DREAMS workshop 3: The economics of selection

Thinking about Selection and Productivity

Adriana Castelli
adriana.castelli@york.ac.uk
@CastelliAdriana

4th December 2017

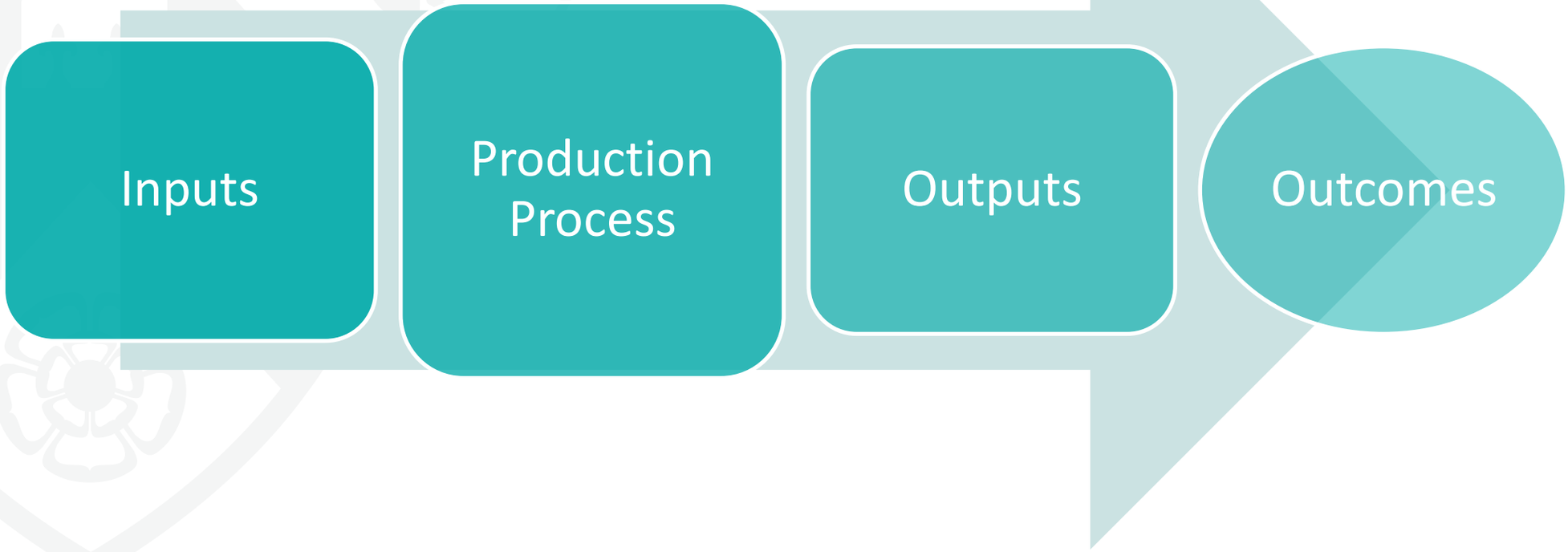
Session Overview

- Productivity
- What it is and what it is not!
- Challenges in measuring government (non-market) productivity
- Labour productivity (in health care)
- Discussion

Productivity

- Ratio of output to input

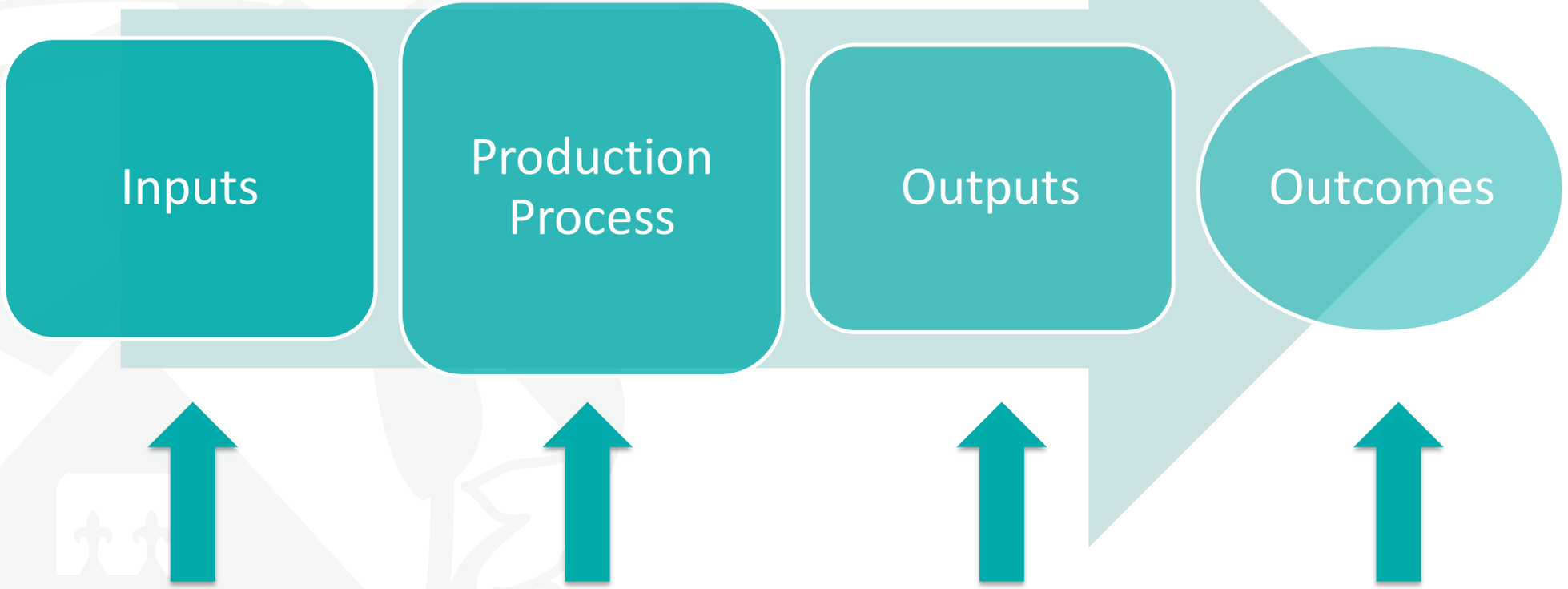
$$Productivity = \frac{Output}{Input}$$



Productivity

- Health care example:
- A person breaks a leg – complete, closed fracture
- Activities involved in production process:
  - Call to 111 , sends out ambulance
  - Ambulance paramedics provide first aid and deliver person to A&E
  - A&E department evaluates injury
  - A&E staff (nurse/doctor) applies splint
  - Medication is prescribed to reduce pain
  - Recovery is monitored in primary care or outpatients
  - Splint is removed

Productivity



L, K, M
L: time spent by health professionals + admin staff
K: Buildings and ambulance
M: medical supplies (splint, medication), electricity, petrol, etc

Activities mentioned

Whole course of treatment, often summarised by HRGs/DRGs

Full mobility, no pain, return to work

Productivity

$$Productivity = \frac{Output}{Input}$$

Absolute measure

$$\Delta Productivity = \frac{\Delta Output}{\Delta Input}$$

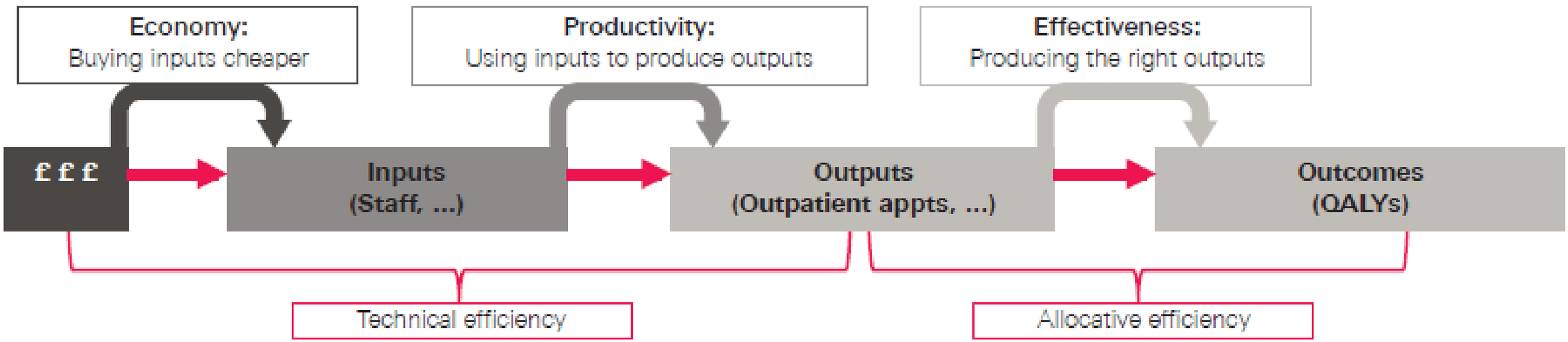
Comparison over time

$$\Delta Productivity = \frac{Output_{yr2} - Output_{yr1}}{Input_{yr2} - Input_{yr1}}$$

What is not Productivity!

- Performance of can be measured in many ways, other than productivity
- **Technical efficiency** → minimising the resources used in producing a particular output
- **Allocative efficiency** → choosing the right mix of inputs and output given relative price
- **Economy** or **value for money** → measure of cost per output or cost per input
- **Effectiveness** → relates outputs to outcomes and producing right outcomes

Performance indicators: summary for healthcare sector



Source: Department of Health Report to Public Sector Efficiency Group, June 2014

Definitions of productivity

Publication	Source	Definition
OECD Compendium of Productivity Indicators (2017)	Organisation for Economic Co-operation and Development (OECD)	***Labour productivity***, measured as Gross Domestic Product (GDP) per hour worked ***Multifactor productivity*** *to include capital and other inputs*
Measuring Productivity OECD Manual (2001)	Organisation for Economic Co-operation and Development (OECD)	"[…] as **single factor productivity** measures (relating a measure of output to a single measure of input) or **multifactor productivity** measures (relating a measure of output to a bundle of inputs)."
Developing new approaches to Measuring NHS Outputs and Activity (2005)	CHE, University of York, and NIESR	**Total Factor Productivity** defined as the ratio of NHS outputs, adjusted for quality, to NHS inputs.
Public Service Productivity: Health	ONS (2004)	As above
Operational productivity and performance in English NHS acute hospitals: Unwarranted variations	Department of Health, England (2016), Lord Carter of Coles	Adjusted treatment cost (ATC) Weighted Activity unit (WUA) Revenue per WTE and PPI

Challenges in measuring government productivity

- Availability of data and granularity of data (both output and input)
- Absence of market prices
- Attribution of outcomes (eg. improvement in mortality)

Challenges in measuring government productivity

- International guidance:
  - SNA93 & 08
  - ESA95 & 10
  - Eurostat Handbook on Price and volume measures, 2001 & 2016

➢ Output: direct (volume) measure for output

➢ Input: direct and indirect measure

Measurement of market output

- Market output is measured in terms of number of commodities produced in a given time period
- Market output is valued, using prices, which reflect both producer and consumer's valuation
- Prices also reflect the quality of the commodity measured, eg. cars

Measurement of government (non-market) output

- Output = Input Convention
  - Output is measured in terms of public expenditure
- Circular and self-justifying
- Implies no productivity change
- Reduction in expenditure because of technological improvements might reduce "output"

Measurement of government (non-market) output

- Output = Input convention is inadequate
- International bodies (United Nations, Eurostat) recommend development of measures of non-market output, not related to expenditure or inputs
- Both SNA93 and ES95 included recommendations to move to DIRECT VOLUME MEASUREMENT
- Education: accounts should measure how many pupils were taught!
- Health: Health output is the “quantity of health care received by patients […] in terms of ***completed treatments*** […] adjusted to allow for the ***qualities*** of the services provided” (Eurostat handbook 1995)

Definitions: health and education

	Health	Education
Input	What the health system uses in order to provide its output	What the education sector uses in order to provide its output
Output	The quantity of health care received by patients, in terms of complete treatments, adjusted to allow for the qualities of the services provided	The quantity of teaching received by students, adjusted to allow for the qualities of the services provided
Activities	The individual actions carried out by the health sector in delivering a complete treatment	n/a
Outcomes	The change in health status due to health sector interventions	There is lack of consensus over what constitute educational outcomes

Source: Eurostat 2001

Problems with cost weights

- Using unit costs as weights assumes
  - Efficient allocation of resources
  - Costs reflect social value
- Unit costs are “equivalent to the price” (Eurostat 2010, §10.29)
- Alternative value activities according to
  - Health outcomes generated
  - Other valued characteristics (eg waiting time)

Inputs

- Labour
- Capital
- Intermediates or materials

➢ Direct observation of (volume of) physical inputs and unit costs ← Rare

➢ Indirect observation of volumes of inputs based on expenditure ← Common

Labour Productivity

- Most important input in many production processes
- If quality not accounted for, best measured in terms of (changes in) average hours worked
- Or alternatively hours paid or full-time equivalent persons

Source:
OECD Compendium Productivity Indicators (OECD, 2017);

Measuring Productivity OECD Manual (OECD, 2001)

Labour productivity: the health care sector

- Data on Full Time Equivalents (FTEs) by occupational groups (ESR for England)
- Salaries (≈unit costs ≈ prices) (Pay-roll & Human Resource System for England)

➢ Labour Productivity

Labour Productivity: the health care sector

- Bloor, Freemantle and Maynard (2012): inpatient activity only, first attempt to explore **clinical** productivity of hospital consultants over time (10 years from 2003), and to analyse the effect of new consultant contract
  - In half of the specialties studied, clinical (consultant) productivity has declined

- Aragon, Castelli and Gaughan (2017): all hospital activity, investigate possible drivers of Total Factor and **Labour** productivity variations over time (2010/11 –2012/13)
  - Authors looked at skill-mix of the hospital workforce (% medical workforce employed over total workforce) ➔ positive association between LP and the proportion of medical workforce ➔ medical staff **important component** of the skill mix of more **productive Trusts**

- Lafond, Charlesworth and Roberts (2017): selection of hospital activity, calculate **consultant** productivity over time (2009/10 to 2015/16), and drivers of variation
  - Positive association between consultant productivity and prop of nurses & support staff ➔ a 4% increase in share of nurses increased consultant productivity by 1%

References:

- Bloor, Freemantle and Maynard (2012), Trends in consultant clinical activity and the effect of the 2003 contract change: retrospective analysis of secondary data' Journal of the Royal Society of Medicine, vol 105, no. 11, pp. 472-479. DOI: 10.1258/jrsm.2012.120130
- Aragon Aragon, Castelli and Gaughan (2017), Hospital Trusts productivity in the English NHS: Uncovering possible drivers of productivity variations, PLOS One; DOI: https://doi.org/10.1371/journal.pone.0182253
- Lafond, Charlesworth and Roberts (2017), A year of plenty? An analysis of NHS finances and consultant productivity, The Health Foundation, http://www.health.org.uk/publication/year-of-plenty.

Discussion

"[…] one hour worked by one person does not necessarily constitute the same amount of labour input as one hour worked by another person. There may be differences in **skills**, **education**, **health** and **professional experience** that lead to large differences in the contribution of different types of labour.

A differentiation of labour input by type of **skills** is particularly desirable if one wants to capture the effects of a changing quality of labour on the growth of output and productivity." (OECD, 2001)

SOURCE:

Measuring Productivity OECD Manual (OECD, 2001)