

# Measuring public sector production and productivity - statistical concepts

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# Outline

1. **Who are we talking about?:** Public sector, general government, industries with large share of non-market producers
2. **4 points:**
  - Equality of nominal value of inputs and outputs does not imply zero productivity growth
  - Common terminology: inputs, outputs, outcomes
  - Hierarchy of volume output measures - in concept
  - Where to start
3. **Conclusions**

# Who are we talking about? (1)

'Public sector' in the SNA (institutional perspective) comprises:

- **General government:**
  - National government, e.g., ministries
  - Social security funds
  - Non-market producers controlled by government, e.g., public schools or public hospitals
- **Public corporations** e.g., railways, utilities, public financial corporations



For analysis:

- General government **in scope** ✓
- Public corporations typically **not in scope** ✗

# Who are we talking about? (2)

## Industry perspective

- Activities with large share of non-market producers, i.e., health, education
- Public administration and defence, compulsory social security



## Pragmatic approach

Industry perspective = preferably with a breakdown of government and non-government units within industries

# Equality of nominal value of inputs and outputs does not imply zero productivity growth

- Non-market producers with economically insignificant prices

⇒ Production value = sum of costs:  $y = \sum p_{x_i} x_i$

$y$ : nominal value of production

$x_i$ : inputs: labour, capital services, intermediates

$p_{x_i}$ : input prices

- Equality in nominal values does not imply equality of volume change of outputs and inputs

Identify units of output  $q_j$  and unit costs  $p_{q_j} \Rightarrow y = \sum p_{q_j} q_j$

Volume change output:  $Q_q \equiv \sum \frac{p_{q_j}^0 q_j^0}{\sum p_{q_j}^0 q_j^0} \frac{q_j^1}{q_j^0} \neq$

Volume change inputs:  $Q_x \equiv \sum \frac{p_{x_i}^0 x_i^0}{\sum p_{x_i}^0 x_i^0} \frac{x_i^1}{x_i^0}$

# Common terminology

- **Inputs:** labour, capital services, intermediate inputs
- **Outputs:** suitably differentiated counts of activities or physical units (e.g., hours of teaching to first year students, the number of normal deliveries in a hospital)
- **Outcomes:** state that is valued by consumers, such as a functioning car; their state of health or the level of knowledge.
- **Note:** outcomes are influenced by many factors, one of which may be outputs e.g., the state of health (an outcome) depends on medical care (an output) but also people's lifestyles and the environment.

# Hierarchy of volume output measures (1)

Measuring outputs - in decreasing order of theoretical attractiveness.

Output =

1. **Contribution to outcome** (e.g., QALYs gained through medical care)

Issues:

- Welfare value of production may imply  $\neq$  sum of costs
- National accountants may not be comfortable with welfare valuations (e.g., monetary value of statistical life)

2. **Quality-adjusted activity** (e.g., waiting-time adjusted standard hip operations)

- Adjustment to price or quantity index
- May still involve valuing welfare gains; otherwise marginal cost of improvement
- Note: quality adjustment is equally difficult for market and non-market producers
- Equality nominal value of production = costs is preserved

# Hierarchy of volume output measures (2)

Measuring the volume of outputs - in decreasing order of theoretical attractiveness. Output =

3. **Stratified count of activities** (e.g., hours of teaching for primary school pupils)
  - Quantities and unit costs per activity required
  - More easily available for health and education
4. **Inputs** (e.g., hours worked by municipal employees)
  - The traditional approach
  - Input data are far from perfect: labour quality, completeness of SNA assets (land); net return (cost of financing) in SNA2025; intermediate inputs and their deflators, especially services (quality adjustment again, e.g. for cloud computing)

# Where to start

- Output measurement is particularly challenging (but possible) for many collective services such as general administration, defence or the fire department
- Easier for individual services such as health care, education or public housing
  - ⇒ Start with individual services
  - ⇒ Aim for quality-adjusted activity measures
  - ⇒ Quality adjustment via (quasi)price or volume indexes

# Conclusions

- Measurement of non-market production **increasingly important** - size and policy interest
- Depending on activity, **definition of unit of service output and quality adjustment** are more or less complex
- **Research has to be kept up** to address important questions around collective services and the value of preventive measures
- Public sector is very large - **large rate of return** for every \$ invested in measurement!

