Price and volume measures for non-market output:
state of play in Europe for health and education

Mariagnese Branchi[1] (European Central Bank)
mariagnese.branchi@ecb.europa.eu

The government sector significantly influences the estimation of productivity growth for the whole economy. While an extensive body of literature exists on the compilation of volume estimates for non-market output and the perception exists that the issue is settled on the research agenda, its implementation in European national accounts still poses challenges for national statistical institutes. Research on, and the harmonisation of, quality adjustment of direct output measures are still needed. Furthermore, the implementation of quality adjusted data in the European Union is relegated to satellite accounts for the next few years. This document aims at providing the state of play in the euro area from a user point of view.

Keywords: non-market output, volume measurement, quality adjustment, EU requirements, outcome

Introduction

The interest in the government[2] sector output is permanent as the latter plays an important role in the estimation of productivity growth for the whole economy. Potential measurement issues in the estimation of health and education volume services may have a noticeable impact on euro area whole economy productivity growth, as this output accounts for about 11% of total final demand in the euro area.

In order to put this work into a context, Table 1 presents the General Government final consumption expenditure (P3) as a percentage of GDP for the euro area and the euro area Member States. The share of education expenditure has been relatively stable over the years, while the health expenditure share has been slowly growing since 2000. Among countries, the share of health expenditure increased particularly in Greece and the Netherlands. In small countries like Cyprus and Luxembourg the share of expenditure in education is higher than the share of health. These results are confirmed if compared to the shares of health and education in government final consumption and total expenditure (not presented here).

From the input to the output method

The difficulty in the estimation of volumes for non-market services resides in the lack of economically significant price information, resulting from the demand and supply of goods and services, as prescribed by the microeconomic theory of producers and consumers. The market price is generally used to calculate output volume estimates by deflating the current price information. In its absence, still not very long ago, the volumes of non-market services were estimated in most countries with the so-called input methods. When the

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[1] The author also benefited from earlier assessments by W. Haine.

[2] The "government" in the document should always be interpreted as the "General Government".

Table 1 – General government final consumption expenditure as a % of GDP

	Education				Health				Total education and health			
	2000	2005	2010	2011	2000	2005	2010	2011	2000	2005	2010	2011
Euro area	4.2	4.2	4.3	4.2	5.6	6.2	6.9	6.8	9.8	10.4	11.2	11.0
Belgium	5.4	5.6	5.9	5.9	6.0	6.7	7.4	7.6	11.4	12.3	13.3	13.5
Germany	3.3	3.4	3.4	3.4	6.1	6.2	6.6	6.5	9.4	9.6	10.0	9.9
Estonia	5.3	4.6	5.2	4.9	3.8	3.5	4.6	4.4	9.1	8.1	9.8	9.3
Ireland	3.3	3.7	4.5	4.3	4.9	5.7	7.2	6.8	8.2	9.4	11.7	11.1
Greece	3.3	3.6	3.8	3.9	2.2	5.6	6.3	5.9	5.5	9.2	10.1	9.8
Spain	3.9	3.9	4.5	4.4	4.9	5.4	6.3	6.0	8.8	9.3	10.8	10.4
France	5.1	5.0	4.7	4.6	6.1	7.0	7.4	7.4	11.2	12.0	12.1	12.0
Italy	4.1	4.1	4.0	3.8	5.7	6.7	7.2	7.1	9.8	10.8	11.2	10.9
Cyprus	4.7	5.1	5.8	5.9	2.1	2.4	2.9	3.0	6.8	7.5	8.7	8.9
Luxembourg	3.7	3.7	4.1	4.0	3.5	4.1	3.9	3.8	7.2	7.8	8.0	7.8
Malta	3.7	4.2	4.3	4.3	4.3	4.8	5.8	5.9	8.0	9.0	10.1	10.2
Netherlands	4.2	4.5	5.0	4.9	4.7	5.5	7.9	8.0	8.9	10.0	12.9	12.9
Austria	5.0	4.6	5.0	4.8	5.0	5.3	5.5	5.3	10.0	9.9	10.5	10.1
Portugal	5.6	6.1	5.7	5.2	5.1	5.9	5.9	5.7	10.7	12.0	11.6	10.9
Slovenia	4.7	4.8	5.0	5.0	5.6	5.5	6.1	6.1	10.3	10.3	11.1	11.1
Slovakia	3.0	2.6	3.2	3.0	3.9	2.1	5.5	5.1	6.9	4.7	8.7	8.1
Finland	4.4	4.7	4.9	4.7	4.9	5.8	6.2	6.3	9.3	10.5	11.1	11.0

Source: Eurostat

output is estimated as the sum of deflated input costs (labour costs, intermediate consumption and capital consumption) the resulting productivity estimates (output over inputs) are zero by construction.

A lot of work has been done internationally for the development of improved compilation methods and there is a long history of research on health and education output measurement. In Europe the publication of the Handbook on Price and Volume measures in national accounts (Eurostat, 2001), gave the principles of implementation by examining both market and non market output and followed the guidance of the Commission Decision (98/715). To force the production of more accurate volume measures, additional EU legislation in 2002 required Member States to measure the volume change of government output directly, at minimum for measuring health and education services, by 2006[3].

Three alternatives to the input-oriented measurement can be distinguished in the Eurostat manual: activities, outputs and outcomes. *Activity or process indicators* give the amount of activities the government unit is carrying out, but they often do not lead to reasonable volume and productivity estimates. For example, a decrease of the number of operations (activity indicator) in a hospital due to new medical treatments would imply a reduced output or productivity, which does not seem appropriate as the overall amount of care that patients receive *(output indicator)* is not reduced. *Outcome indicators* (e.g. life expectancy, the level of education of the population) are generally not representative of the output but of the subsequent effect of the output, they may be influenced by other, unrelated factors and they are difficult to quantify.

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[3] European Commission Decision of 17 December 2002.

Therefore, the agreed EU requirements generally prefer output indicators. In some cases, however, outcome indicators could be used as indicators for the quality of the output. Key to Eurostat's approach was the introduction of an A/B/C type classification. In the case of individual services, like health and education, the EU recommended as 'A' methods, those methods which measure the output and which satisfy the following criteria:

✓ they cover all services produced by the producer that are provided to external users, and only those activities that are in fact ancillary to the main output should not be counted;
✓ they are weighted by the costs of each type of output in the base year;
✓ they are defined in as much detail as possible;
✓ they are quality-adjusted.

If the above criteria are not fully satisfied the output method becomes an acceptable but non-optimal 'B' method (for instance, if the level of detail could be improved or if the method did not take changes in quality into account). Input methods ('C') are based on the simple sum of the inputs (e.g. the number of teachers) and should not be used as in this case an increase in the number of teachers would lead to an equal increase in education output without any evaluation of the actual effect on the amount of education received by the students.

During the last decade, the research was sparked by the Atkinson review in 2005. The principles put forward were consistent with the Eurostat recommendations. A main objective of the Atkinson review was to promote the use of more direct output measures, in particular for government output, including allowance for quality changes.

Eurostat organised three workshops between 2005 and 2008 to discuss the Atkinson recommendations and the implementation and the treatment of quality in price and volume measurement of non-market services. The workshops identified the need to clearly define the concept of quality and how quality adjustment can be practically implemented in the compilation of volume measures. As regards non-market education, the discussion set the need to clarify some specific methods like how to take changes in the class size into account, while for health services it appeared that NSIs did not envisage adopting 'A' methods because of the difficulties in identifying appropriate quality adjustment indicators. Eurostat and the Directors of national accounts decided in July 2008 to remove the requirement of quality adjustment from the core accounts. The decision was also based also on considerations on the non-comparability of the quality adjusted non-market volume estimates.

Discussions also continued in the General Conference of the International Association for Research on Income and Wealth in 2008, particularly focusing on the debate of "output" versus "outcome". The "outcome", -as intended by national accounts and also mentioned above - is a state valued by the consumer, referring to the definitions of utility and welfare as something that is valued by individual consumer based on this subjective experience. Its direct use to estimate output is criticised as being "beyond GDP", as taking non-produced assets into the production account and not solving any of the problems related to the compilation of output volumes, e.g. lack of information on the price formation process (Heikkinen and Hautakangas, 2008). In the international context, however, the output approach is recommended and the outcome is interpreted as

one of the criteria to be used to identify explicit quality adjustment factors (SNA 2008, 15.122). Considerations on outcome should be used to assess objective quality characteristics of the service to be used to quality adjust the quantity indicators (Schreyer, 2008-2012).

In 2010 the OECD published a comprehensive Handbook on measurement of volume output of education and health (Schreyer 2010). The Handbook provides useful guidance reflecting both the discussion of national accountants in Eurostat and in the international arena as well as discussions with sector specialists in the above-mentioned fields. It considers both temporal and spatial comparisons of volume measures. It advocates the use of a suitable and detailed stratification to account for implicit quality adjustment. Furthermore, it states that explicit quality adjustment may be required referring to the outcome of the service. It is recognised that explicit quality adjustment is complex. For education services a quality adjustment based on the effects of teaching on exam scores is proposed, while for health services different quality adjustment methods are discussed but no concrete measure is put forward as there is no agreed method to isolate the effect of medical treatment on health outcomes. Overall the manual is in line with the EU requirements (Eurostat 2001), although it also promotes more controversial quality adjustment methods. The handbook also presents a valuable overview of country practices in the volume measurement of health and education services[4].

Due to the lack of consensus, the decision to remove quality adjusted volume estimates from the core national accounts is now carved in the ESA2010[5]. The outcome criterion that is that two units of non-market services are considered equivalent if they give the same outcome, is defined and still considered valuable, but the difficulty in the measurement of outcome is recognised. For health and education services the European legislation requires countries to compile "estimates of production and of consumption in volume terms on the basis of direct output measure – not adjusted for quality - by weighting up the quantities produced by the previous year costs for these services". The Eurostat Handbook on price and volume measures is being revised to reflect the new requirements.

Implementation of output-based quality adjusted measures in the euro area

Based on the information in Table 2 below, most euro area countries have implemented direct output measurement for health and education services (no information is available for Ireland, Cyprus and Portugal on education and for Spain, Cyprus and Malta on health and it is not clear if in these countries input methods are still being applied). The change in the EU regulation on the removal of quality adjusted measures will affect the measurement of education in four to five countries, including Spain, Italy, Malta, Slovenia and possibly also Slovakia. They account for about 29% of euro area GDP. A quantitative assessment of the impact of the removal of quality adjustment should become available following the implementation of the ESA 2010 in September 2014[6]. The impact on the euro area GDP is likely to be minor, and likely negligible

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[4] This information is used in the overview in Table 2. Mid-2013 the overview for Germany and Italy was confirmed, complemented by update information for the Netherlands and Slovenia.

[5] Chapter 10: Price and volume measurement, paragraph 10.30

[6] Collesi (2008) indicated that the quality adjustment on education in Italy in 2007 was around 0.1% of GDP volume level. An indicative estimate of the UK Office for National Statistics (ONS) suggests that the impact of the quality

when compared with other changes foreseen for ESA2010 implementation. At the national level the situation might be different.

Table 2 – Overview of implementation of direct output volume measures in the euro area

Non-Market Service		Belgium	Germany	Estonia	Ireland	Greece	Spain	France	Italy	Cyprus	Luxembourg	Malta	Netherlands	Austria	Portugal	Slovenia	Slovakia	Finland
Education	Output	x	X	x	…	x?	x	x	x	…	x	x	x	x?	…	X	x?	x
	Quality						x		x			x				X	x?	
Health	Output	x	x	x?	(x)	x?	…	x	x	…	x	…	x	x	x	X	X	x

Source: OECD (2009), CBS, Destatis, Istat, Statistical Office of the Republic of Slovenia (2012).
Legend : … No information
X? Implementation planned but not confirmed
 X Implemented
(X) Partial implementation

Some considerations on the state of play

There is a general agreement on the basic idea that output measures are preferred to input measures or outcome measures. The unit cost (quasi price) approach is to be used to weight the quantity indices based on homogeneous services. A detailed stratification is the basic requirement but in some cases not sufficient to reach the same quality of the service.

The important data requirements needed for the estimation of non-market output are recognised in the literature. In order to arrive at homogenous product, a very detailed stratification needs to be implemented and the use of the Diagnosis Related Groups for hospital services also requires detailed information. Heikkinen (2008) indicates it as one of the major practical problems in the compilation of volume measures of non-market output. We need on the unit costs side a huge amount of observations as we cannot assume – as in the case of market output, where only a small amount of price data can be used to compile deflators – that similar products will follow a general price movement, forced by competition. Furthermore, additional data will be needed in the future if explicit quality adjustment with hedonic methods will be used, as advocated by Schreyer (2012).

Since 2008 the discussion seems to stall around controversies on the implementation of quality adjustment of direct output indicators. Some additional research has taken place in this field, for instance as part of the EU Grant agreement 2008 and 2010 on the "improvement of quality of National Accounts"[7]. A Eurostat task force is supposed to follow up on this work in the autumn 2013. Priority should be given to further work in the field of education and to the idea of a narrow definition of outcome (de Haan, 2009), where a possibility to

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adjustment for government non-market output for health and education on the GDP level, on an annual basis, is around 0.5%.

[7] See A.G. Chessa (2008) and J. van den Tillaart (2008).

reach a consensus is more likely. Recently released results for Slovenia after many years of testing are encouraging (see Podnar 2012).

Conclusions

Direct output volume methods measures for non- market individual services like health and education have been implemented in most euro area countries. Nevertheless, the development of improved estimates of volumes of non-market services is still a challenging issue in Europe. The topic is not new and a lot of material has been written in the last fifteen years: there is an overall agreement at the international level on the need to quality adjusts output volume estimates. However, no common practical solution for the implementation has yet been found. More coordinated pragmatic research is required in this field in order to find a compromise solution for the issue of quality adjustment of direct output health and education.

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