General Government Output and Productivity

2005-2012

DANMARKS STATISTIK

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Corrected in relation to original version (November 25, 2013).
Corrections of the figures 8.2, 8.3, 8.4 og 8.5 on pages 57, 59, 62 and 64.
Corrections of a number in the text on page 57.
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Explanation of symbols

0 0,0 }	Less than a half of the unit applied
•	Category not applicable
. .	Data too uncertain
. . .	Data not available
-	Nil

Foreword

This publication describes the development in the volume of public services. More precisely the calculations include non-market individual services produced in the general government sector of the national accounts. These services account for approximately 20 per cent of the Danish economy.

The volume growth is calculated using a variety of indicators. Some of these are the number of treatments carried out by the healthcare authorities, the number of students in various educational institutions, the number of children in nursery schools, the number of elderly in day care centres and residential homes for the elderly, etc. All data are updated and calculated for the period 2005-2012.

The calculations are made as part of a development project concerning the volume of services produced in general government. The new method (output-method) measures the growth in the volume of public output more directly than the method used in the current national accounts. The new method will be incorporated into the Danish national accounts in September 2014 and thus meet EU guidelines in that field. The publication provides illustrative calculations of the effect the new approach would have on GDP and productivity growth.

The new method generally gives higher growth rates and would increase the GDP growth rate by 2.1 percentage point in total for the period 2005 to 2012. The greatest impact is observed in 2011 and 2012 where the output method increases GDP growth with 0.4 and 0.6 percentage points respectively.

Volume based calculations are highly dependent on whether the quality changes of the services can be measured, and how the different quality indicators are weighted. The publication illustrates by examples how it is possible to make quality adjustments and the implications of such adjustments. However, the field is still under development, both in Denmark and other EU countries.

The publication is prepared by Statistics Denmark in collaboration with the Danish Ministry of Finance. This publication is prepared in the National Accounts division by Nura Deveci. The publication is also published in Danish.

Statistics Denmark, November 2013

Jørgen Elmeskov / Timmi Rølle Graversen

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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 production of the general government in Denmark makes up about 25 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 the way 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, educational and social protection services.

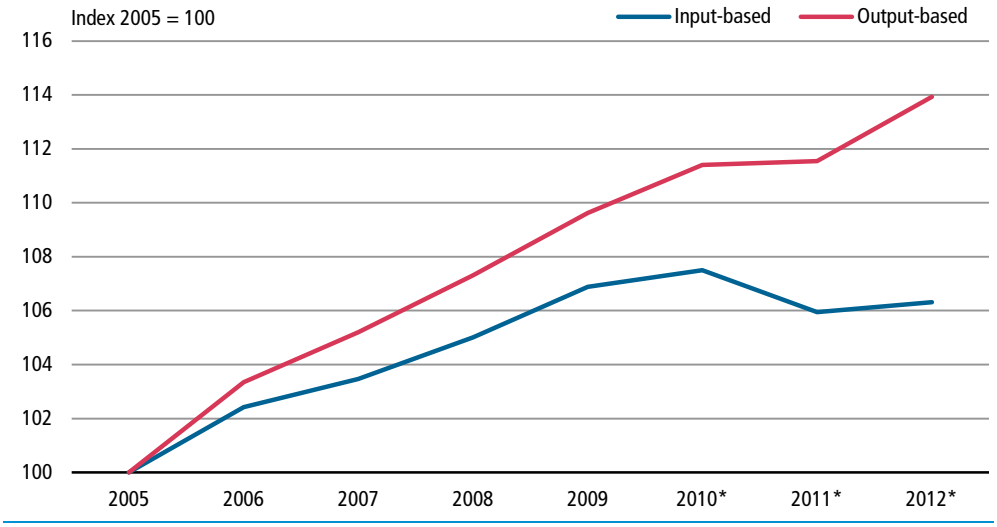
Input- and output-based measures of non-market output in National Accounts

The volume of non-market individual services is calculated according to the EU guidelines. The results show that changing the compilation method will result in substantial revisions to the Danish national accounts figures. In this publication, figures for 2005 to 2012 are compiled.

Effects on price indices

Figure A shows that output-based volume for the whole non-market services were increasing more rapidly than input-based output, which implies that real growth of the non-market economy has been underestimated in the current national account. Notice that the difference between the two indices is increasing over time.

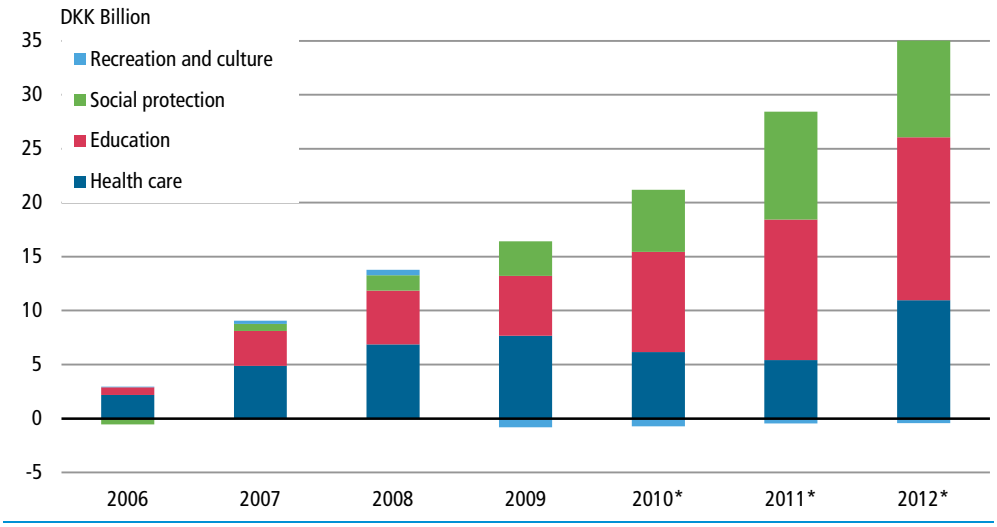
Figure A Volume increase for the whole non-market economy



Effects on production value

The overall production value increases by between DKK 3 and 35 billion annually as a result of the output-based method. The health care, social protection and education services contribute positively over the entire period, when the new method is applied (figure B). The effects of the new method on recreation and culture are changing over time, but since these industries represents a very small part of total non-market services, it has minor impacts on overall production value.

Figure B Difference in production values distributed according to service type. Chained 2005 values

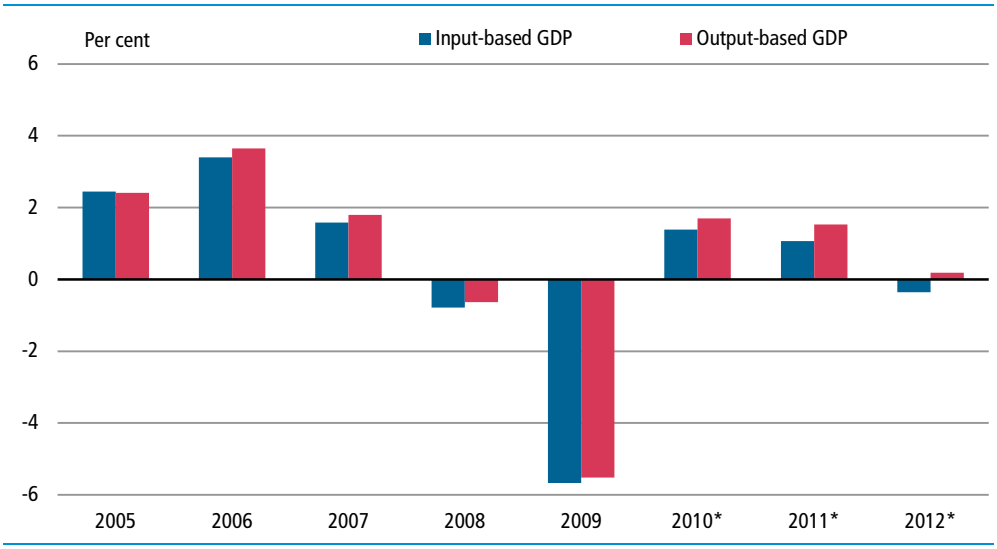


Effects of the output method on the whole economy

Changes in GDP

The output-based constant price calculation changes the growth rate of GDP figures. In 2006 and 2010 the difference was 0.3 percentage point, while in 2007, 2008 and 2009 a difference of 0.2 percentage point increase in GDP growth was observed. In 2008, both methods generate negative GDP growth rates of -0.8 and -0.6 per cent for input- and output-based methods, respectively. The negative development continues in 2009 where GDP fell by over 5.7 per cent for input-method and fell by 5.5 per cent when the output-method is implied. The greatest impact is observed in 2011 and 2012 where the output method increases GDP growth with 0.4 and 0.6 percentage points respectively.

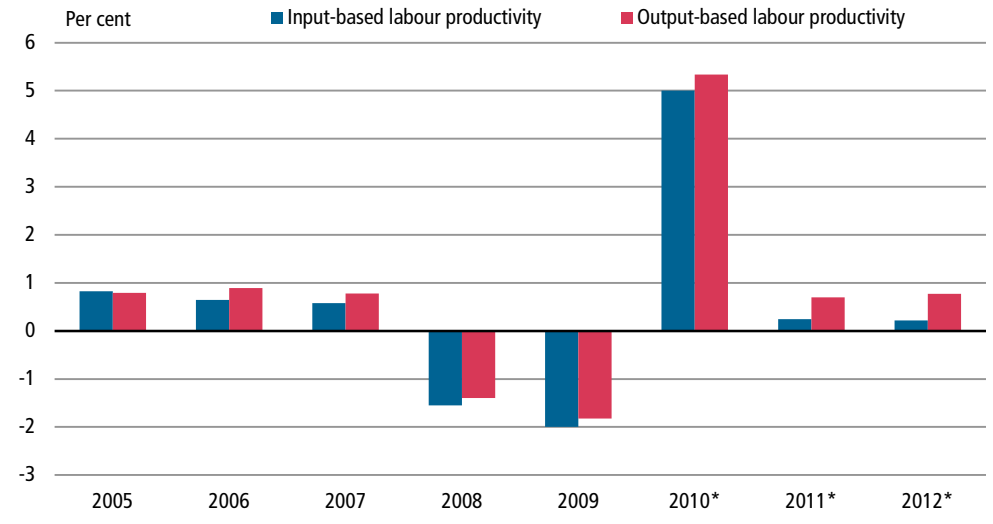
Figure C Growth in gross domestic product distributed according to calculation method



Productivity increases

If the alternative figures are used for the production value in productivity calculations, an equivalent effect is observed (figure D). Productivity is here measured as output per hour worked for the total economy. The output-based production value generally increases productivity growth compared to the official calculations. The most visible difference occurs in 2011 and 2012, where the output-based method produces a productivity increase, which is nearly 0.5 percentage point higher than the official calculations. For the period as a whole, the published productivity figures indicate an average annual growth rate of productivity of 0.5 per cent, while the alternative calculations produce an average annual growth rate of 0.7 per cent. These calculations show that the average productivity growth from 2005 to 2012 would be 0.2 percentage point higher using the output-based calculations. The productivity decreased sharply in 2008 and 2009 using both methods, though it increased again in 2010 for both methods.

Figure D Output per hours worked distributed according to calculation method



Note: For interpretation of current data, see fact box in chapter two: Facts about non-market-related finance and work productivity.

Experimental quality adjustment

We have made some experimental estimates with quality adjustment of health care services and education but these calculations are not included in the reported results of the output method. The experimental quality adjustments of health care and education have 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 for a few areas. Since only a small part of the non-market production is quality adjusted, the effects are not fully reflected. The quality indicators are only calculated for 2001 - 2006.

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[1]. 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 (about 25 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 firstly to calculate the production value for non-market 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 based on five pilot projects published in 2007, 2009, 2011 and 2012 and contains updated figures and a presentation of the progress made since then. This publication also covers the initial experiments with explicit quality adjustment for health care services as well as some educational services and includes some discussion about the quality of social services.

Data inconsistency due to local government reforms

In Denmark, a major reform in the local governments was implemented in 2007. The reform implied substantial changes in the way that most services were compiled. This data break must be taken into account when comparing 2006 with 2007.

Productivity figures in this publication are based on the revised number of hours worked published in June 2013.

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 output 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.

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

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. 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 total production costs.

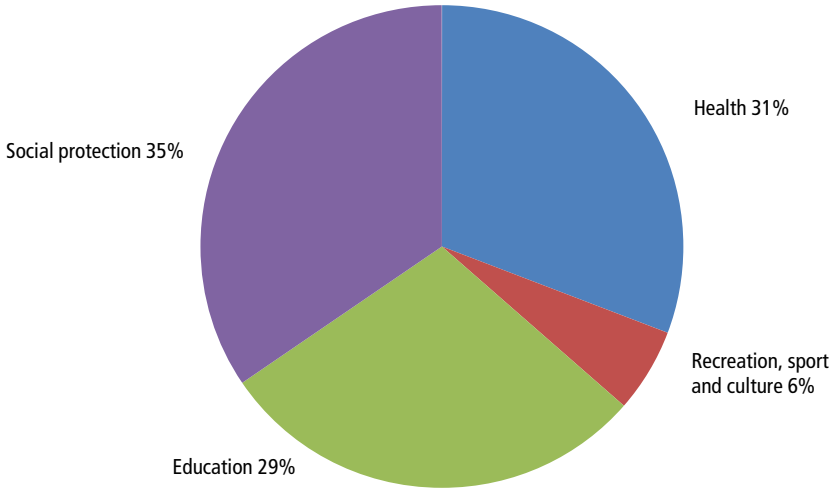
Individual and collective services

The non-market services are divided into individual and collective services. The individual services are consumed by the household, while the collective services are provided to society as a whole.

Individual services

In Denmark, education, health and social services are the most common kinds of government provision free of charge or at prices, which are economically in significant. The above mentioned individual services – including recreation, culture and religion – comprise 74 per cent of non-market output. Under these circumstances, the price paid cannot 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 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 and subsidies on production.

Figure 2.1 General government expenditure on non-market individual services. 2010



The breakdown of the 2010 costs of providing individual series is given in figure 2.1. Social protection has the largest weight with 35 per cent of the total individual consumption followed by health care and education that make up 31 and 29 per cent respectively. Recreation, culture and religion make up 6 per cent.

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. the prices and quantities determine the value at which the producers supply and the purchasers buy. These services are not discussed in this publication.

GDP and productivity

Setting input = output has a tendency to underestimate the contribution of the government output to GDP. It also neglects changes in public sector productivity.

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 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 of 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 questions to be answered are: what is the public output and how do we measure it? However, identifying such indicators is not that simple. It requires distinguishing between output, outcome and activity. 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, e.g. by lifestyle changes 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 the total of output growth can be calculated.

Quality

To be able to reflect the changes in the real value of output, it is important that the calculation of production value takes quality changes into account. Atkinson's 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 are assumed to 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 according to their quality. When one considers the changes in price and volume of the market production, it is also necessary to look at the changes in the quality. The same is true for the non-market-production, but here it is difficult to measure 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 and 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. rice 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 publication will discuss and present some examples of quality indicators in health care service and education, and discuss the quality of social protection services. Also, the above-mentioned aspects will be further developed for each of these services.

Outcome vs. output

It is important to recognise the difference between measuring output from the public service and measuring outcomes, and the link between them. Measuring the volume 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 to learn, socioeconomic background and motivation. Measuring the direct outcome of an education service can be examining the pupils' level of knowledge at the beginning of the school year and the same examination could be conducted at the end of the school year. Hence the level of transferred knowledge and skills are 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). Output denotes the service provided, i.e. it includes activities such as preparing lessons, classroom teaching, setting examinations, marking students' work, general supervision and counselling.

The same measurement problem exists for health care services - how can the contribution of health services be measured? The most optimal way may be to measure 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. Weights need to be determined in order to combine the different aspects to form a single quality adjusting indicator. For complex areas, e.g. health care, the quality

consists of many dimensions, for instance the effectiveness of the treatment, waiting time before a given treatment etc. An important challenge is to combine the different quality dimensions and weight them according to importance.

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

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

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

$$Output = Quantity \times Quality$$

The characteristic of the quality indicators

Quality indicators have to reflect all 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 considerations: the importance of the indicator, the scientific and methodical reliability and the access to data.

2.1 Productivity

Input-based productivity

One of the weaknesses of the input-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 that 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 there are no changes in input-based productivity.

In practice, the composition of the workforce and capital will not be constant over time, since there are constant changes to the workforce volume and its educational composition changes, along with investment in new capital equipment. Productivity will therefore, change over time.

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.

The production value can now change, regardless of the amount number of working hours.

Facts about non-market-related finance and 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.

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

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.

$$Wages \uparrow \Rightarrow \text{Production value} \uparrow \Rightarrow Grossvalueadded \uparrow$$

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.

$$Workproductivity \leftrightarrow = \frac{Grossvalueadded \uparrow}{Hours \uparrow}$$

Or

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

3. Individual non-market services in the National Accounts

This chapter will describe the public non-market individual 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 straight-forward 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 play 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. [2]

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.

[2] 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.

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
- 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

The public non-market activity is recorded at current prices in the Danish national accounts by adding 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, inputs are deflated. 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 should 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 to deflate of compensation of employees should consequently cover the same concepts.

In the context of the national accounts, a rise in the average cost of wages is not deemed to necessary represent a wage increase. We distinguish between changes in remuneration that are due to a change in the quality of the workforce and changes that occur to ensure the availability of a sufficient 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 production. 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[3].

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. This ensures that the time frame for implementing the method is long enough to ensure a sufficiently high quality data for the whole period.

The next few sections describe the guidelines for 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. In chapter 5 we describe the way social protection calculation should be carried out, while 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.

[3] 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 price and volume growth is calculated from a theoretical point of view using the output-based method, cf. the box below.

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 is that 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 value 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:

$$V_t^Y = \sum_j P_{t,j} * M_{t,j} \qquad 3.1$$

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:

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

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

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

When calculating chained volumes, 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 equation for the Laspeyres chain index between periods t and t+1 will be as follows:

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

while the formula for the following year is:

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

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*, 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 according to equations 3.1 and 3.2:

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

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

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

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

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:

$$PV_{t+1}^{D} = \frac{1}{P_{t,t+1}^{B}} * PV_{t+1}^{Y} \qquad 3.9$$

This produces PV_{t+1}^{D}, which is the *PV* for the period *t+1* calculated at 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_{t+1}^{D} and PV_{t}^{Y}, which is the PV in the prices in the previous period, t. These two PV's 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:

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

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.

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

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 purposes.

Danish Healthcare Services

The Public Danish Healthcare Services are extremely extensive; therefore they are 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
- Public dental services
- Residential and day care places for the elderly

General hospital activity

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.

Change in DRG

The National Board of Health made some changes in the DRG's between 2006 and 2007 which means that some diseases are difficult to compare over time. This causes some inconsistency in data.

Psychiatric hospitals

Until 2006 the specialized hospitals, i.e. psychiatric hospitals, were separate, independent units in the National accounting, but after the local government reforms they are now perceived as being part of general hospitals. The National Board of Health made a DRG for psychological diseases from 2008 and we have included these treatments in the calculations.

Public dental services

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

Regarding residential and day care facilities for the elderly, it is classified as an A method when the number of people receiving care is distributed according to the level of care. 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. In cases 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 industries, namely:

- ☐ 860010 Hospital activities
- ☐ 860020 Medical and dental practice activities
- ☐ 870000 Residential care activities

Hospitals

Non-market production of hospital services is placed in industry 860010 Hospitals. Production in this industry is almost exclusively non-market: nearly the entire production value is generated from non-market producers; a minor share is produced by market producers - in this case private hospital. In 2010, the industries' total production value was over DKK 84 billion.

860010 Hospitals

- The production value in 2010 was approx. DKK 84 billion measured at current prices
- 99 per cent of production is non-market
- Hospital services make up 65 per cent of all health services
- Non-market production from hospital services makes up over 16 per cent of the total non-market production.

Medical and dental practice activities

In industry 860020 Medical and dental practice activities, 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.

860020 Medical and dental practice activities

- The production value in 2010 was approx. DKK 35 billion measured at current prices
- 23 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

Industry 870000, Residential care activities shows data for care and social services for the elderly and other people at residential homes. This industry 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 2010 was approx. DKK 32 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. Therefore the part that is considered as health care should be included in the calculations of volume indicators for health care.

870000 Residential care activities

- The production value in 2010 was approx. DKK 32 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 describes the sources used to calculate the output-based price index for the health care services, and determines output-based price indices for the health care services in Denmark. The price index for the quantity of health care services, which is determined by equation 3.8:

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

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, contains about 2,350 product numbers, this level of detail is not always comprehensive enough to set up a price index.

Deflation of hospitals

Industry 860010 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 hospitals. Therefore, it is necessary to draw on more detailed information in order to perform a constant price calculation, which takes into account the price growth for hospital services.

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 the 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 2010

COFOG		DKK mill.	per cent share
0713	Therapeutic appliances and equipment	1 124	1
0721	General medical services	1	0
0723	Dental services	2 309	2
0724	Paramedical services	4 279	4
0731	General hospital services	82 299	68
0732	Specialised hospital services	8	0
0734	Nursing and convalescent home services	24 301	20
0740	Public health services	1 766	1
0750	R& D health	186	0
0760	Health n.e.c.	4 184	3
070	Total health	120 458	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 industry 860020 Medical and dental practice activities 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 disabled

870000 Residential care activities 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. Hence a weighted price index for nursing homes, etc. is 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 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 2010, it was used to convert the production values for about DKK 85 billion. The price index thus has a decisive influence on the price and volume growth for the non-market economy. In fact, this index is given so much weight that a major change in the deflator is directly reflected in 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 DRG system contains information about the number of treatments and the associated fees for about 800 different types of treatment. The data is distributed according to a range of established main categories, known as MDC classification. 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. As mentioned above there are some inconsistencies in data between 2006 and 2007, where the Danish

National Board reorganised the DRG groups, because of this the two years are not fully comparable.

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 compareable are used. When equation 3.8 is applied to DRG data, a price index for the period 2011 to 2012 can be calculated as:

$$P^{B}_{2011,2012} = \frac{72\,141\,567}{74\,563\,991} = 0.968$$

The price for general hospital treatments between 2011 and 2012 decreased 3.2 per cent.

Table 4.2 shows the price development for the periods 2005 to 2012 calculated according to the above method, using the DRG data, which is comparable between two consecutive periods. The table shows that in three out of eight years, it was on average less expensive to perform an equivalent treatment in the following year.

Table 4.2 Price change for general hospitals

	2005	2006	2007	2008	2009	2010	2011	2012
	per cent annual growth							
Price change for general hospitals	1.7	-2.2	-1.7	0.3	4.5	3.9	1.8	-3.2

4.2.2 Price index for public dental services

Public dental services are the least valuable sector for which a direct price index is calculated. In 2010, non-market production from dental services totalled DKK 2.3 billion.

A special extract from the Social Resource Statistics[4] (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 4.3 provide an overview of the number of people receiving dental treatment.

Table 4.3 Number of treatments

	2005	2006	2007	2008	2009	2010	2011	2012
	quantity							
Public dental clinics	1 069 276	1 076 184	1 068 531	1 107 196	1 113 386	1 120 150	1 121 287	1 101 425
Dental services: practising dentists	171 524	171 902	151 252	141 120	137 211	136 024	125 481	111 000
Orthodontic treatment: public clinics	15 911	16 389	16 880	17 834	18 581	18 658	18 244	17 839
Orthodontic treatment: practising dentists	2 830	2 943	3 061	3 183	3 311	3 324	3 250	3 178
Total	1 259 541	1 267 418	1 239 724	1 269 333	1 272 489	1 278 156	1 268 262	1 233 442

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

[4] Published by Statistics Denmark

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 4.4 Costs associated with dental treatments

	2005	2006	2007	2008	2009	2010*	2011*	2012*
	DKK 1000							
0723 Total dental services	1 945 548	1 943 264	2 012 542	2 182 957	2 278 734	2 317 226	2 317 226	2 317 226
Dental care	1 297 032	1 295 509	1 341 695	1 455 305	1 519 156	1 544 817	1 544 817	1 544 817
Orthodontic treatment	648 516	647 755	670 847	727 652	759 578	772 409	772 409	772 409

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, cf. table 4.5.

Table 4.5 Calculated fee for dental treatments

	2005	2006	2007	2008	2009	2010*	2011*	2012*
	DKK per treatment							
Dental care	1 045	1 038	1 100	1 166	1 215	1 230	1 239	1 274
Orthodontic treatment	34 604	33 507	33 641	34 622	34 697	35 138	35 935	36 751

By means of the prices in table 4.5 and the volumes in table 4.3, 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 4.6 shows the calculated price index.

Table 4.6 Price increase for dental treatment

	2005	2006	2007	2008	2009	2010*	2011*	2012*
	per cent annual change							
Price increase for dental treatment	2.8	-1.5	4.0	4.9	2.8	1.2	1.3	2.6

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

Industry 870000 Residential care activities, consists of both non-market care for the elderly and other non-market services for the elderly, e.g. non-nursing residences and so on. The part considered as "care" is classified as a health service in COFOG, and therefore should 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 2010 was approx. DKK 32 billion.

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, which means that nursing home places have been converted or discontinued in favour of homes for the elderly. According to the Danish

industry codes[5], homes for the elderly belong to an industry for adult social care. Thus they are included in the following chapter and not in these calculations.

Table 4.7 Number of residential and day care places for the elderly

	2005	2006	2007	2008	2009	2010	2011	2012
	quantity							
Residential places								
Nursing homes/residencies	17 819	15 424	12 235	9 823	9 436	8 761	7 546	6 907
Sheltered housing	3 016	2 870	2 242	1 987	1 824	1 804	1 507	1 313
Elderly homes	24 566	30 983	31 081	33 048	35 575	36 449	36 550	37 527
Housing for the elderly	27 788	26 270	29 211	30 224	31 808	34 498	35 237	34 686
Day care places								
Day centre[1]	25 476	25 758	11 670	12 819	10 655	15 060	18 191	19 267
Social centres[2]	3 722	3 766	-	-	-	-	-	-

[1] Day centres consisted of day centres- with and without visitation before the municipality reform in 2007. Day centres without visitations have been discontinued as a result of the reform.
[2] Social centres is added to Day centres from 2007.

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. Copenhagen City first began to present its 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 before 2006 and after. For this reason, the unit costs from 2006 to 2012 are based on retrospective calculations based on the overall growth.

Table 4.8 Unit prices for residential and day care places for the elderly

	2005	2006	2007	2008	2009	2010*	2011*	2012*
	unit prices							
Nursing homes/residences	361 549	386 315	379 612	398 420	400 911	407 867	403 202	405 629
Sheltered housing	139 375	148 922	146 338	153 588	162 060	164 871	162 986	163 967
Elderly homes	361 549	386 315	379 612	398 420	400 911	407 867	403 202	405 629
Housing for the elderly	90 387	96 579	94 903	99 605	100 228	101 967	100 801	101 407
Day centres	174 218	186 152	182 922	191 985	202 574	206 088	203 732	204 958
Social centres	43 555	46 539	45 731	47 997	50 644	51 523	50 933	51 240

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 0.5 per cent and 6.6 per cent in the period, cf. table 4.9.

Table 4 9. Price increases for residential and day care places for the elderly

	2005	2006	2007	2008	2009	2010*	2011*	2012*
	per cent annual growth							
Price increase for residential and day care places for the elderly	0.5	2.0	4.2	5.5	6.6	2.5	0.8	3.9

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

4.3 Quality of health care

This section will consider some important aspects 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 calculate a quality adjusted output-based price index.

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 whereby 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; the importance, the scientific soundness of the measure and, 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, the death rate of patients admitted with acute disease, such as appendicitis, 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 a 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 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 little data is available for preventive arrangements. The National Board of Health has data about the asthma mortality rates covering the analysis period. Also, the National Board of Health has 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

Denmark has experienced a centralization of hospitals. One of the main goals was to concentrate the expertise in a few, central hospitals. For instance, the small, provincial hospitals no longer were allowed to perform 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 the 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. Firstly, they may dislike waiting; waiting may be a bad experience for patients even when they are not in pain. Secondly, 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 of 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 have 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.

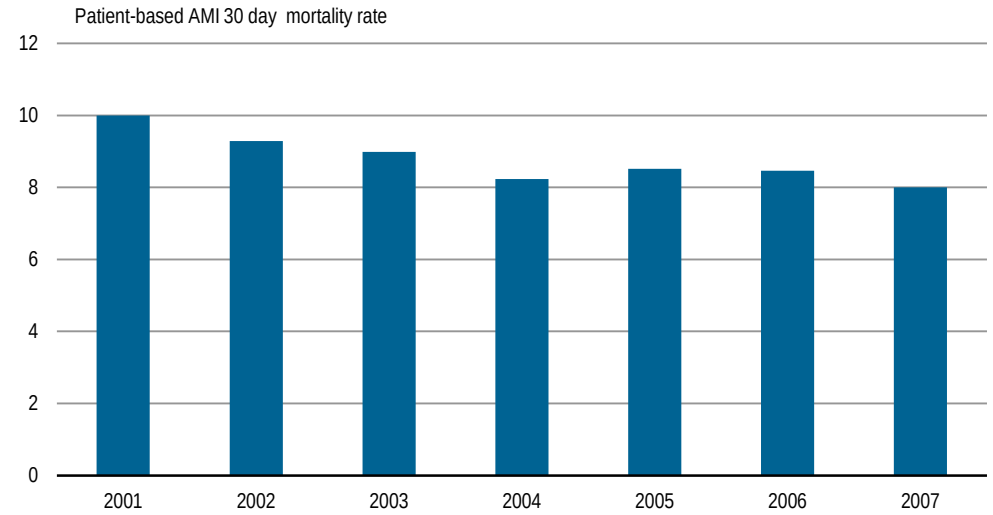
Survival rates

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. a hundred per cent and there will always be some unmeasured factors left, either because they cannot be measured or because they cannot 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 2007. 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 the Board is 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 weigh 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

In this publication patient experiences are also 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. Here, patient experience is 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

Decrease in heart attack mortality rate

The figure above shows the patient-based AMI (heart attack) 30-day 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.

Patient-based AMI 30-day mortality-rate

The quality index for heart attack is calculated in the following way; the changes in Patient-based AMI 30-day mortality rates illustrated in the figure and patient experience are used as quality indicators for the period 2001 to 2006. The data shows a 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 experience enter negatively to the quality index.

The table below shows calculations for the quality index for heart attacks in detailed level; the first two rows show the changes in mortality rate and patient experience, respectively. As 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 to 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.

As stated before, 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 70 per cent of the full quality.

Quality index for heart attacks

	2001	2002	2003	2004	2005	2006
Changes in for patient-based AMI 30- day mortality rate	-9.0	-7.1	-3.3	-8.4	3.4	-0.5
Change in patient experience .	1.0	1.0	-1.9	-1.9	-0.3	-0.3
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
Contributiong factor	-5.3	-4.1	-2.2	-5.2	2.0	-0.3
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

Quality index for general hospitals

The quality adjusted output-based price indices for general care are calculated from 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 of different indicators, which are selected and weighted according to their importance (subjective assessment). The quality adjusted output-based price index for the 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, e.g. heart attacks, but this one covers 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 4.10). The quality adjusted indices grow at a lower rate in four out of six periods, while it grows faster 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 the choice of weight given to the indicators is both subjective and can result in other indices if the criteria change.

Table 4.10 Comparison of price indices with and without quality adjustment

Price changes 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. 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 of family and children, when the data is quality adjusted, it is classified as an A method. If no quality adjustment is made, this too is classified as a B method.

Quality of the social protection services

This chapter will try to outline some of the key quality issues of the public social services, i.e. we will briefly discuss the possible quality aspects of those services and suggest some indicators to measure quality over time.

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

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

- 870000 Residential care activities
- 880000 Social work activities without accommodation

Industry 870000 Residential care activities, includes data for residential homes and centres, which includes care of the elderly, which is classified as a health service and social service, foster families, residential homes for children or young persons, homeless, rehab centres and so on. Over 90 per cent of this total production is non-market and is made up primarily of health services (primary elderly homes). The part of this industry that is related to health care for the elderly is treated above in chapter four, and this chapter calculates volume indicators for the other part of this industry considering social services, which includes rehabilitation, foster families and homes for children or young people etc.

870000 Residential care activities

- The production value in 2010 approximately 32 DKK 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, disabled adults, children and young people with special needs.

Industry 880000 Social work activities without accommodation includes crèches, kindergartens, after-school centres, special educational assistance, preventive arrangements, day centres, individually care and help in own home and so on. Approx. 85 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, individual help at homes, special educational assistance, and help for practical purposes and preventive offers for persons with any kind of social problems and disabilities.

880000 Social work activities without accommodation

- The production value in 2010 was almost DKK 105 billion measured in terms of the prices for the year
- Approx. 85 per cent of the production value is non-market
- Social work activities without accommodation includes crèches, kindergartens, after-school centres, day centres, individually care and help in own home and etc.

5.2 Output-based price index for social protection

This section 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 according to 3.8.

As illustrated above, the social services in national accounts are placed in two industries. 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.

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. The COFOG groups are:

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

Table 5.1 Non-market production of social protection 2010

COFOC		DKK mill.	per cent share
1012	Sickness and disability	32 101	23
1020	Old age	15 984	12
1040	Family and children	58 367	42
1050	Unemployment	14 523	10
1060	Housing	0	0
1070	Social exclusion n.e.c	6 457	5
1090	R&D Social protection	10 042	8
1000	Total social protection	138 695	100

5.2.1 Residential care activities

Industry 870000 Residential care activities, consists of both non-market services for the elderly, different types of social services for disabled people with various needs. The part of Industry 870000 considered as "care" is classified as a health service in COFOG, and, therefore, is included in the calculations of volume indicators for health care in chapter 4. The part that is not considered "care" is classified as social protection services and treated in this chapter.

The Social Resource Statistics provides 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 any representative key fees for different types of institutions, therefore the costs for these services are given in the internal database. The detailed COFOG code 1012 disabled and, 1040 family and children include costs for non-market residential social services. 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. The weighted price index for residential institutions is compiled by multiplying the calculated unit price by activity, weighted with their respective production values from the COFOG classifications. The price index for residential institutions is given in table 5.4. This index is compiled as a weighted index for all residential institutions inclusive elderly centres calculated in chapter 4 above.

Table 5.2 Number of residents at different social institutions

	2005	2006	2007	2008	2009	2010	2011	2012
	Quantity							
Residential offers for people with physical disabilities[1]	7 732	7 925	11 097	10 421	10 138	9 865	8 982	8 421
Temporary residential offers for people with special needs	5 893	6 022	5 915	6 013	5 857	6 109	6 008	6 486
Residential offers for people with mental disabilities [2]	3 871	3 933	•	•	•	•	•	•
Foster families and residential homes for children and young persons[3]	11 614	13 633	14 224	14 542	14 666	14 597	14 259	14 259
Preventive arrangements for children and young persons	12 077	12 776	13 235	13 365	14 318	14 992	14 543	14 543
Residential institutions for children or young persons[4]	5 054	5 054	5 444	5 833	6 146	5 927	5 703	5 748

[1+2] is merged from 2007 as a result of the local government/ municipality reform.

[3+4] No figures for 2007, therefore it is assumed that the same level as the previous year

Table 5.3 Unit prices for residential institutions

	2005	2006	2007	2008	2009	2010	2011	2012
	unit prices							
Residential offers for people with physical disabilities[1]	694 380	705 395	553 514	683 653	701 372	737 014	771 778	854 962
Temporary residential offers for people with special needs	415 988	440 275	497 164	565 277	629 233	634 907	610 738	627 250
Residential offers for people with mental disabilities[2]	478 673	503 433	•	•	•	•	•	•
Foster families and residential homes for children and young persons	382 133	336 837	354 672	387 923	419 730	429 163	421 968	428 082
Preventive arrangements for children and young persons	138 525	140 491	162 561	184 629	206 405	212 811	215 542	234 214
Residential institutions for children or young persons	686 279	717 051	517 305	546 026	568 762	599 937	561 454	519 624

Note: The large changes in unit prices between 2006 and 2007 are mainly due to the municipality reform, where the way of counting services changed in many service areas

[1 + 2] is merged from 2007 as a result of the local government/ municipality reform.

Table 5.4 Price change for residential institutions

	2005	2006	2007	2008	2009	2010*	2011*	2012*
	per cent annual change							
Price change for residential institutions	2.7	5.5	-3.5	5.5	6.6	2.5	-0.8	3.9

5.2.2 Price index for Social work activities without accommodation

Industry 880000 Social work activities without accommodation, consists primarily of non-market services for families and children and of institutions such as kindergartens and after-school activities for children and young persons. This industry also includes offers for children and young people with special needs, for instance foster families and residential homes as well as preventive arrangements As well as practical help to elderly and disabled people in their own home. Table 5.5 show the number of places in different kinds of institutions. The Social Resource Statistics provide details concerning the number of people in the different institutions without accommodation.

Currently, it is not possible to find any representative key fees for different types of institutions; therefore the costs for these services are given in the internal database. The detailed COFOG codes 1012 Old age and 1040 Family and children includes costs for non-market social services for institutions without accommodation. The internal data specifies the costs 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.

Price indices for social institutions without accommodation are given in table 5.10 and it varies between -3.0 per cent in 2011 and 3.7 per cent in 2007. However the price indices for industry 880000 do not vary as much as those for industry 870000, where the volatility in price indices is very high; it varies between -3.5 per cent in 2007 and 6.6 in 2009.

Table 5.5 Number of children at different social institutions without accommodation

	2005	2006	2007	2008	2009	2010*	2011*	2012*
	quantity							
Day care	65 666	65 666	66 007	63 562	62 394	60 358	56 032	51 357
Day nursery	16 994	16 994	13 339	12 241	11 988	11 756	11 171	10 238
Kindergarten	106 087	106 087	98 783	91 000	83 960	82 094	76 748	67 202
After-school centre	207 024	205 714	222 366	227 792	232 929	234 666	240 685	249 984
Age integrated institutions	134 170	134 170	144 005	159 587	163 540	170 157	188 844	198 690
Clubs for children and young	33 253	32 939	20 140	16 832	16 911	17 249	12 832	9 998
Youth recreation centres	75 203	75 203	73 382	71 658	76 959	76 332	66 492	63 276
Special day-care centres	1 960	1 960	1 868	1 775	1 815	1 941	2 062	1 923

Table 5.6 Unit prices for child care

	2005	2006	2007	2008	2009	2010*	2011*	2012*
	unit prices							
Day care	89 746	92 802	93 418	97 303	103 797	107 171	109 082	111 643
Day nursery	124 422	126 631	126 312	138 365	145 757	143 476	118 561	120 611
Kindergarten	67 291	66 167	68 196	72 984	77 313	74 309	69 511	67 940
After-school centre	24 797	26 085	26 594	27 804	28 970	28 837	27 512	25 965
Age integrated institutions	74 158	79 222	82 783	80 913	89 321	91 903	85 206	86 980
Clubs for children and young	36 167	37 267	42 604	39 917	40 492	36 566	37 960	44 611
Youth recreation centres	20 619	20 969	21 722	20 663	19 950	19 848	22 350	23 613
Special day-care centres	377 090	390 930	404 371	512 248	584 844	595 060	520 884	539 243

Table 5.7 Number of adult/elderly at different social institutions without accommodation

	2005	2006	2007	2008	2009	2010*	2011*	2012*
	quantity							
Special educational assistance	14 951	16 833	15 935	20 181	24 408	26 836	29 585	31 237
Protected employment	12 300	11 400	8 163	8 356	8 865	9 569	9 217	8 898
Activity- and social offer	20 545	21 912	18 784	19 042	22 455	25 834	22 865	24 171
Rehabilitation[1]	6 019	8 039	•	•	•	•	•	•
Contact- and companion arrangements	12 602	13 909	10 621	13 378	14 670	15 146	15 038	14 726

Note: The large changes in between 2006 and 2007 are mainly due to the municipality reform, where the way of quantifying services changed for many services.

[1] from 2007 is no longer a social service product

Table 5.8 Unit prices for different social institutions without accommodation for adult and elderly

	2005	2006	2007	2008	2009	2010*	2011*	2012*
	Unit prices							
Special educational assistance	68 630	64 805	57 939	41 901	35 630	29 324	21 503	18 690
Protected employment	84 301	96 438	130 695	125 197	125 331	116 182	115 972	125 715
Activity- and social offer	83 301	83 247	90 344	104 134	91 418	83 181	92 064	88 100
Rehabilitation[1]	160 594	127 909	•	•	•	•	•	•
Contact- and companion arrangements	40 723	39 177	40 361	34 051	31 202	30 371	27 840	29 287

Note: The large changes in between 2006 and 2007 are mainly due to the municipality reform, where the way of counting services changed for many services.

[1] from 2007 is no longer a social service product

Table 5.9 Number of hours of individual care for the elderly and disabled in their own home

	2005	2006	2007	2008	2009	2010*	2011*	2012*
	quantity							
Individually help and care in own home	28 712 444	25 079 119	26 172 749	29 454 516	28 947 927	27 401 416	24 452 813	22 938 739

Table 5.10 Price change for social institutions without accommodation

	2005	2006	2007	2008	2009	2010*	2011*	2012*
	per cent annual growth							
Price change for social institutions for institutions without accommodation	2.5	2.3	3.7	3.5	3.6	-0.5	-3.0	0.7

5.3 Quality of social protection services provided by the government

The output-based measures can be improved by adjusting output in a way that takes into account the quality changes of the service provided over time. Principle B of the Atkinson Review stated that 'the output of the government sector should be measured in a way that is adjusted for quality changes over time.

Social care is currently measured in the National Accounts equating input used to provide the services with output. This publication uses a cost-weighted activity index, which weights together growth in prices. The limitations of this approach are that:

- A measure based on activity fails to take into consideration changes of quality in the service provided over time.

The social protection expenses constitute a significant part of the government spending in Denmark, hence it is important to be able to measure the value of the services correctly, i.e. the output of the public services.

Adult social care

The purpose of the adult social care is to meet the needs caused by old age and weakness by helping people with personal care and, to a certain extent, provide friendship for those who might be isolated, i.e. the main goal of social care is improvement of quality of life that people feel as a result of using the service. In Denmark, care for the elderly is primarily provided as home care and at nursing homes.

To measure the value of social care services correctly it is essential also to measure the changes over time, and measuring quality is not that simple; firstly, it is essential to define the quality aspects for the diverse services and, secondly, to identify the crucial indicators for those services. The quality of services in the case of social care for adults can be divided in two areas, namely the basic needs and the needs at higher domains.

Basic needs as:

- Accommodation
- Cleanliness and comfort
- Food
- Safety
- Personal cleanliness.

Needs at higher domains:

- Better quality of life, which includes involvement and control over daily life, dignity, activity and social participation.
- Involvement of the home residents in decision making.

Quality adjustment requires a system of weighting all quality aspects together in order to combine the different components to form a single quality indicator. But weighting of quality aspects together according to their relative importance is not that easy and another difficult and important issue is weighting of quality and quantity components together. For instance, should one per cent change in quality imply one per cent change in quantity? And who is best to make a judgement? (Providers, users, experts or general public and preference studies etc.) It is also vital that the weight given to the different indicators can change over time, the importance of a given service may not be constant over time, it may change with the structure of the society and technically development etc.

Quality indictor for the elderly care

As part of a documentation project conducted in 2011 Statistics Denmark collected several indicators that can be used to quality adjust home care. The data is primarily collected from a consumer experience survey which measures the share of elderly who are satisfied with the service provided. The survey covers approximately 10.000 elderly people where about 75 per cent have fully or partially answered. Some of the collected indicators are as follows:

- Quality of help
- The stability of help

Children's social care

Nursery houses, kindergartens and after school centres are the most common institutions, where children's social care services in Denmark are provided. This is related to the Danish labour market structure. Although it also includes plenty of special institutions for children and young people with special needs, for instance foster families and care homes.

One of the main goals for the high number of children's institution is to provide child care for children whose parents both work outside the home. At the same time, it is expected that children and young people join in a wide variety of high quality, positive activities developing their personal and social skills, i.e. by engaging children and young people in structured, positive activities and help them develop good personal and social skills, as well as giving them a better sense of well-being; thereby reducing risky behaviours. Most importantly; children should be ready to start school with appropriate skills and confidence.

Since the unit cost we have for these activities does not reflect the quality of those services given, that unit cost is based on producer valuation and not consumer valuation and the fact that quality of services changes over time. One of the most important quality aspects in the case of child care is the number of children per present adult, i.e. adjusted for absenteeism, etc. The more time spent on one child, i.e. fewer children per adult, the higher the quality is considered to be. But at the moment we do not have any empirical research that shows the optimal number of children per adult. Therefore, quality adjustment is necessary to reflect the 'true'

value of the service. Below is a list of quality indicators that could be used to adjust social institution (for primary cares as nursery houses, kindergartens and after school centres) for quality over time:

- Child/educator (adult) ratio
- Staying safe
- Personal, social, physical and emotional and behavioural development
- Creative development
- Personal care routines
- Language, communication and reasoning
- Knowledge and understanding the world
- Family and social background

However, most of those indicators are difficult to measure in practice.

Another important part of child social care is fosters families, care homes and other special institutions for children with special needs, which are either related to their socioeconomic background or are congenital.
The quality changes for special institutions and homes could be measured by some of the indicator given below.

- Children per adult
- Children who are placed at foster families and children's homes and their obtained education level and exam results over time. For instance the share that has obtained a 9th grade exam, the share that finishes a high school and the share with and higher education.
- Personal, social, physical and emotional and behavioural development over time
- Labour market commitment, how well are they performing in the labour market over time
- Socioeconomic and demographic development

Measuring methods for social protection services

The mentioned quality indicators for social protection services are in general not easy to measure, it may require vast amounts of resources, but the most reasonable method may be observation by specialists and surveys.

6. Education

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

The education industry 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.

Therefore, A and B methods will cover entire or very large portions of the educational industry. 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 higher education
    - University courses
    - Other higher 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 Eurostat's 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. Regardless of method, the same applies 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 industries:

- 850010 Primary education
- 850020 Secondary vocational education
- 850030 Higher education
- 850042 Adult education etc. (other non-market)

All areas producing educational services contain exclusively non-market services. Market-based educational services are placed in industry 850042 Adult education etc. (market). This includes, e.g. driving and music schools.

850010 Primary schools

- The production value in 2010 was over DKK 52 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 industry also includes figures for continuing education colleges and schools

Industry 850010 Primary 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.

850020 Secondary education

- The production value in 2010 was DKK 31 billion measured in terms of the prices for the year
- The entire production value is non-market
- The industry includes figures for post-secondary, higher preparatory exams, commercial colleges, trade schools, agricultural colleges, social and health education, and so on.

850020 Secondary educations include both technical and general post-secondary schools by definition. The industry also includes a broad range of business schools along with social and health education. All education is classified as non-market.

850030 Higher educations

- The production value in 2010 was approximately DKK 30 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.

850030 Institutes of higher 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.

850042 Adult educations etc. (other non-market)

- The production value in 2010 reached about DKK 3.6 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.

Industry 850042 Adult education etc. is the smallest of the non-market educational industries. 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 according to equation 3.8.

Educational services in the national accounts are, as previously stated, placed in four industries covering the various educational levels available in the education system. All four industries exclusively contain 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. 2010

COFOG		DKK mill.	per cent share
0920	Primary and lower secondary education (0912 + 0921)	65 002	56
0932	Post-secondary and other mid-length education, and preparatory schools for tertiary education	24 424	21
0940	Tertiary education (0941 + 0942)	19 411	17
0950	Education not definable by level	5 296	5
0960	Subsidiary services to education	76	0
0970	R&D education	483	0
0980	Education n.e.c.	2 340	2
090	Total education	117 031	100

In the educational industry, 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:

1. 0920 Primary and lower secondary education is placed in 850010 Primary and lower secondary education
2. 0932 Post-secondary education etc. is placed to 850020 Post-secondary and vocational education
3. 0940 Tertiary education is linked to 850030 Institutes of further education.
4. 0950 Education not definable by level is linked to 850042 Adult education etc. (other non-market)

Information will be used to distribute the calculated index so 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 homogeneous. 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.

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.

Data on the number of students/pupils

In Statistics Denmark's databases each student/pupil is given a code for according to type 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 be understood as 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[6]. 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.

Alternative data on the number of hours taught.

In the case of primary, secondary and post-secondary education, a more accurate measurement of volume is the number of hours taught. For primary education, UNIC has data for pupil hours so the figures for 2010 are based on number of pupil hours instead of number of pupils. The calculations for secondary education are still based on the less accurate measurement of volume, the number of students.

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 link between the two sources. 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; hence the fee for this has 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.

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*, using equation 3.8 is used to calculate the growth rate for primary and lower secondary education the following result is produced:

$$P^{B}_{2011,2012} = \frac{40\,482\,401\,014}{40\,362\,219\,937} = 1.003$$

The growth rate of prices for primary and lower secondary education between 2011 and 2012 was 0.3 per cent.

---

6 See chapter 3

Table 6.2 Price change for education

	2005	2006	2007	2008	2009	2010*	2011*	2012*
	per cent annual growth							
Price increase for primary ed. . . .	3.3	2.9	0.9	3.8	5.7	0,6	-4,0	0,3
Price increase for secondary ed.	4.6	0.5	-0.4	1.5	1.0	4,3	-0,7	-0,4
Price increase for higher ed.	0.8	-0.4	1.7	1.5	3.1	4,4	-0,5	-0,5
Price increase for adult ed.	-0.8	-0.7	0.5	1.5	1.0	-9,0	-0,7	-0,6

[1] There is a break in the estimation of price indices for elementary schools, as indices in 2010 are based on student hours rather than number of students.

The other three price indices are similarly calculated. Table 6.2 shows a total overview of the price indices for educational services between 2005 and 2012. The change in the price index for primary education varies between -4.0 in 2011 and 5.7 in 2009. It is to be noted that the indicators of primary school for the period from 2010 to 2012 are pupil hours and not number of students as is the case for previous periods. The data for secondary education shows that the prices for this service varied between a price drop of 0.7 per cent and a price rise of 4.6 per cent. For higher education, the growth rate of price was calculated at between -0.5 per cent and 4.4 per cent, while adult education varied between a price drop of 9 per cent and a price rise of 1.5 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. 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 based equation 3.12.

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 economic well-being of individuals and 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, because highly educated people earn a higher wage than people with lower education, and thus pay higher taxes during their lifetime.

In general, education outcome is considered to depend on 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.

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

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 and with a lot of discussions within the classroom. However, other studies confirm that class size does not have a statistically significant impact on learning (Wet stein and Mora, 2003).

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

The teacher/ student time

The amount of 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 a form of input to 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 and so is 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 spend on projects and team work could be an indicator of quality, since projects are considered to improve the pupils' skills in terms of 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 covers 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 are regarded as indications of good education service and high quality. The drop-out rated is available for public primary and lower secondary education

6.3.1 Quality adjustment of Danish educational services – an example

In this theme publication, we will show an illustrative example o quality-adjusting the education outcome with changes in class size for primary and lower secondary education. The data on class size is from Statistics Denmark's education register and it is only available from 2009 and onwards. Class size is currently the only available quality indicator we have. However, the partial data availability will give an incomplete picture of the education output. The data only covers the public primary and lower secondary education.

The quality adjusted output-based price indices for education are calculated according to 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 of different indicators, which are selected and weighted according to their importance (subjective assessment). The quality adjusted output-based price index for period 2011 to 2012 can be calculated as:

$$P^{q}_{2011,2012} = 1.003 * 1.010 = 1.013$$

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 higher than the index without quality adjustment. The higher price indices *with* quality adjustment indicate that the real volume growth will be lower if the production volume is quality adjusted.

Table 6.4 Comparison of output-based price indices *with* and *without* quality adjustment - for primary/lower secondary education

	2010	2011	2012
	per cent annual growth		
Output-based *without* quality adjustment	0.7	-3.9	0.3
Output-based *with* quality adjustment	1.2	-1.5	1.3

Negative contribution from increasing class size

The increasing class sizes indicate that the teachers' teaching time will be allocated to an increased number of students hence contributing negatively to the quality because the teachers will have less time per student (see the discussion above). Increasing class size means (if the output is not quality adjusted) that the unit costs per student hour will decrease (lower unit cost) and thus the deflator will decrease implying an increase in measured productivity. When the output is explicitly quality adjusted, the decline in quality would not cause output and hence productivity to rise. As the example shows that the decline in the quality causes the price index to rise and hence the output and the productivity will not be overestimated as it would have been if the output was not quality-adjusted.

7. Recreation, culture and religion

This chapter describes the sources used to calculate the output-based price index for the individual non-market production of Recreation, culture and religion.

Religion is classified as collective service, and since this publication only treats individual services, the figures for religion would not be showed in this publication.

Libraries, museums and other cultural activities

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

Sports activities

It is the same case for sports activities, when the number of people receiving services is distributed according to the level of services, this is classified as an A method. If the total number of people receiving services is used but not distributed according to level of service, this is classified as a B method.

7.1 Non-market production of Recreation and Culture in the National Accounts

Public non-market recreation and culture is mainly produced in the industries 910002 and 930012 which include both market and non-market production of

- 910002 Libraries, museums and other cultural activities (non-market)
- 930012 Sports activities (non-market)

Industry 910002 Libraries, museums and other cultural activities (non-market) includes data for the number of visits at libraries, museums, art galleries, exhibition halls, monuments, historic houses and sites, zoological and botanical gardens, etc., while the Industry 930012 includes support of facilities for active sporting pursuit's parks, swimming pools and activities like badminton, tennis, golf courses, football, gymnastics, handball etc. Over 80 per cent of the entire sector is non-market.

910002 Libraries, museums and other cultural activities (non-market)

- The production value in 2010 was DKK 7.8 billion measured in terms of current prices
- Over 90 per cent of the production value is non-market

930012 Sports activities (non-market)

- The production value in 2010 was approximately DKK 2.4 billion measured in terms of current prices
- About 80 per cent of the production value is non-market

7.2 Output-based price index for recreation, sports and culture

This section describes the sources used to calculate the output-based price index for recreation, sport and cultural services and determines output-based price indices, i.e. the quantity part of the output will be calculated by equation 3.8.

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

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 7.1 shows an extract from DIOR regarding the services classified as Recreation, culture and religion according to COFOG.

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

- 0810 Recreational and sporting services
- 0820 Cultural services

Table 7.1 Non-market production of Recreation, culture and religion. 2010

COFOG		DKK mill.	per cent share
0810	Recreational and sporting services	5 812	26
0820	Cultural services	8 606	38
0830	Broadcasting and publishing services	22	0
0840	Religious and other community services	7 026	31
1050	R&D recreation, culture and religion	340	2
1060	Recreation, culture and religion n.e.c	834	4
0800	Total Recreation, culture and religion	22 639	100

7.2.1 Price index for Recreation, sports and culture

In order to calculate the volume growth for Industries 910002 and 930012 according to an output-based method, we need some indicators for activity level as well as unit prices. However, it is not yet possible to find the actual activity level and representative key fees for different types of sporting activities that take part in the consumption of COFOG 0810. The total costs for Recreation, sports and cultural services, are given in the internal database. The activity level is assumed to be the number of individual memberships of sport clubs.

Table 7.2 shows the annual price increase for recreation, sport and culture. The price is a cost weighted index for different activities in industry 910002 Libraries, museums and other cultural activities. There is no clear tendency in the price index

Table 7.2 Price increase change for recreation, sport and culture

	2005	2006	2007	2008	2009	2010*	2011*	2012*
	per cent annual growth							
Libraries, museums and other cultural activities (non-market)	4.6	3.7	0.9	0.3	7.9	4.6	-3.7	2.8
Sports activities (non-market)	8.5	1.5	-1.9	5.0	-5.3	-5.6	2.6	-0.3

Generally, there were problems with systematic indicators for the activity level and indicators applied here are uncertain, i.e. collections of more systematic indicators are needed in order to compile a more accurate outcome for those industries.

8. 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. Thus the existing national accounts figures are recalculated using the new, output-based price indices, calculated in chapters 4-7. In other words, for non-market public individual 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 total 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 only a small part of the production is still quality adjusted.

8.1 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 industry 870000 also contains social services for the elderly and adults. Therefore, this section will analyse the effects of the following two indices:

Price index for 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 8.1 provides an overview of the development of the current and new price indices from 2005 to 2012.

Input-based deflators identical in the preliminary years

From the table, we can see that the input-based price indices are identical 2010-2012. This is because the national accounts calculations for those years have not yet been finalised. Since the calculations are not final, detailed product balances will not be presented and detailed deflation will not be applied. For the period 2010-2012 the same deflator was used for all non-market services, which is the reason why the price indices are identical. The method for 2010-2012 is based on materials from the preliminary year in which there are no detailed material available. The Danish national accounts are finalised three years after the end of a calendar year. Hence, 2010 is an extraordinary preliminary year.

General hospitals

In the case of hospitals, the comparison shows that the input-based price index measured a higher price growth than the output-based price index in six out of eight years. Figure 8.1 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.

Public dental services

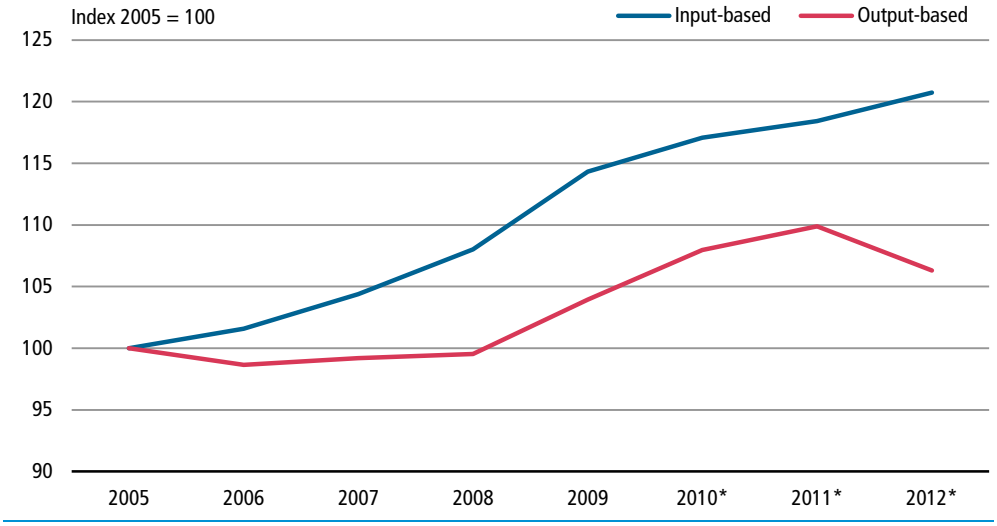
The picture is different in the case of the price index for public dental services; the output-based index grows faster in 5 out of 8 periods.

Table 8.1 Comparison of input- and output-based price changes for health care

	2005	2006	2007	2008	2009	2010*	2011*	2012*
	per cent annual growth							
General hospitals								
Input-based national accounts	2.1	1.6	2.8	3.5	5.8	2.4	1.2	2.0
Output-based	1.7	-2.2	-1.7	0.3	4.5	3.9	1.8	-3.2
Medical and dental practice activities								
Input-based national accounts	2.3	2.3	2.6	3.9	3.4	2.4	1.2	2.0
Output-based	2.8	-1.5	4.0	4.9	2.8	1.2	1.3	2.6

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 of input-based price index, and the output-based price index indicates higher real growth rates of medical care services. Figure 8.1 illustrates that there is a clear difference between the two methods in the case of general hospitals. Price, price indices calculated after the input-based method increase significantly, while growth in output-based price indices is more stable.

Figure 8.1 Input- and output-based price indices for general hospitals



Calculation of production values

Based on the product balances at current prices 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 at the prices of the previous year. Chained values are then calculated, starting with 2005 prices and based on formulas 3.10 and 3.11. Table 8.2 shows the results of these calculations and a comparison with existing calculations.

Higher production value for hospitals

The calculation for 860010 Hospitals shows that the output-based calculation has a production value that is higher than the input-based value in all periods 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 860020 Medical and dental practice activities, the changes are much smaller than for 860010 Hospitals. This is due to the fact that the non-market services constitute about a quarter of the total production value of the industry.

This means that more than three quarters of the calculation is by definition unchanged.

Table 8.2 Input- and output-based production value calculations

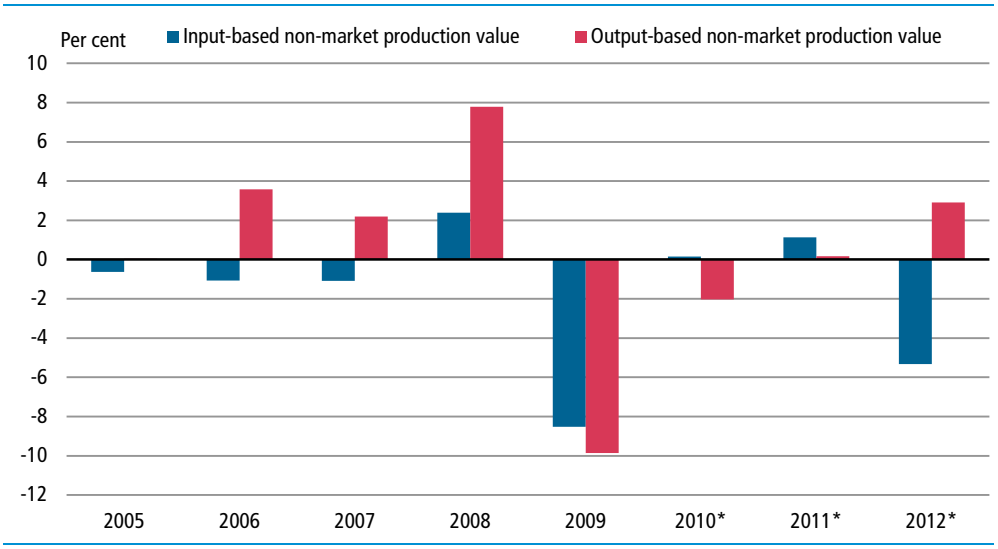
	2005	2006	2007	2008	2009	2010*	2011*	2012*
	2005 prices, chained values, DKK mill.							
860010 Hospitals								
Input-based national accounts	61 960	66 008	67 903	70 848	72 725	71 110	71 349	69 981
Output-based	61 960	67 974	71 453	76 897	79 991	77 106	76 895	79 473
Difference	0	1 965	3 550	6 049	7 266	5 996	5 545	9 492
860020 Medical and dental practice activities								
Input-based national accounts	26 602	27 098	29 308	30 116	31 224	31 008	31 000	30 930
Output-based	26 602	27 305	30 525	31 931	32 641	32 016	31 822	33 343
Difference	0	206	1 217	1 815	1 418	1 007	823	2 413
Total								
Input-based national accounts	88 562	93 107	97 211	100 964	103 948	102 118	102 349	100 910
Output-based	88 562	95 278	101 978	108 829	112 632	109 122	108 717	112 816
Difference	0	2 171	4 767	7 865	8 683	7 004	6 368	11 905

8.1.1 Productivity for health care

Statistics Denmark does not publish productivity calculations for the non-market economy.[7] 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 publication, productivity is defined as output per hours worked.

The output-based method allows us to calculate productivity figures for the non-market economy. Figure 8.2 shows the evolution of productivity in health care services. Overall, productivity growth is considerably faster with the output-based method; over the period, productivity growth is 0.5 per cent, while it is -1.7 per cent when the input-method is applied. Productivity growth compiled in accordance with the output-based method is positive in six out of eight periods, while productivity compiled after the input-based method is only positive in three out of eight periods.

Figure 8.2 Annual growth rates of productivity for health care



Note: These productivity figures should be interpreted with caution; there may be changes in the next publication.
Figure corrected January 21th 2014

8.2 Social protection

This section will show the effects of the output-based method on calculations of output of social protection services in the Danish National Accounts. The part of Social institutions for adults that is related to residential and day care places for the elderly, i.e. the part concerning health care is also included in the results for industry 870000 Residential care activities for adults below. Table 8.3 shows the annual growth rates of the price indices for the two social industries.

For the industry 870000 Residential care activities, a weighted price index is calculated. This includes both the part of the industry 870000 that is related to health care services and the part that is related to social protection services. The input-based price index shows a more stable development than the output-based price index, which is more volatile and grows faster in two out of eight periods.

[7] 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.

880000 Social work activities without accommodation

The results for industry 880000 Social work activities without accommodation show that the input-based index increases faster than the output-based index in six out of eight periods. The input-based index also shows a more uneven growth than in the case of output-based index. As mentioned above, there are some inconsistencies in data between 2006 and 2007 because of the local government reform, so, there is a data break in social protection services.

Table 8.3 Comparison of input- and output-based price changes for social protection

	2005	2006	2007	2008	2009	2010*	2011*	2012*
	2005 prices, chained values, DKK mill.							
Residential institutions								
Input-based national accounts	2.2	2.1	2.9	3.9	5.9	2.4	1.2	2.0
Output-based	2.7	5.5	-3.5	5.5	6.6	2.5	-0.8	3.9
Social institutions without accommodation								
Input-based national accounts	2.2	2.4	3.0	3.9	6.1	2.4	1.2	2.0
Output-based	2.5	2.3	3.7	3.5	3.6	-0.5	-3.0	0.7

8.2.1 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 prices of the previous year. Subsequently, the chained values are calculated, starting with 2005 prices based on formulas 3.10 and 3.11. Table 8.4 shows the results of these calculations and a comparison with existing calculations for the social protection services.

870000 *Residential care activities*

Table 8.4 shows the production value of 870000 Residential care activities, 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 higher than the input-based calculations in all periods except 2006, i.e. if the output-based index is used the production value will be lower.

Lower production value for industry 880000

In the case of 880000 Social work activities without accommodation the situation is the same, the output-based method generates higher production in six out of eight periods.

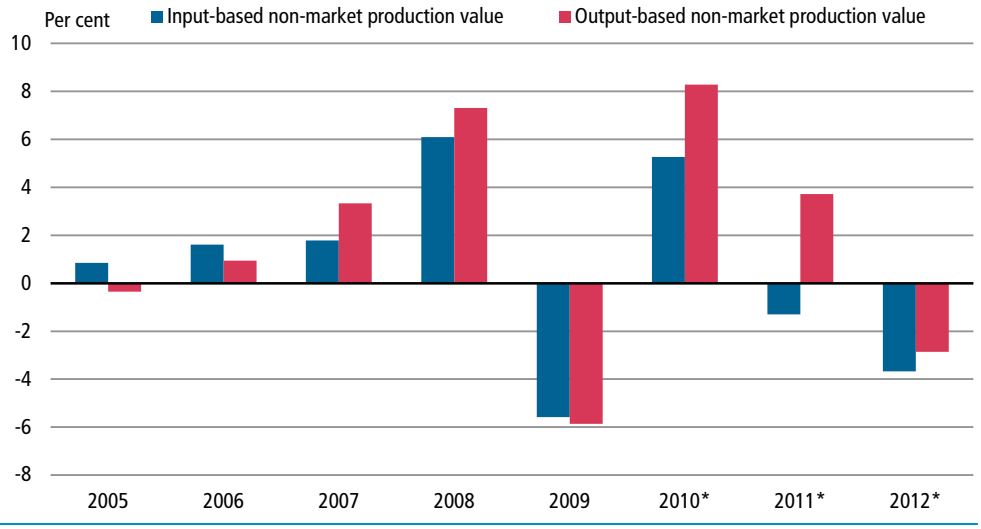
Table 8.4 Input- and output-based production value calculations for social protection

	2005	2006	2007	2008	2009	2010*	2011*	2012*
	2005 prices, chained values, DKK mill.							
870000 Residential care activities								
Input-based national accounts	22 988	23 667	24 877	26 730	26 710	27 329	21 910	20 479
Output-based	22 988	22 993	25 983	27 484	27 157	27 700	22 652	20 767
Difference		- 675	1 106	754	448	370	743	288
880000 Social work activities without accommodation								
Input-based national accounts	84 451	86 089	86 410	87 440	87 135	87.361	86.430	84.819
Output-based	84 451	86 218	85 940	88 106	89 893	92 749	95 654	95 016
Difference		129	- 470	666	2 758	5 388	9 224	10 197
Total								
Input-based national accounts	107 439	109 756	111 287	114 170	113 845	114 691	108 340	105 298
Output-based	107 439	109 210	111 924	115 589	117 050	120 449	118 307	115 783
Difference		- 546	637	1 419	3 205	5 758	9 967	10 485

8.2.2 Productivity for social protection

Figure 8.3 demonstrates the annual productivity growth for the social protection services. Over the period, productivity increase by 1.7 per cent on average when it is compiled in accordance with the output method and by 0.6 per cent when the input method is applied.

Figure 8.3 Annual growth rates of productivity for social protection



Note: These productivity figures should be interpreted with caution; there may be changes in the next publication.
Figure corrected January 21th 2014

8.3 Education

For use in constant price calculations from non-market educational services, four different price indices were calculated according to the output-based method. These are:

Price index for primary education
Price index for secondary education
Price index for higher 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 8.5.

Input-based deflators identical in the preliminary years

The four input-based price indices are all identical for 2010 to 2012. This is because the national accounts calculations for these years 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 2010, 2011 and 2012, because the price indices are identical. The method for 2010 to 2012 is based on materials from the preliminary year in which there are no detailed material available. The Danish national accounts are only finalised three years after the end of a calendar year.

Table 8.5 Annual growth rates of input- and output-based price indices for education

	2005	2006	2007	2008	2009	2010*	2011*	2012*
	per cent annual growth							
Primary education								
Input-based national accounts	2.2	1.5	2.6	3.8	5.9	2.4	1.2	2.0
Output-based	3.3	2.9	0.9	3.9	5.7	0.6	-4.0	0.3
Secondary education								
Input-based national accounts	2.2	2.1	3.8	3.8	3.6	2.4	1.2	2.0
Output-based	4.6	0.5	-0.4	1.5	1.0	4.3	-0.7	-0.4
Higher education								
Input-based national accounts	2.2	2.2	1.6	3.8	2.5	2.4	1.2	2.0
Output-based	0.8	-0.4	1.7	1.5	3.1	4.4	-0.5	-0.5
Adult education								
Input-based national accounts	2.2	2.4	2.5	3.8	5.0	2.4	1.2	2.0
Output-based	-0.7	-0.7	0.5	1.5	1.0	9.0	-0.7	-0.6

Primary education

In the case of primary education, this comparison shows that the output-based growth rate measured a lower price change than the input-based growth rate did in five out of eight periods. All else being equal, this implies that if the output-based growth rate is used in national accounts calculations, the volume growth will be greater. The volume of primary schools from 2010 to 2012 is estimated by the number of average teaching hours rather than the number of pupils.

Secondary education

In the case of secondary education, the relationship between the two price indices shows no clear trend. From 2006 and onwards the input-based index grows much faster than the output-based one except for 2010.

Higher education

In the case of higher education, the input-based growth rate measured a higher price growth than the output-based growth rate did in all years, except for 2007, 2009 and 2010. However, the unit prices for research based higher education (university education) increased in 2007 as a result of a “taximeter reform” implemented by the Ministry of Science, Technology and Innovation. All else being equal, this implies that if the output-based growth rate is used, the volume growth will be greater.

Adult education

The output-based growth rate for adult education shows the greatest variation. A relatively substantial price increase in 2010 was negated in 2011 by a price drop. 2010 is the only year in which this index measured a stronger price growth than that measured by the input-based method. As with the output-based growth rate for health and social services, the output-based growth rate for educational services shows a more uneven price growth than is the case with the input-based calculation.

8.3.1 Calculation of production values

As with the calculation for health care and social protection the new production values, in this context, are calculated using the output-based price index. Using formula 3.9, it is possible to calculate the product balances for the prices of the previous year. Subsequently, the chained values are calculated, starting with 2005 prices based on formulas 3.10 and 3.11. Table 8.6 shows the results of these calculations and a comparison with existing calculations.

Table 8.6 Input- and output-based production value calculations for education

	2005	2006	2007	2008	2009	2010*	2011*	2012*
	2005 prices, chained values, DKK mill.							
850010 Primary education								
Input-based national accounts	44 795	45 803	45 316	44 955	45 522	44 461	43 955	43 114
Output-based	44 795	45 202	45 455	45 426	45 662	45 371	47 262	47 121
Difference	0	- 600	139	471	140	910	3 306	4 007
850020 Secondary education								
Input-based national accounts	27 470	27 170	25 524	25 617	26 212	26 052	25 877	25 384
Output-based	27 470	27 844	27 598	28 371	29 792	29 057	29 409	29 544
Difference	0	674	2 074	2 754	3 579	3 005	3 531	4 160
850030 Higher education								
Input-based national accounts	20 155	20 585	21 590	25 198	26 267	26 335	26 022	25 287
Output-based	20 155	21 110	22 438	26 721	27 733	31 284	31 414	31 289
Difference	0	525	848	1 523	1 466	4 948	5 392	6 002
850042 Adult education etc. (other non-market)								
Input-based national accounts	4 044	3 987	3 447	3 249	3 146	3 072	3 037	2 979
Output-based	4 044	4 106	3 624	3 500	3 521	3 516	3 541	3 562
Difference	0	118	176	252	375	443	504	583
Total								
Input-based national accounts	96 464	97 546	95 877	99 019	101 146	99 921	98 892	96 764
Output-based	96 464	98 263	99 114	104 018	106 708	109 227	111 625	111 516
Difference	0	717	3 236	4 999	5 561	9 306	12 733	14 752

In contrast to health services, where there were relatively substantial fluctuations overall, educational services are more consistent between the two calculations. In 850010 Primary education, the production value is higher when the output-based method is used, but in 2006 the the production value calculated by the input method is higher. The differences between the two methods are very small from 2007 to 2010, In 2010 the difference increases which may be due to the method of compiling the output-based price index in 2010, where we applied the number of student hours instead of number of pupils. Industry 850020 generates in all periods higher production value when the output-method is used; the difference is over DKK 4 billion in 2012. 850030 Institutes of higher education generates higher output all periods, when the output-based method is implied. 850042 Adult education, etc. has a production value, which is also higher in all period when the output-based calculation method is applied.

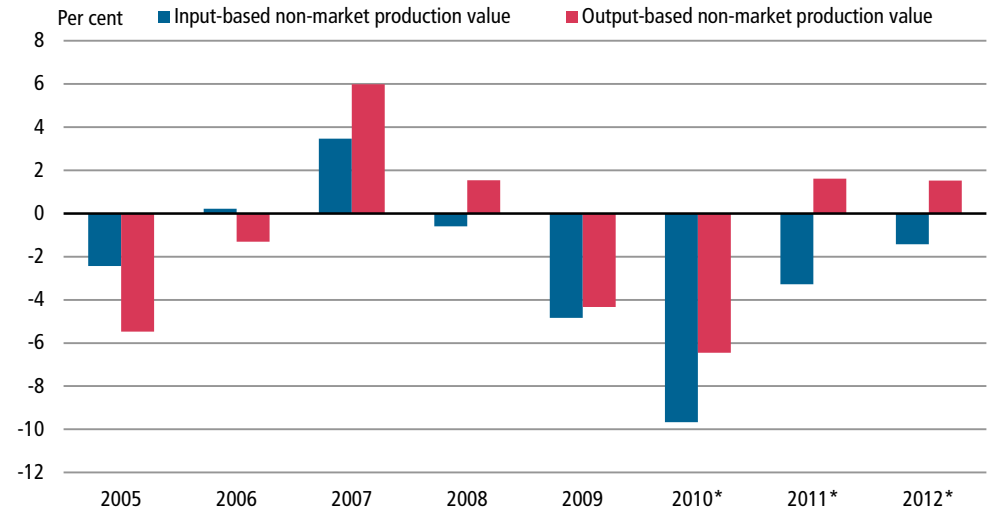
In total 2012, the output-based method produces approx. DKK 4billion higher production value for industry 850010 than the input-based method. Industry

850020 Secondary education contributes with approx. DKK 4.1 billion, industry 850030 Higher education contributes with DKK 6 billion while industry 850042 Adult education etc. contributes with DKK 0.8 billion .

8.3.2 Productivity for education

The growth of productivity for education is illustrated in figure 8.4. The graph does not show any clear trend in the productivity movements; the productivity growth is positive in four out of eight periods for output-method. On average, the productivity fell by 2.4 per cent per year when it is compiled in accordance with the input-method and fell by 0.9 per cent when the output -method is applied.

Figure 8.4 Annual growth rates of productivity for education



Note: These productivity figures should be interpreted with caution; there may be changes in the next publication.

Figure corrected January 21th 2014

8.4 Recreation, sport and culture

This section will show the effects of the output-based method on calculations of output of recreation, sport and cultural services in the Danish National Accounts. Table 8.7 shows the development of the price indices for these sectors and it seems that there is no clear trend in the movement of price indices, but the input-based indices seem to be more consistent over time.

Table 8.7 Annual growth rates of input- and output-based price indices for recreation, sport and culture

Growth rate for:	2005	2006	2007	2008	2009	2010*	2011*	2012*
	per cent annual growth							
Libraries, museums and other cultural activities								
Input-based national accounts	2.9	3.6	2.9	3.9	1.9	2.4	1.2	2.0
Output-based	4.6	3.7	0.9	0.3	7.9	4.6	-3.7	2.8
Sports activities								
Input-based national accounts	3.5	4.3	2.6	3.9	2.0	2.4	1.2	2.0
Output-based	8.5	1.5	-1.9	5.0	-5.3	-5.6	2.6	-0.3

8.4.1 Calculation of production values

The new production values are calculated in this context using the output-based price index. Table 8.8 shows the results of these calculations and a comparison with existing calculations. For industry 910002 the output-based method generates less production value in five out of eight periods, i.e. the current method generally overstates the production value. For industry 930012 the output is greater when output-based price index is used.

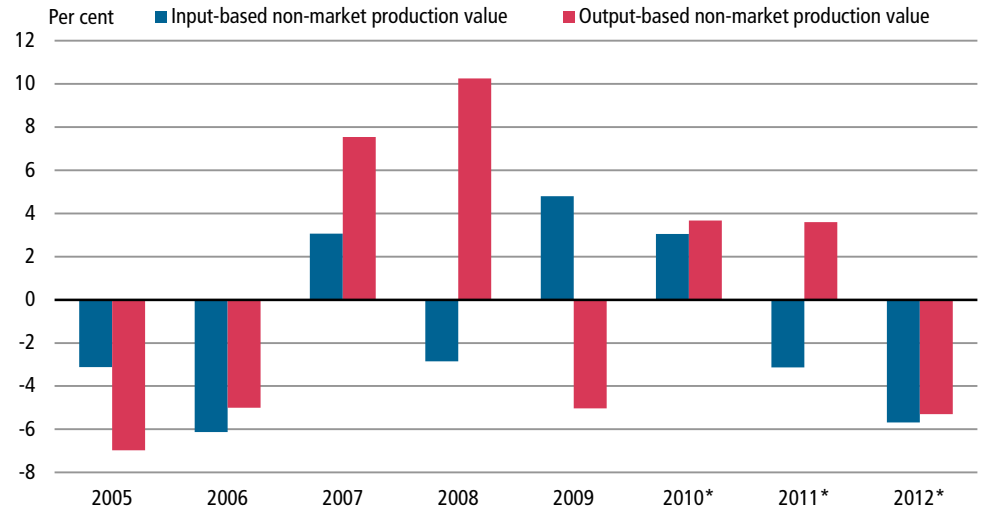
Table 8.8 Input- and output-based production value calculations for recreation, sport and culture

	2005	2006	2007	2008	2009	2010*	2011*	2012*
	2005 prices, chained values, DKK mill.							
910002 Libraries, museums and other cultural activities (non-market)								
Input-based national accounts	6 999	6 898	6 667	6 852	6 917	6 756	6 678	6 523
Output-based	6 999	6 896	6 794	7 231	5 825	5 569	5 780	5 600
Difference	0	- 2	127	379	- 1 092	- 1 187	- 899	- 924
930012 Sports activities (non-market)								
Input-based national accounts	2 366	2 508	2 264	2 434	2 114	2 064	2 041	2 002
Output-based	2 366	2 577	2 432	2 544	2 380	2 521	2 456	2 463
Difference	0	69	168	109	266	457	416	462
Total								
Input-based national accounts	9 365	9 406	8 931	9 286	9 031	8 820	8 719	8 525
Output-based	9 365	9 473	9 226	9 774	8 205	8 090	8 236	8 063
Difference	0	67	295	488	- 826	- 730	- 483	- 462

8.4.2 Productivity for recreation, sport and culture

The productivity evaluation for recreation, sport and culture is demonstrated in figure 8.5. The productivity increases in four out of eight periods for the output-method and three out of eight periods for the input-method. On average, the productivity increased 0.1 per cent with output-method and by -1.3 per cent when it is calculated according to input-method.

Figure 8.5 Annual growth rates of productivity for recreation, sports and culture



Note: These productivity figures should be interpreted with caution; there may be changes in the next publication.

Figure corrected January 21th 2014

8.5 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 the non-market economy are placed in the context of some more general concepts in the national accounts.

Price indices for the input- and output-based methods are illustrated below (figure 8.6) 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 8.7).

Figure 8.8 summarises the differences in terms of production values between the input-based and output-based calculations. The greatest difference is found in 2011 and 2012, where production is about DKK 30 billion higher when the output-based method is used. Health services and education are by far the most important factors in this higher production value. Social protection services contribute positively in all period. Recreation and culture denote a small part of the total non-market services, and even though it is not very visible in the figure, it contributes negatively to the production difference in four periods.

Figure 8.6 Input- and output-based price growth for the whole non-market economy

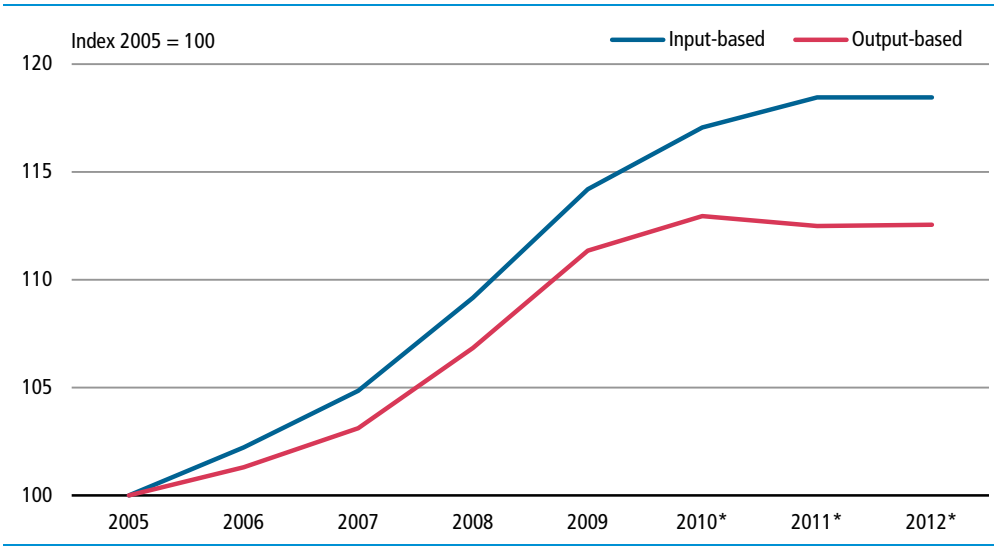


Figure 8.7 Input- and output-based volume growth for non-market services

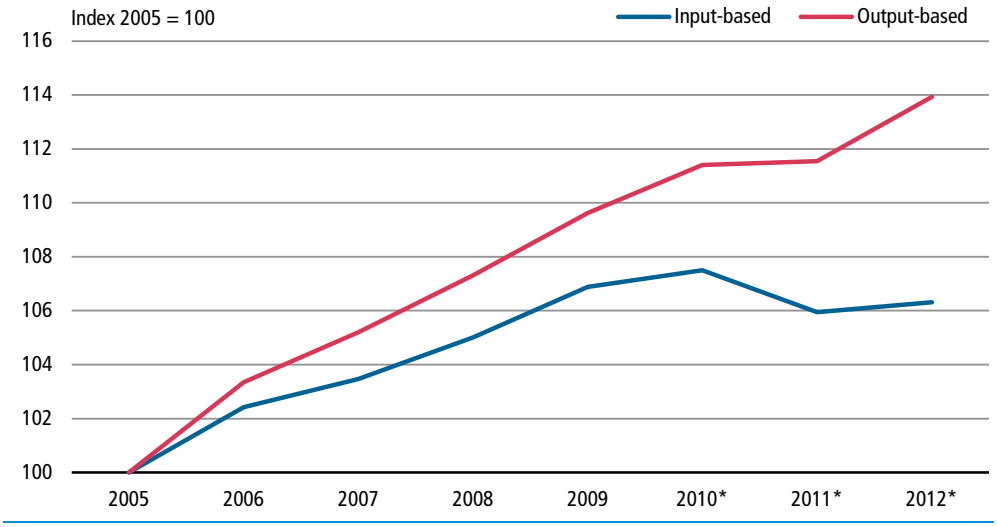


Figure 8.9 illustrates the overall difference caused by changing the calculation method in the context of the total non-market production value. It shows that changing the calculation method for non-market public individual services affects the level of the non-market economy's total production value. The production value increased by 3.6 per cent in 2010, by 5.3 per cent in 2011, and by 7.2 per cent in 2012 due to the alternative deflation method.

While the total non-market production value does not seem to change much – cf. figure 8.9 – this is not the case if we focus on growth rates rather than levels. Figure 8.10 shows the real growth rates of production for the two types of calculations. We can see that the growth rate of non-market production looks slightly different when the output-based calculation is applied. In seven out of eight periods, the output-based production grows faster than the input-based production. In, 2006 and 2010-2012 the growth rate increases by 1 percentage point or more, while the increase in 2007, 2008 and 2009 is about 0.5 percentage point. In 2005, the growth rate is around 0.1 percentage point smaller.

Figure 8.8 Difference in production values distributed according to service type
Chained 2005 values

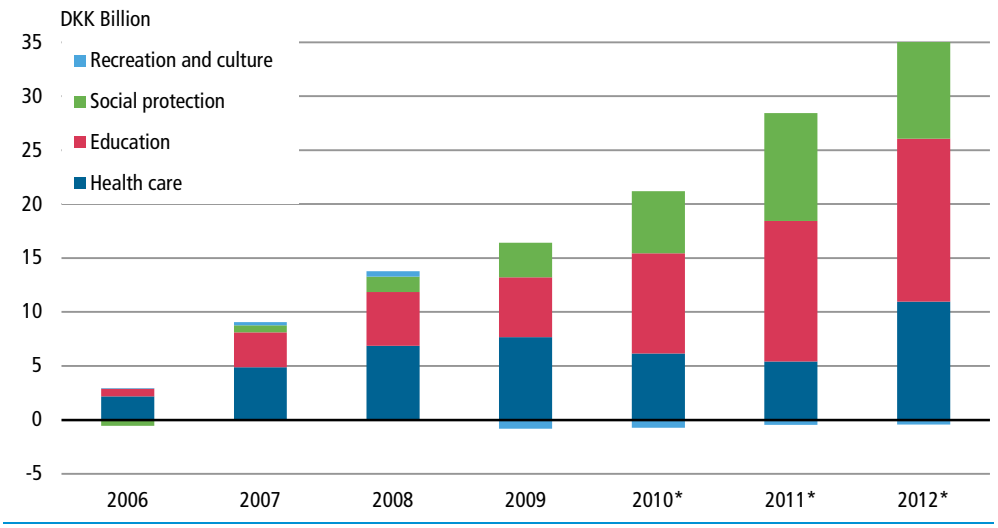
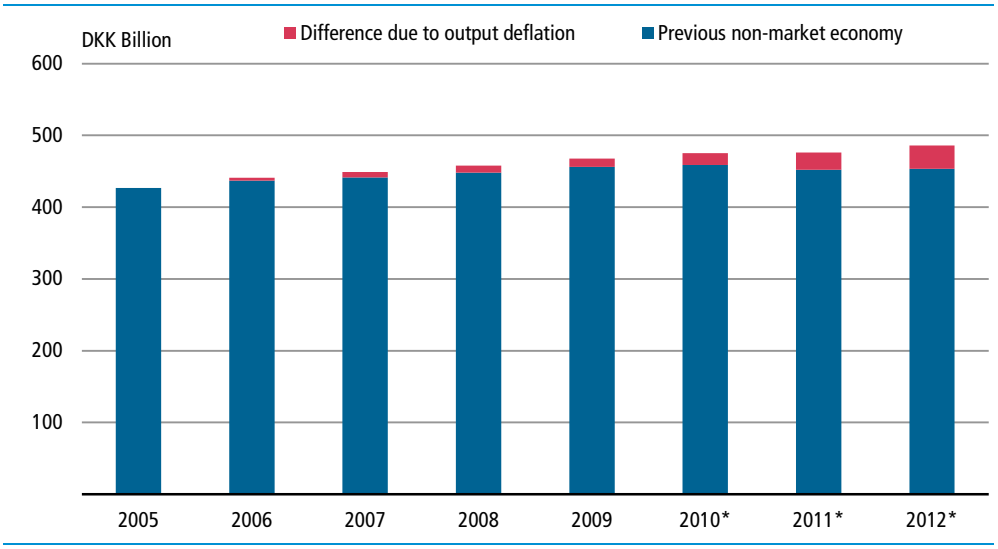


Figure 8.9 Production value for the overall non-market economy
Chained 2005 values



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 8.10 Real growth rates in production values distributed according to calculation type

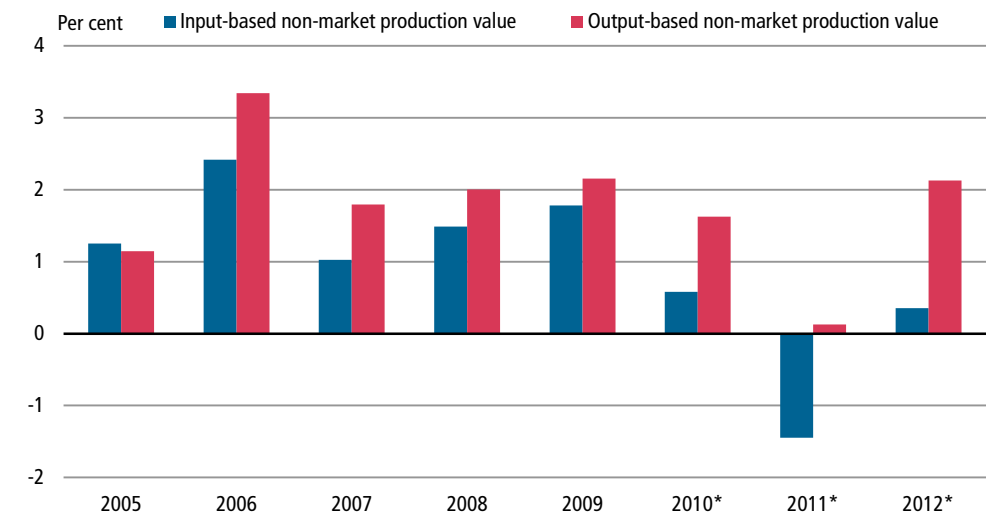


Figure 8.11 shows figures relating to gross value added. From figures 8.9 and 8.11, we can see that intermediate consumption in the non-market economy is approx. DKK 100 billion, since the gross value added is approx. DKK 100 billion smaller than the production value. In addition, changing the calculation method seems to have a significant effect on the total non-market value added: the level in 2011 and 2012 is about 10 per cent higher.

Figure 8.11 Gross value added for the non-market economy overall. Chained 2005 values

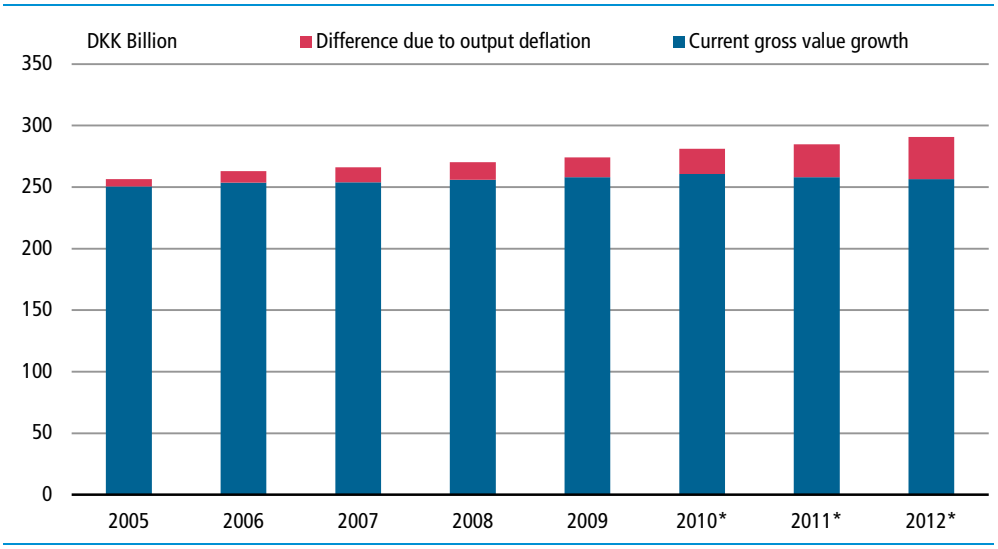
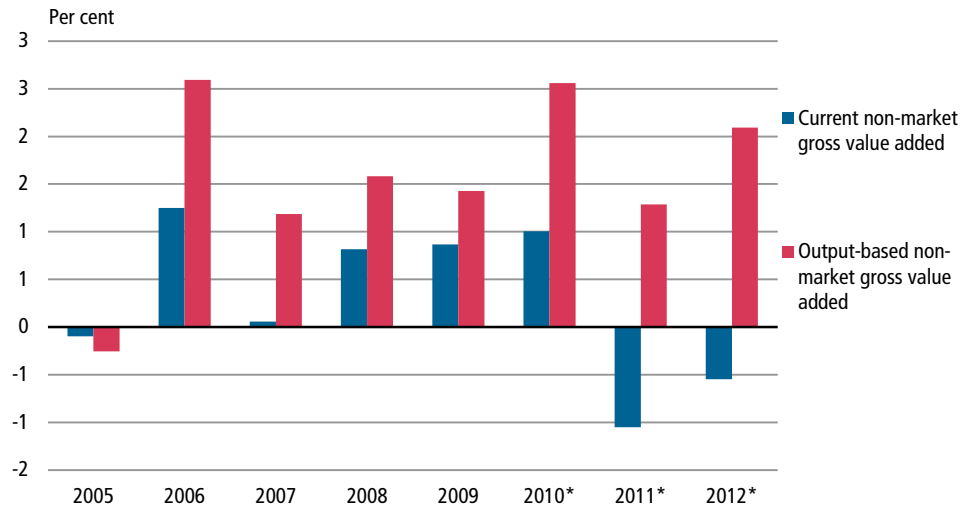


Figure 8.12 shows the growth rates of gross value added. In the period 2006-2012 the output-based calculation grows faster, while in 2005 the growth rate is more negative with the output-based method. In the years in which the growth rate is now higher, an increase of over 2 percentage point is observed, while the drop in 2005 is 0.3 percentage point.

Figure 8.12 Real growth rates in gross value added distributed according to calculation type



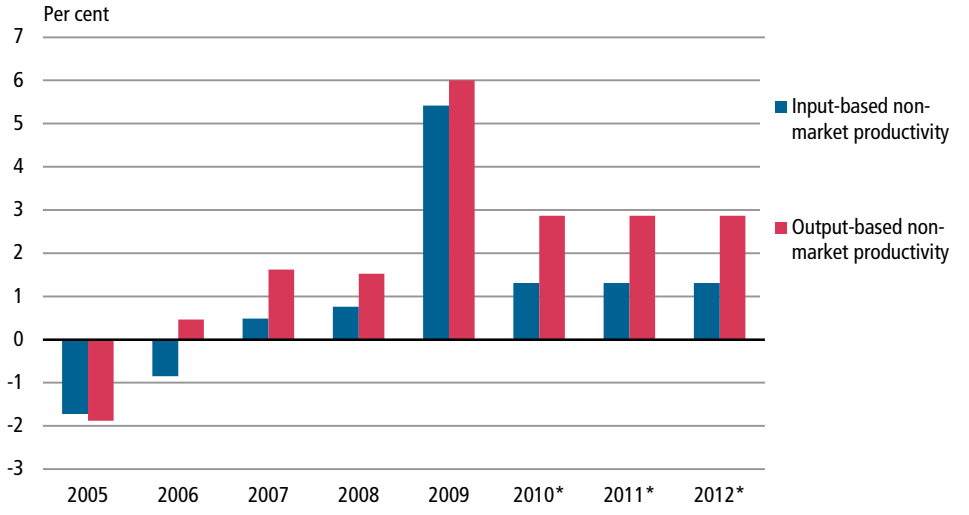
Productivity

As mentioned above, Statistics Denmark normally does not publish productivity calculations for the non-market economy.

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 individual public services, which make up approximately three fourth of the total non-market production.

Figure 8.13 shows the productivity growth for the entire non-market economy. A trend according to this chart is that productivity compiled according to the output-based method grows faster if productivity is growing. Overall, productivity is slightly higher with the output-based method; on average over the period, productivity is nearly 1.3 percentage point higher here.

Figure 8.13 Growth in non-market-related outcome per hours worked distributed according to calculation type

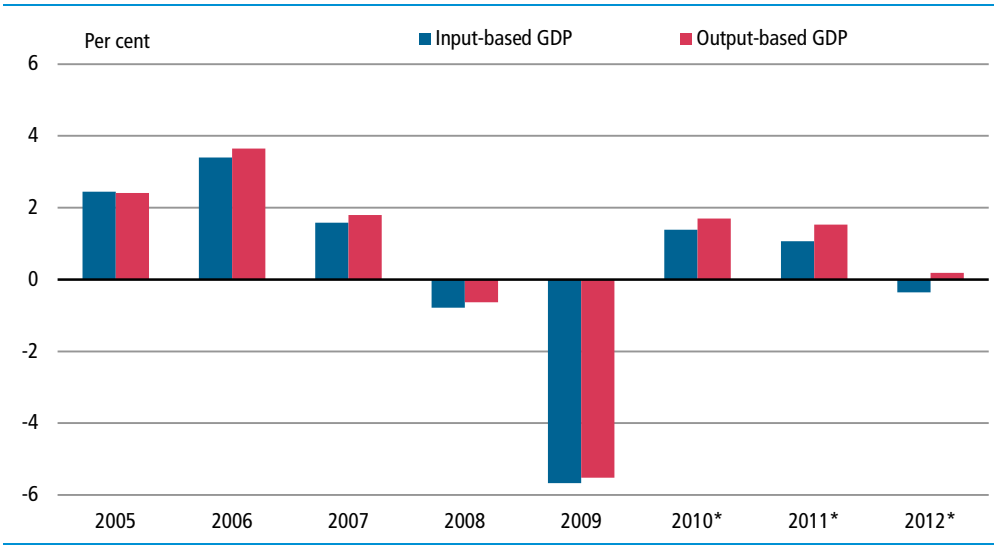


Note: For interpretation of current data, see fact box: Facts about non-market-related finance and work productivity.

8.6 The economy as a whole

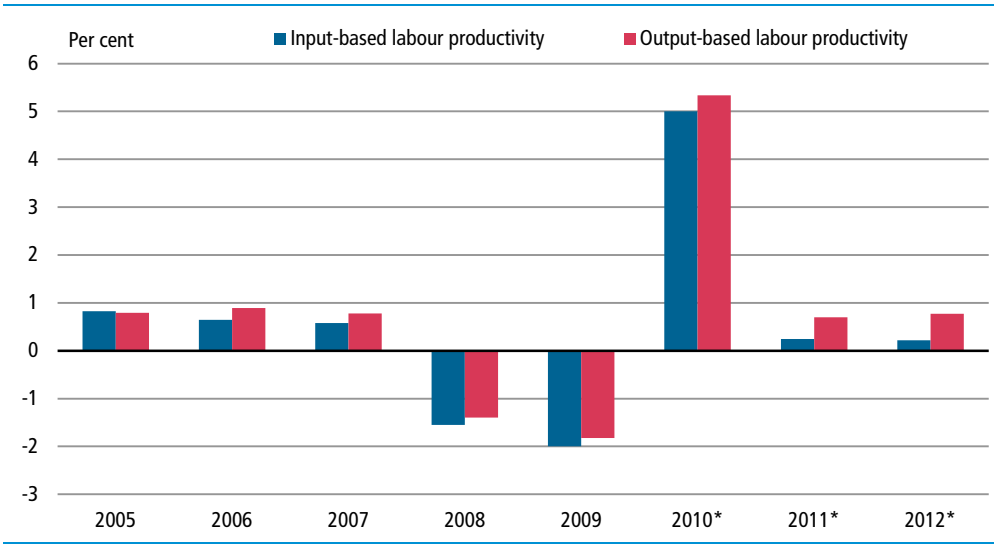
This section provides an overview of how the alternative deflation method affects a range of key figures for the overall economy. Figure 8.14 shows the growth rate for gross national product, GDP, according to the input-based calculations, and how individual public services change the growth rate of GDP if they are output-deflated.

Figure 8.14 Annual growth rate of gross national product distributed according to calculation type



From the chart, we can see that the alternative deflation method affects the GDP growth. The greatest difference in the results is in 2011 and 2012. While the official growth rate is 1.1 and -0.4 per cent, respectively, it is calculated at 1.5 and 0.2 per cent, respectively, when the output-deflated figures are used. In 2005 to 2010 and the difference between the two methods is between 0.0 and 0.3 percentage point. In 2008 and 2009 both growth rates are negative. In 2012 the input-based GDP growth rate is negative while the output-based is positive. The output-based method generates an annual growth rate of GDP of 0.6 per cent on average while the input-based method generates an average annual growth rate of 0.3 per cent during the period.

Figure 8.15 Growth in output per hours worked distributed according to calculation type



Note: For interpretation of current data, see fact box: Facts about non-market-related finance and productivity.

Figure 8.15 shows changes in 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 productivity growth. There is a positive effect of the output-based method in the entire period except for 2005. The most noticeable difference again occurs in 2011 and 2012 where the alternative calculation produces estimates of productivity growth that are 0.5 and 0.6 percentage points higher than the official calculations, respectively.

Output-deflation contributes higher productivity

For the period as a whole, the published average growth rate of productivity is 0.5 per cent annually, while the alternative calculations produce an average annual growth rate of 0.7 per cent. These calculations demonstrate that the average productivity growth rate for the period 2005-2012 is 0.2 percentage point higher if the alternative calculations are applied. This difference initially appears relatively modest, but for users of productivity calculations it is substantial. The huge productivity decrease in 2008 and 2009 is the main reasons that the average productivity is low.

9. The Danish data on output measures

This section will highlight the quality of the Danish data on output measures and compare them with those of other countries that Denmark is normally compared with.

9.1 Education

For output measurement in the national accounts, interest focuses on the economic units whose primary activity is the provision of education services. The system of national accounts considers education service as products that are consumed by households. However, measuring the volume of the education service is a great challenge. As mentioned earlier in the publication, there exist difficulties in identifying and measuring sustainable indicators which can be used to measure the output of education, which reflects the sum of the individual benefit provided to each pupil.

The OECD Handbook (2010) recommends for primary and secondary education services the number of pupil-hours, differentiated by the level of education (where pupil hours appear to be a satisfactory proxy for output in situations where teaching in classrooms is a dominating channel in transferring knowledge). While there is not given any particular recommendation for measurement of higher education services.

Primary and secondary education

The system of national accounts considers primary and secondary education services as products that are consumed by households. The OECD Handbook (2010) recommendation for a quantity indicator for education is that a single unit of education services should be expressed as an hour of teaching received by a student at a particular level i.e. pupil hours, that is the number of hours that pupils spend being taught. Alternatively, the number of pupils could be used.

In this edition, we have managed to estimate the volume of primary education by pupil hours for the latest period; hence our indicator quality in the area meets the international recommendations (OECD, EU, etc.). In Denmark we do not have any data on pupil hours for secondary education and for that reason we continue using the number of pupils. Many problems remain; changes in education quality cannot be captured nor is number of pupils an accurate proxy for the quantity of services provided. However, using the number of pupils as a measure for the activity level explicitly requires quality adjustment for the service delivered.
This means that Denmark could improve the quality of volume indicators for secondary education by a shift from number of pupils to pupil hours.

Higher and further education

Higher education is organised differently from primary and secondary education. The number of lessons provided to students is smaller. Compared to lower level education, attainments in higher education depend more on a student's own efforts. Thus student hours are not a useful measure of outputs. Therefore, it is very difficult to clearly separate services provided by the individual educational institution and their quality from the input provided by the student him- or herself.

An indicator that is used often to measure output is the number of students. However, it is necessary that such a measure is based on full-time-equivalent students. As mentioned above many problems remain. Changes in quality cannot be captured and for that reason the student numbers are not a correct indicator for the quantity of services provided. Participation in studies varies significantly and sometimes students may even have finished their studies but prefer to remain in the university register due to tough labour markets etc. (OECD Handbook (2010))

Another alternative is to use data on student credits (the European Credit Transfer and Accumulation System (ECTS) where students' attainments during a year are measured as credits obtained from mastering various programmes during a year. Credits are allocated to all educational components of a study programme (such as modules, courses, placements, dissertation work, etc.). However one big problem arises when student credits are used: the credits can only be obtained by the students who pass the study programmes or examinations. The students who followed the teaching, but have not passed the examination would not be included in the volume of output, although they received the teaching and supervision. Then using ECTS points as an indicator for quantity would not reflect the real value of the service delivered.

In Denmark we use number of full-time-equivalent students for higher and further education, which is in line with the practice of most of the countries we normally compare Denmark with and the OECD Handbook (2010) recommendations.

9.2 Health care

Health care volume output should be measured as the quantity of health services provided to individuals with an adjustment for new products or services and quality changes.

DRGs

The most widely available classification of hospital inpatient and outpatient services is provided by diagnosis related groups (DRGs). They were developed to create cost homogeneous groups in order to compare hospital activities. DRG systems are god indicators for the measurement of volume output because they provide information on (unit) costs per type of treatment and on the number of treatments. DRG systems include a large number of categories (500-1000), where each category denotes a rather homogenous service and thus, in principle, the construction of a unit cost or of a volume index from the most detailed level of categories is desirable. This is, however, not always possible. A main reason is that DRG systems are updated on an ongoing basis with some categories being aggregated and others disaggregated, making comparisons between periods difficult.

Given cost weights and the number of treatments, either a unit cost price index or a direct volume index can be constructed.

Psychiatric hospital

Psychiatric hospital treatment is not covered by the DRG system in our present calculations, but from 2008 the Danish health authorities has implemented a DRG system for psychiatric hospitals and we expect to include those in our calculations in the next publication.

In summary it could be concluded that the Danish data on health care services are considered to be of high quality and it is in line with the practice of other European countries we normally compare ourselves with.

9.3 Social protection services

The social protection services makes up 35 per cent of the non-market individual services, which is equivalent to approx. DKK billion 125 in 2008 and it is for that reason very crucial to measure it correct, so it reflect the real value of the services delivered. In Statistics Denmark we use the existing activity data i.e. we try to make best volume indicators out of the data we already have and not necessarily what we need for measure the social protection services in a more suitable way. The number of indicators we use here is very limited; we have about 25 indicators to measure

the whole sector. If we compare social protection services with health care and education that is almost the same size, is represented by almost 1000 indicators each. Actually some of the indicators on social protection services are quite homogenous and robust, primary children and elderly institutions, for instance the number of children at day care or kindergartens or number of elderly at nursing homes/residences, which are some of the largest and most important areas of social protection. However social protection services also comprehend other areas that are more heterogeneous and thus more difficult to measure; for instance services for people with mental- and physical disabilities, protected employment, special educational assistance, contact and companion arrangements. The existing data on these services are more inconsistent and difficult to compare over time, which is partly due to fact that the authorities change the grouping or classification of those services often, so it is difficult to get time consistent data.

Another problem that arises when we compile price indices for social protection services is the lack of unit cost; the authorities do not estimate the unit cost for each of those services in a way that can be compared over time. In Statistics Denmark we compile unit cost by dividing the related total Cofoc cost by the number of activities.

To get some more accurate output measures for the social protection services it is essential that we collect more systematic data, which we have confidence will reflect the social services delivered.

9.4 Culture, religion and sports

Within culture, religion and sports we have a higher uncertainty concerning the indicators for activity level as well as unit prices. However, it is not yet possible to find the actual activity level and representative key fees for different types of recreation, sporting activities and cultural services.

In the case of Industry 910001 Libraries and museums the activity is assumed to be the number of visits to museums and libraries and the number of books and phonograms borrowed. The unit cost is compiled by dividing the corresponding weighted Cofoc cost by the activity level.

The activity level in Industry 930012 Sports is measured by the number of individual memberships of sport clubs or any recreational activities. In Denmark sport clubs are given subsidies depending on the number of memberships. For that reason the number of membership is chosen as one of the best indicators to measure sports activities, where the level of activity is compiled by the share of the population who are members of a sport club, based on a survey conducted in 2004. Statistics Denmark does not have any data on the actual number of members.

10. Concluding remarks

10.1.1 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 five reports on this area, published in 2007, 2009 and 2011. The publication shows how the output-based method can be implemented for the non-market public 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 in order to achieve 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 health care and education. For social protection services and recreation, sport and culture the data is of international standards, but our assessment is that it could be improved.

Based on the results achieved, it is possible to conclude that calculations covering the whole non-market economy and meeting the international guidelines for calculation of national accounts at constant prices already exist. What makes the current calculations suitable are:

- Almost 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, especially as a result of the reform in local governments. 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.

10.1.2 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.

Volume growth for health care services calculated after the output-based method increase more than the input-based method. Social services also generate higher growth rates, when output-based deflators are applied. Generally, educational services grow faster when output-based method is applied. Recreation, sport and culture have minor effects on the main results, since it makes up a very small part of the whole non-market sector.

10.1.3 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 has 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 the way they should enter the calculations of price indices.

However quality adjustment is no longer is no longer a requirement from the European Commission because at present it is not possible to find robust and among countries comparable indicators and methods.

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