# Measuring Public Service Productivity

# Agenda

- Global experience in measuring  public sector productivity

- Key Steps in measuring public sector productivity

- Experimental Project measuring  public sector productivity for the  education sector

- Role of statistics in developing national and sectoral public sector productivity measurement initaitives

# National and sectoral public sector productivity measurement initiatives - Countries initiatives

- **Measuring public sector productivity in the UK**

Since 1988, the Office for National Statistics has been progressively moving away from the output=input approach to productivity, and incorporating direct measures of the volume of government output in the national accounts. the UK government commissioned Sir Tony Atkinson to undertake a review of the measurement of government output in the national accounts. This review (Atkinson, 2005) provides a

comprehensive overview of developments and recommendations for future progress.

- **Measuring public sector productivity in Finland**

widely regarded as  a European leader in public sector productivity measurement. A project was established to measure public sector productivity in Finland in 1995, located in Statistics Finland, the national statistics office.

- **Measuring public sector productivity in Sweden**

Sweden has been measuring public sector productivity since the mid-1980s. An Expert Group on Public Finances ( a subcommittee under the Ministry of Finance) established a steering group to conduct the work. The steering group was supported by Statistics Sweden, the national statistics office (Ministry of Finance, 1997). Particular focus is given to the development of output indicators for services

# The Extent of Direct Measurement of Real Government Output in Selected OECD Countries

| | Government functions for which volume of government outputs are being directly estimated | Percentage coverage |
|---|---|---|
| United Kingdom | Health, education, social protection, public order and safety | Two-thirds of government output |
| Canada | University education | 7 per cent of government output |
| Finland | Health, education, social protection, public order and safety | 70-80 per cent of employee expenditure by central government |
| New Zealand | Health, education, social protection, public order and safety, public insurance services | Between 60 per cent and 70 per cent of central government output |
| Norway | Health, education | — |
| Australia | Health, education | Between 50 per cent and 60 per cent of government output. Experimental measures in other areas. |
| Netherlands | Health, education | Between 20 per cent and 50 per cent of government output |
| Italy | Health, education | Between 20 per cent and 50 per cent of government output |
| Other European Union countries | — | See text |

Sources: Various, including OECD (1999a), OECD (2003), Tuke (2004), Atkinson (2004:33), Snelling (2004), Fraumeni et al. (2004). Countries may use different methods.

# Measuring government productivity :  Key steps

- measure public service output using a direct volume approach
- adjust the volume measures of output for quality change
- measure public service inputs using direct or indirect methods
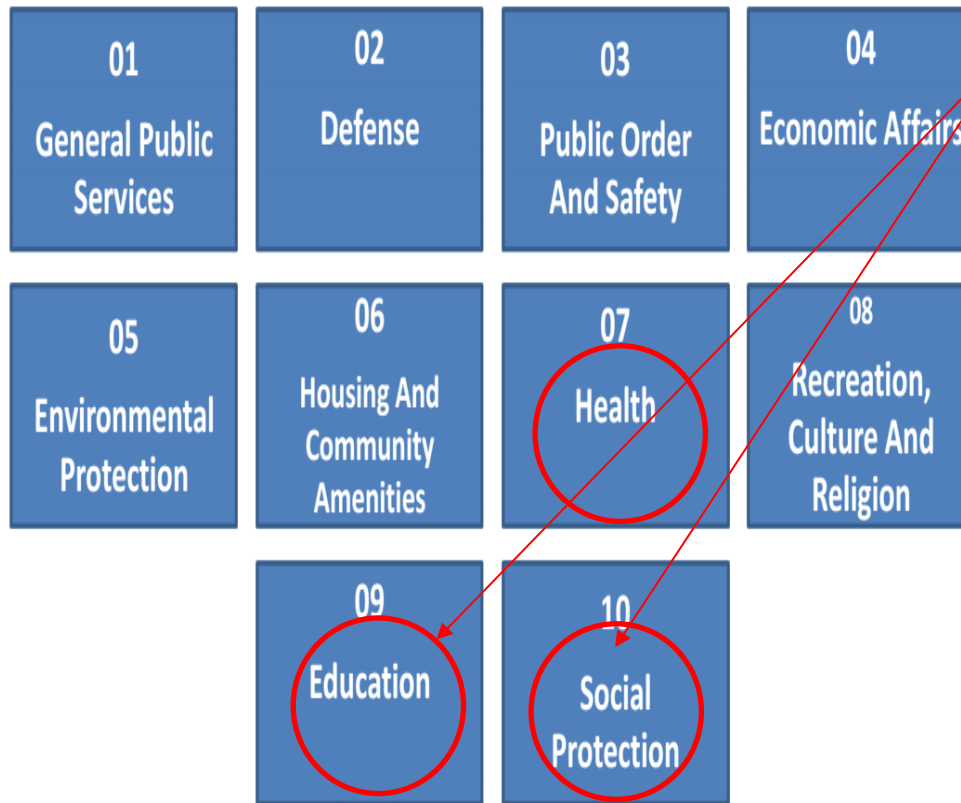- ensure that appropriate input deflators are used

# Make the distinction between individually and collectively consumed serves

**CLASSIFICATION SYSTEM (USED)**

**COFOG - Classifications of the functions of government**

## MAIN COFOG DIVISIONS

| | | | |
|---|---|---|---|
| **01** General Public Services | **02** Defense | **03** Public Order And Safety | **04** Economic Affairs |
| **05** Environmental Protection | **06** Housing And Community Amenities | **07** Health | **08** Recreation, Culture And Religion |
| | **09** Education | **10** Social Protection | |

**Individual Consumption**
Individual goods and services are those that are consumed by individual households eg. Health Education and Social Protection

**Collective Consumption**
Collective services, on the other hand, are those provided to society as a whole, such as defence and law and order, where individual households cannot be excluded from the benefits of those services.

## Table B.1. **First and second level COFOG** (*cont.*)

| First-level | Second-level |
|---|---|
| Health | • Medical products, appliances and equipment.<br>• Outpatient services.<br>• Hospital services.<br>• Public health services.<br>• R&D health.<br>• Health n.e.c. |
| Recreation, culture and religion | • Recreational and sporting services.<br>• Cultural services.<br>• Broadcasting and publishing services.<br>• Religious and other community services.<br>• R&D recreation, culture and religion.<br>• Recreation, culture and religion n.e.c. |
| Education | • Pre-primary and primary education.<br>• Secondary education.<br>• Post-secondary non-tertiary education.<br>• Tertiary education.<br>• Education not definable by level.<br>• Subsidiary services to education.<br>• R&D education.<br>• Education n.e.c. |
| Social protection | • Sickness and disability.<br>• Old age.<br>• Survivors.<br>• Family and children.<br>• Unemployment.<br>• Housing.<br>• Social exclusion n.e.c.<br>• R&D social protection.<br>• Social protection n.e.c. |

Eurostat established a task force to develop a manual on the application of COFOG to national account expenditure data and to discuss the collection of second-level COFOG data for European countries. Second-level COFOG data are not available for Switzerland and all non-European member countries of the OECD: Australia, Canada, Chile, Japan, Israel, Korea, Mexico, New Zealand and the United States. In addition, these data are available only for selected COFOG divisions in some members of the EU. Efforts are underway to reach agreement with these countries about the submission of these data to the OECD.

# COFOG code <u>09</u>

## Hierarchy

- **Division: 09 - Education**

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## Breakdown:

This Division is divided into the following Groups:

- <u>09.1</u> - Pre-primary and primary education
- <u>09.2</u> - Secondary education
- <u>09.3</u> - Post-secondary non-tertiary education
- <u>09.4</u> - Tertiary education
- <u>09.5</u> - Education not definable by level
- <u>09.6</u> - Subsidiary services to education
- <u>09.7</u> - R&D Education
- <u>09.8</u> - Education n.e.c.

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## Explanatory note

Government outlays on education include expenditures on services provided to individual pupils and students and expenditures on services provided on a collective basis. Expenditures on individual services are allocated to groups (09.1) through (09.6); expenditures on collective services are assigned to groups (09.7) and (09.8).

Collective educational services are concerned with matters such as formulation and administration of government policy; setting and enforcement of standards; regulation, licensing and supervision of educational establishments; and applied research and experimental development into education affairs and services. However, overhead expenses connected with administration or functioning of a group of schools, colleges, etc. are considered to be individual expenditures and are classified to groups (09.1) through (09.6) as appropriate.

The breakdown of education is based upon the level categories of the 1997 International Standard Classification of Education (ISCED-97) of the United Nations Educational, Scientific and Cultural Organization (UNESCO).

# Detailed structure and explanatory notes

## COFOG code 09.7.0

Structure   Notes

**Hierarchy**

- Division: 09 - Education
- Group: 09.7 - R&D Education
- **Class: 09.7.0 – R&D Education (CS)**

**Explanatory note**

- Administration and operation of government agencies engaged in applied research and experimental development related to education;
- grants, loans and subsidies to support applied research and experimental development related to education undertaken by non-government bodies such as research institutes and universities.
Excludes: basic research (01.4.0).

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- 05.6 - Environmental protection n.e.c.
- 06 - Housing and community amenities
  - 06.1 - Housing development
  - 06.2 - Community development
  - 06.3 - Water supply
  - 06.4 - Street lighting
  - 06.5 - R&D Housing and community amenities
  - 06.6 - Housing and community amenities n.e.c.
- 07 - Health
  - 07.1 - Medical products, appliances and equipment
  - 07.2 - Outpatient services
  - 07.3 - Hospital services
  - 07.4 - Public health services
  - 07.5 - R&D Health
  - 07.6 - Health n.e.c.
- 08 - Recreation, culture and religion
  - 08.1 - Recreational and sporting services
  - 08.2 - Cultural services
  - 08.3 - Broadcasting and publishing services
  - 08.4 - Religious and other community services
  - 08.5 - R&D Recreation, culture and religion
  - 08.6 - Recreation, culture and religion n.e.c.
- 09 - Education
  - 09.1 - Pre-primary and primary education
  - 09.2 - Secondary education
  - 09.3 - Post-secondary non-tertiary education
  - 09.4 - Tertiary education
  - 09.5 - Education not definable by level
  - 09.6 - Subsidiary services to education
  - 09.7 - R&D Education
  - 09.8 - Education n.e.c.

**Hierarchy**

- Division: 09 - Education
- **Group: 09.1 - Pre-primary and primary education**

**Breakdown:**

This Group is divided into the following Classes:

- 09.1.1 - Pre-primary education (IS)
- 09.1.2 - Primary education (IS)

**Hierarchy**

- Division: 09 - Education
- Group: 09.1 - Pre-primary and primary education
- **Class: 09.1.1 – Pre-primary education (IS)**

**Explanatory note**

- Provision of pre-primary education at ISCED-97 level 0;
- administration, inspection, operation or support of schools and other institutions providing pre-primary education at ISCED-97 level 0.
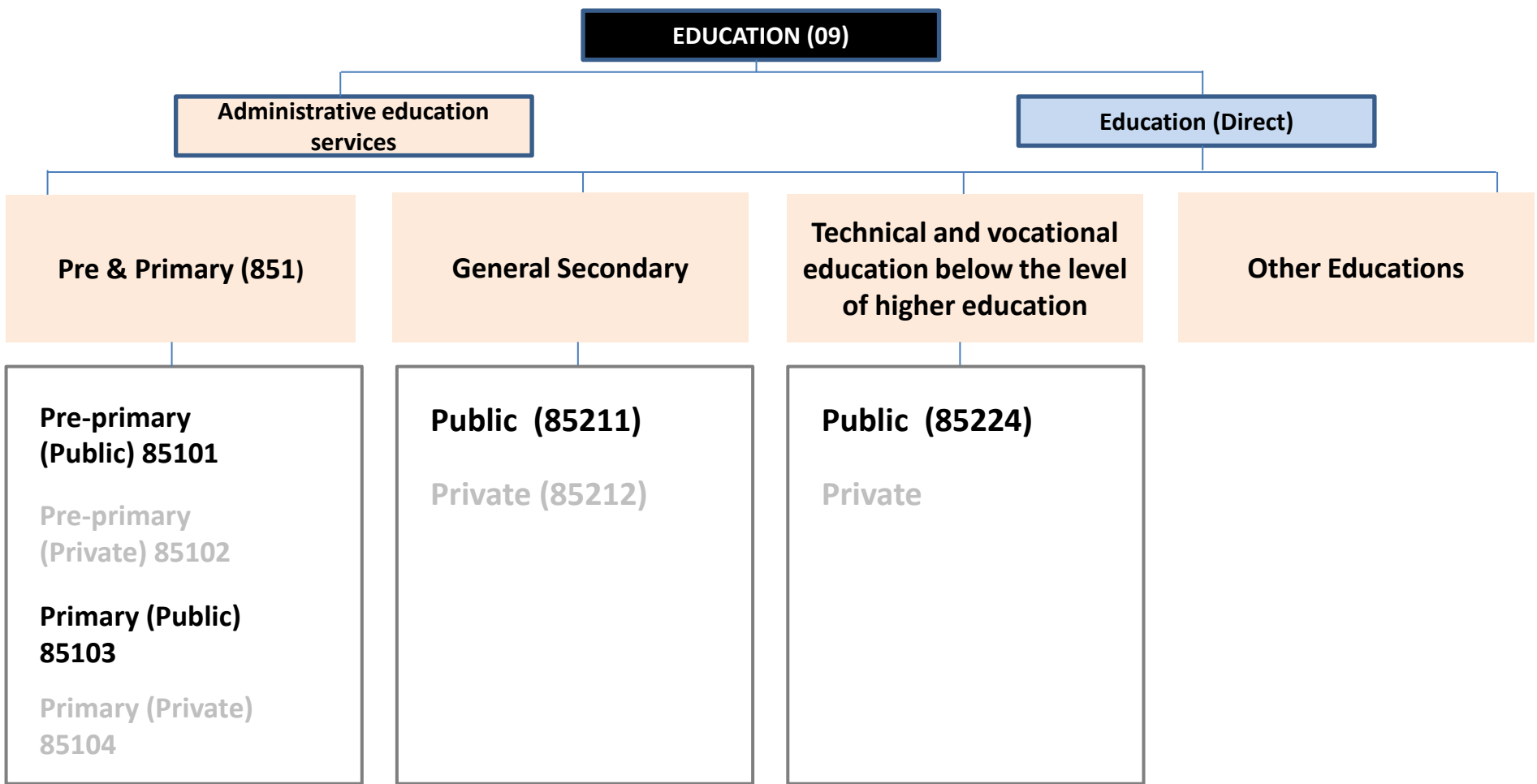Excludes: subsidiary services to education (09.6.0).

**Hierarchy**

- Division: 09 - Education
- Group: 09.1 - Pre-primary and primary education
- **Class: 09.1.2 - Primary education (IS)**

**Explanatory note**

- Provision of primary education at ISCED-97 level 1;
- administration, inspection, operation or support of schools and other institutions providing primary education at ISCED-97 level 1.
Includes: literacy programmes for students too old for primary school.
Excludes: subsidiary services to education (09.6.0).

# Education Expenditure Structure

Based on Classification of Functions of the Government (COFOG), all expenditures under Kementerian Pendidikan categorized  as Education (09) . Under the Education category, there were  six (6) public-related categories divided based on MSIC 2008  -   Administrative Education services , Pre-primary education ,  Primary education,  General school secondary education , Technical and vocational below the level of higher education  and  Other  education

## EDUCATION (09)

### Administrative education services

### Education (Direct)

| Pre & Primary (851) | General Secondary | Technical and vocational education below the level of higher education | Other Educations |
|---|---|---|---|
| **Pre-primary (Public) 85101**<br><br>Pre-primary (Private) 85102<br><br>**Primary (Public) 85103**<br><br>Primary (Private) 85104 | **Public  (85211)**<br><br>Private (85212) | **Public  (85224)**<br><br>Private | |

# Identify key programme related to core function

**Operasi pendidikan & Pembangunan profesionalisme identified as core**

| Code | Programme | Percentage Share expenditure % |
|------|-----------|-------------------------------|
| 010000 | PENGURUSAN | 3.83 |
| 020000 | OPERASI PENDIDIKAN | 79.4 |
| 030000 | PENYELIDIKAN DAN PEMBANGUNAN ILMU | 0.06 |
| 040000 | PEMBANGUNAN PROFESIONALISME | 2.13 |
| 050000 | PENGUKUHAN OPERASI PENDIDIKAN | 1.78 |
| 060000 | DASAR PENILAIAN DAN PENGURUSAN PRESTASI | 0.17 |
| 070000 | MAJLIS PEPERIKSAAN MALAYSIA | 0.04 |
| 080000 | DEWAN BAHASA DAN PUSTAKA | 0.19 |
| 090000 | PROGRAM KHUSUS | 9.83 |
| 100000 | DASAR BARU | 0.00% |
| 110000 | ONE-OFF | 2.58 |

*Source : Federal Government Financial Statements, 2015*

# What are we trying to measure
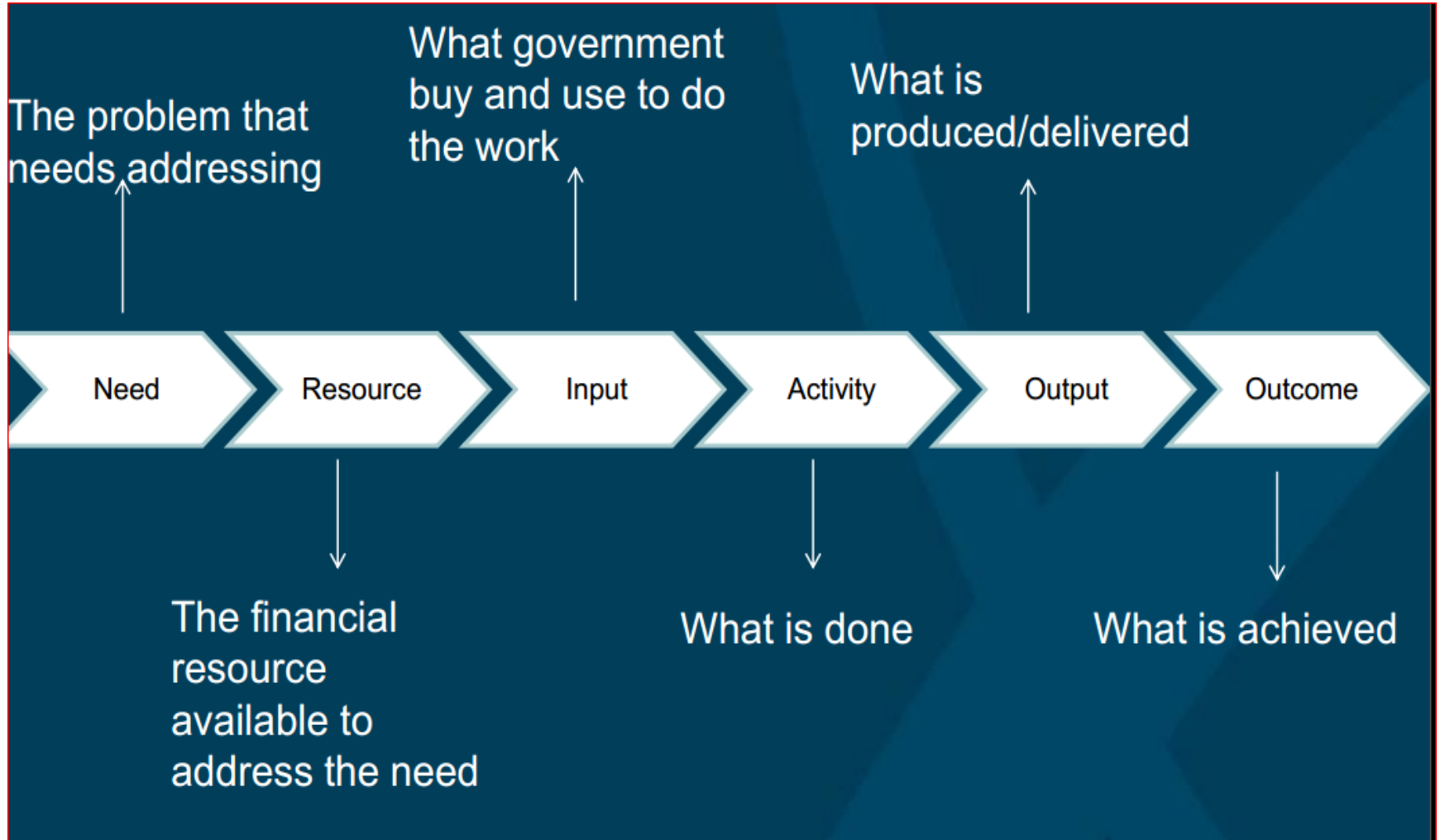
# Defined / Selected Output by sectors

| COFOG categorization | Output Measure | Types of Output | * Quality adjustment |
|---|---|---|---|
| 06 Housing & Community Amenities | Inputs = Outputs | Deflated expenditure (pay, goods & services, capital consumption) | Threshold measure (5 or more grade C- & above) |
| 07 Health | Activity measure | • # Hospital treatment<br>• # GP consultations<br>• # Prescribed drugs<br>• # Dental Care<br>• # Ophthalmic Care | • Health gain<br>• Short term survival<br>• Waiting Times<br>• National Patient Survey<br>• Primary Care Outcomes |
| 08 Recreation, Culture & Religion | Inputs = Outputs | Deflated expenditure (pay, goods & services, capital consumption) | |
| 09 Education | Activity measure | # Pupils (Pre-primary, Primary, Secondary)<br># Pupils (Teacher's training & Healthcare Courses) | • Average point scores (APS) for all examinations<br>• Achivement in UPSR (Share of student achieved K1 &K2)<br>• Achivement in SPM (Share of student achieved K1 &K2) |
| 10 Social Protection Personal social services | Activity measure | # Adults in care<br># Children in care | |
| Administration of social security | Activity measure | # Housing benefit cases | |

- Besides measuring quantity of output , impak is equally important in delivering public service – indicators to adjust quality must be identified
- K1 :

# Defined / Selected Output by sectors

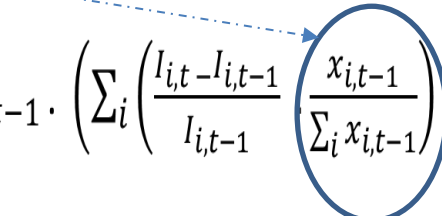| COFOG categorization | Output Measure | Types of Output |
|---|---|---|
| 01 General Public Services | Inputs = Outputs | Deflated expenditure (pay, goods & services, capital consumption) |
| 02 Defence | Inputs = Outputs | Deflated expenditure (pay, goods & services, capital consumption) |
| 03 Public Order & Safety 03.1 Police | Inputs = Outputs | Deflated expenditure (pay, goods & services, capital consumption) |
| 03.2 Fire | Activity measure | # of fires attended & # of other services |
| 03.3 Courts | Activity measure | Caseload weighted by average costs |
| 03.4 Prisons | Activity measure | # prisoners |
| 03.4 Probation | Activity measure | Workload hours & # people under supervision |
| 04 Economic Affairs | Inputs = Outputs | Deflated expenditure (pay, goods & services, capital consumption) |
| 05 Environmental Protection | Inputs = Outputs | Deflated expenditure (pay, goods & services, capital consumption) |

Source: Office of National Statistics,UK

# Formula to compute Public Service Volume of Output

As there is no effective price index for the selected sector, the methodology **adopts a volume-based approach to the output** activities whereby;

i.  Identify the expenditure for each level output of the sector over time.

ii. Compute unit cost for the output for the sector (weightage - proxy to price)

iii. A Chain-linked Laspeyres volume index of output is produced for each output for the sector at National Level

iv. Adjusted volume measures of output for quality change eg using using change in average point scores at SPM level for education.

iii. **A National-Level**, chain-linked Laspeyres volume **index of output quantity** is calculated using the **individual sector indices and relative cost weights**, such as

$$L_t = L_{t-1} \cdot \left( \sum_i \left( \frac{I_{i,t} - I_{i,t-1}}{I_{i,t-1}} \left( \frac{x_{i,t-1}}{\sum_i x_{i,t-1}} \right) \right) + 1 \right)$$

Where:
i and t index sectors, and time respectively
$L_{i,t}$ is a chain-linked aggregate National Laspeyres index of output quantity
$I_{i,t}$ is a chain-linked Laspeyres index of output quantity
$x_{i,t}$ is the level of expenditure in current price terms

Output in the initial period, t=0, is set equal to 100

# Input Index

- **Public service inputs are the labour, Supplies and Services grant and fixed charges, other expenditure and capital service used to produce public service output**

- **Measure public service inputs using direct (number of employees ) or indirect methods (emolument)**

- **Ensure that appropriate input deflators that are specific to the public service are used in the indirect method**

- **Compute  Volume  Input index  using relative cost weights (**Weighting growth of each component by their respective share in aggregate expenditure

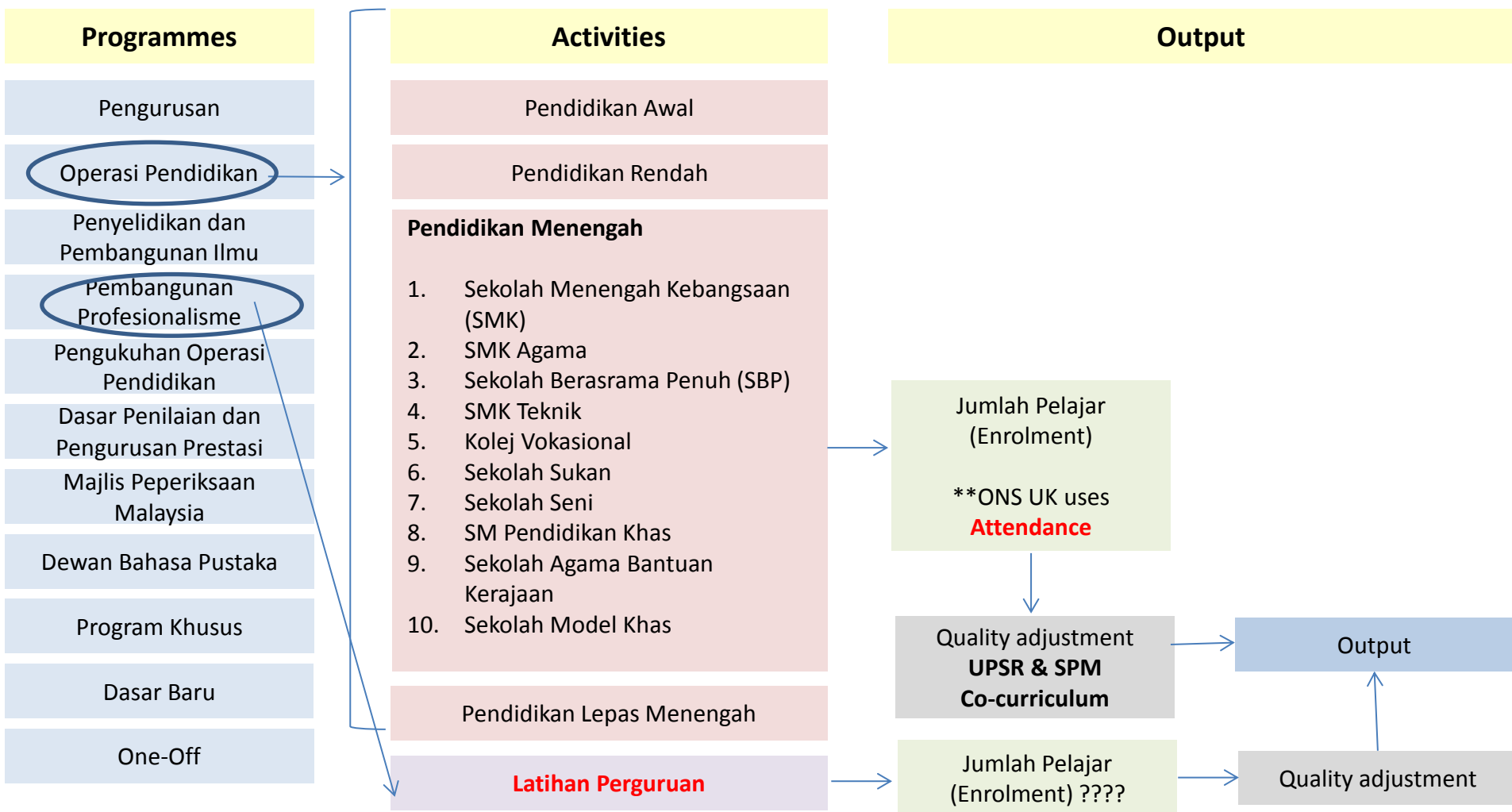# Experimental project measuring education sector productivity

Enhanced methodology of measurement which started in 2015, focus on education based on technical visit to Office for National Statistics and engagement with ONS public service productivity measurement experts;

- Align public service function (education) to Classifications of the Functions of (COFOG) by Dept of Statistics Malaysia (DOSM)
- Quality Adjust output to incorporate impact measures
- Improved use of weightage, direct inputs to reduce inflationary impact on data over time

| INPUT | OUTPUT |
|---|---|
| 1. Emolument<br>2. Supplies and Services<br>3. Consumption of Fixed Capital (COFC)<br>4. Grant and Fixed Charges<br>5. Other Expenditures | Student enrolment in pre-primary, primary, secondary, matriculation and institute of teacher education |
| | **Quality adjustment**<br>Student examination performance in UPSR (primary school) and SPM (secondary school) |

# Experimental project measuring education sector productivity

## Mapping  public service  programmes, activities and output

| Programmes | Activities | Output |
|---|---|---|

**Programmes:**

- Pengurusan
- Operasi Pendidikan
- Penyelidikan dan Pembangunan Ilmu
- Pembangunan Profesionalisme
- Pengukuhan Operasi Pendidikan
- Dasar Penilaian dan Pengurusan Prestasi
- Majlis Peperiksaan Malaysia
- Dewan Bahasa Pustaka
- Program Khusus
- Dasar Baru
- One-Off

**Activities:**

Pendidikan Awal

Pendidikan Rendah

**Pendidikan Menengah**

1. Sekolah Menengah Kebangsaan (SMK)
2. SMK Agama
3. Sekolah Berasrama Penuh (SBP)
4. SMK Teknik
5. Kolej Vokasional
6. Sekolah Sukan
7. Sekolah Seni
8. SM Pendidikan Khas
9. Sekolah Agama Bantuan Kerajaan
10. Sekolah Model Khas

Pendidikan Lepas Menengah

**Latihan Perguruan**

**Output:**

Jumlah Pelajar (Enrolment)

\*\*ONS UK uses **Attendance**

Quality adjustment **UPSR & SPM Co-curriculum**

Output
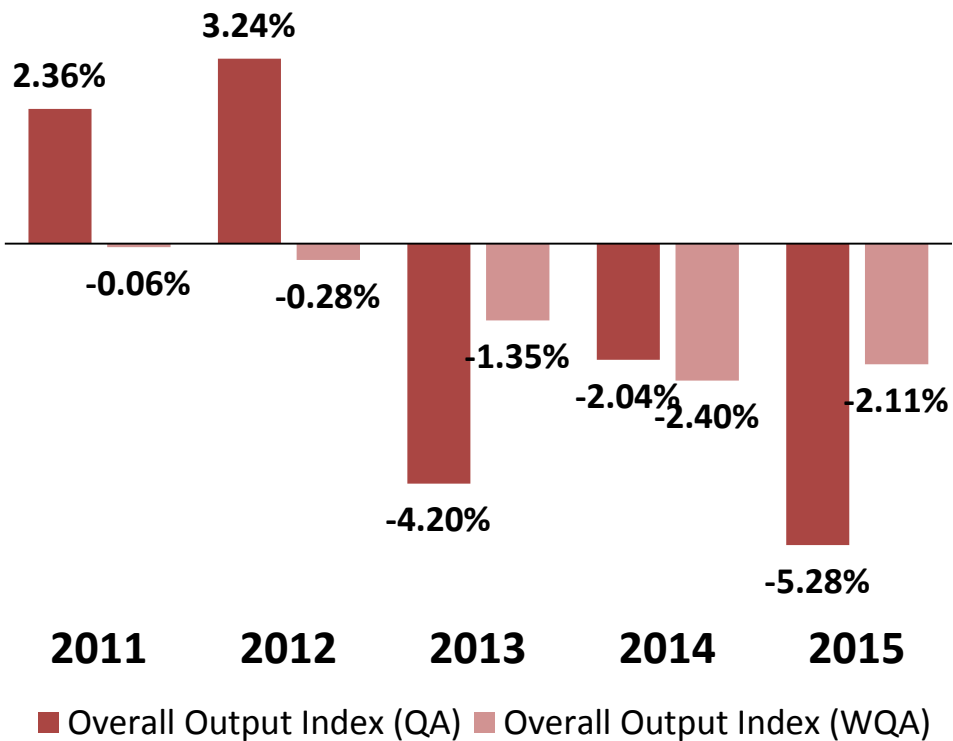
Jumlah Pelajar (Enrolment) ????

Quality adjustment

# Output Index

- Compute Output Index using chain link / Laspayres index method
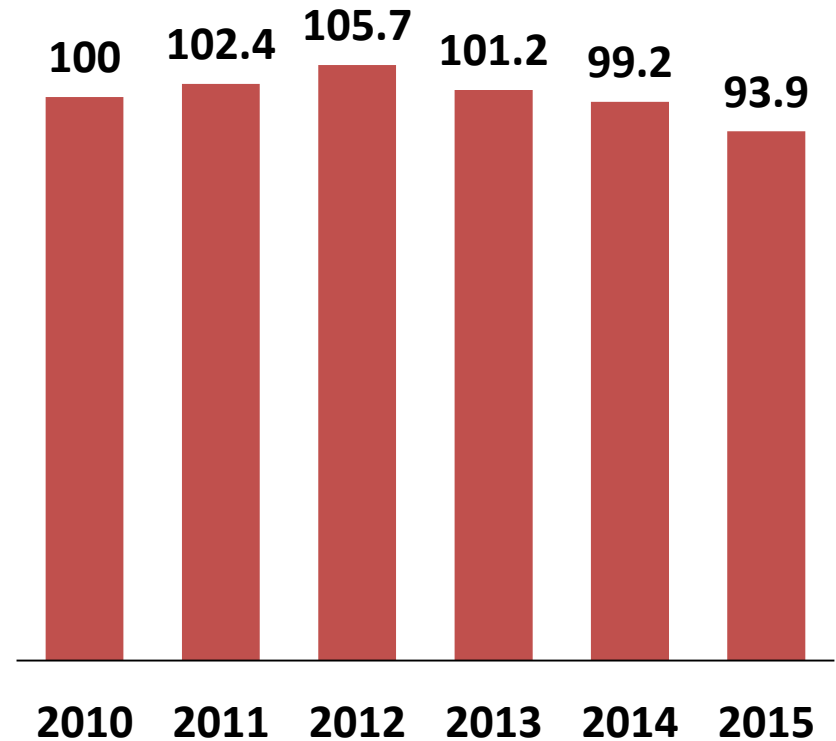- Output adjusted with quality

## Output Growth, 2011-2015
Without quality adjustment vs with quality adjustment



3.24%

2.36%

-0.06%

-0.28%

-1.35%

-2.04%

-2.40%

-2.11%

-4.20%

-5.28%

2011    2012    2013    2014    2015

■ Overall Output Index (QA)  ■ Overall Output Index (WQA)

## Overall Output Index

*(2010 index = 100)*



100    102.4    105.7    101.2    99.2    93.9

2010    2011    2012    2013    2014    2015

Output Index is calculated using the chained-link sub indices

# Input Index

Input Index increased by 2.6% between 2010-2015.

## Education Sector
## Input Index, 2010-2015

*(2010 index = 100)*
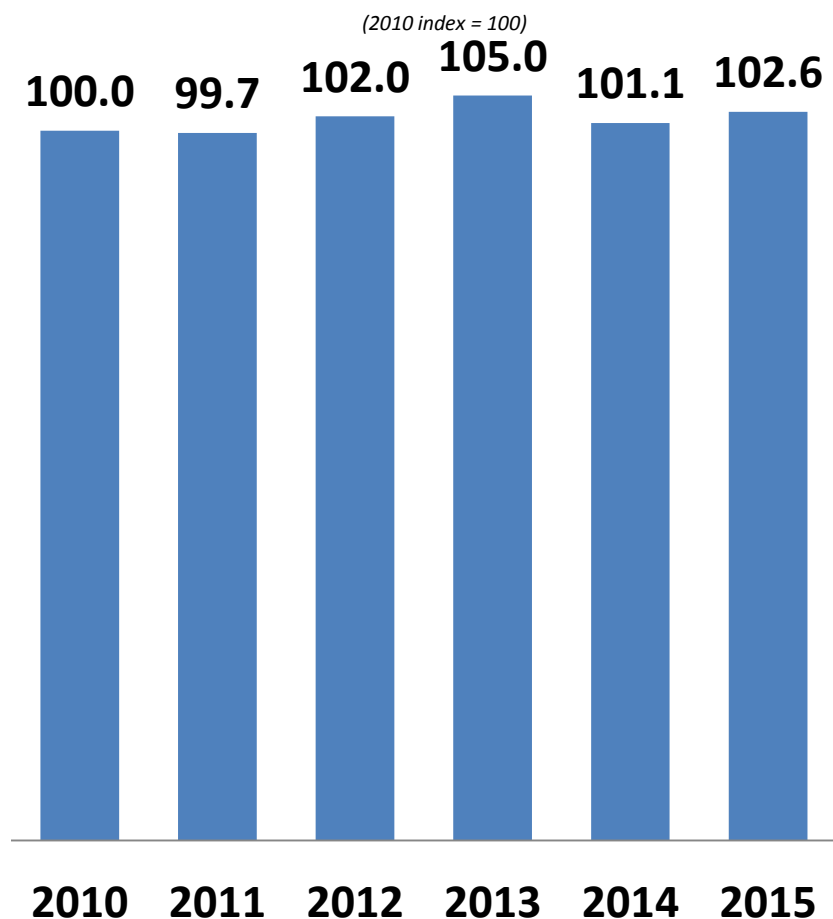
| Year | Index |
|------|-------|
| 2010 | 100.0 |
| 2011 | 99.7 |
| 2012 | 102.0 |
| 2013 | 105.0 |
| 2014 | 101.1 |
| 2015 | 102.6 |

| Share in aggregate expenditure | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|
| Emolument | 77.9% | 76.1% | 78.4% | 76.7% | 76.4% | 75.7% |
| Supplies and Services | 9.3% | 11.1% | 10.3% | 11.5% | 12.5% | 12.9% |
| Grant and Fixed Charges | 11.5% | 11.6% | 10.3% | 10.8% | 10.2% | 10.5% |
| Other Expenditures | 0.000% | 0.000% | 0.004% | 0.000% | 0.000% | 0.000% |
| Capital Service | 1.2% | 1.1% | 1.0% | 1.0% | 0.9% | 1.0% |
| **TOTAL** | 100% | 100% | 100% | 100% | 100% | 100% |

| Weighting growth of each component | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|
| Emolument | -1.7% | 2.3% | 1.6% | -2.2% | 0.6% |
| Supplies and Services | 1.5% | -0.7% | 0.8% | -0.5% | -0.2% |
| Grant and Fixed Charges | -0.2% | 0.7% | 0.5% | -1.1% | 1.2% |
| Other Expenditures | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| Capital Service | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **TOTAL** | **-0.32%** | **2.32%** | **2.91%** | **-3.70%** | **1.55%** |

# Education Sector Productivity Index - Findings

With quality adjustment, Education Sector declined by 8.5 % between 2010-2015

## Productivity Index, 2010-2015
*(2010 index = 100)*

**100.0**    **102.7**    **103.6**    **96.5**    **98.1**    **91.5**

2010    2011    2012    2013    2014    2015

■ **Output**    ■ **Inputs**    ■ **Productivity**
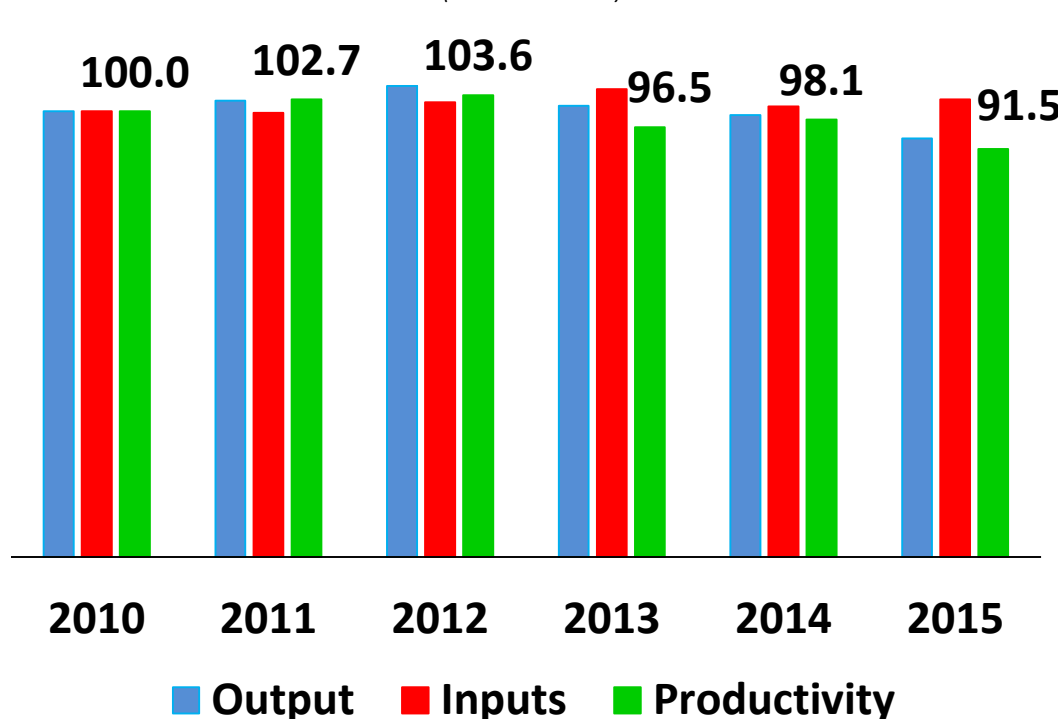
- Output index declined in line to the decline in number of students.
- Besides decline in number of students, quality of education was also declining for the last three (3) years, especially for SPM results
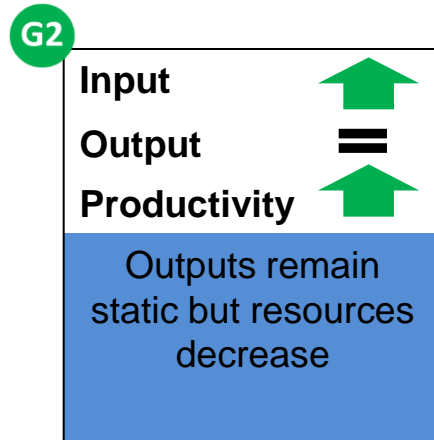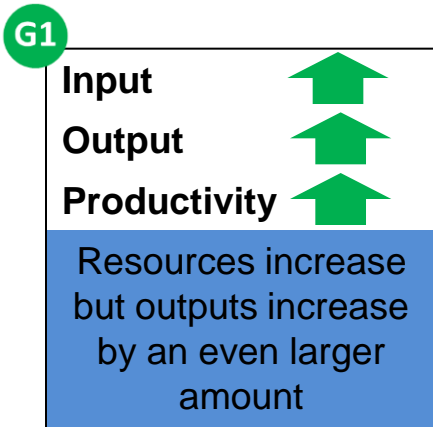
# There are 8 productivity scenarios

**Output > Input**
**Positive Productivity Growth**

**Input > Output**
**Negative Productivity Growth**

**G1**

| Input | ⬆ |
| Output | ⬆ |
| Productivity | ⬆ |

Resources increase but outputs increase by an even larger amount

**G2**

| Input | ⬆ |
| Output | = |
| Productivity | ⬆ |

Outputs remain static but resources decrease

**R1**

| Input | ⬇ |
| Output | ⬇ |
| Productivity | ⬇ |

Resources decrease but outputs decrease by an even larger amount

**R2**
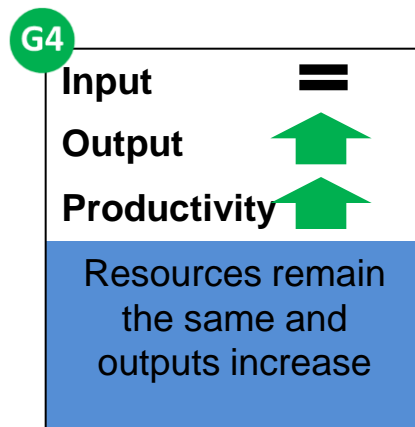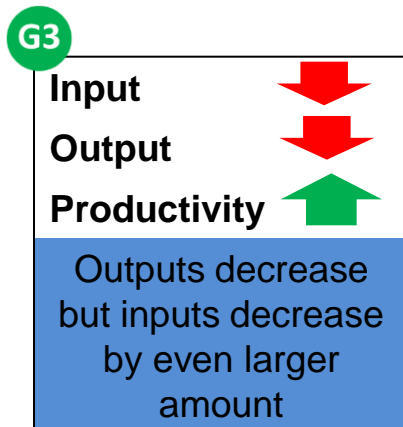
| Input | = |
| Output | ⬇ |
| Productivity | ⬇ |

Resources remain the same and outputs decrease

**G3**

| Input | ⬇ |
| Output | ⬇ |
| Productivity | ⬆ |

Outputs decrease but inputs decrease by even larger amount

**G4**

| Input | = |
| Output | ⬆ |
| Productivity | ⬆ |

Resources remain the same and outputs increase

**R3**

| Input | ⬆ |
| Output | ⬆ |
| Productivity | ⬇ |

Outputs increase but inputs increase by even larger amount

**R4**

| Input | ⬆ |
| Output | = |
| Productivity | ⬇ |

Output remain static but resources increase

# Public Service  Productivity Analysis

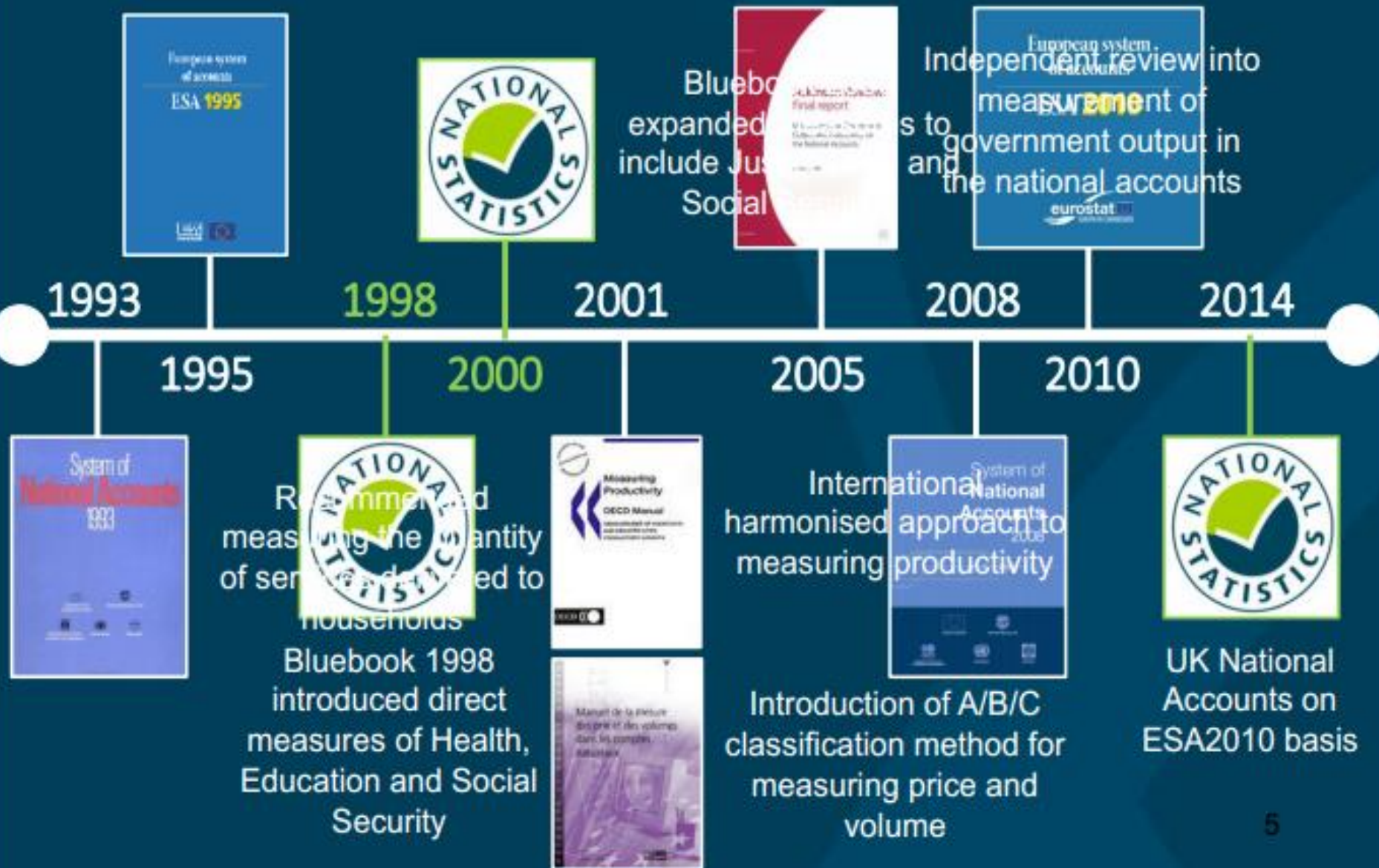- According to the OECD [3], "productivity is commonly defined as a ratio of a volume measure of output to a volume measure of input use," that is, outputs divided by inputs. Productivity estimates should be distinguished from performance measures.

- Productivity estimates provide insight into the drivers of efficiency in government service  by breaking down growth into growth of inputs, growth of output, and changes in productivity.

- Change in productivity, or change in the ratio of output to inputs, is one of many indicators that may be of interest to those wishing to understand the efficiency of the government sector in utilising resources when delivering public service

# The ONS Journey

**1993**

**1995**

**1998**

**2000**

**2001**

**2005**

**2008**

**2010**

**2014**

Recommended measuring the quantity of services delivered to households

Bluebook 1998 introduced direct measures of Health, Education and Social Security

Bluebook expanded measures to include Justice and Social Security

Introduction of A/B/C classification method for measuring price and volume

International harmonised approach to measuring productivity

Independent review into measurement of government output in the national accounts

UK National Accounts on ESA2010 basis

5

# Thank You