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NATIONAL Accounts and Financial Statistics Division

OECD Handbook 'Measuring Education and Health Volume Output'

The use of credits and fields of education in tertiary education - the Finnish metho

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1. Introduction

This report describes the output volume methods of tertiary education that are used in Finnish national accounts, the data that is used in the calculations, as well as the results obtained with the calculations. This report is mainly shortened from development project report Statistics Finland (2006): Revision of the method for calculating the volume of general government output (author Olli Seppänen). All changes, added updates and possible mistakes are ones of authors of this paper.

As for output of education, number of pupils/students and credits are the main volume indicator categories. For tertiary education, the main indicators are mainly number of credits. Volume indicators are divided in quality groups of type or education, type of pupils and by field of education and are measured individually. This practice is mainly for capturing structural quality changes within the total output volume of education.

Achievement of ideal indicators is generally not possible in practice. For example, no data are collected in Finland on student hours. This being the case, an indicator approximating an ideal indicator has to be used. Dependent of the field of studies, in educational services this could be the number of students or credits. There is no clear evidence that the use of approximated indicators could not make sufficient picture of volume development for inter-country comparisons at least in the short term.

2. Notes on volume measures and quality change in tertiary education

2.1. The aim of output indicators in the Finnish system

Finnish national accounts for general government are the main users of volume measures of education. The share of general government supply of education services is roughly 2,5 per cent of total supply in Finnish economy. Educational services also make up a significant proportion, approximately one-third, of the individual services provided by general government. So by all means it is important to make proper volume measures for non market production.

In national accounts education comprises the services provided by local sector in pre-school, primary, lower secondary, vocational and upper secondary education, polytechnic activity, voluntary cultural activities of adult education centres and similar, basic art education and other educational services. In the central government sector this activity extends to universities and vocational and general education provided by the state, as well as further education of teachers. The activities of universities account for 95 percent of central government's educational service activity. University level education is therefore solely provided by central government and polytechnic education mainly by local government.

Other usage of volume measures is to make productivity statistics for local and central government for performance evaluating purposes (Statistics on local government productivity and Statistics on central government productivity).

The aim for all statistics is to produce yearly change of volume of education in the level of national account data for domestic use. Question of other uses raise different aspects relating volume measures. When there is need of longer time series within national accounts framework, volume measures of non-market production are often criticised for not taking every aspect of volume into account and therefore the long-time development is distorted. This is similar situation to the market production of services. Detecting volume development for service production through market prices is leaning strongly to price statistics that cannot necessarily follow the quality changes in long time trends. Same critique of non-market service volume measures can be extended to other service production.

2.2. *Detecting quality*

For as long as there has been discussion about measurement of the volume of output of non-market services, there has also been discussion about the related measurement of changes in the quality of these services. Changes in the quality of products can be divided into two components: structural quality changes and internal quality changes. Of these, the former can be measured more easily than the latter (as a change in the volume of output).

Structural changes in the quality of services can be measured as changes in output volume by classifying services into strictly homogeneous quality groups of products. In this case of tertiary education, the quality groups are based on classification by field of education (20 classes). This grouping is based on our national monitoring traditions and is not fully compatible with International Standard Classification of Education (ISCED) classification. This may diminish international comparability of the data. Naturally, there are still areas that can be improved in the methods, and these should receive attention in the future.

This measure does not take into account the difficulty of education although basic level courses give fewer credits than advanced courses in some study programs. From the producer's point of view, the production process of basic and advanced study can be exactly the same and only the content of the lecture changes. In this case the extra 'burden' is on the student not the provider of educational service.

According to the experiences gained from compiling the volume data, giving consideration to structural changes in services does not always essentially change the development of output volume compared to "less precise" measures. At the level of an individual activity, the effect is often in the region of a couple of decimals of a percentage point. This being the case, it can be concluded that in many cases even quite rough volume indicators (from large data) give an apposite picture of development in the volume of output. The essential reason for this is that service output has remained quite similar from year to year and the quality does not change so vividly in the short term.

The problem of new products in volume measures could be difficult, because in the first examination year the volume of new products cannot be compared against that of the previous year. One method to produce volume changes that are comparable with market production is to combine the volume of a new product with that of an "old" product so that the volume of the new product is weighted against the "old" product with the help of unit costs.

This problem of new products is quite small in tertiary education because there have not been any observed changes in 'product set' of education in recent years. As generally, new public products play a minor role in early years of production. Therefore it is likely that the sequential information of new services is formed before their significance is so big that they can influence the volume indicator.

Internal quality changes in services refer to quality changes other than those in their structure, i.e. changes within the quality of a specific service group. The measurement and verification of these changes is considerably more difficult.

In this case, problem of quality is solved by joining separate quality indicators with volume indicators. There is again two approaches to measure changes in quality, by measuring characteristics of products or to measure the sort of 'hedonistic' quality aspects monitored from changes in the effects from the services (e.g. learning in educational services and health in health care services). The latter has, indeed, already been tested in the United Kingdom.

Two matters must be solved before separate measures of quality can be exploited in regular statistics production. First, the way in which a change observed in a quality indicator should be converted into a change in volume and, second, the basis and the principle on which a measured change in a quality

indicator should be combined (weighted) with a separate volume indicator. When measuring effects, it should be borne in mind that the direction of the service producers' share of a change in the effects can be either parallel or opposite to the effects from other affecting factors. If the cause for a change in effects is not known it is best to assume that quality of service has not changed. Creation of complex calculation and modelling systems should be given thorough consideration because they are difficult to control as we can learn from climate models.

Using separate quality indicators to assess change in the internal quality of services is not really possible in Finland. Indicators describing quality or effect are not systematically available at the moment. There are no general data on learning results available with which the effectiveness of educational services could be described.

The Finnish practice of forming volume measures tries to transform the problem of quality to the problem on new products. Changes in quality are mainly taken into account in output volume indicators by dividing services/products into quality categories. Some changes in quality can easily go unnoticed as a change in volume if quantitative indicators are used, although changes in the structure of services, i.e. part of the change in quality, can be measured as a change in volume if a very detailed classification of products is used.

The impacts or effectiveness of the services are brought up in the dialogue concerning service quality. These are, of course, very important issues. However, the ruling principle in the measurement of output volume should be that produced (and consumed) services are measured as output and not, for instance, their needs or effects. In addition, when effects are assessed it should be borne in mind that only some of the changes observed in effects are caused by the actions of the producers of non-market services.

3. Volume indicators of tertiary education

In Finland, educational services make up a significant proportion, approximately one-third, of the individual services provided by general government. In national accounts education comprises the services provided by municipalities and joint municipal authorities in pre-school, primary, lower secondary, vocational and upper secondary education, polytechnic activity, voluntary cultural activities of adult education centres and similar, basic art education and other educational services. In the central government sector this activity extends to universities and vocational and general education provided by the state, as well as further education of teachers. The activities of universities account for 95 per cent of central government's educational service activity. (Table 1)

Table 1: Structure and used indicators in measuring General Government education output.

	Central Government	Local Government
Education		
Primary education		
Pre-school education		number of pupils, (disabled separated)
Comprehensive education (preliminary and lower secondary general)	number of pupils (only disabled) by level of disability and age levels	number of pupils, by age levels (disabled separated)
Secondary education		
Technical and vocational secondary education	number of pupils (only disabled)	number of students by field of education
Upper general secondary education	number of pupils (only language schools)	number of students
Tertiary education		
Polytechnic education		ECTS credits, by field of education
University education	ECTS credits, by field of education number of students in post-graduate education programs number of publications from research programs	
Adult and other education		number of students

The Handbook on Price and Volume Measures states that the output in education is the quantity of teaching received by students, adjusted for changes in quality, at each level of education. The best suited indicator method (method A) for output in education is so-called student-hour (pupil-hour), which refers to the number of hours of teaching received by students (not the number of organised teaching hours). An alternative method (method B) would be the number of student-hours without adjustments for quality or number of students, if it can be shown that the number of hours spent being taught is sufficiently stable.

Number of students is believed to be a better volume indicator than the number of student-hours for education at the tertiary level (universities, polytechnics), where only some of the teaching is provided at lessons. In the case of tertiary education, there are some other characteristic features that may compromise the use of students as an volume indicator. People, at least in the level of university education, can choose the “consumed” volume of educational services. Thus the education services output can vary because of demand. Double diplomas could affect on credit levels if the same credit is reported from two different units despite of the fact that they are not request to do so.

Credits are used for volume indicators in all polytechnic and university education. Credits are based on European Credit Transfer and Accumulation System (ECTS) since year 2005, before that the classification was based on domestic credit system. The specific problem with the use of data on student numbers for tertiary level of education is that the students progress at highly varying speeds in their studies and a considerable proportion of them do not necessarily gain a single credit during an academic year. Many of this latter mentioned share of students do not study at all.

The credits of university and polytechnic are not summed up together because there is believed to be some quality differences (inside tertiary education) between university and polytechnic levels. Then again all units inside polytechnic education are summed up because there are quality standards that are presented by The Finnish National Board of Education and are obligatory. In universities there are no such national standards. It can be assumed that that there is no wide difference in certain courses or education

programmes between universities. The universities are mainly monitoring themselves that the content of their programmes are at the same level as their domestic and foreign counterparts.

(It has to be said here that in the Finnish national accounts some of the output of central government's educational activity belongs to research and development services, which are collective services. Thus, as far as this part of the non-market production is concerned, output indicators must also be specified for a collective service, because production and income formation cannot be compiled at constant prices through both output and costs. Numerical data on publications are used as the output indicator for research and development services.)

The volume indicator used for education leading to a basic degree in the educational services of universities is credits obtained from Statistics Finland's statistics on educational institutions. Data on student numbers obtained from the Ministry of Education (KOTA online service) are used on preliminary estimates. The educational services of education leading to a basic degree have been divided into 20 product groups by field of study (Table 2). The indicator used for university education leading to a higher degree is the number of students (1 product group) while the indicator used for research is the number of publications (1 product group). The source for these data is mainly the KOTA database. Since 2004, data used on university education leading to a higher degree has been obtained from Statistics Finland's statistics on educational institutions.

Table2: Field of education classification

Polytechnic fields of education	Universities fields of education
Natural resource	Theology
Engineering and traffic	Humanities
Commerce and management	Art and design
Travel, nutrition and home economics	Music
Social and health care	Theatre and dance
Culture	Education
Humanities and education	Sport sciences
	Social sciences
	Psychology
	Health sciences
	Law
	Economics
	Natural sciences
	Agriculture and forestry
	Engineering
	Medicine
	Dentistry
	Veterinary medicine
	Pharmacy
	Fine arts
	Higher degree programmes
	Research

Data on credits for the whole calendar year becomes available approximately 17 months after the end of the statistical reference year. Data on the spring semester, which becomes available about five months after the end of the statistical reference year, is used as preliminary data for the latest statistical reference year. The product indicators for research and higher degree level education become available with a delay of approximately five months from the end of the statistical reference year.

Cost shares for the products (Table 2) of university education have been calculated using the cost data by business area contained in the KOTA database. The cost shares of the products of general and vocational education have been determined using the data in the cost reports of the Board of Education's Financing system of educational and cultural services.

Table3: Cost shares and unit costs on fields of education in universities

Universities fields of education	Average cost share 2004-06, %	Average total costs 2004-06, 1000€	Average credits 2004-06	Average cost/credit 2004-06, 1000€	Average students 2004-06	Average cost/student 2004-06, 1000€	Average credits/student 2004-06
Theology	0,88	5 453	67 671	0,08	2 392	2,28	28,29
Humanities	10,75	66 604	647 374	0,10	24 450	2,72	26,48
Art and design	3,95	24 417	65 661	0,37	2 537	9,62	25,88
Music	2,66	16 449	33 985	0,48	1 376	11,95	24,70
Theatre and dance	1,42	8 804	10 947	0,80	412	21,37	26,57
Education	10,63	65 751	423 197	0,16	12 681	5,19	33,37
Sport sciences	0,73	4 542	27 548	0,17	725	6,27	38,00
Social sciences	6,96	43 156	418 259	0,10	15 940	2,71	26,24
Psychology	0,80	4 950	48 471	0,10	1 417	3,49	34,21
Health sciences	1,08	6 665	81 380	0,08	2 402	2,78	33,88
Law	1,78	11 030	123 441	0,09	3 990	2,76	30,94
Economics	8,25	51 070	520 541	0,10	17 349	2,94	30,00
Natural sciences	15,41	95 476	547 549	0,17	23 560	4,05	23,24
Agriculture and forestry	2,71	16 773	85 059	0,20	3 052	5,50	27,87
Engineering	19,97	123 602	821 220	0,15	31 919	3,87	25,73
Medicine	8,10	50 213	193 011	0,26	3 853	13,03	50,09
Dentistry	0,90	5 602	20 945	0,27	501	11,18	41,81
Veterinary medicine	1,18	7 299	15 600	0,47	379	19,26	41,16
Pharmacy	1,19	7 389	55 999	0,13	1 629	4,54	34,38
Fine arts	0,63	3 908	8 649	0,45	224	17,45	38,61

As we can see from table 3 the cost per credit is remarkably different between the fields of education. The difference between natural and social sciences is not so obvious, because fields of art tend to be the most expensive ones in term of costs per credits or per student. Reason for this could be that the 'production process' of art education has more individual guidance by nature and also uses intermediate products more intensively. Also, it has to be noted that average number of credits per student is higher on medical orientated fields of education. In addition, the average cost per credit is higher in medical sciences than in most other fields of education.

Data on credit numbers derived from Statistics Finland' statistics on educational institutions is used as the volume indicator for polytechnic education starting from the statistical reference year of 2003¹ whereas prior to this the number of students and costs were obtained from the reports of the Board of Education's Financing system of educational and cultural services. Data of the Board of Education on student number are used as a preliminary indicator.

The cost shares of local government's educational services have first been calculated for each level of education using data from the statistics on the finances and activities of municipalities and joint municipal authorities. After this, cost shares have been determined for the indicators at each level of education using the data in the cost reports of the Board of Education's Financing system of educational and cultural services and, in respect of upper secondary general education, with the help of unit cost data.

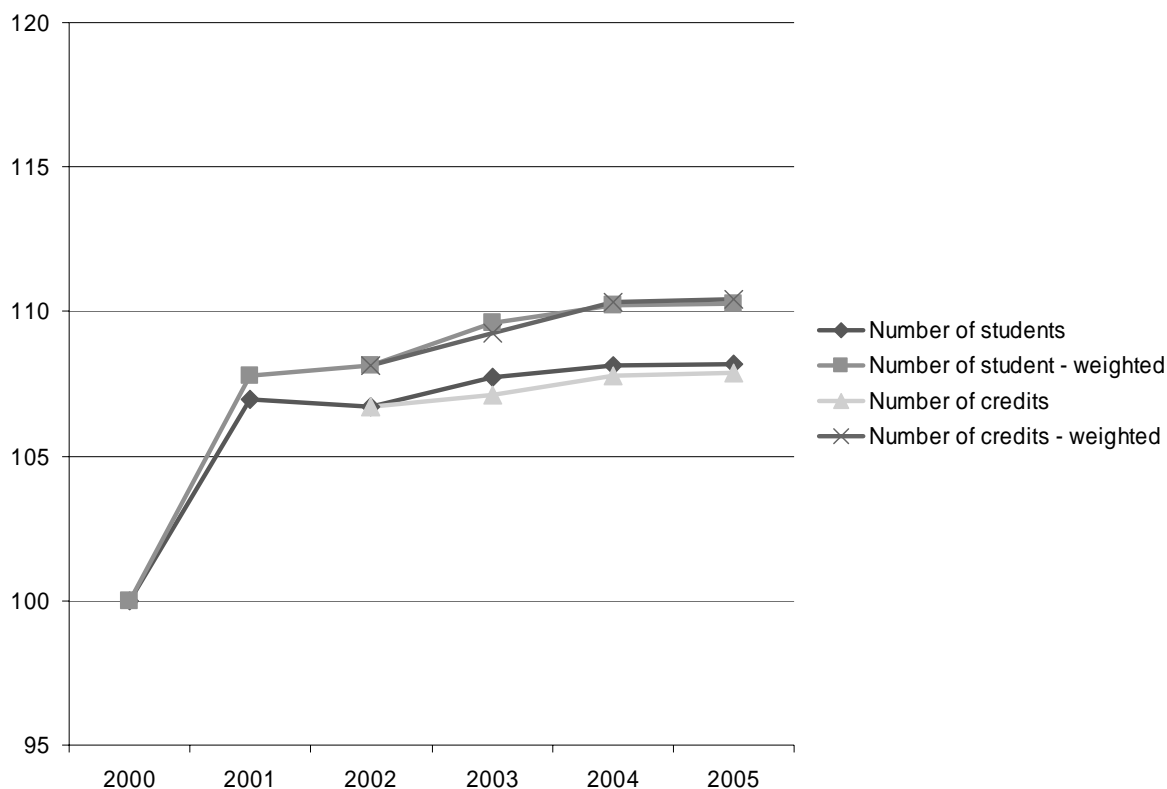
4. Results

There is no significant difference between a indicator based on the number of students and a indicator based on the number of credits in polytechnic education. This indicates that students take credits quite

¹ The data have not been produced prior to this.

equally inter-temporally on average even though the number of students has increased. Reason for this could be that study programs in polytechnic institutions are rather limited on their content. There is, however, difference between weighted number of students and credits and the non-weighted number of students and credits. Weighting fields of education by cost shares leads to a higher level in growth of volume which indicates that both number of students and number of credits have grown in the most expensive fields more than in general. (Figure 1)

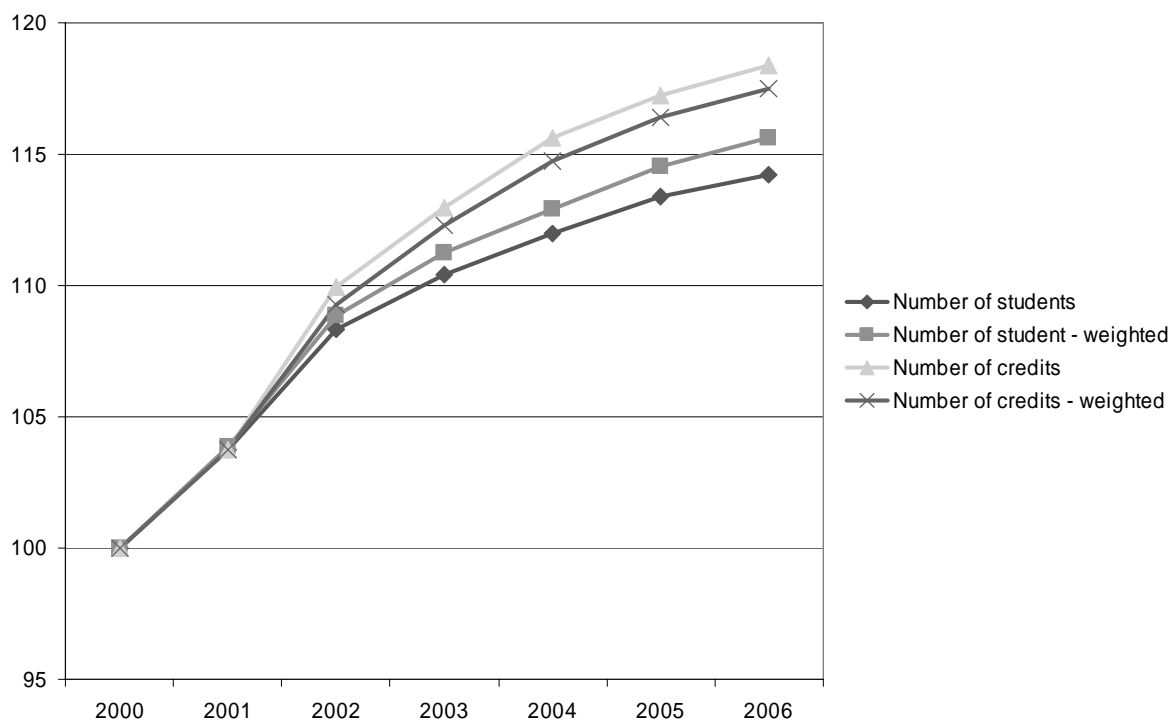
Figure 1: Different volume indicators of polytechnic education.



As for university education, output volume changes are rather similar with all indicators. Non-weighted sum of student number gives the smallest change in volume. If the student number is corrected by weighting it by fields of education, the indicator gives higher volume changes than the non-weighted. This indicates that students are taken in universities in more expensive fields of education programs. Credits give higher output volume development than the number of students. There is a notable difference to polytechnic education, because students can choose freely the contents of their programme.

The non-weighted sum of number of credits gives a slightly higher change in volume than the weighted one. This indicates that actually educational service has slightly moved towards more inexpensive courses. Average service per student (credit/student) has risen, but is slightly biased towards cheaper education products (fields of education). (Figure 2) One explaining reason for this could be that the number of students has slightly risen in fields of art but the number of credits has not followed in the same share. Art students study little less than in previous years at the same time that there has been slight increase at the credit/student -ratio in the fields of humanities and economics.

Figure 2: Different volume indicators of university education.



This is an example of how the quality changes can be measured in the structure of the volume indicator by splitting it into several more homogeneous indicators so that the volume change reveals the change in quality. Number of credits seems to be useful indicators in tertiary education, because they react better on the situation when student decides to gain more educational service by taking added courses in their programme.

5. Problems, needs and future work

In the central government's educational services, closer definition of research products is the main target for improvement. The project on the development of statistics on the productivity of central government by administrative sector will bring improvements to the problem. The use of ISCED classification could bring some known quality aspects visible. In some of the classes in the Finnish national classification, field of education keeps inside very heterogeneous educational services.

In the local government, collecting of data on credits in vocational education has also been started but it is not yet known how usable this data is. Even in course-format upper secondary general education, credits would probably also be a better indicator for the measurement of the volume of the service. Another matter that should be considered in the future is the possible use of the number of pupils present instead of number of pupils as volume indicator. In addition, methods for the measurement of changes in quality are permanently topical targets for development work.

When taking the approach of transferring the problem of quality change from internal quality to structural quality (problem of quality as a problem of new products), there is a severe need of detailed data of different service volumes and production costs. Also, in all cases the additional data on characteristics of

service products is needed for keeping track on the situation within a service group. Strong demand is directed to classification of products because the used classifications should tell about quality differences. Classification of non-market services should be changed rather quickly following the new products, which means that there could not be long time series on the volume of certain product but there can be a long time series on yearly volume changes.

Further development of volume calculations continues. The focus should fall on the need to have more timely data than at present for the compilation of national accounts data on trends and preliminary annual accounts. Due to delay in the production of indicator data, the volumes of many non-market output products cannot be measured with the best possible indicator for the first preliminary data of annual accounts or for quarterly accounts. The volume of local government's educational services can be calculated for the first preliminary annual accounts, but volume indicators for all products only become available for the compilation of third preliminary annual accounts, approximately 13 months after the end of the statistical reference year.

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