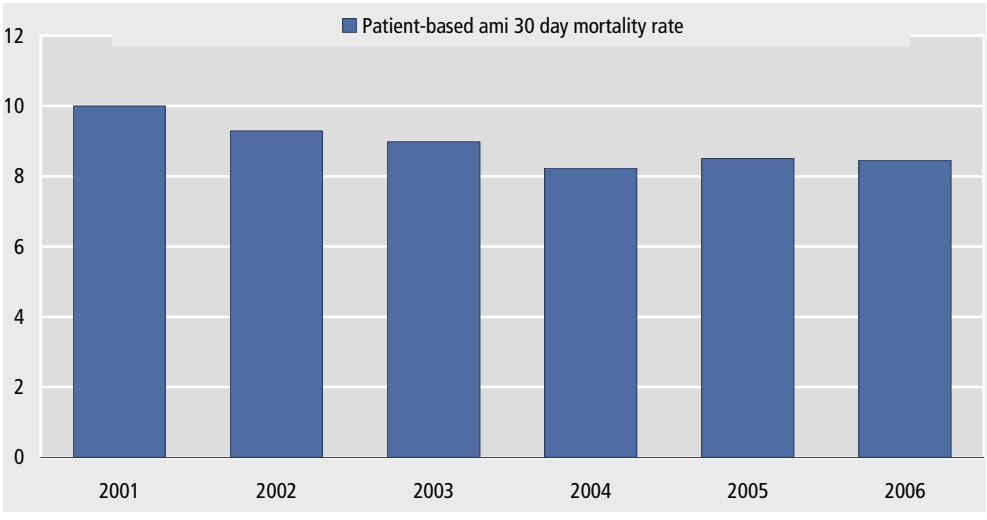
Survival rates

The above survival rates are used to quality adjust the related DRG's. The weight 0.6 is given to these indicators, since surviving such diseases are regarded as more important than patient experience and waiting time. There was no available information about waiting time for these DRG's, and we have chosen to give the survival rates the weight 0.6 and patient experience the weight 0.1. However, this is an assumption and it may vary with enhanced arguments. We believe that it would not be possible to measure the quality perfectly, i.e. hundred per cent and there will always be some unmeasured factors left, either because they can not be measured or because they can not be observed.

Decrease in heart attack mortality rate

Figure 4.1 shows the patient-based AMI (heart attack) 30 mortality rate for the period between 2001 and 2006. The mortality rates are decreasing over the period, meaning that the quality of the treatment is increasing.

Figure 4.1 **Patient-based AMI 30-day mortality rate**



Waiting time as an indicator

The National Board of Health has waiting time data for some diseases and they are used to quality adjust the health care services. The waiting time for, e.g. cataracts

operations is regarded as average waiting time for the MDC group 2, Eye and waiting time for kidney diseases is regarded as an indicator for waiting time for the MDC group 4, Respiratory System. The weight 0.4 is given for these diseases since the dead frequency is very low for this MDC group, waiting time may then weight more than in diseases with higher dead frequency. For diseases with high frequency the waiting time may weight less. In-hospital waiting time for hip fracture surgery is also used as a quality indicator for all DRG's related to these diseases.

Patient experiences in this publication

Patients' experiences are also in this publication regarded as a central quality element of health care output. Patient experience is measured through surveys commissioned by the Unit of Patient-Perceived Quality, The Capital Region of Denmark. The objective of the surveys is to compare patient experiences over time, and the survey includes questions about clinical services, patient safety, communication, information, progress of treatment, cooperation, physical surroundings, waiting time and free hospital choice. In this publication, the questions are divided into four main areas, information, cooperation, waiting time and quality. The surveys were conducted at two-year intervals in the period between 2000 and 2006.

The relative importance of patient experience to health gain may vary by diseases or situation. Patient experience is here assumed to be less important for diseases where the frequency of dead is higher and for emergency cases, but more important in situations where treatment is part of a regular relationship. In this publication, the patient experience is given weights 0.1 for diseases with high dead frequency and 0.4 for disease with low dead frequency and regular relationship.

An essential question about quality adjustment is how, do we quality adjust in practise? The example below demonstrates how we calculate quality adjusted output-based price indices all DRGs concerning heart attack.

Example

The quality index for heart attack is calculated in the following way; the changes in Patient-based AMI 30-day mortality rates illustrated in figure 4.1 and patient experiences are the used as quality indicators for the period 2001 to 2006. The data shows fall in mortality rate and improvements in patient experience, implying that both indicators contribute positively to the quality.

A drop in mortality rate, i.e. an increase in quality contributes negatively to the price index, since a drop in the price index contributes to an increase in the volume of output, i.e. improvements in quality implies lower price index and higher volume of output. The same is suitable for increases in patient experience and thus an increase in quality contributes negatively to the price index and accordingly contributes positively to the volume growth. For that reason the changes in patient experiences enter negatively to the quality index.

Table 4.15 shows calculations for the quality index for heart attacks in detailed level, the first two rows show the changes in mortality rate and patient experiences, respectively. As previously described, since both factors contribute positively to the quality, they thus contribute negatively to the price index. Rows three and four show the weight given to the two factors, respectively, where row five gives the joint contribution for this to factors to the quality index. Row six shows the quality index for heart attacks, calculated by adding 1 the contribution factor in row five. Row six reports price changes from quantity effect, while row seven shows the quality adjusted price growth in per cent, calculated by multiplying row six and seven, see the equation below.

As expressed above, the weight given to the quality indicators is based on subjective assessments, and the idea behind this assessment is that it is not and will not be possible to cover the quality hundred per cent, and indicators that we have are important and therefore they may cover about 7/10 of what is called full quality adjustment.

Quality index for heart attacks

	2001	2002	2003	2004	2005	2006
	per cent annual increase					
Changes in for patient-based AMI 30 day mortality rate	-0.09	-0.07	-0.03	-0.08	0.03	-0.01
Change in patient experience	-0.01	-0.01	0.02	0.02	0.00	0.00
Weighting factor for mortality rate	*0.60*	*0.60*	*0.60*	*0.60*	*0.60*	*0.60*
Weighting factor for patient experience	*0.10*	*0.10*	*0.10*	*0.10*	*0.10*	*0.10*
Contribution factor	-0.05	-0.04	-0.02	-0.05	0.02	-0.00
Price change from quality effect	-5,3	-4,1	-2,2	-5,2	2,0	-0,3
Price change from quantity effect	0,4	-0,4	1,1	-8,6	13,3	-3,9
Quality adjusted price increase	-4.9	-4.4	-1.1	-13.4	15.6	-4.2

The variation in the indices calculated in this example is very high and may be due to the detailed level. Since heart attack constitutes a small part of the all DRG's, the variation does not have any significant effects on indices for the hospitals in general.

Quality index for general hospitals

The quality adjusted output-based price indices for general care are calculated by equation 3.12

$$P^{B}_{t,t+1} = \frac{\sum_i P_{t+1} * M_{t+1} * F(q_{t+1})}{\sum_i P_t * M_{t+1} * F(q_t)}$$

F is of function of quality, and quality is composed by different indicators, which are selected and weighted according to their importance (subjective assessment). The quality adjusted output-based price index for period 2005 to 2006 can be calculated as:

$$P^{q}_{2005,2006} = 0.978 * 0.998 = 0.976$$

The first part of this equation is the cost index calculated in section 4.2 (quantity) and the second part is a quality index for general hospitals calculated by the same method as the quality index for the example of heart attacks, but this one cover all the DRG-groups. The quality index for general hospitals is calculated by weighting different quality indicators in the following way; the DRG's are partially quality adjusted with survival rates, i.e. only DRG's with a corresponding survival rate are quality adjusted with this indicator, and it is given the weight 0.6. The DRG's are also partially quality adjusted with respect to waiting time, since only few MDC groups had an indicator for waiting time and the weight 0.1 is given to this indicator. On the other hand, all DRG's are quality adjusted with respect to patient experience and the given weight is 0.1. The quality indices are calculated by the same method as the quality indices for heart attacks shown above.

The indices based on the output method with and without quality adjustment for the hospital services are given below (table 4.13). The quality adjusted indices are lower in four out of six periods, while it is higher in the two first periods, indicating that the quality adjustment contributes positively to the output volume in four periods with lower price indices. But this result should be regarded with caution, since the indicators are only partially quality adjusted, and both the choice the weight given to the indicators are subjective and can give other indices if the criteria change.

Table 4.13 **Comparison of price indices *with* and *without* quality adjustment**

Price increases for:	2001	2002	2003	2004	2005	2006
	per cent annual growth					
General hospitals						
Output-based	0.2	-0.4	1.9	-1.6	1.7	-2.2
Output-based with quality adjustment	1.0	-0.2	1.2	-2.3	1.6	-2.4

5. Social protection services

This chapter describes the sources used to calculate the output-based price index for the social protection services.

The Danish social protection services are also very extensive and divided into several areas, and the areas that will be treated here are:

- Sickness and disability
- Old age
- Family and children.

Sickness and disability

In the case of sickness and disability, when the number of people receiving services and care is distributed according to the level of care and services, this is classified as an A method. If the total number of people receiving care is used but not distributed according to level of care, this is classified as a B method. Where there is no quality adjustment, this is also classified as a B method.

Old age

The same is valid for old age, when the number of people receiving services and care is distributed according to the level of care and services, this is classified as an A method. If the total number of people receiving care is used but not distributed according to level of care, this is classified as a B method.

Family and children

In the case family and children, when the data is quality adjusted, when it is classified as an A method. If no quality adjustment is made, it is also classified as a B method.

5.1 Non-market production of social protection in the National Accounts

Non-market production of social protection is produced in two main sectors, namely:

- 853109 Social institutions children and young persons
- 853209 Social institutions for adults

Sector 853109 Social institutions children and young persons includes crèches, kindergartens, after-school centres, special educational assistance, foster families, residential homes for children or young persons, preventive arrangements and so on. Approx. 80 per cent of the total production is non-market and is made up mainly of social services to children and young persons and consists of pre- and after-school activities as kindergartens and after-school centres, and preventive and residential offers for children and young persons with any kind of social problems and disabilities.

853109 Social institutions children and young persons

- The production value in 2005 was almost DKK 46 billion measured in terms of the prices for the year
- The entire production value is non-market
- Social institutions children and young persons include figures for crèches, kindergartens, after-school centres, and foster families, residential homes for children or young persons and so on.

Sector 853209 Social institutions etc. for adults include data for care of the elderly, which is classified as a health service and social service. Over 90 per cent of this total production is non-market and is made up primarily of health services and cost of rest homes for the elderly. The part of this sector that related to health care for the elderly

is treated above in chapter four (approx. 35 percent of the total prod.), and this chapter calculates volume indicators for the other part of this sector considering social services, which include rehabilitation, special educational assistance, and help for practical purposes.

853209 Social institutions etc. for adults

- The production value in 2005 was over DKK 62 billion measured in terms of the prices for the year
- Over 90 per cent of production is non-market
- Production consists almost exclusively of health services for the elderly and disabled adults

5.2 Output-based price index for social protection

This chapter describes the sources used to calculate the output-based price index for social protection services and determines output-based price indices for the social protection care services in Denmark, i.e. the quantity part of the output will be calculated by equation 3.8.

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

As illustrated above, the social services in national accounts are placed in two sectors. The accounts database for public accounts, provides the source data for calculating the non-market production value in the national accounts. Since this data is aggregated and needs to be distributed in more detail. Table 5.1 shows an extract from DIOR regarding the services classified as social protection-related according to COFOG.

The following three COFOG groups are included in the non-market product number for social protection, i.e. in practice, this division means that individual indices are calculated for:

- 1012 Sickness and disability
- 1020 Old age
- 1040 Family and children.

Table 5.1 **Non-market production of social protection 2005**

COFOG		DKK mill.	per cent share
1012	Sickness and disability	19 518	20
1020	Old age	17 025	17
1040	Family and children	47 138	47
1050	Unemployment	3 070	3
1060	Housing	10	0
1070	Social exclusion n.e.c	4 015	4
1090	R&D Social protection	9 045	9
1000	**Total social protection**	99 932	100

5.2.1 Price index for Social institutions for children and young persons

Sector 853109 Social institutions for children and young persons consists primarily of non-market services for families and children and consist of institutions as kindergartens and after-school activities for children and young persons. This sector also includes offers for children and young with special needs, for instance foster families and residential homes as well as preventive arrangements. Table 5.2 shows the number of places in different kinds of institutions. The price index for social institutions for children and young persons is very important, since the production value in 2005 was over DKK 47 billion, cf. table 5.1.

The Social Resource Statistics provide details concerning the number of children and young people, who have a place in the different institutions. Table 5.2 shows the number of places in different types of institutions.

Currently, it is not possible to find some representative key fees for different types of institutions, and therefore the costs for these services are given in the internal database. The detailed COFOG code 1040 Family and children includes costs for non-market social services for children and young persons. The internal data specifies the costs at the detailed level, so it is possible to calculate a fee for different type of services. The detailed costs divided by number of places at different institutions produce the fee for the year.

Table 5.3 **Number of children at different social institutions**

	2000	2001	2002	2003	2004	2005	2006
	quantity						
Day care	81 327	79 119	76 231	70 835	65 398	65 146	65 666
Day nursery	19 579	18 944	19 123	18 995	17 720	17 339	16 994
Kindergarten	126 906	128 257	128 303	127 737	111 358	109 486	106 087
After-school centre	161 708	172 902	181 248	185 689	176 314	178 771	181 612
Age integrated institutions	121 546	120 877	123 025	125 704	123 894	130 612	134 316
Clubs for children and young	37 356	34 294	34 870	34 668	35 279	34 179	33 253
Youth recreation centres	68 817	70 163	71 678	74 500	77 295	75 891	75 203
Special day-care centres	1 473	1 549	1 702	1 750	1 781	1 822	1 960
Foster families and residential homes for children and young persons	9 709	9 218	9 651	10 545	11 019	11 614	11 426
Preventive arrangements for children and young persons	11 361	12 748	14 072	14 616	15 082	15 894	16 689
Residential institutions for children or young persons	4 751	5 018	5 033	5 020	5 210	5 051	5 054

Table 5.4 **Unit prices for childcare**

	2000	2001	2002	2003	2004	2005	2006
	Unit prices						
Day care	70 682	74 126	77 087	81 706	89 280	90 463	92 802
Day nursery	105 205	108 657	108 525	112 731	119 380	121 946	126 631
Kindergarten	53 330	54 601	53 822	54 893	63 653	65 202	66 167
After-school centre	24 432	25 005	25 058	25 791	28 429	28 716	29 547
Age integrated institutions	62 071	66 966	67 937	70 112	75 490	76 178	79 136
Clubs for children and young	30 573	33 025	32 220	34 635	33 359	35 187	36 915
Youth recreation centres	16 596	20 564	20 286	19 905	19 614	20 432	20 969
Special day-care centres	-	-	290 695	342 242	354 931	405 651	390 930
Foster families and residential homes-for children and young persons	328 247	402 112	413 797	396 235	383 955	382 133	401 899
Preventive arrangements for children and young persons	83 919	88 366	91 399	93 181	101 863	105 258	107 552
Residential institutions for children or young persons	563 993	570 781	586 498	629 686	635 752	686 686	717 051

Table 5.5 **Price increase for social institutions for children and young persons**

	2001	2002	2003	2004	2005	2006
	per cent annual growth					
Price increase for residential and day care places for the elderly	6,6	2,4	2,9	6,9	2,2	3,2

5.2.2 Social institutions for adults

Sector 853209 Social institutions for adults consists of both non-market services for the elderly and different types of social services for disabled people with various needs. The part of Sector 853209 considered as “care” is classified as a health service in COFOG, and is therefore included in the calculations of volume indicators for health care in chapter 4. The part that is not “care” then classified as social protection services is treated in this chapter.
The Social Resource Statistics provide details concerning the number of people at different institutions and number of individual assistance hours, care and help for practical purposes given to the elderly and disabled people in their homes respectively.

Currently, it is not possible to find some representative key fees for different types of institutions, and therefore the costs for these services are given in the internal database. The detailed COFOG code 1012 Disabled and 1020 Old Age includes costs for non-market social services adult. The internal data specifies the cost at the detailed level, so it is possible to calculate a fee for different types of services. The detailed costs divided by number of places at different institutions produce the fee for the year. Salary per hour for public employees for different service levels are multiplied by the number of hours worked to get a weighted price index for the part of service concerning service for the elderly people. These two indices and the two COFOC code are weighted with their respective production values from the COFOG classifications and the price index for social service for the adult is given in table 5.9.

Table 5.6 **Number of adult/elderly at different social institutions**

	2000	2001	2002	2003	2004	2005	2006
	quantity						
Special educational assistance	10 530	12 045	12 501	14 557	14 204	14 951	13 916
Protected employment	11 912	12 408	12 750	12 089	12 319	12 151	11 400
Activity- and social offer	16 388	18 372	20 052	20 144	20 060	20 564	21 908
Rehabilitation	7 382	6 561	6 838	6 290	5 970	6 019	8 039
Long duration residential offers for people with physical disabilities and those suffering from arrested development	8 304	7 858	7 849	7 780	7 876	7 852	7 980
Temporary residential offers for people with special needs	6 603	6 589	6 178	6 439	5 876	5 988	6 174
Contact- and companion arrangements	7 332	9 855	9 837	10 647	10 874	12 602	13 909
Long duration residential offers for people with mental disabilities and those suffering from arrested development	3 554	3 570	3 845	4 013	4 013	3 974	4 001

Table 5.7 **Unit prices for social protection for the adult**

	2000	2001	2002	2003	2004	2005	2006
	Unit prices						
Special educational assistance	78 831	71 742	70 668	63 668	69 933	68 630	78 389
Protected employment	55 582	58 312	67 352	78 302	82 985	85 335	96 438
Activity- and social offer	59 405	57 908	62 970	70 027	77 747	83 224	83 262
Rehabilitation	119 028	146 352	166 663	160 812	161 979	160 594	127 909
Long duration residential offers for people with physical disabilities and those suffering from arrested development	609 196	674 055	633 049	657 875	675 856	683 768	700 533
Temporary residential offers for people with special needs	239 968	242 652	128 633	326 749	352 784	409 388	429 436
Contact- and companion arrangements	24 113	20 630	37 097	39 919	43 293	40 723	39 177
Long duration residential offers for people with mental disabilities and those suffering from arrested development	364 407	434 654	418 173	436 836	454 035	466 267	494 877

Table 5.8 **Number of permanent home help for the elderly and disabled**

	2000	2001	2002	2003	2004	2005	2006
	quantity						
Total hours home help	**1.067.001**	**1.096.978**	**1.110.268**	**1.079.874**	**1.023.498**	**1.069.875**	**1.113.002**
Individually help and care	821.441	875.420	881.617	867.883	822.559	888.079	930.417
Help for practical issues	245.560	221.558	228.651	211.991	200.939	181.796	182.585

Table 5.9 **Price increase for *s*ocial institutions adults**

	2001	2002	2003	2004	2005	2006
	per cent annual change					
Price increase for residential and day care places for the elderly	5,4	-1,6	9,4	4,6	2,9	2,2

6. Education

The approach of this chapter is first to define the direct outcome indicators of education, and secondly to look at the quality of education.

The education sector is extremely extensive in that it produces a long list of different types of education services. In order to measure the growth in prices and volumes accurately, data meeting the following criteria is required:

- Data must be completely or almost completely comprehensive
- Data should be stratified, so that it reflects both the level and focus of the education.

A and B methods will therefore cover entire or very large portions of the educational sector. Similarly, the data source will provide enough detail for the following categories to be covered:

- Pre-school education
- Schools for children and young people
- Education at post-secondary school level, both general and technical
- Education at institutes of further education
  - University courses
  - Other further education

In addition to being sufficiently stratified, data should also achieve a certain standard of quality. The pupil-hours, i.e. number of teaching hours, 1st best quantity index of the output according to the Eurostat handbook on volume and price. If data is quality-adjusted, the method is classified as an A method; if no quality adjustment is made, it is classified as a B method. In the case of further education, it is recommended that only the number of students/pupils is used to indicate volume growth.

All methods that are more closely linked to input rather than output are considered to be C methods. If the number of teaching hours is used to indicate the growth, this method is classified as a C method. The same applies, regardless of method, if data is not broken down to an appropriate level of detail.

6.1 Non-market production of education in the National Accounts

Public non-market education is produced in four sectors:

- 801000 Primary and lower secondary education
- 802000 Post-secondary and vocational education
- 803000 Institutes of further education
- 804002 Adult education etc. (other non-market)

All areas producing educational services contain exclusively non-market services. Market-based educational services are placed in sector 804001 Adult educations etc. (market). This includes e.g. driving and music schools

801000 Primary and lower secondary schools

- The production value in 2005 was almost DKK 50 billion measured in terms of the prices for the year
- The entire production value is non-market
- Private primary and independent schools are considered to be non-market for the purpose of the national accounts, since under half of their costs are covered by user payments
- The sector also includes figures for continuing education colleges and schools

Sector 801000 Primary and lower secondary education includes both general and private schools. Private primary and lower secondary schools are classified as non-market, since under half of their costs are covered by payments from the students themselves.

802000 Post- secondary and vocational schools

- The production value in 2005 was DKK 20 billion measured in terms of the prices for the year
- The entire production value is non-market
- The sector includes figures for post-secondary, higher preparatory exams, commercial colleges, trade schools, agricultural colleges, social and health education, and so on.

802000 Post-secondary and vocational schools includes both technical and general post-secondary schools by definition. The sector also includes a broad range of business schools along with social and health education. All education is classified as non-market.

803000 Institutes of further education

- The production value in 2005 was over DKK 19 billion measured in terms of the prices for the year
- The entire production value is non-market
- Institutes of further education include figures for universities, business schools, technical colleges, educational seminars, and police and defence schools and so on.

803000 Institutes of further education consists of both general and technical colleges and universities. Seminars, etc. are also placed here, as are training institutions linked to the police and Danish Defence.

804002 Adult educations etc. (other non-market)

- The production value in 2005 over DKK 9 billion measured in terms of the prices for the year
- The entire production value is non-market
- Institutes of further education include figures for folk high schools, workshop schools, labour market training and so on.

Sector 804002 Adult education etc. is the smallest of the non-market educational sectors. Institutions, such as folk high schools, workshop schools and various labour market training, including so-called AMU courses under the labour market training scheme, are placed in this category.

6.2 Output-based growth rate for education

The main objective of this section is to determine the output-based quantity index, which is calculated by equation 3.8.

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

Educational services in the national accounts are, as previously stated, placed in four sectors covering the various educational levels available in the education system. All four sectors contain exclusively non-market activity. In contrast to health services, where it was necessary to draw upon data in the DIOR database to define the individual services, the product divisions in the national accounts contain sufficient information to identify the relevant products. For the sake of clarity, we have provided a table showing non-market production of educational services; see table 6.1 below.

Table 6.1 **Non-market production of educational services 2005**

COFOG		DKK mill.	per cent share
0920	Primary and lower secondary education (0912 + 0921)	52 659	51
0932	Post-secondary and other mid-length education, and preparatory schools for tertiary education	19 972	19
0940	Tertiary education (0941 + 0942)	20 748	20
0950	Education not definable by level	7 592	7
0960	Subsidiary services to education	89	0
0970	R&D education	59	0
0980	Education n.e.c.	2 593	3
090	**Total education**	**103 713**	**100**

In the educational sector, non-market production is derived from five COFOG groups: 0920 Primary and lower secondary education, 0932 Post-secondary and other mid-length education, and preparatory schools for tertiary education, 0940 Tertiary education, 0950 Education not definable by level and 0980 Education n.e.c. There is a close correlation between the national accounts 130 industry classification and the COFOG classification of educational services. This is as follows:

- 0920 Primary and lower secondary education is placed in 801000 Primary and lower secondary education
- 0932 Post-secondary education etc. is linked to 802000 Post-secondary and vocational education
- 0940 Tertiary education is linked to 803000 Institutes of further education.
- 0950 Education not definable by level is linked to 804002 Adult education etc. (other non-market)

Information will be used to distribute the calculated index so that its scope corresponds to the above. The various price indices calculated are as follows:

- Price index for primary and lower secondary education
- Price index for post-secondary education
- Price index for tertiary education
- Price index for adult education

In contrast to the health sector in which a range of different sources were used to calculate the various price indices, the education sector is much more homogenised. The volume data for the four price indices are all derived from one source. This source is Statistics Denmark's Education Register, which contains information about the number of students/pupils undertaking the various types of education.

Data about the number of students/pupils

Table 6.2 shows an extract from the volume data produced by Statistics Denmark. Each student/pupil is given a code for the various types of education as well as a proprietary code, specifying whether the education is private or public and whether it is a course. In this context, private should exclusively be taken to mean private schools producing non-market services. As previously described, private schools represent non-market production, since the user payments cover less than half of the costs for the service[8]. This division is relevant, since the fee differs depending on whether the school is private or public. In the case of part-time study, the quantity is made up of student years, i.e. data is compiled in terms of full-time study.

Two codes associated with education are used. The first, UDD, is Statistics Denmark's code for education in progress. This code is used, in this context, to transition between prices and volumes. The second is emerge codes, the first two digits of which indicate the level of education and are therefore used to distribute the data across the four price indices.

Hours more accurate for primary, secondary and post-secondary students

In the case of primary, secondary and post-secondary students, a more accurate measurement of volume is the number of hours during which students were taught. This information is not available from Statistics Denmark's Education Register. UNI-C has started to register this information, but they do not cover the period of analysis treated in this theme publication. The calculations for primary and secondary education are thus based on a less accurate measurement of volume: the number of students.

Sources for calculation of prices

Market prices do not exist for educational services. However, the individual educational institutions are subsidised by the government according to the number of students passing the relevant course. This payment is made according to a detailed annual fee directory, which contains fees for many different courses. The fees are published each year in the annual Danish budget. These fees are the best indication of prices for educational services and will be used for all types of education, except for public primary and lower secondary education.

There are no educational codes in Statistics Denmark's Education Register or the annual Danish budget that enables these prices and volumes to be linked. Comprehensive manual intervention was required to produce a transition between the two sources. One key producing a connection between the two sources is produced from an objective code, CØSA, under budget code FSP1E in table 6.2. Based on this transition key, the annual Danish budget fees can be linked in the Education Register. This provides information about prices and volumes for all types of education calculated according to fees in the annual Danish budget.

Special calculation for public primary and lower secondary education

The annual Danish budget does not contain fees for public primary and lower secondary education; the fee for this has therefore been calculated on the basis of the total costs for primary and lower secondary education. This is available from the published accounts under COFOG classification 0920; cf. table 6.1. This figure is divided by the total number of pupils in primary and lower secondary schools, producing a fee for public primary and lower secondary education. Table 6.2 also shows the Educational Register where fees in the annual Danish budget are linked based on the aforementioned transition key.

[8] See chapter 3

Table 6.2 **Fees and number of students distributed according to type**

UDD	FSP1E	Owner	Education	2005	2006	2005	2006
				quantity		fee	
1100	05010010	OFF	Nursery school	59 454	59 480	51 126	52 990
1100	05010010	PRV	Nursery school	8 028	8 127	40 838	40 836
1101	10021010	OFF	Year 1	59 225	58 968	51 126	52 990
1101	10021010	PRV	Year 1	8 066	8 211	40 838	40 836
1102	10022010	OFF	Year 2	60 369	58 500	51 126	52 990
1102	10022010	PRV	Year 2	8 092	8 237	40 838	40 836
1103	10023010	OFF	Year 3	60 159	59 817	51 126	52 990
1103	10023010	PRV	Year 3	8 085	8 230	40 838	40 836
2441	15101030	KUR	Folk high schools, gen.	1 346	1 980	60 652	60 713
2442	15101040	KUR	Folk high school, sport/PE	213	729	60 652	60 713
2445	15101070	KUR	Folk high school, disabled	62	60	60 652	60 713
4710	30390310	OFF	The commercial sector	16 736	16 425	52 339	25 164
4712	30401010	OFF	Technology and comms.	6 097	6 063	87 030	86 739
4713	30421010	OFF	Building and construction	6 379	6 984	87 030	86 739
4714	30441010	OFF	Trade and technology	2 139	2 181	87 030	86 739
4715	30461010	OFF	Food services	5 749	5 011	92 646	92 336
4716	30481010	OFF	Engineering/transport/logistics	3 902	3 718	92 646	92 336
4717	30491010	OFF	Services	4 019	4 275	92 646	92 336
5443	35201010	OFF	Basic educational training (PGU)	1 476	1 319	53 883	53 703
5153	50904010	OFF	Voc. degree occupational therapy	1 711	1 705	62 398	62 189
5151	50904510	OFF	Voc. degree physiotherapy	2 137	2 189	62 398	62 189
6522	60250610	OFF	Philosophy degree	641	701	40 900	40 763
6540	60250620	OFF	History of ideas degree.	156	156	37 200	37 076
6534	60250810	OFF	History degree	1 507	1 496	37 200	37 076
8410	60801010	OFF	Veterinary, bach.	144	101 200	323	100 862

Calculation of growth rate

The data set in which prices and volumes are linked is now used to calculate the price indices for the four different educational services. Based on the educational codes, it is possible to identify the indices in which individual observations should be included.

The method outlined in chapter 3 is used to calculate the price index. To calculate a specific index, the types of education, i, which needed to be included in the calculation of the relevant index, were selected from all the observations, j. When equation 3.8 is used to calculate the growth rate for primary and lower secondary education;

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

-the following result is produced:

$$P^{B}_{2005,2006} = \frac{36{,}802{,}396{,}504}{35{,}768{,}212{,}982} = 1{,}029$$

The price growth for primary and lower secondary education between 2005 and 2006 was 2.9 per cent.

Table 6.3 **Price increase for education**

	2001	2002	2003	2004	2005	2006
	per cent annual growth					
Price increase for prim./lower sec. ed.	4,4	3,7	3,2	2,7	3,3	2,9
Price increase for post-secondary education	4,0	2,4	5,1	-1,2	4,6	0,5
Price increase for tertiary education	1,8	0,6	4,4	-0,5	0,8	-0,3
Price increase for adult education	2,9	1,8	6,5	-8,8	-0,8	-0,7

The other three price indices are similarly delimited in accordance with this method. Table 6.3 shows a total overview of the price indices for educational services between 2000 and 2006. The growth rate for post-secondary education shows that the prices for this service varied between a price drop of 1.2 per cent and a price rise of 5.1 per cent. For tertiary education, the price growth was calculated at between minus 0.5 per cent and 4.4 per cent, while adult education varied between a price drop of 8.8 per cent and a price rise of 6.5 per cent. This is probably due to the fact that the composition of adult education is rather different when compared with other educational services.

6.3 Quality of education

In the previous section, the quantity/volume of education was calculated, and in this section the quality aspect of education will be discussed and possible quality indicators will be introduced. Possible quality indices will be determined and then quality adjusted price indices will be calculated by equation 3.12.

$$P^{B}_{t,t+1} = \frac{\sum_i P_{t+1} * M_{t+1} * F(q_{t+1})}{\sum_i P_t * M_{t+1} * F(q_t)}$$

The education output

The main quality component of the output of an education system is the sum of the expected transfers of knowledge and skills towards all pupils, i.e. the total transfer of knowledge and skills performed by education.

The aim of education is to improve knowledge and skills, i.e. put the pupil's potentials to maximum use. Education has a positive effect on the individuals and on society as a whole, since there is a strong causal relationship between education, earnings and productivity. Educated (highly educated) citizens generate higher tax incomes for the government, i.e. highly educated people make more money than people with lower education, and thus pay higher taxes during their lifetime (Information, 31.08.2009 (Danish newspaper)).

In general, education outcome is considered to represent three components:

- Natural abilities, knowledge and skills attributable to the socio-economic background
- Motivation and work effort from the student
- Knowledge and skills transferred by the education institutions

Since the purpose of this publication is to measure the output of education services, the focus will be on the third component, i.e. measuring the educational contribution, independently of the two first components. The first two components are supposed to be constant in this publication.

The educational outcome for individuals is their education status, i.e. their level of knowledge and skills.

The rest of this section will identify and describe some relevant quality indicators regarding educational services.

Class size (pupil / teacher ratios)

There are many factors creating a quality education environment, which maximizes each student's ability to learn. Class size is one of the most discussed factors of quality and a common belief is that small classes give more benefit than larger ones, and there are studies supporting this (Biddle, 2002). The logic behind this quality aspect is that if there are fewer pupils per teacher, then teachers will be able to devote more time and care to each pupil, i.e. it will be much easier for the pupils to get individual attention from the teacher. It is believed that pupils learn best in small environments with a lot of discussion. However, some other studies confirm that class size does not have a statistically significant impact on learning (Wet stein and Mora, 2003).

By class size we mean the pupil-teacher ratio, i.e. the number of pupils in a school divided by the number of qualified teachers

However, in Denmark we do not have the data for class size yet, and for that reason this quality aspect/indicator will not be included in the calculations of the output of education.

The teacher student time

The time a pupil spends with the teacher is also an important indicator of quality, how much time is spent by the teachers with each pupil, how much feedback does pupils get? Feedback is some form of input on the pupils' work from the teacher or supervisors. Receiving constructive feedback gives pupils a clearer idea of how well they are doing in their studies and how they could improve and get some useful advice. Feedback can improve results and strengthen the level of knowledge, since each source of feedback can provide a unique perspective that should be taken into consideration. Thus, it is essential for the quality of education that the teacher has enough time to give feedback, for instance, on written tasks.

Teacher qualifications

The competence of the teacher in a classroom is supposed to make a huge difference as well, i.e., providing the teacher with the proper curriculum and tools to teach is important as well as the teacher's pedagogical knowledge. The rate of teachers with a relevant education could be applied as a quality indicator.

Projects / team work

The share of time pupils spent on projects and on team work could be an indicator of quality, since projects are considered to improve the pupils' skills as being creative, independent, responsible, and thus improve their ability to work in teams, given that collaborative learning is very beneficial, especially if the purpose is to enhance critical thinking and problem-solving skills or to introduce multiple perspectives on an issue.

Academic scores / grades

The academic scores and grades are normally supposed to be a measurement of the level of knowledge and skills. However, all academic scores are subjective. Each teacher has a different subjective method of scoring. Educational attainment, as reflected in examination results, has been the main basis for discussions about quality; but one important question is whether exams can be compared over time; will examinations become easier when the educational institutions know that examination results are regarded as quality indicators? Statistics Denmark does not have access to the examination results, and therefore they will not be included in the quality calculations of education output in this publication.

PISA

The Programme for International Student Assessment (PISA) supplies data for the evaluation of 15-year-olds' competences in reading, math and science. The data cover the period from 2000 to 2006 at an interval of three years. This will be applied as a quality indicator for primary and lower secondary education.

Drop-out rate

A reduction in the share of pupils, who fail to graduate and drop out of school at different levels of education, is regarded as an important quality indicator. Falling drop-out rates is regarded as better education service and thus higher quality. The drop-out rated are available for public primary and lower secondary education

6.3.1 Quality adjustment of Danish educational services

The main difficulty in measuring quality is the availability of data: In this theme publication, we are able to quality-adjust the education outcome with the PISA data and the drop-out rates. Drop-out rates are from Statistics Denmark's education register. However, the partial data availability will give an incomplete picture of the education output. The data only cover the public primary and lower secondary education.

Weight

An important issue is to combine those two quality indicators and weight them by relative importance. In this publication, it is chosen that the two indicators together weight half of what is regarded as full quality adjustment, i.e. 50 per cent of the quality will be covered and the other 50 per cent may be due to other unobserved factors/indicators. The drop-out rates are given the weight 20 per cent and the while the weight given to PISA results is 30 per cent (50 per cent of total).

The quality adjusted output-based price indices for education are calculated by equation 3.12

$$P^{B}_{t,t+1} = \frac{\sum_{i} P_{t+1} * M_{t+1} * F(q_{t+1})}{\sum_{i} P_{t} * M_{t+1} * F(q_{t})}$$

where F is of function of quality and quality is composed by different indicators, which are selected and weighted according to their importance (subjective assessment). The quality adjusted output-based price index for period 2005 to 2006 can be calculated as:

$$P^{q}_{2005,2006} = 1.029 * 0.997 = 1.026$$

The first part of this equation is the cost index calculated in section 6.2 (quantity) and the second part is the quality index, calculated by the same method as in the example in chapter 4.3.

Quality adjustment of primary and lower secondary education

Output-based price indices *with* and *without* quality adjustment for the primary and lower secondary education are given in table 6.4. The quality adjusted growth rate is lower than the index without quality adjustment, but the differences between the two indices are very small. The lower price indices *with* quality adjustment indicate that the real volume growth will be higher if the production volume is quality adjusted. The quality adjustment is here also assumed to weight half of what will be considered as full quality adjustment, because of lack of data and other possible indicators of quality. And again we do not believe that it is possible to measure the full quality.

Table 6.4 **Comparison of output-based price indices *with* and *without* quality adjustment**

	2001	2002	2003	2004	2005	2006
Growth rate for prim./lower sec. ed.	per cent annual growth					
Output-based *without* quality adjustment	4.4	3.7	3.2	2,7	3,3	2,9
Output-based *with* quality adjustment	4,3	3,6	3,3	2,6	3,1	2,6

Positive contribution from PISA negative contribution from drop-out rates

The PISA results indicate improvement of the qualification the Danish students, hence contribute positively to the quality, while the drop-out rates are increasing and contribute negatively to the quality. The increase of the drop-out rates in primary and lower secondary educations is primarily because of increasing number of refugees and immigrants from 3rd world countries, who has less knowledge of the Danish language combined with a lower educational background, which makes it difficult for them to finalize their education. Positive contribution from quality adjustment to volume growth is from the PISA results. However, as previously mentioned, the quality adjustment is here assumed to cover only half of what is regarded as full quality adjustment. The other half is assumed to cover other unobserved and other factors that cannot be measured.

7. National accounts in the context of output-based price indices

This chapter will show the effects of the output-based method in the National Accounts. It performs a calculation from the national accounts using constant prices. The existing national accounts figures are therefore recalculated using the new, output-based price index, calculated in chapters 4-6. In other words, for non-market health, social and educational services, the existing input-based calculation is replaced by an output-based calculation to see the effects of the new method.

As described in chapter 3, a single price index is not used to calculate the production values for constant prices, but instead the totalled cost components for constant prices. This chapter, therefore, deduces the implicit price index for existing calculations as the relationship between the individual product production values at annual and constant prices. This price index can then be compared with the output-based price index.

In this chapter only the effects of output-based method *without* quality adjustment will be analysed, i.e. the results from the output-based method *with* quality adjustment will not be analysed in the general context, because still only a small part of the production is quality adjusted.

7.1 Health

As demonstrated in chapter 4, four different price indices were calculated according to the output-based method for constant price calculation from non-market health services. The price index for residential and day care places for the elderly are included in the results for social service in the next section, since the sector 853209 also contains social services for the elderly and adults. Therefore, this section will analyse the effects of the following three indices;

- Price index for hospitals
- Price index for psychiatric hospitals
- Price index for public dental services

These indices are used in this chapter for the new national accounts calculations for health services.

For the sake of clarity, table 7.1 provides an overview of the current and new price indices.

Current, input-based deflators identical in the preliminary years

From the table, we can see that the current four price indices are all identical for 2006. This is because the national accounts calculations for that year have still not been finalised. Since the calculations are not final, detailed product balances will not be presented and detailed deflation will not be applied. In 2006 the same deflator was used for all non-market services, which is the reason why the price indices are identical. The Danish national accounts are finalised three years after the end of a calendar year.

Only one price index for hospital services

In the case of general and psychiatric hospitals, the input-based price indices are also identical. This is because, as previously stated in chapter 4, there is only one product for hospital services. It is not possible, therefore, to show separate price indices for these two service types.

General hospitals

In the case of hospitals, this comparison shows that the input-based price index measured a higher price growth than the output-based price index did in all years, except for 2003. Figure 7.1 shows that output-based prices of hospital services increased less

rapidly than input-based prices and this indicates that real growth of medical services has been understated.

Psychiatric hospitals and public dental services

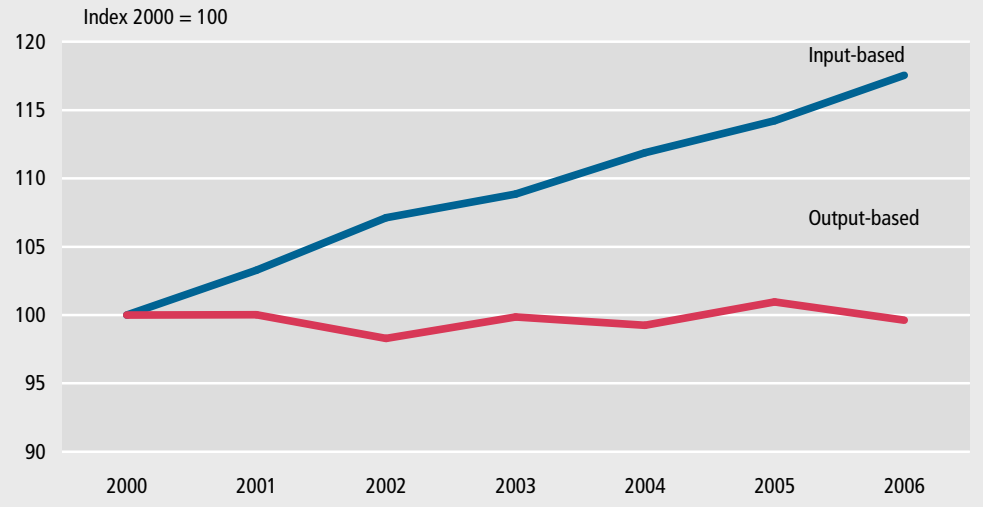
The price index for psychiatric hospitals varies more extensively. During the first two years, the input-based calculations show the strongest price growth, while the reverse is true from 2003 to 2006. A similar picture emerges in the case of the price index for public dental services; it is not possible to identify any clear trend.

Table 7.1 **Comparison of input- and output-based price increase for health care**

Growth rate for:	2001	2002	2003	2004	2005	2006
	per cent annual growth					
General hospitals						
Input-based national accounts	3.3	3.7	1.5	2.8	2.1	2.9
Output-based	0.2	-0.4	1.9	-1.6	1.7	-2.2
Psychiatric hospitals						
Input-based national accounts	3.3	3.7	1.5	2.9	2.0	2.9
Output-based	1.9	1.3	4.6	7.0	2.2	6.4
Public dental services						
Input-based national accounts	5.0	3.0	0.7	3.0	2.2	2.9
Output-based	-0.3	5.5	0.4	0.9	2.5	2.8

Based on the price indices for health services, it is possible to conclude that the output-based price index demonstrates more uneven price growth than is the case with the input-based price index, and the output-based price index indicates higher real growth rates of medical care services.

Figure 7.1 **Price growth for general hospitals**



NB: National accounts 2006 are not final.

7.1.1 Calculation of production values

Based on the product balances in the prices for the year and the output-based price index, it is possible to perform an alternative national accounts calculation, which clarifies the impact of switching from input to output deflation. Using formula 3.9, it is possible to calculate the product balances for the previous year's prices. Chained values are then calculated, starting with 2000 prices and based on formulas 3.10 and 3.11. Table 7.2 shows the results of these calculations and a comparison with existing calculations.

Higher production value for hospitals

The calculation for 851100 Hospitals shows that the output-based calculation has a production value, which is higher than the input-based calculations in all periods. Similarly, the real growth rate is higher in all periods, except for 2003 to 2005, where the previous calculation indicates stronger growth. The calculations clearly show that if the output-based price index is used, the growth in prices would be more moderate, and thus the input-based method understates the real growth rate.

More moderate change for doctors, dentists and veterinarians

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 – particularly over the period as a whole – and especially the fact that the non-market services constitute less than a quarter of the sector's total production value. This means that more than three quarters of the calculation is by definition unchanged.

Table 7.2 **Input- and output-based production value calculations**

Production value for:	2000	2001	2002	2003	2004	2005	2006*
	2000 prices, chained values, DKK mill.						
851100 Hospitals							
Input-based national accounts	45 679	47 480	48 963	50 885	51 923	54 317	57 394
Output-based	45 679	49 024	52 542	54 554	57 540	60 428	66 557
Difference		1 544	3 579	3 669	5 617	6 111	9 163
851209 Doctors, dentists, veterinarians							
Input-based national accounts	22 326	22 876	23 095	23 503	23 628	25 040	25 206
Output-based	22 326	23 121	23 412	23 835	24 085	25 545	25 870
Difference		246	317	332	457	505	663
Total							
Input-based national accounts	68 005	70 356	72 058	74 388	75 551	79 357	82 600
Output-based	68 005	72 145	75 954	78 389	81 624	85 973	92 427
Difference		1 790	3 896	4 001	6 073	6 616	9 826

7.2 Social protection

This section will show the effects of the output-based method on calculations of output of social services in the Danish National Accounts. The part of Social institutions for adults that are related to residential and day care places for the elderly, i.e. the part concerning health care is also included in the results for sector 853209 Social institutions for adults below. Table 7.3 shows the price indices for the two social sectors. The two input-based price indices are all identical for 2006, because the national accounts calculations for these years have still not been finalised.

853109 Social institutions for children and young person

The results for sector 853109 Social institutions for children and young persons show that the output-based indices increase more than input-based indices, except for 2002. The output-based indices also show a more uneven growth than in the case with input-based indices, indicating that a real growth rate for this sector has been overstated.

853209 Social institutions for adults

For the sector 853209, Social institutions for adults a weighted price index is calculated, and it includes both the part of the sector 853209 that is related to health care services and the part that is related to social protection services. In three out of six cases the output-based price indices are higher than the input-based indices. In 2001, the output-based index is lower than the input-based index, while in 2004 and 2005 the indices are equal.

Table 7.3 **Comparison of input- and output-based price increase for social protection**

Price increase for:	2001	2002	2003	2004	2005	2006
	per cent annual growth					
Social institutions for children and young person						
Input-based national accounts	3.7	3.0	2.9	3.2	2.2	2.9
Output-based	6.6	2.5	2.9	6.9	2.3	3.2
Social institutions for adults						
Input-based national accounts	3.5	3.2	2.4	3.1	2.5	2.9
Output-based	2.2	4.3	2.6	3.1	2.5	2.1

7.2.1 Calculation of production values

As in the case of health care services using formula 3.9, it is possible to calculate the product balances for the previous year's prices. Subsequently, the chained values are calculated, starting with 2000 prices based on formulas 3.10 and 3.11. Table 7.3 shows the results of these calculations and a comparison with existing calculations for the social protection services.

Lower production value for sector 853109

Table 7.4 shows the production values based on current input-based national accounts and output-based price indices, respectively. Results show that the output-based calculation has a production value that is lower than the input-based calculations in all periods, i.e. if the output-based indices were used the production value will be lower.

853209 Social institutions for adults

In the case of 853209 Social institutions for adults, the situation is almost the same, output-based method generates lower production value in four out of six periods, and the price indices show good consistency over time.

As expected, the production value for social protection services is lower when output-based price indices are applied, since the output-based price indices were, in general, higher than the input-based price index in almost all periods.

Table 7.4 **Input- and output-based production value calculations for social protection**

Production value for:	2000	2001	2002	2003	2004	2005	2006*
	2000 prices, chained values, DKK mill.						
853109 Social institutions for children and young person							
Input-based national accounts	37 787	38 640	38 803	39 040	39 415	39 506	39 442
Output-based	37 787	37 588	37 943	38 177	37 209	37 279	37 128
Difference	-	- 860	- 863	- 2 206	- 2 227	- 2 315	- 1 052
853209 Social institutions for adults							
Input-based national accounts	48 366	50 378	51 906	52 416	52 898	53 563	50 097
Output-based	48 366	51 018	52 002	52 391	52 883	53 427	48 544
Difference	-	640	96	- 26	- 14	- 136	- 1 554
Total							
Input-based national accounts	86 154	89 018	90 709	91 456	92 312	93 069	89 540
Output-based	86 154	88 606	89 945	90 567	90 093	90 706	85 671
Difference	-	- 412	- 764	- 888	- 2 220	- 2 362	- 3 868

7.3 Education

Four different price indices were calculated according to the output-based method, for use in constant price calculations from non-market educational services.

- Price index for primary and lower secondary education
- Price index for post-secondary education
- Price index for tertiary education
- Price index for adult education

In this chapter, these indices are used to perform alternative national accounts calculations for educational services. Again, we have produced a table providing an overview of the current and new price indices; cf. table 7.5.

Input-based deflators identical in the preliminary years

The input-based four price indices are all identical for 2006. This is because the national accounts calculations for that year have still not been finalised. Since the calculations are not final, detailed product balances will not be presented and detailed deflation will not be performed. The same deflator was used for all non-market services in 2006, because the price indices are identical. The Danish national accounts are only finalised three years after the end of a calendar year.

Table 7.5 **Comparison of input- and output-based price increase for education**

Price increase for:	2001	2002	2003	2004	2005	2006
	per cent annual growth					
Primary and lower secondary education						
Input-based national accounts	3.5	2.9	2.8	3,0	2,2	2,9
Output-based	4.4	3.7	3.2	2,7	3,3	2,9
Post-secondary education						
Input-based national accounts	3.5	3.0	2.8	3,0	2,2	2,9
Output-based	4.0	2.4	5.1	-1,2	4,6	0,6
Tertiary education						
Input-based national accounts	3.5	2.8	3.3	3,0	2,2	2,9
Output-based	1.8	0.6	4.4	-0.5	0.8	-0,3
Adult education						
Input-based national accounts	3.4	2.6	2.7	3.0	2.2	2.9
Output-based	2.9	1.8	6.5	-8.8	-0.8	-0.7

Growth rate for primary and lower secondary education

In the case of primary and lower secondary education, this comparison shows that the input-based growth rate measured a lower price change than the output-based growth rate did in all years, except for 2004. All else being equal, this implies that if the output-based growth rate is used in national accounts calculations, the volume growth will be smaller.

Growth rate for post-secondary education

In the case of post-secondary education, the relationship between the two price indices shows no clear trend. The strongest price growth switches between the indices from year to year.

Price index for tertiary education

In the case of tertiary education, the input-based growth rate measured a higher price growth than the output-based growth rate did in all years, except for 2003. All else being equal, this implies that if the output-based growth rate is used, the volume growth will be greater.

Price index for adult education

The output-based growth rate for adult education shows the greatest variation. A relatively substantial price increase in 2003 was negated in 2004 by an even greater price drop. 2003 is the only year in which this index measured a stronger price growth than that measured by the input-based method. The 2004 drop in the output growth rate is clearly not reflected in the input-based index, but as previously stated, the index for 2004 is merely a general growth rate for the non-market economy. Against this background, it is difficult to compare these. As with the output-based growth rate for health and social services, the output growth rate for educational services shows a more uneven price growth than is the case with the input calculation.

7.3.1 Calculation of production values

As with the calculation for health care and social protection the new production values are calculated in this context using the output-based price index. Using formula 3.9, it is possible to calculate the product balances for the previous year's prices. Subsequently, the chained values are calculated, starting with 2000 prices based on formulas 3.10 and 3.11. Table 7.8 shows the results of these calculations and a comparison with existing calculations.

Table 7.6

Input- and output-based production value calculations for education

Production value for:	2000	2001	2002	2003	2004	2005	2006*
	2000-prices, chained values, DKK mill.						
801000 Primary and lower secondary education							
Input-based national accounts	37 693	38 357	40 177	40 571	41 824	43 042	43 453
Output-based	37 693	38 031	39 546	39 783	41 117	41 850	42 271
Difference	-	- 326	- 631	- 787	- 707	- 1 191	- 1 181
802000 Post-secondary and vocational education							
Input-based national accounts	16 739	17 308	16 929	16 831	17 523	17 325	17 396
Output-based	16 739	17 221	16 926	16 450	17 841	17 230	17 708
Difference	-	- 88	- 3	- 381	318	- 95	312
803000 Institutes of further education							
Input-based national accounts	15 551	15 065	15 856	15 888	16 530	16 664	16 700
Output-based	15 551	15 306	16 457	16 310	17 557	17 938	18 555
Difference	-	241	601	422	1 027	1 274	1 856
804002 Adult education etc. (other non-market)							
Input-based national accounts	9 221	8 970	8 822	8 963	8 081	8 113	8 179
Output-based	9 221	9 009	8 926	8 738	8 884	9 176	9 616
Difference	-	39	104	- 225	803	1 063	1 437
Total							
Input-based national accounts	79 203	79 700	81 784	82 253	83 958	85 145	85 727
Output-based	79 203	79 566	81 856	81 282	85 399	86 195	88 150
Difference	-	- 133	71	- 971	1 441	1 050	2 423

In contrast to health services, where there were relatively substantial fluctuations overall, educational services are more consistent between the two calculations. 2003 and 2004 represent the extremes, where the differences are plus and minus a billion Danish kroner, respectively. 803000 Institutes of further education and 804002 Adult educations etc. both have a production value, which is approx. DKK 1 billion higher in 2005 than in the output-based calculation. This is primarily balanced by 801000 Primary and lower secondary education, where in 2005 the production value is over DKK 1 billion lower than when the output-based method is used. In 2006, output-based method produce approx. DKK 2.5 billion higher production value; sector 803000 Institutes of further education shows a difference about DKK 1.9 billion, where sector 804002 Adult education etc. shows nearly DKK 1.5billion, while sector 801000 Primary and lower secondary education exhibits about DKK 1.2 billion lower production value, when the output-based method is applied.

Sector-specific production values

The noticeable drop in production value for 801000 Primary and lower secondary education is not unsurprising, since the output-based price index was higher than the input-based growth rate in four of the six periods. As expected, the production value for 802000 Post-secondary and vocational education varies between exceeding and undercutting the existing calculation. This is due to the measured price growth, which varies in strength. The price index for 803000 Institutes of further education shows the clearest indication of a lower price growth, which is also reflected in the size of the production value. The output-based calculation produces a higher production value in all periods, and except for 2003, the growth rate is also higher in all periods. The price index for adult education showed both the highest increase and the biggest drop. This is also reflected clearly in the calculation of the production value, where the output-based calculation in 2003 is less than the existing one due to the substantial price growth between 2002 and 2003. In 2004, this is replaced by a noticeably higher production value due to an observed price drop of around 9 per cent.

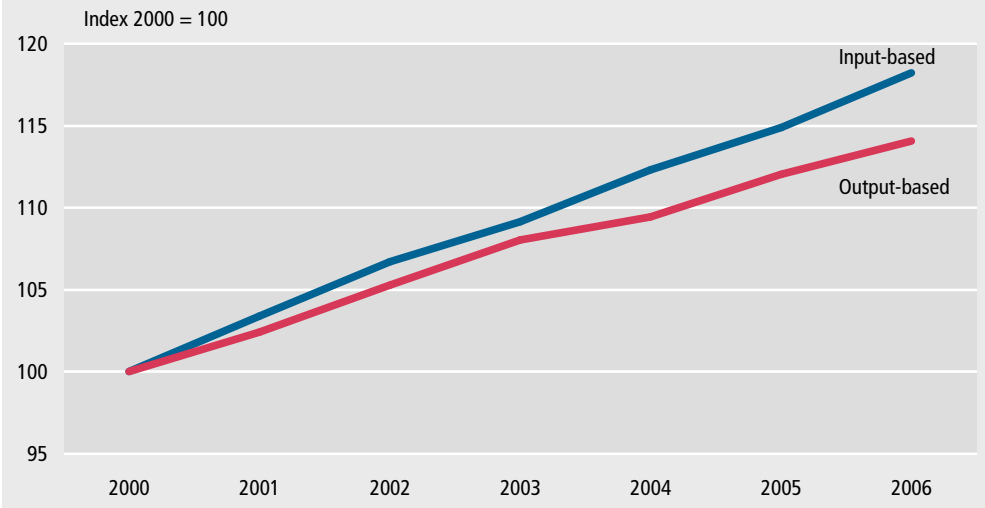
7.4 The non-market economy in total

This section applies the previous, detailed calculations in a more general context. The consequences of the alternative calculations for health care, social protection and education are placed in the context of some more general concepts in the national accounts.

Price increase for the input- and output-based methods are illustrated below (figure 7.2) and the figure shows that the output-based prices for the whole non-market services grew slower than the input-based prices, which indicates that real growth of the non-market economy has been understated. The differences in price development according to the methods are clearly reflected in volume output of the non-market services (figure 7.3).

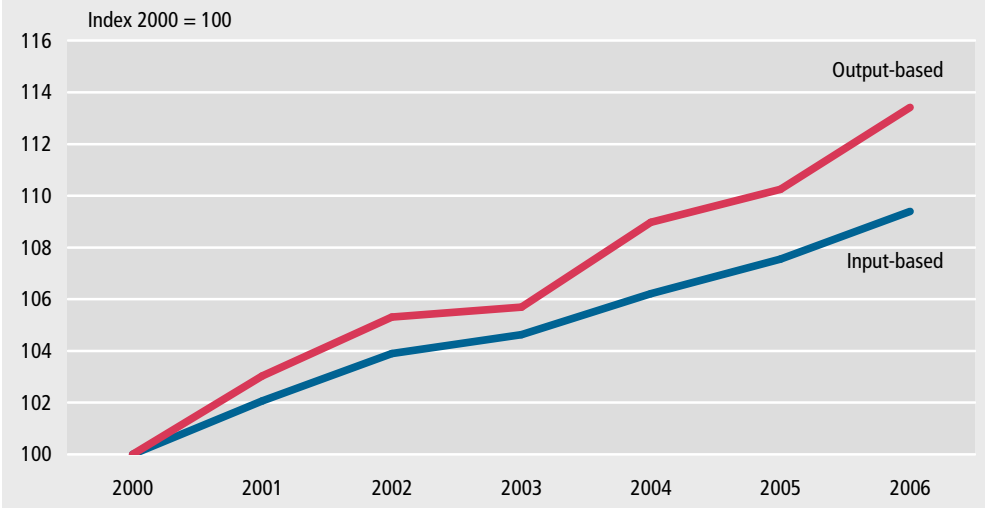
Figure 7.4 summarises the differences between the input-based and output-based calculations. The greatest difference is found in 2006, where production is over DKK 8 billion higher. Health services are, by far, the most important factor in this higher production value. Social protection services contribute negatively in all periods and educational services contribute negatively to the differences in the production value in 2001 and 2003.

Figure 7.2 **Price growth for the whole non-market economy**



NB: National accounts figures for 2006 are not final.

Figure 7.3 **Volume growth for non-market services**

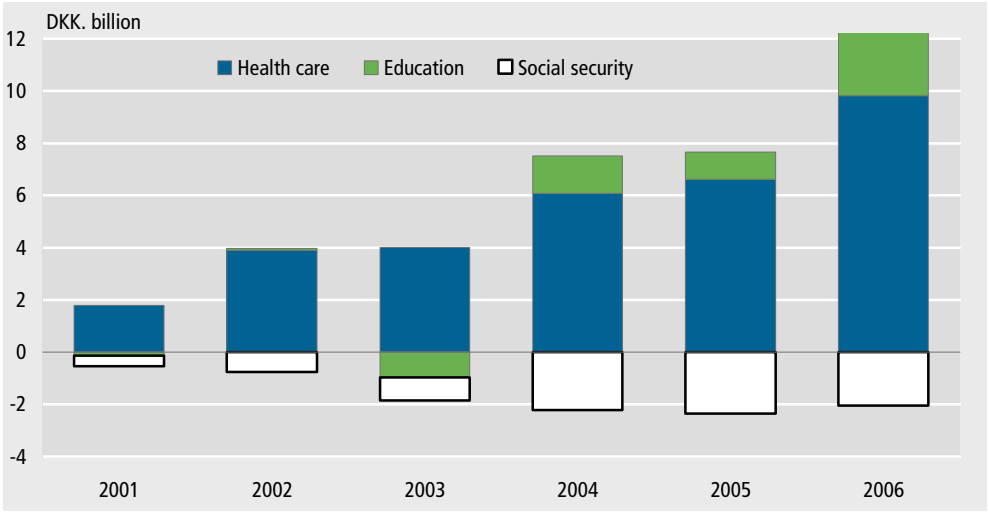


NB: National accounts figures for 2006 are not final.

Figure 7.5 illustrate the overall difference caused by changing the calculation method in the context of the total non-market production value. It shows that changing the calculation method for the three biggest areas in non-market production does not significantly affect the level of the non-market economy's total production value. The production value is increased by the corresponding to 3 and 4 percent due to the alternative deflation method in 2005 and 2006, respectively.

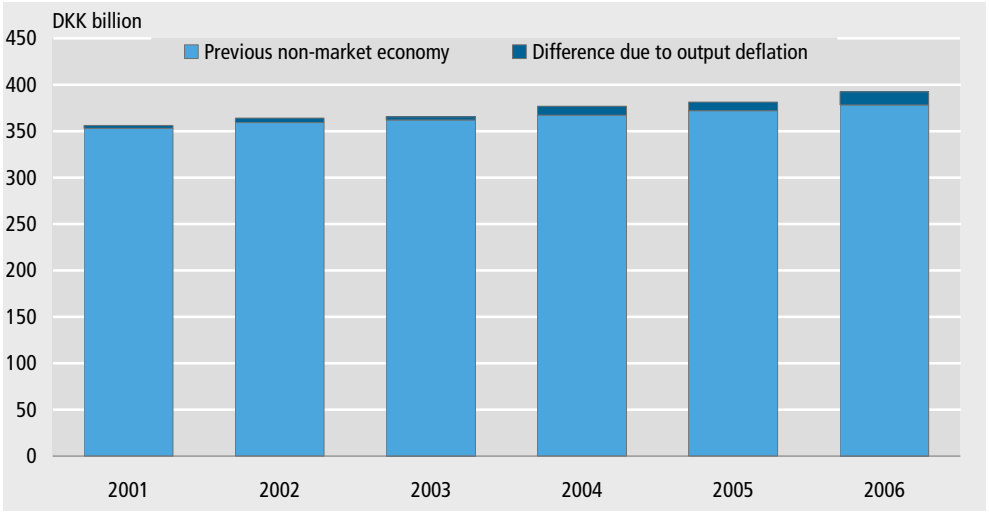
While the total non-market production value does not seem to change much – cf. figure 7.5 – this is not the case if we focus on growth rates rather than levels. Figure 7.6 shows the growth rates for the two types of calculations for the production value. We can see that the growth rate of non-market production looks slightly different when the output-based calculation is applied. In four out of six periods, the output-based growth rate increases in 2001, 2004 and 2006, the growth rate increases by 1 per cent and more, while the increase in 2002 is about 0.5 per cent. In 2003 and 2005, the growth rate is around 0.2 per cent smaller.

Figure 7.4 **Difference in production values distributed according to service type**
Chained 2000 values



NB: National accounts figures 2006 are not final.

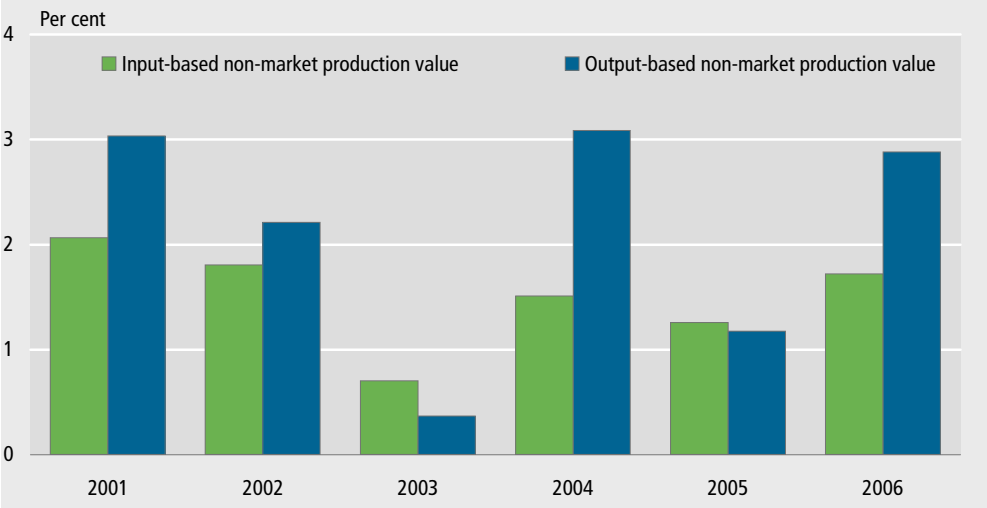
Figure 7.5 **Production value for the overall non-market economy**
Chained 2000 values



NB: National accounts figures 2006 are not final.

It is not just the production value that is affected by the change in calculation method. Another crucial parameter, the gross value added, is similarly affected. The gross value added is the production value minus the intermediate consumption in production, i.e. purchase of products. Because only the production value is affected by the change, the gross value added will increase by the same amount as the production value.

Figure 7.6 **Real growth rates in production values distributed according to calculation type**

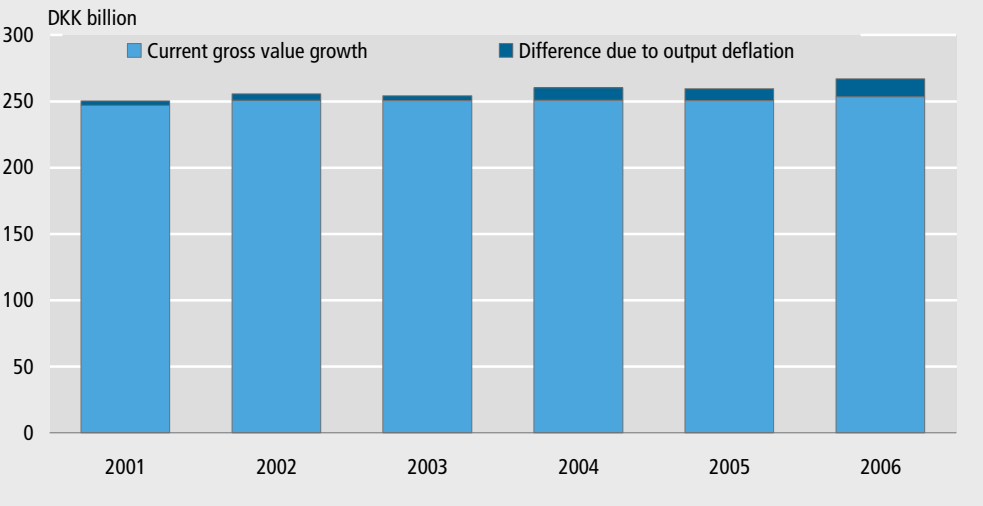


NB: National accounts figures for 2006 are not final.

Figure 7.7 shows figures relating to gross value added. From the figures 7.4 and 7.6, we can see that public consumption in production is approx. DKK 100 billion, since the gross value added is approx. DKK 100 billion smaller than the production value. In addition, changing the calculation method does not seem to have any particular effect on the total non-market value added.

However, the level of growth in the gross value is DKK 100 billion smaller. All else being equal, the change will have a rather major influence on the growth rates.

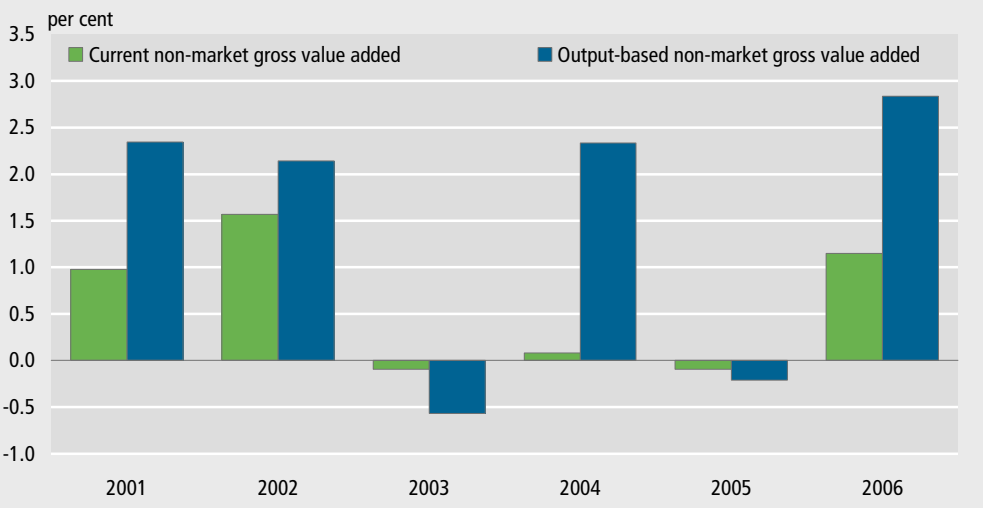
Figure 7.7 **Gross value added for the non-market economy overall**
Chained 2000 values



NB: National accounts figures for 2006 are not final.

Figure 7.8 shows that the same situation applies as in figure 7.9, i.e. as a consequence of the output-based calculation, the growth rate in 2001, 2002, 2004 and 2006 with the output-based calculation is greater, while in 2003 and 2005 the level is more or less consistent. Because the growth rates are calculated from values that are around DKK 100 billion lower, the effects on the growth rates are on a similar scale. In the four years in which the growth rates are now higher, increases of more than 2 per cent are observed, while the drop in 2003 and 2005 is 0.1 per cent and 0.6 per cent, respectively.

Figure 7.8 **Real growth rates in gross value added distributed according to calculation type**



NB: National accounts figures for 2006 are not final.

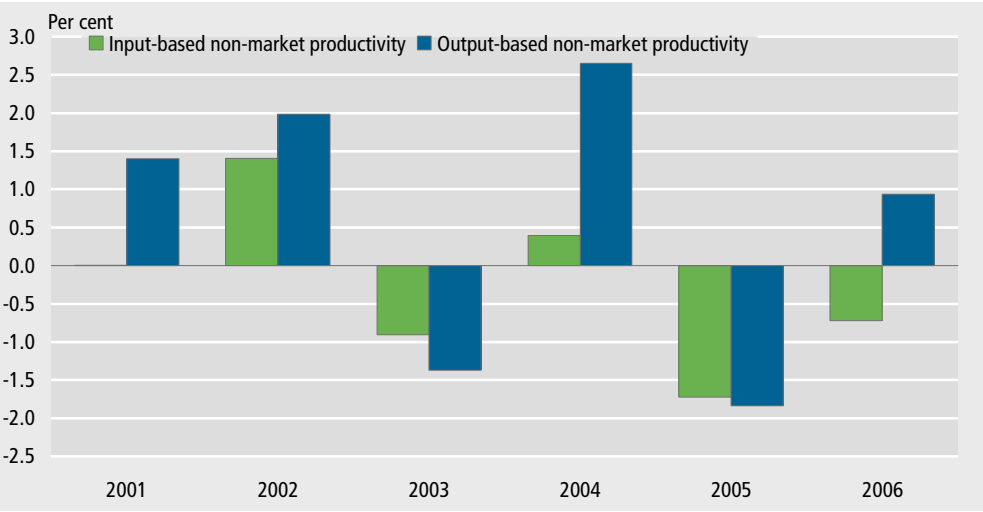
Productivity

Statistics Denmark does not publish productivity calculations for the non-market economy.[9] This is because the production value in the non-market economy is calculated on the basis of costs; cf. also chapters 2 and 3. In this study, productivity is defined as outcome per 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 by all of the non-market economy, but only in relation to health care, social protection and educational services, which make up over 60 per cent of the total non-market production.

Figure 7.9 shows the work 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 more negative in periods in which productivity is declining. Overall, productivity is slightly higher with the output-based method; on average over the period, productivity is nearly 1 per cent higher here.

Figure 7.9 **Non-market-related outcome per hours worked distributed according to calculation type**



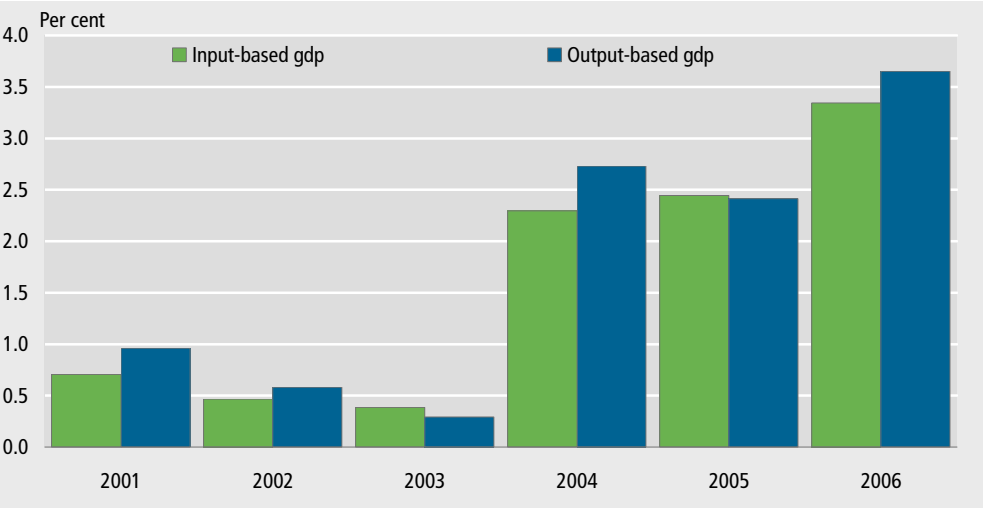
NB: National accounts figures for 2006 are not final. For interpretation of current data, see fact box: Facts about non-market-related finance and work productivity.

[9] See, e.g. the feature publication: Produktivitetsudviklingen i Danmark 1966 til 2003 (Productivity Growth in Denmark 1966-2003) produced by Statistics Denmark Statistik for the detailed description of Statistics Denmark's calculations.

7.5 The economy as a whole

This section provides an overview of how the alternative deflation method affects a range of key figures for the overall economy. Figure 7.10 shows the growth rate for gross national product, GNP, according to the input-based calculations, and how health care, social protection and educational services changes GDP if they are output-deflated.

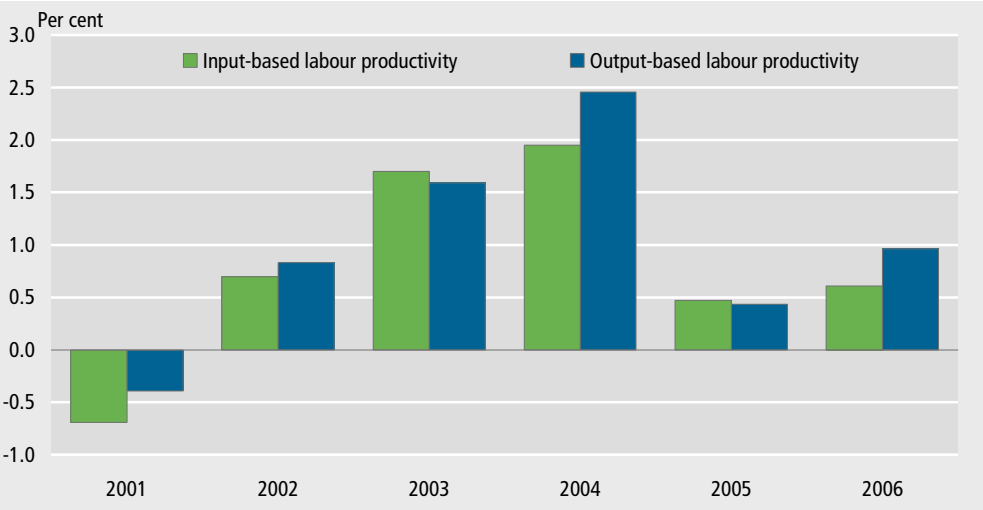
Figure 7.10 **Growth in gross national product distributed according to calculation type**



NB: National accounts figures for 2006 are not final.

From the chart, we can see that the alternative deflation method changes the GDP growth. The greatest difference in the results is found between the two methods in 2004. While the official growth rate is 2.3 per cent, it is calculated at 2.7 per cent when the output-deflated figures are used. In 2001 and 2006, the growth rates were 0.3 per cent higher, when the output-based method is applied. In 2002, 2003 and 2005 the difference between two methods is between 0 and 0.2 per cent.

Figure 7.11 **Output per hours worked distributed according to calculation type**



NB: National accounts figures for 2006 are not final. For interpretation of current data, see fact box: Facts about non-market-related finance and work productivity.

Figure 7.11 shows work productivity as published by Statistics Denmark along with calculations using the output-deflated figures. The results show that if the alternative figures are used, this will have an overall positive effect on work productivity. The well-known picture, in which there is a positive effect in 2001, 2002, 2004 and 2006

and a less negative effect in 2003 and 2005, also applies here. The most noticeable difference occurs in 2004 and 2006 where the alternative calculation produces productivity increases by 0.5 and 0.4 per cent higher than the official calculations.

Output-deflation contributes higher productivity

For the period as a whole, the increase in work productivity is 0.8 per cent annually, while the alternative calculations produce an average annual increase of 1 per cent. These calculations demonstrate that the average productivity for the period 2000-2006 is 0.2 per cent higher if the alternative calculations are applied. This difference initially appears relatively modest, but for users of productivity calculations it is substantial. For example, this difference is the same as the effect of better education. Productivity calculations carried out by Statistics Denmark show that between 1966 and 2003 the rising educational level of the workforce resulted in an average annual increase of 0.2 per cent in productivity[10].

One of the most important causes of rising productivity is investment in information and communications technology. Between 2000 and 2003, these investments contributed an average productivity increase of 0.6 per cent, according to Statistics Denmark's productivity calculations.

[10] Bonde and Sejerbo Sørensen: Productivity Growth in Denmark 1966-2003. Statistics Denmark 2005 (Produktivitetsudviklingen i Danmark 1966 til 2003).

8. Concluding remarks

Data quality and characteristic for output-based deflators

This publication calculates Danish output-based deflators within the framework of the EU guidelines. The calculations are a continuation and extension of the first report on this area, Health and Education, Sørensen (2007). The publication shows how the output-based method can be implemented for the health care, social protection and educational services in line with the EU guidelines for calculation of national accounts at constant prices.

In general, the data quality has been high, which is crucial to the achievement of reliable results. The price indices have primarily demonstrated stable results, which is promising for future work of the method. It can be concluded that the results of the output-based method are promising for the health care. For social protection and educational services the data are of international standards, but our assessment is that they could be improved.

Based on the results achieved, it is possible to conclude that calculations already exist covering the three main areas and which meet the international guidelines for calculation of national accounts at constant prices. What makes the current calculations suitable is:

- Identical sources for the entire period, which ensures continuity in the calculations
- Data complies with international guidelines
- Calculations are based on data that is also expected to be available in the future

These calculations meet an important criterion for the Danish national accounts, i.e. that data should be of consistent quality. Comparisons over time are worthless, unless data is calculated using the same criteria. The Danish national accounts have a long tradition of ensuring that data is comparable over time. However, it is clear that, since these calculations can only be implemented retrospectively as far as back 2000, a certain amount of continuity is lost. Rather than covering a longer period with data of inconsistent quality, which in any case makes comparisons over time more difficult, we will instead focus on ensuring data of a consistently high quality from 2000 and into the future.

The main part of the individual non-market services, over 96 per cent are covered in this publication, the remaining services under Recreation, culture and religion will be covered in the next publication in 2010.

Effects of the output-based method

The output-based method generates higher volume growth than the input-based method, i.e. the input-based method understates the volume of government output.

Health care services calculated after the output-based method contributes positively to the volume growth, while the social services contribute negatively in all periods, which indicates that the volume growth for social protection in the current National Accounts is overvalued. Educational services have generally positive effects on volume growth.

Quality adjustment of non-market services

The quality issue is an essential part of the output-based method. The first attempts to pin down the difficult area of quality adjustment into operational concepts have been made. Data have been selected and used in several areas. Examples are made with experimental calculations where it is shown how different quality indicators could enter into the calculations of price indices for General Government services. It is clear that such calculations rely heavily on assumptions on how these effects will influence output. The investigation of this area will continue in the coming year, both regarding the selection of quality-indicators and regarding the way they should enter the calculations of price indices.

References

Bonde and Sejerbo Sørensen (2005): *Produktivitetsudviklingen i Danmark 1966 til 2003 (Productivity Growth in Denmark 1966-2003)*, Statistics Denmark 2005.

Biddle (2002): *The importance of class size*

Dansk Branchekode 2003 (Danish Industrial Classification 2003), Statistics Denmark 2002.

DRG i psykiatrien – slutnotat 2006 (DRG for psychiatry – end note 2006), Danish National Board of Health 2007.

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

Mora and Wetstein (2003): *The Impact of Class Size on Student Success: The Importance of Controlling for Instructor and Course*, Characteristics Paper initially prepared for presentation at the 41st Annual Conference of the Research and Planning Group.

Nationalregnskab, Fastprisberegninger, Kilder og metoder/Inventory of Sources and Methods: Price and Volume Measures in the Danish National Accounts, Statistics Denmark, May 2002.

OECD (2007a): "OECD Handbook 'Measuring Education and Health Volume Output', Introduction – history and context, OECD 2007.

OECD (2007b): "OECD Handbook 'Measuring Education and Health Volume Output', Draft chapter 1 – Terminology and Concepts, OECD 2007.

OECD (2007c): "OECD Handbook 'Measuring Education and Health Volume Output', Draft chapter 2 – on education output, OECD 2007.

OECD (2007d): "OECD Handbook 'Measuring Education and Health Volume Output', Draft chapter 2 – on health output, OECD 2007.

Biddle (2002): The importance of class size

Appendix

Table A.1 **Diagnosis groups in the National Register of Patients**

Code	Text
DF0	Organic (incl. symptomatic) psychologically sufferings
DF1	Psychologically sufferings and behaviour disorder caused of psychoactive drugs incl. alcohol
DF2	Schizophrenia and other psychologically sufferings
DF3	Affective mental disorders
DF4	Nervous and stress-related states plus conditions related to nervous physical symptoms
DF5	Behavioural related to physiologically disturbances and physically factors
DF6	Disturbances and changes off personality structures and behaviour
DF7	Mentally retarding
DF80-98	Behavioural- and emotional disturbances started in the childhood or adolescens
DF99	Psychologically sufferings or disturbances, not specified in an other way
DX6	Self damaging by poisoning
DX70-84	Self damaging by violence methods
DX85-DY09	Attacks or abuse
DZ0-13	People in contact with doctors and hospitals concerning psychological test
DZ2	People with potentially health risks in connection with infectious diseases
DZ7	People in contact with health authorities under other circumstances
DZ80-99	People with potentially health risks connected with family or own anamnesis that can affect the state of health

DRG i psykiatrien – slutnotat 2006. Sundhedsstyrelsen

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