

FEATURE

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Improvements to the measurement of government output in the National Accounts

SUMMARY

Measuring the output and productivity of our public services, such as healthcare and education, is important for public accountability. Taxpayers, users and providers of public services have an interest in how government spends its money on these services and in whether services are good value for money.

This article describes recent improvements made by the Office for National Statistics to measures of government output, and reports the impact of doing so on estimates of GDP. It also describes further developments proposed for future inclusion in the National Accounts.

Measuring the output and productivity of our public services, such as healthcare and education, is important for public accountability. Public services account for around a fifth of total gross domestic product (GDP). Taxpayers, users and providers of public services have an interest in how government spends its money on these services and in whether services are good value for money.

Public services are included in the National Accounts, which measure economic activity overall, alongside the market sector.¹ Up to 1998, the Office for National Statistics (ONS), like other national statistics offices, measured the output of public services for the National Accounts by assuming the outputs were equal to the inputs used to produce them.

The economic rationale behind early National Accounts treatment of public sector output was that government was considered as a procurer of services on behalf of the citizen. Valuing government output at the cost of its input was therefore an appropriate measure, and adequate to represent economic activity for macroeconomic policy purposes. However, it does not represent government's role as a producer of services, or the value of outcomes those services may deliver.

The 'input equals output' convention meant that measured output could only ever grow at the same rate as input and measured productivity growth would always be zero (since productivity is calculated as the ratio of output to input).

From the introduction of ESA 95 (the

European System of Accounts) in 1998, ONS started to measure public service output by direct methods and made good progress. However, the data and methods available to measure output directly were far from ideal and progress was rather piecemeal. Recognising the importance of moving this work to a higher standard, the then National Statistician, Len Cook, asked Sir Tony Atkinson to carry out a review. The Atkinson Review – *Measurement of Government Output and Productivity for the National Accounts* (Atkinson 2005) – was published in January 2005, and set out principles and recommendations for moving this work forward.

Following the review, in July 2005, the UK Centre for Measurement of Government Activity (UKCeMGA) was set up within ONS to take forward implementation of the Atkinson principles and recommendations. Since its launch, UKCeMGA has made substantial progress on improving public services data that are fed into the National Accounts, and has published a series of public service productivity articles on healthcare, education, adult social care and social security administration.

This article sets out to describe the impact that changes to methods in measuring public service output have had on the National Accounts since work started on the Atkinson Review. It also lists the main changes that have been made to methods and data series for public service measurement in the National Accounts during the last three years. Previous changes

Box 1**Atkinson principles**

Principle A: the measurement of government non-market output should, as far as possible, follow a procedure parallel to that adopted in the National Accounts for market output.

Principle B: the output of the government sector should in principle be measured in a way that is adjusted for quality, taking account of the attributable incremental contribution of the service to the outcome.

Principle C: account should be taken of the complementarity between public and private output, allowing for the increased real value of public services in an economy with rising real GDP.²

Principle D: formal criteria should be set in place for the extension of direct output measurement to new functions of government. Specifically, the conditions for introducing a new directly measured output indicator should be that: (i) it covers adequately the full range of services for that functional area; (ii) it makes appropriate allowance for quality change; (iii) the effects of its introduction have been tested service by service; (iv) the context in which it will be published has been fully assessed, in particular the implied productivity estimate; and (v) there should be provision for regular statistical review.

Principle E: measures should cover the whole of the UK; where systems for public service delivery and/or data collection differ across the different countries of the UK, it is necessary to reflect this variation in the choice of indicators.

Principle F: the measurement of inputs should be as comprehensive as possible; capital inputs to production should be measured using capital services; labour inputs should be compiled using both direct and indirect methods, compared and reconciled; consideration should be given to the split between current and capital spending.

Principle G: criteria should be established for the quality of price deflators to be applied to the input spending series; they should be sufficiently disaggregated to take account of changes in the mix of inputs and should reflect full and actual costs.

Principle H: independent corroborative evidence should be sought on government productivity, as part of a process of 'triangulation', recognising the limitations in reducing productivity to a single number.

Principle I: explicit reference should be made to the margins of error surrounding National Accounts estimates.

were documented in Pritchard (2004) and ONS (2005), and are not repeated in this article.

This article contains sections covering the following:

- a summary of the extent to which the recommendations from the Atkinson Review have been implemented
- an overview of the extent to which output methods are used to measure public service activity
- the procedures involved in revising the National Accounts and the overall extent of revisions from UKCeMGA
- detail on the particular improvements made in the measurement of each service area
- some further developments that are proposed for inclusion in the National Accounts

The Atkinson Review

The Atkinson Review made 54 recommendations, covering some general principles and some specific issues relating to the measurement of government output and productivity. The principles are listed in **Box 1**.

The recommendations have several pervasive themes, particularly those relating to analysis of outputs:

- to improve output methods
- the introduction and improvement of quality adjustment methods
- developing better links and methods

with the devolved administrations

- production of a series of articles describing the output and productivity of government-funded services

A range of specific recommendations relate to the measurement and use of government expenditure data (input in the productivity equation).

Good progress has been made on many recommendations. The recommendations were wide-ranging in themselves – some contained many parts, some will take a long time to fully implement, and others, for example, reinforced a particular general direction for ONS. Overall, half of the recommendations have been fully or mostly implemented, with work underway or planned for the remainder.

Some of the main developments are as follows:

- UKCeMGA now produces a range of productivity articles – so far, articles have been written on health, education, social security administration and adult social care. These are available from UKCeMGA's website at www.statistics.gov.uk/ukcemga
- Productivity articles extend analysis of public service output and productivity beyond the National Accounts. Data and methods used for productivity articles may differ from those used in the National Accounts where this can be justified, in particular by using more 'developmental' methods, or use

methods that are not appropriate for the National Accounts. The series will be further developed in due course

- developing relationships with, and better utilising data from, the devolved administrations. The benefits of this have been seen in some service areas and from some of the devolved administrations; further (joint) work is ongoing to improve the coverage of the four countries of the UK
- some progress has been made on recommendations relating to government expenditure (input) data, particularly through HM Treasury's Combined Online Information System

Output methods used in the measurement of public service activity

The Atkinson Review was clear that output methods should be used wherever possible to measure government output. Output methods are preferred because they can better capture the value added resulting from government spending.

Government output contributes to the expenditure method of calculating gross domestic product (GDP(E)). GDP(E) measures final consumption expenditure, so the measure of government output relevant here is general government final consumption expenditure (GGFCE). This will be referred to for convenience in this article as government output, but needs to be interpreted with its specific meaning. It specifically excludes transfer payments such

Table 1
Proportion of current price GGFCE¹ estimated using output methods: by public service, 2003

Service	Proportion of GGFCE (%)
Healthcare	30.0
Education	17.4
Adult social care	6.1
Social security administration	2.8
Children's social care	2.2
Prisons	1.1
Fire and rescue	1.0
Legal aid	1.0
Probation	0.3
Crown Prosecution Service	0.2
Criminal courts	0.2
County courts	0.1

Note:

1 General government final consumption expenditure.

as social security payments, but includes the costs involved in administering those payments. General government includes both central and local government.

Overall, 60 per cent of government output is currently measured using output methods. **Table 1** shows the breakdown of government services measured by ONS using output measures. Proportions are of current price GGFCE in the latest base year for the National Accounts, 2003.

Military defence and the Criminal Justice System (CJS) cover half of the remaining 40 per cent of government output. Work is underway to improve output measures for the various aspects of the CJS while developing a new method for the system as a whole. UKCeMGA is also evaluating the extent to which output of military defence may be measured more effectively.

The remaining output of government is also measured using the 'input equals output' convention. These components are individually relatively small proportions of total government output, but are in total quite significant, representing one-fifth of total government output.

Revisions to National Accounts data

Revisions to National Accounts data are taken into *Blue Book* each year as improved data and methods become available. This follows the principle of always ensuring the best available approved methods are used, along with the best available data, with the effect that over several years, revisions can sometimes cancel each other out. More information about the National Accounts revisions policy is available at www.statistics.gov.uk/about/methodology_by_theme/revisions_policies/downloads/

[na_revisions_policy.pdf](#)

The quality assurance process for new National Accounts methods is described in Robinson and Obuwa (2006).

Revisions since the Atkinson Review

Some immediate changes to data and methods were made in the light of the work of the Atkinson Review team for healthcare in *Blue Book 2004* and for other public services in *Blue Book 2005*. A further range of improvements was made following the Review.

This section describes the impact on estimates of government output over the period from 1995 to 2005. The latest estimates as published in *Blue Book 2007* are compared with those published in *Blue Book 2003*, which was the last *Blue Book* before improvements that can be attributed to the work of the Atkinson Review were introduced.

It is not possible to take full account of the implementation of all new methods arising from the Atkinson Review because healthcare estimates for 2003 onwards and estimates for all services (including healthcare) for 2004 onwards are unavailable based on 'pre-Atkinson' methods. Figures here are therefore only indicative of the total revision. Revisions can be in either direction, so the total revision may be more or less than that shown later in this article.

In order to illustrate the magnitude of revision that may have occurred were a true pre-Atkinson series able to be produced, a new 'baseline' series has been constructed. The series originally published in *Blue Book 2003* for 1995 to 2002 has been appended with imputed data for the years 2003 to 2005. Data for 2003 were imputed by

applying the growth rate between 2002 and 2003 as published in *Blue Book 2004* to the value for 2002 as published in *Blue Book 2003*. The series was extended to 2004 and 2005 similarly.

The series of estimates for 1995 to 2005 as published in *Blue Book 2007* was then compared against that constructed series. The total revision to the cumulative growth in government output from 1995 to 2005 on that basis is 3.8 percentage points. This is equivalent to an increase in the cumulative growth in GDP from 1995 to 2005 of 0.7 percentage points.

The size of the revision to GDP could be higher than that shown above. Changes to methods made to the healthcare series at the time of the Atkinson Review caused upward revisions to GDP of around 0.1 percentage points each year from 1999 to 2003. It is clearly difficult to know for how long the original and new methods would continue to diverge at the same rate. Assuming they did continue to diverge at the same rate for 2004 and 2005, then the revision to cumulative growth in GDP from 1995 to 2005 would be 0.9 percentage points.

Analysis of improvements for individual service areas

This section provides more details about improvements to the individual service areas currently being measured using output methods.

Healthcare

Healthcare represents just under one-third of government output measured as GGFCE at current prices. The growth in government output in healthcare from 1995 to 2005 has been revised upwards from 27.9 per cent to 36.7 per cent, a revision to the cumulative growth of 8.7 percentage points, equivalent to 0.8 percentage points per year. This equates to a revision of about 2.3 percentage points to the cumulative growth in total government output (**Figure 1**).

As described in the previous section, changes to methods – the use of more disaggregated series for measuring healthcare output – caused upward revisions to the healthcare output series of between 1.0 and 2.3 percentage points each year from 1999 to 2003. The estimate of a total cumulative revision of 8.7 percentage points described in the previous paragraph would be too low under the assumption that the new method would have had a similar effect for 2004 and 2005. However, in the absence of data about how the previous method would have applied in those

Figure 1
Healthcare output

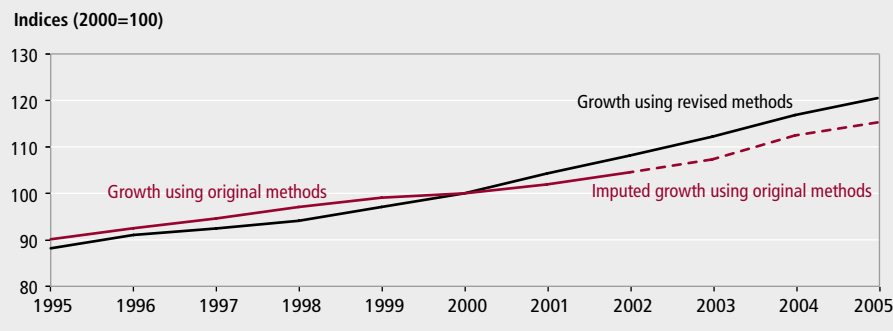


Figure 2
Education output

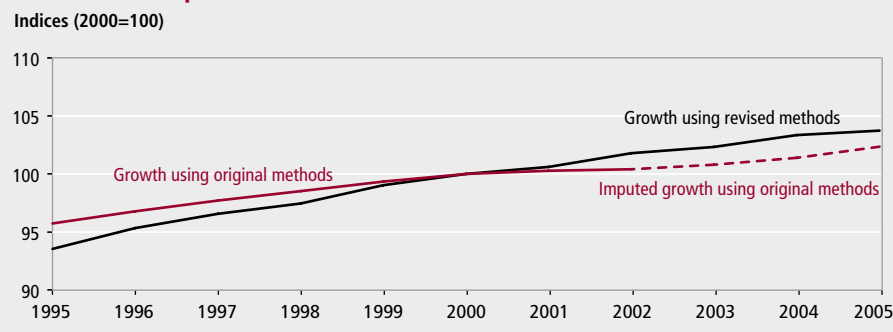
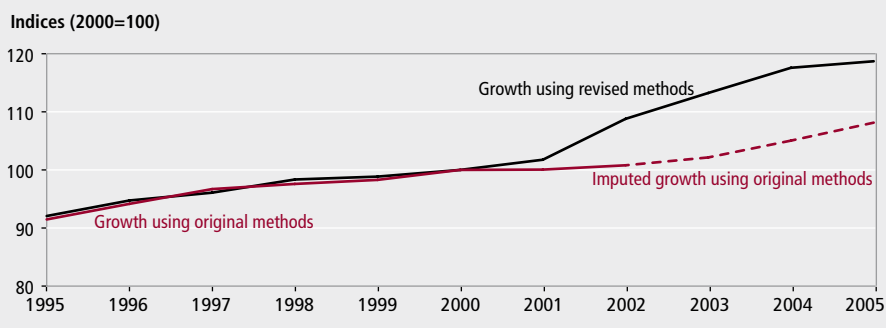


Figure 3
Personal social services output



years, it is impossible to roll forward that assumption with any degree of certainty.

In *Blue Book 2005*, the number of treatment categories covered by the output measure for England increased from 1,929 to 2,515. Treatment categories now include hospital inpatient, day case and outpatient episodes, distinguished by healthcare resource group, GP and practice nurse consultations and prescriptions, dental treatment, sight tests and ambulance journeys. The number of categories used also increased in Northern Ireland.

An improved source of information for GP activity was used from 2005 data in *Blue Book 2007*.

Education

Education represents about one-sixth of

government output measured as GGFCE at current prices. The growth in government output in education from 1995 to 2005 has been revised upwards from 6.9 per cent to 10.9 per cent, a revision to the cumulative growth of 4.0 percentage points, equivalent to 0.4 percentage points per year. This equates to a revision of about 0.8 percentage points to the cumulative growth in total government output (**Figure 2**).

Two improvements have been made to the measure of educational output.

First, from *Blue Book 2005*, government-funded places in private, voluntary and independent nurseries in England and Northern Ireland were included in the publicly-funded education measure, including back data to 1996/97. Data for Scotland are now available, but not yet used in the National Accounts, and data for

Wales are expected in the near future.

Second, improved weights and weighting methods have been included in *Blue Book 2007*. The weights developed are additive and so provide flexibility to construct country weights, and therefore it is now possible to produce separate chain-linked output indices for England, Scotland, Wales and Northern Ireland. In addition, chain-linking is applied throughout the index calculation at the lowest level.

Personal social services

Personal social services represent about 8.3 per cent of government output measured as GGFCE at current prices. The growth in government output in personal social services (adult social care and children's social care) from 1995 to 2005 has been revised upwards from 18.2 per cent to 28.9 per cent, a revision to the cumulative growth of 10.7 percentage points, equivalent to 1.0 percentage points per year. This equates to a revision of about 0.8 percentage points to the cumulative growth in total government output (**Figure 3**).

Adult social care

Two improvements have been made to the measure for adult social care for *Blue Book 2007*.

First, coverage has been increased by incorporating Scottish data in addition to the previous England only measure. Work is continuing to extend this measure to full UK coverage. A separate output index for Scotland was calculated for the first time, including in the measure 17 activities that cover a variety of services: assessment of need, day care, home care and the provision of home places.

Second, technical improvements were introduced to create better calendar year data from financial year data, and to replace forecasts with actual data.

Children's social care

Technical improvements have been made to create better calendar year data from financial year data, and to improve forecasting, which is required to estimate current data because of lags in supply of actual data.

Social security administration

Social security administration represents about 2.8 per cent of government output measured as GGFCE at current prices. The growth in government output in social security administration from 1995 to 2005 has been revised upwards from -12.6 per cent to -10.0 per cent, a revision to the

Figure 4
Social security administration output

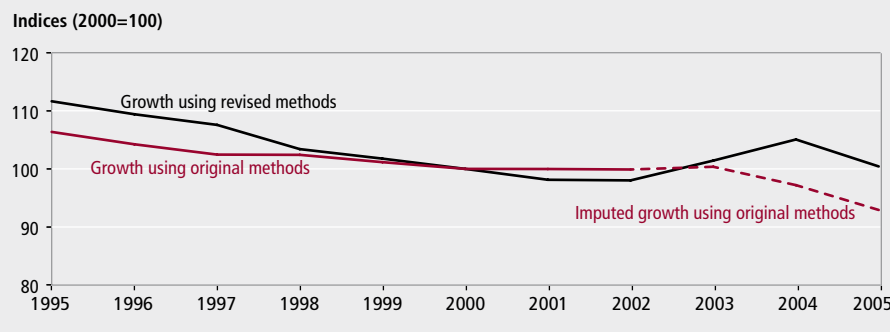


Figure 5
Fire services output

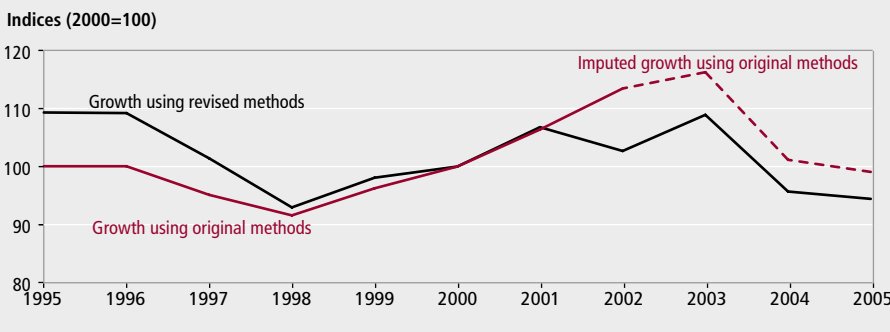
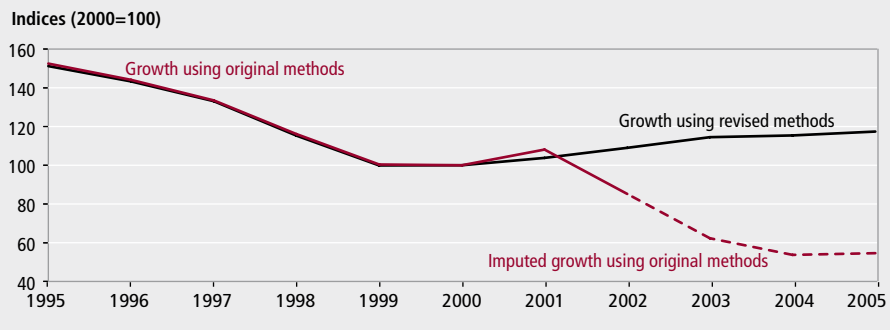


Figure 6
County courts output



cumulative growth of 2.6 percentage points, equivalent to 0.3 percentage points per year. This equates to a revision of about 0.1 percentage points to the cumulative growth in total government output (Figure 4).

Improved chain-linking of data for social security administration from *Blue Book 2006* onwards has caused small revisions.

Additionally, unit costs were reassessed for the period 1998 to 2004, which has caused further revisions to growth.

Fire and rescue services

Fire and rescue services represent about 1.0 per cent of government output measured as GGFCE at current prices. The growth in government output in fire services from 1995 to 2005 has been revised

downwards from -1.0 per cent to -13.6 per cent, a revision to the cumulative growth of -12.6 percentage points, equivalent to -1.3 percentage points per year. This equates to a revision of about -0.2 percentage points to the cumulative growth in total government output (Figure 5).

Two improvements have been made to the fire and rescue services component of *Blue Book* data.

First, chain-linking was introduced from *Blue Book 2007*. This improved upon previous methods where most series had a fixed base.

Second, forecasting, which is required to estimate current data because of lags in supply of actual data, now takes place at a more disaggregated level, which permits better overall estimates.

County courts

County courts represent 0.1 per cent of government output measured as GGFCE at current prices. The growth in government output in county courts from 1995 to 2005 has been revised upwards from -64.2 per cent to -22.4 per cent, a revision to the cumulative growth of 41.8 percentage points, equivalent to 3.6 percentage points per year. This equates to a revision of about 0.1 percentage points to the cumulative growth in total government output (Figure 6).

The reasons for these large revisions are given below.

First, coverage has been expanded from the existing six components to 106 key activities within case types (case types are, for example, land repossession, insolvency, divorce), using a cost-weighted approach. Weights are available annually, but data are still for England and Wales only.

Second, family and insolvency work are both now included (insolvency is only available annually).

Other technical improvements made were forecasting data at a more disaggregate level, better chain-linking and updating of weights annually.

Summary

Table 2 summarises the various important measures described in this article.

Future developments for the National Accounts

This section describes some of the more immediate improvements that UKCeMGA proposes to put forward for consideration for the National Accounts. Because of the modernisation of National Accounts systems, *Blue Book 2007* was a transition *Blue Book*, paving the way for modernised National Accounts in 2008 (Beadle 2007). One of the ways in which the scope of *Blue Book 2007* was reduced was that some previously planned methodological improvements have been postponed to 2008. In addition, data were only revised back to 2004 in *Blue Book 2007*, so there will be further revisions to data before that in future *Blue Books*.

Improvements across a range of service areas have been proposed for inclusion in the National Accounts, relating to improvements in output data series from data suppliers and better estimates of cost weights. Better methods of weighting and chain-linking will also be applied across service areas as they are improved in each area.

A range of improvements will be

Table 2
Summary of revisions to government output series

Service	Proportion of GGFCE (%)	1995–2005 growth in service area		Cumulative contribution of service area to revision to	
		Cumulative revision	Annual revision	1995–2005 GGFCE growth	1995–2005 GDP growth
Healthcare ¹	30.0	8.7*	0.8*	2.3*	0.4*
Education	17.4	4.0	0.4	0.8	0.1
Personal social services	8.3	10.7	1.0	0.8	0.1
Social security administration	2.8	2.6	0.3	0.1	0.0
Fire and rescue	1.0	-12.6	-1.3	-0.2	0.0
County courts	0.1	41.8	3.6	0.1	0.0
Total				3.8*	0.7*

Note:

¹ As described earlier in this article, alternative assumptions applied to this series could have increased the revision to GDP over the period 1995 to 2005 to 0.9 percentage points. The other starred figures will also be higher under those same assumptions.

included in the National Accounts as a result of expanding the range of data that are available from Scotland, Wales and Northern Ireland.

Specific improvements relating to individual service areas are as follows:

- an improved measure of the volume of drugs prescribed in general practice was introduced for the February 2006 Public Service Productivity: Health article (ONS 2006). When branded drugs fall out of patent and cheaper generic drugs come onto the market, this fall in cost for similar drugs is counted as part of the price change. Previously, this was counted as volume change. This improvement will be proposed as a change to the National Accounts in due course
- a change to be implemented follows recommendations in the Willmer report (Willmer and Little 2007). The change involves moving from hospital episodes to treatment spells (a closer match with the patient treatment pathway) as the unit of activity to be measured, and moving to a better source of data for measurement of output in the healthcare sector. It is therefore proposed that the hospital care component of the healthcare output index will be based on the new approach, and this proposal will be submitted for consideration in the National Accounts
- for children's social care, future developments include plans to broaden output coverage by including measures of additional children's social care outputs such as core assessments completed, the number of children adopted, the number of hours support provided for children supported within

their families, and the number of those leaving care

- for social security administration, improved data will be available from *Blue Book* 2008. For most benefits, separate data series are available for the number of new claims, and the size of the ongoing load; the unit costs for each type of activity are quite different. Data for housing benefit and child benefit payments are now available for claims and load separately; prior to that, data were available only for the load

Concluding remarks

ONS has made a range of improvements to methods and data used for the National Accounts since the Atkinson Review began in 2004. Many of these were made around the time of the publication of the Atkinson Review, based on the work that was ongoing at that time. Further improvements have since been made to data and methods that have fed through to revisions in the National Accounts. More improvements to the National Accounts are in the pipeline, and UKCeMGA has a programme to continue the development of methods for its outputs. Work has extended into two new areas of government activity – the Criminal Justice System and military defence.

Notes

- 1 Market output is defined in National Accounts Concepts, Sources and Methods as output that is sold at prices that are economically significant or otherwise disposed of on the market or intended for sale or disposal on the market.
- 2 Subsequent to the Atkinson Review, an independent economic advisory panel

was set up, to consider in detail whether measures of public service output should be adjusted to take account of complementarity. The overall recommendation of the panel was that adjustments based on public/private sector complementarity should only be made where there is a compelling argument in their favour (ONS 2007, section 4).

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