STATISTICS DENMARK Productivity growth (based on output or GDP at factor cost)

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0.4 Purpose and History	Shortcut to this page
The purpose of estimating the	www.dst.dk/declarations/96379
producutivity growth is to detect the	

sources behind the productivity growth. This enables us to understand the sources behind the productivity growth in a better way than what one can do using the labour productivity growth statistics.

The implementation of the revised labour accounts on employment and hours ensures that an important source for productivity calculations is now available. Another significant source, the compilation of fixed capital that provides a picture of the productive capacity of the economy's capital stock has been accessible since February 2001. Both sources are compiled according to guidelines in the present European national accounting system, ESA95. Moreover, time series for the capital stock of ICT has been composed, in order to quantify the significance of the increasing growth of investments in ICT (and software). Finally the aspect of a higher level of education in the labour force is being taken into account based on detailed information on the composition of employees and their education.

In november 2010 we supplemented the method based on GDP at factor cost with the so-called KLEMS-method. The productivity measurement for this method is output divided by the number of labour working hours. The KLEMS-method calculates the contributions from K, L, E, M and S (Capital, Labour and intermediate consumption of Energy, Materials and Services).

0.5 Users and Application

Measures of productivity growth constitute core indicators of the analyses of economic growth. Users are primary researchers, economic departments and organisations.

0.6 Sources

The sources used for calculating productivity measures consists mainly of data collected from supply- and use tables in the national accounts.

0.7 Legal Authority to Collect Data

There is no response burden as the data are collected via registers

0.8 Response burden

There is no response burden as the data are collected via registers

0.9 EU Regulation

Council Regulation (EC) No. 2223/96 of 25 June 1996 on The European National and Regional Accounts in the European Community (ESA95) (OJ L 310. 30.11.96, p. 1)

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1 Contents

1.1 Description of Contents

The growth in productivity based on GDP at factor cost is derived from contributions from four sources:

It-capital deepning Non-it capital deepning Educational level Total factor productivity

The KLEMS-method is based on output (divided by the number of labour working hours) and is therefore derived from contributions from the above four sources (calculated in another way than by the GDP-method above) and the three sources below:

Intermediate consumption of Energy Intermediate consumption of Materials Intermediate consumption of Services

1.2 Statistical Concepts

Here we define Labour productivity as GDP at factor cost divided by the number of labour working hours. Changes in labour productivity may on the other hand arise from other sources than a changing labour input. Input of capital and other factors of production may change, or a development in technology may occur. On account of this, it is important to come up with a measure of productivity, that is build on the relation between GDP at factor cost and the input of all production factors. This is named total factor productivity (TFP).

Total factor productivity is calculated as an index of GDP at factor cost divided by an index of the total input of production factors. Total factor productivity can be interpreted as an indicator of efficiency, due to developed technology, more efficient organisation of the working process within firms etc. The measure consequently expresses, how much of the productivity growth, that is not just a result of an increased level of production factors.

Increasing capital deepening will under normal circumstances cause the labour productivity to grow, since e.g. machines can replace employees. And thereby attaining more GDP at factor cost with an unaltered or smaller input of labour. Capital deepening is decomposed as it and non-it capital deepening.

It-capital covers

Information and communication technology (ICT) Software

Non-it capital covers

Machinery and equipment excl. ICT Transport equipment Buildings and structures Livestock Software Minerale Exploration Entertainment, literary or artistic originals

The final source to labour productivity growth is from labour quality. The index of labour quality measures the contribution of substitution among the components of labour input to the volume obtained from a given number of hours. Labour quality is thus an indicator of the quality of the input of labour hours and captures the compositional change in the working force.

The heterogeneity among the employees is here based on their educational attainment, and therefore the index is called educational level. The educational attainment of the employees are divided into five educational categories:

Basic school Vocational Some college no BA BA More than BA

The calculations and the procedure for the KLEMS-metod (output divided by the number of labour working hours) are almost as above, although it contains three more production factors (intermediate consumption of energy, materials and services).

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2 Time

2.1 Reference Period

Productivity growth refer to the year as a period.

2.2 Date of Publication

Productivity growth is at the moment recorded for the period that you can see at www.statbank.dk/NATP23 www.statbank.dk/NATP25

www.statbank.dk/NATP25V www.statbank.dk/NATP28 www.statbank.dk/NATP28V

In the future there will be a yearly publication of updated time series of productivity growth.

2.3 Punctuality

The statistic is expected to be published according to schedule.

2.4 Frequency Yearly.

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3 Accuracy

3.1 Overall accuracy

Statistics of productivity are consistent with the rest of the national accounts.

3.2 Sources of inaccuracy

The uncertainty on productivity growth is closely related to the uncertainty on the sources used from the national accounts. In addition, there is uncertainty connected with the assumptions made, for example in relation to production functions and their assumptions.

3.3 Measures on accuracy

No traditional measure of the error margins for the variables described by the statistic is available. In principle such a measure is not possible.

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4 Comparability

4.1 Comparability over Time

One of the fundamental goals when compiling national accounts statistics is to achieve a high degree of comparability over time. The statistical sources are therefore adapted in order to be consistent with the concepts of the national accounts.

Fundamental changes of nomenclatures as for example classification of industries, changes in definitions as a result of new guidelines as well as new and better sources will inevitably lead to changes in the national accounts and thus in the growth of productivity and its sources. A thorough revision of the data in national accounts was undertaken in the year 2005.

4.2 Comparability with other Statistics

The compilation of productivity growth is consistent with the rest of the national accounts.

As the compilation of national accounts follows international guidelines a high degree of comparability with other countries is achieved. This applies in particular to the European Union, where the Commission represented by Eurostat goes to great lengths to achieve comparability between the national accounts in member states. The approach to determine productivity growth in terms of theory and methodology can play an separate role on the published statistics.

4.3 Coherence between provisional and final statistics

For the provisional statistics only the most aggregated time series will be available.

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5 Accessibility

5.1 Forms of dissemination

News from Statistics Denmark (Nyt fra Danmarks Statistik), Statbank Denmark, and the theme publication *Produktivitetsudviklingen i Danmark 1966-2003*, May 2005 (Danish).

5.2 Basic material: Storage and usability

Basic material is stored electronically. In some cases more detailed material can be made available on a service basis at a charge.

5.3 Documentation

A detailed description of sources and methods is published in (Danish) the theme publication, *Produktivitetsudviklingen i Danmark.* 1966-2003. Since then part of the method has changed, see the danish publication *Nyt fra Danmarks Statistik* nr.430 from 2010. The 3rd of november 2010 the traditionel productivity measurement was supplemented by the KLEMS-method, see the danish publication *Nyt fra Danmarks Statistik* nr.485 from 2010.

5.4 Other Information

A general documentation of the Danish national accounts is available in "Danish National Accounts - Sources and Methods 2003". Danmarks Statistik 2007. For a theoretical background and methods for deriving growth of productiviy: "Growth of U.S. Industries and Investments in Information Technology and Higher Educaiton", Jorgenson, D.W., Ho, M.S. and Stiroh, K. J. 2002 and "Measurement of aggregate and industry-level productivity growth", OECD 2001. The later can be downloaded from OECD's homepage: www.oecd.org

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