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Measurement of Non-market services in Norway with examples from education

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1. Introduction

In Norway, as in many other countries, we have paid attention to the problem of measuring volume growth of non-market services. In particular, we have tried to establish direct measures of volume growth in two important fields of Government service production: education and health.

Price indices for services provided by the government and other non-profit institutions in Norwegian National Accounts have traditionally been input price indices. A well-known drawback with this method is that it doesn't allow you to use the figures to analyse productivity changes.

The concern about the implicit assumption of no change in productivity led to research on the topic at international level. As a result of the work undertaken within EU, the *Handbook on price and volume measures in national accounts* was published in 2001 (Eurostat, 2001). It sets down principles for the measurement of non-market output and gives recommendations for preferable methods. In the case of individual non-market services, the traditional input method is classified as an unacceptable method, while acceptable methods can be based on direct volume measurement of output.

Independent of the national accounts work to establish indicators for the volume of the service production, Statistics Norway has been working with projects for better statistics on Government services. The ambitions for the larger project are to produce statistics showing resources used in relation to indicators of results achieved in many fields of government. Local government activities, including education, have been covered by a statistical system since 2001. Higher education is chosen to be a pilot study for central government production.

2 . Some aspects of Government production

Unlike market services, you cannot observe market values of Government production. That is why, by convention, Government production is measured as the sum of the costs. This is, however, a measurement convention only. Government production can be described in terms of services that are produced. These services could be measurable, but most often not in value terms. That is why one can discuss productivity changes in government service production, despite of the conventional measurement of the value of output.

Traditionally, the main concern for the National accounts has been to get the volume growth rates right. So, with direct observations of volumes, we should do well even in the absence of good measures of production in value terms. The challenges are then:

- All services produced should be specified and measured
- The services should be measured in volume terms
- We need weights for aggregation purposes.

In general, it is a challenge to specify and measure service products, even in the case of market producers. In Norway there is great interest in measuring services supplied by general government in quantity terms. Some projects for education services are described later in this paper. It has been difficult, however, to measure (or to define) quality changes of the services provided. As the usual quantity measures used, at least in the field of education, tend to be rather simplistic, there is a need to take quality changes into account. This concern could be

less pressing if the description of the services is very detailed. However, the level of detail is constrained by the need for corresponding detail in the cost data that can be used for aggregation.

Keeping the conventional measure of production valued at cost, the direct volume measures define an indirect estimate of a price. If the services are detailed described in quantity units, cost per unit can be well defined, and changes in unit costs can be similar to a price index. Many economic models contain an equilibrium condition saying that price equals unit costs (unit costs then include the full capital services, which is not the case in non-market services). On the aggregate level, the implicit price level for non-market production is somewhat arbitrary, as a consequence of the convention for measuring the current value of production.

3. Norwegian efforts to measure Government production of services

3.1 Central government education services

Central government in Norway is responsible mainly for higher education, although they also run some few other institutions for other types and levels of education. For the last years, Statistics Norway, on contract for the Ministry of government administration and reform has worked to develop a system of indicators in order to analyze results from and productivity of central government activity, including higher education.

The indicators were developed by a group of educational experts. The tables for the indicators are available at the web-site:
http://www.ssb.no/emner/04/02/40/uh_statres/

The indicators for Central government higher education are presented in four main categories.

Table 1 Indicators for higher education

Domain	Types of indicators/statistics
Resources	Costs, investments and personnel statistics
Activities and services	Number of students
Results	Students with educational points, total number of points, average points per student, passed degrees, publication points
Unit costs and productivity	Costs and employees per educational point, unadjusted and adjusted for cost differentials
Related indicators	Applicants per number of admitted students, Level of education in the population

These indicators are generally available by type of study, and also for each educational institution (to the extent that data privacy rules allows).

At first glance, this overview of indicators fit nicely in with the present National Accounts description of higher education. 'Resources' describes the various inputs, 'activities and services' is output, and the 'results' could be related to outcomes, which is not measured in the National Accounts. However, there are some problems with this story.

Firstly, there is a question whether all output is well measured by the indicator 'number of students'. On the one hand there are activities that the staff do that are not measured, such as research and development. If publication points are seen as the result of an R&D activity, there should be R&D services on the activity list. On the other hand, the number of students does not tell much about the quality of the teaching done. So far, no indicator of quality has been suggested in this specific statistical project.

For National accounts purposes, we would like to see separate cost data for R&D and for teaching. Such a split of the cost data is not possible to find in the accounting data for the educational institutions. However, there is a separate statistics for R&D expenditures within higher education, which we (in the National accounts unit) plan to use for the R&D satellite accounts. Perhaps this could be used to improve the cost data for weights and allow separate volume calculations for the two kinds of services.

We note that the indicator, unit costs, is seen as an indicator of productivity. The idea is that unit costs are to be compared between the individual institutions of higher education at one point in time. The data are, however, shown as time series for each institution. It is a paradox that what is presented as productivity would be interpreted as a measure of price change in the National accounts setting. The statistical project does not (yet?) present measures of cost at constant prices, which would be better for analyzing the time series data for unit costs.

3.2 Local government production of education services

Data on local government service production are covered in Statistics Norway's KOSTRA-system. KOSTRA is an abbreviation for "Municipality-State-Reporting" and provides various economic indicators as well as indicators on the municipalities' priorities, productivity and the coverage of needs. These data are available at the web-site http://www.ssb.no/english/subjects/04/02/20/grs_kostra_en/

Education in primary and upper secondary schools is one of the major services provided by the local government. KOSTRA gives a set of indicators which can be classified similar to the indicators for higher education.

Table 2 Indicators for primary and upper secondary education

Domain	Types of indicators/statistics
Resources	Operating expenditures (gross, net and adjusted)
Activities and services	Number of pupils and full time equivalents
Unit costs and productivity	Operating expenditures per pupil or full time equivalent, wages and salaries per pupil or full time equivalent

On the basis of the indicators presented in table2, we are able to calculate a quantity measure which does not take quality changes into account. We need to find proper indicators that can be used to adjust the simple volume measure for quality aspects. Actually, KOSTRA has defined a series of quality indicators, covering primary as well as upper secondary schools. The following types of indicators are included to describe quality of education for primary, lower secondary and upper secondary schools:

- Average points for lower secondary schools

- Transition to upper secondary schools
- Proportion of pupils who passed upper secondary education within theoretical duration
- Proportion of pupils who dropped out of school during the school year
- Average group size, 1st-7th grade and 8th-10th grade
- Number of pupils per computer
- Proportion of 6 years olds continuing at school care the second year
- Proportion of employees in school care with skill training

We see that the indicators chosen for local government in table 2 are of the same kind as those for central government, except that the local government indicators do not contain the 'Results' category. On the other hand, there is a set of indicators defined as quality indicators of which the first four of the quality indicators could also be seen as indicators of results.

Based on such classification, it can be argued that the first four points describe the outcome. Average points for lower secondary schools are based on marks achieved by pupils graduating to upper secondary school, and gives information about the pupils skills when graduating. Together with transition to upper secondary schools, the indicators reflect how well the primary schools have prepared the pupils for secondary education. However, information about graduate pupils covers only a part of the education progress. Therefore the indicators would have to serve as a proxy for the total output when adjusting for quality in primary schools.

For upper secondary schools, on the other hand, data on the proportion of pupils who pass different levels of education are available along with data on pupils who pass within theoretical duration and who drop out. Finally, one has to bear in mind that pupil attainment also depends on other elements that are out of the local governments influence, such as socioeconomic background.

The two next indicators capture the structure of the service and how the education is organized. It can of course be justified that average group size has a direct impact on pupil attainment, anticipating that fewer pupils per teacher crates a better learning environment. The number of pupils per computer can best be characterized as an indicator for input quality. For National Account purposes it would, however, be better to take advantage of an indicator that measures the outcome directly, and not the quality of the inputs. It is not easy to say how such a variable should be taken into account, measuring the volume of inputs. It is equally difficult to do quality adjustments to the output on basis of quality changes of inputs, even if the relevant quality change of the inputs could be measured.

School care is in Norway a way of organized day care for the children before and/or after the regular school hours. This services rendered can vary a lot between municipalities. Usually there is a fee to be paid for the parents, the size of which varies a lot as well. The last indicator tries to tell to what extent the activities of the school care is educationally relevant. In the national accounts, school care is seen as part of social care, and thus not relevant for education output.

In addition to indicators in KOSTRA, the Norwegian Directorate for Education launched a web service in 2004, the School Portal, which provides data relating to the fields of learning dividends, learning environment, completion of upper secondary education and resources.

Information is available from the individual school level aggregated to national level. Several indicators from the School Portal are suited candidates for quality adjustment in National Accounts. The School Portal also includes data about private schools. With that we have available indicators for primary and upper secondary education no matter ownership of the schools.

4. Non-market education services in the Norwegian national accounts

In accordance with the guidelines from the Commission Decisions 1998/715 and 2002/990, Norway started a project to develop an appropriate and efficient methodology for establishing output measures for education to satisfy the requirements of the *Handbook*. The direct output measures for educational (and health) services were for the first time implemented in the Norwegian national accounts in 2005, starting from the reference year 2003.

Measured as the value of production, approximately 95 per cent of education services in Norway are supplied by non-market producers, mainly by local government. Education expenditures accounted for 23 per cent of total government final consumption in 2005, and are the second largest item of government expenditure. If one takes into account all non-market expenditures, including those paid by government and non-profit institutions serving households (NPISH); education amounts to 5 per cent of GDP. In other words education constitutes an important part of government services and is a constant subject of evaluation both in media and among politicians.

In the Norwegian national account educational services provided by non-market producers are divided into three industries according to who is the supplier. Table 3 gives a brief overview of the industries and classification by type of service, largely corresponding to different levels of education.

Table 3 Education industries, education services and corresponding volume index

Industry	Product	Volume index
Local government education services	Primary education	Pupil hours in ordinary and special schools – weighted by gross operating expenditure from year t-1
	Upper secondary education	Full year equivalent number of pupils stratified by education programs (3 general studies, 9 vocational) – weighted by gross operating expenditure from year t-1
	Adult education	Number of students and participants in primary and upper secondary education – weighted by gross operating expenditure from year t-1
Central government education services	Primary education	Pupil hours in ordinary and special schools – assumed the same cost weight as for local government primary education

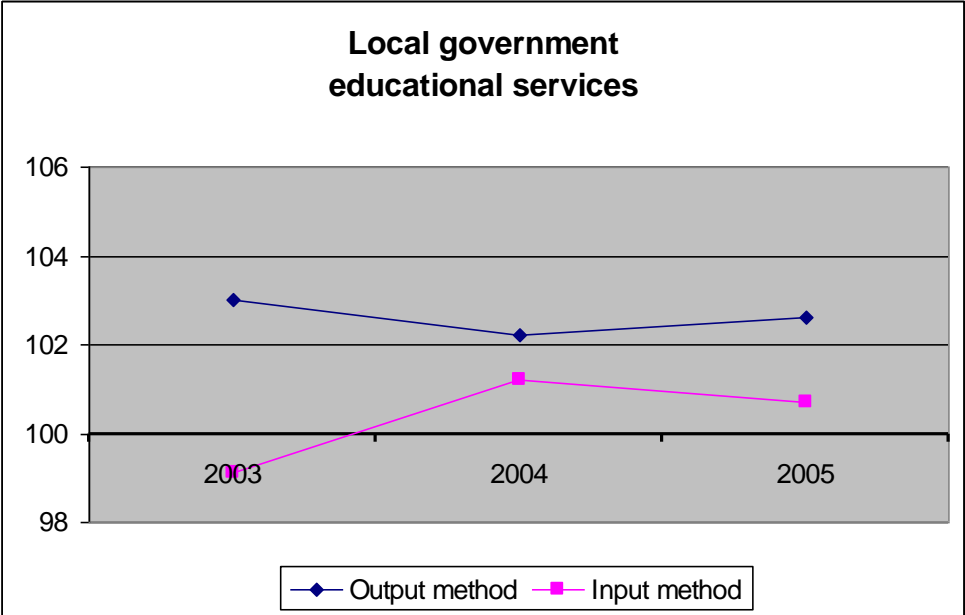|		
	Upper secondary education	Number of pupils (only two schools)
	Higher education	Number of students in colleges, university colleges, institutes of arts and universities – weighted by operating expenditure from year t-1. Universities are in addition stratified by groups of faculties having different unit costs.
NPISH, private	Primary education	Pupil hours in ordinary and special schools – assumed the same cost weights as for local government primary education
	Upper secondary education	Number of pupils
	Adult education	Consumer price index as for private adult education supplied by market producers

Local government (municipalities and county municipalities) are responsible for management and administration of primary and upper secondary education. Tertiary education in Norway consists of seven universities, six university colleges, two institutes of arts and 24 colleges which are all run by the central government. In addition there are 29 private colleges that belong to market educational services. The NPISHs are responsible for private primary and upper secondary schools.

An essential question when measuring the volume of the educational services is what is being produced. The volume indicator should as far as possible capture the output from the service supplied. The *Handbook* defines education output as "the quantity of teaching (that is, the transfer of knowledge, successfully or not) received by the students". It also suggests that this output can be measured by number of hours that pupils or students spend at being taught, so called pupil-hours.

Table 3 gives also a summary of the volume indicators that are used in the Norwegian output measurement. We have so far adopted the B-method which doesn't require quality adjustments. For primary education data on pupil-hours is available. This level of education is stratified by ordinary and special schools since the costs per pupil are considerably higher in the latter. For other levels of education pupil-hours are not available. As the table indicates we use the simple number of students as an alternative, except from for upper secondary training, where full year equivalent number of pupils is the quantity indicator. Both upper secondary and tertiary education services are further stratified according to different unit costs. Satisfactory data are still not available for adult education. For private producers we have not found data that allows us to separate volume indicators for market producers and non-profit institutions serving households. So far we have applied deflation by CPI price indexes.
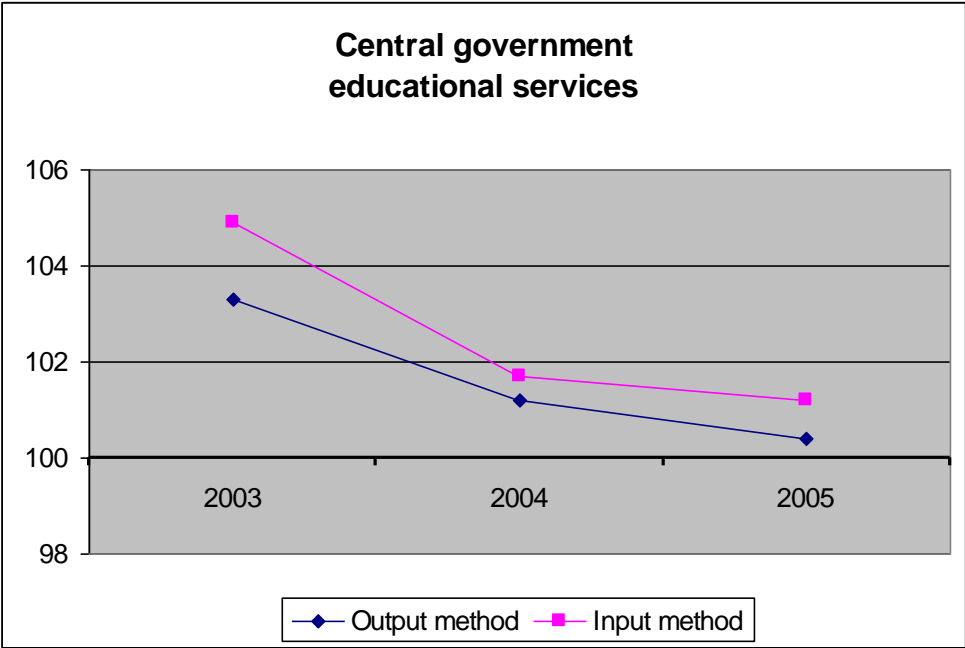
Today's situation is however that the direct volume indicators cover most of the educational production and the cost weights are updated annually. In figures 1-3 we have compared the results of the direct volume indicators with the old method of deflation with input price indexes. The results for 2003 should be interpreted with caution. 2003 was the first year when direct measurement of educational output was introduced into National Accounts. Minor methodical changes and new data sources have been implemented continuously.

Figure 1 Volume growth rates; comparison of output method approach and input method for local government educational services. Previous year=100
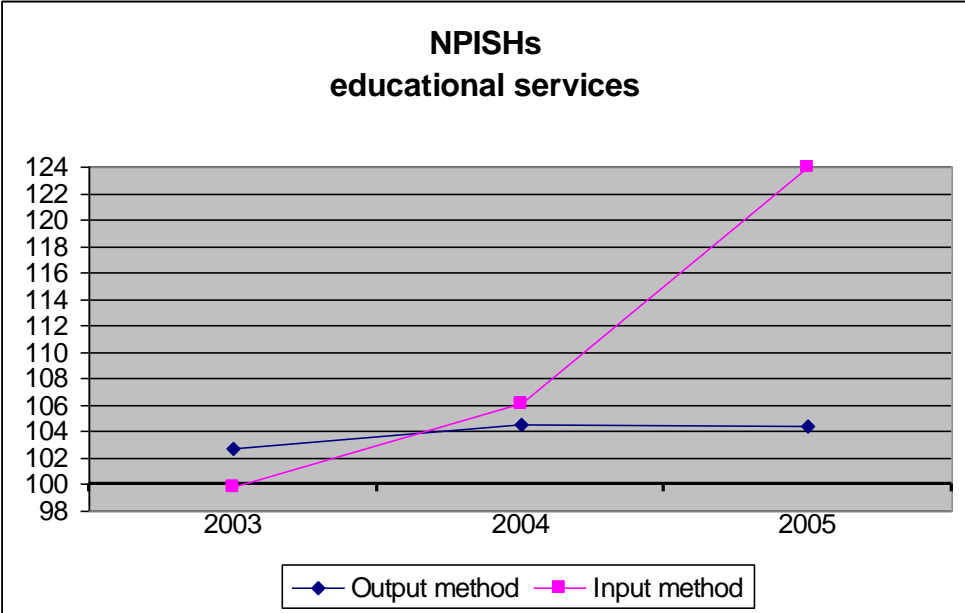

Local government is by far the largest provider in NACE education. An overall consideration shows that the output method tend to give higher volume growth indexes than the input method. This is connected with the increase in number of pupils in primary schools during the period 2003-2005. Correspondingly we have seen an even stronger growth in the number of students aged between 16 and 18 attending upper secondary schools. As the plotted series in figure 1 indicate, there is a rather large difference between the input index and the output index in 2003. The reason is a considerable increase in the compensation of employees due to higher pension premium for teachers. Since the compensation of employees is the main component of the production costs, the input price index was very high that year, leading to a decline in the educational output in constant prices. In this case we consider the method with direct output measure for successful. Increased rates of pension premiums should not affect the volume growth of production, and therefore the output method gives a better result in this case. For the two following years the volume series are more similar to each other, but still the output method gives lower volume growth that the input price method.

Figure 2 Volume growth rates; comparison of output method approach and input method for central government educational services. Previous year=100

**Central government
educational services**

The opposite pattern is the case for central government and tertiary education. Our calculations show a lower volume growth when measured by number of students compared to the traditional input price method. The time series are otherwise quite similar and show the same development. The declining growth rate is connected to declining number of students at most of the governmental education institutions.

Figure 3 Volume growth rates; comparison of output method approach and input method for NPISHs educational services. Previous year=100

**NPISHs
educational services**

Education by Non-profit institutions serving households is a small industry compared to educational production in general government. The dramatic difference in the volume of output between the input and the output method is due to a break in the time series. From 2005 new data based on annual accounts for the private non-profit schools was available. This led to a rather marked growth in production measured in current prices. The number of pupils

in private non-profit schools has, however, increased steadily in later years. In the case of direct measure of output, the volume growth follows the same pattern as the number of pupils, while the implicit price index is affected. Looking at the input method, the input price index was calculated to 2.2 per cent in 2005. It can be seen from the figure that as a consequence the volume index would have made a considerable jump compared with previous year.

As education by NPISH is an insignificant industry in Norway, it was decided to take the new level of production at current prices into the accounts. The alternative would have been to postpone the utilisation of the new data source until the next general revision. The direct volume growth estimate made it possible to incorporate the new source and have good estimates of the volume growth as well, but at the cost of a meaningless estimate of the implicit price index relating to these services. The old input price method would have given a normal price index, but, as seen from figure 3, a biased estimate of the volume growth rate for the industry. Normally the national accounts would prefer to get the volume growth rate right, so the output method should be preferred in this very special case.

5. Adjustments for quality change in education

As explained above, no specific adjustments for quality changes in education are done in the Norwegian national accounts. There is a detailed stratification of the educational institutions, especially in the medium and higher level of education. The unit price differentials are believed to express the fact that the activities are different in different strata, it is not clear to what extent this difference is due to quality differences.

We do some efforts to take into account quality changes in labour. This is based on a stratification of the employees (Røgeberg et al., 2004). The skill of the work force is measured according to different criteria concerning education level, occupation and public service seniority. In this case it seems reasonable to say that the stratification shows a quality profile, and this is confirmed by observed pattern of market wages. For the moment, such a stratification of labour inputs are used for collective services produced in three government industries; central government public administration and compulsory social security services, defence services and local government public administration and compulsory social security services.

Our quality adjustment for labour inputs should be relevant also for education services. When productivity is analysed using the growth accounting method, we need not only the volume growth of outputs, but the volume growth of inputs as well. Further, it seems that high quality of the inputs, such as well educated teachers, access to IT services etc, should imply high quality of the services produced as well. It is not obvious, however, how to assess the quality change of the outputs that results from quality changes of inputs.

In Norway, our registers make it possible to study returns to education at the individual level. Empirically, economic returns to education across cohorts in Norway show a decline in the returns to education across cohorts (Hægeland, 2001). Controlling for self-selection into education, however, the cohort differences vanish. The relevant self-selection is that those with the better abilities tends to choose longer educations, but also tends to have better earnings and better returns from education independent of their educational level. The econometric study concludes that there is no support for the hypothesis that the quality of schooling has declined over time.

Given the uncertainty of the development of quality in education, and in view of the difficulties in assessing the changes in quality in education output that results from the available quality indicators, it seems unlikely that quality adjustment of education output should be done in the short run. In order to improve on the present output indicators, it seems more promising to improve the specification of output from the educational institutions. Especially it would help to have a better separation of education vs. research and development services produced in higher education. We have an ongoing project for a satellite account for Research and development that we hope shall give a basis for such a separation.

References

Eurostat, 2001, *Handbook on price and volume measures in national accounts,* Office for Official Publications of the European Communities.

Hægeland, Torbjørn, 2001, *Changing Returns to Education Across Cohorts: Selection, School System or Skills Obsolescence?* Discussion Papers No 302, June 2001. Statistics Norway Research Department

Norwegian Directorate for Education, http://skoleporten.utdanningsdirektoratet.no

Røgeberg, Lasse et al, 2004, *Report on the project Quality adjusted input price indices for collective services in the Norwegian national accounts,* Statistics Norway Documents 2004/9, http://www.ssb.no/emner/09/90/doc_200409/doc_200409.pdf