# Experimental higher education multifactor productivity estimates

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Australian Bureau of Statistics
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# Drivers

- Desire to improve quality of ‘non-market’ output measurement in the Australian national accounts – specifically, to reduce/eliminate the use of the input cost deflation method for output consumed individually
- Difficulty in measuring/aggregating/weighting in absence of ‘economically significant’ final consumer prices
- Education industry currently excluded from ‘official’ measures of MFP growth in Australia because of the significance of non-market activity within it

# Published work

- Output of Australian universities
- MFP productivity growth in higher education (experimental, GO-based)
- Capital services indexes (experimental)
- Conceptual arguments and frameworks for non-market activity

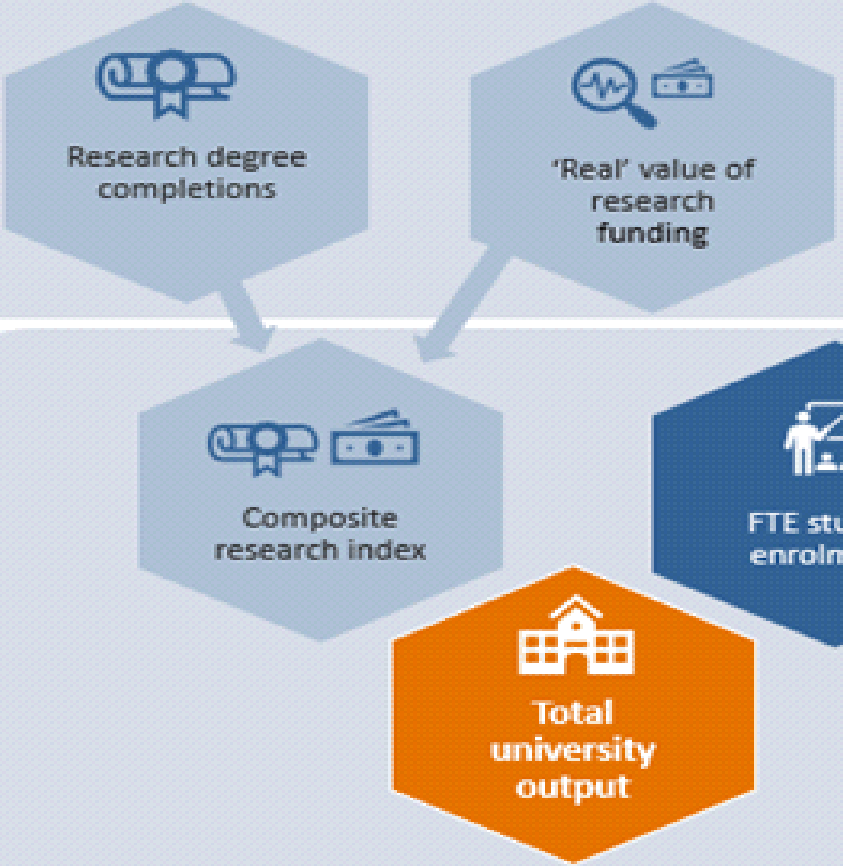
# The measurement problem

- For market activity, volume measures can be derived directly (quantity indicator method) or indirectly (price deflation method)
- When prices lack meaning or are non-existent, price deflation is not possible
- Lack of (relative) prices makes weighting and aggregation difficult – we use (relative) costs of production as a proxy
- This approach is considered superior to input cost deflation

# Output of higher education

- Universities produce two outputs: teaching and research
- Research output has two components: research degree completions and output from funded research
- Weighted by operating costs allocated to teaching and research activity
- (Primary data source: Commonwealth Department of Education)

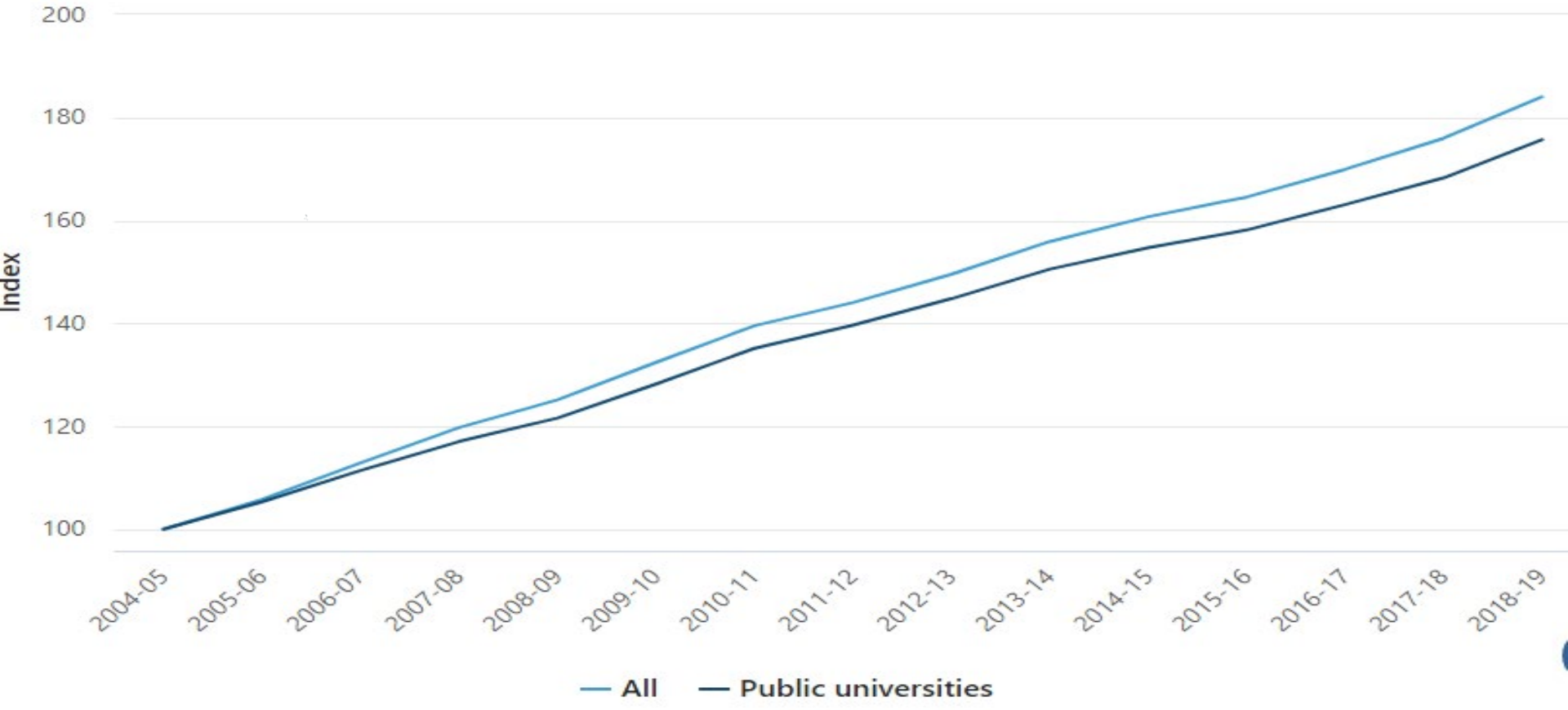
# Aggregation of components



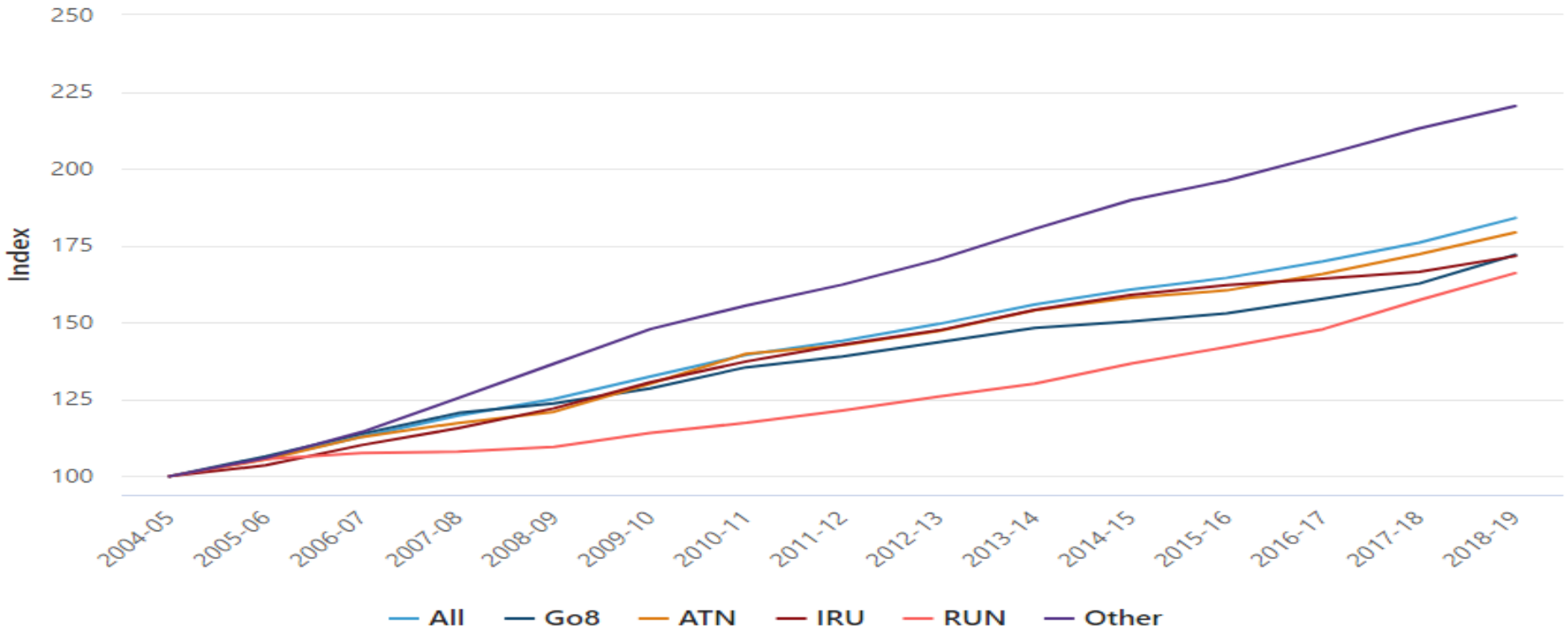

Expenditure-weighted research degree completions and the deflated value of research output funded by government and industry are aggregated to form a composite research index, using the weights $\theta_{comple}$ and $\theta_{teach}$

The composite research index is then aggregated with a cost-weighted index measuring teaching output, using the weights $\omega^{t}_{teach,i}$ and $\omega^{t}_{research,i}$ to derive an index reflecting growth in total university output.

# Volume output growth – higher education



# Volume output growth – by cohort




Notes: Go8 – Group of Eight Universities, ATN – Australian Technology Network Universities, IRU – Innovative Research Universities, RUN – Regional Universities Network.[9] Other includes non-aligned universities and non-university higher education institutions.

# Inputs to production

- Labour index: labour account hours worked (ANZSIC subdivision level)
- Intermediate use (E, M, S) index: current price expenditure data from DESE published dataset, deflated
- Capital services: experimental index (ANZSIC division level)
- Combined input index – Törnqvist using input cost shares as weights

# Capital services

$$C_t = T_t(r_t P_{t-1} + \delta_t P_t - \Delta P_t) + x_t P_{t-1} \qquad Equation\ 1$$

where

$r_t$ is the rate of return;

$P_t$ is the asset price;

$\delta_t$ is the rate of economic depreciation (consumption of fixed capital);

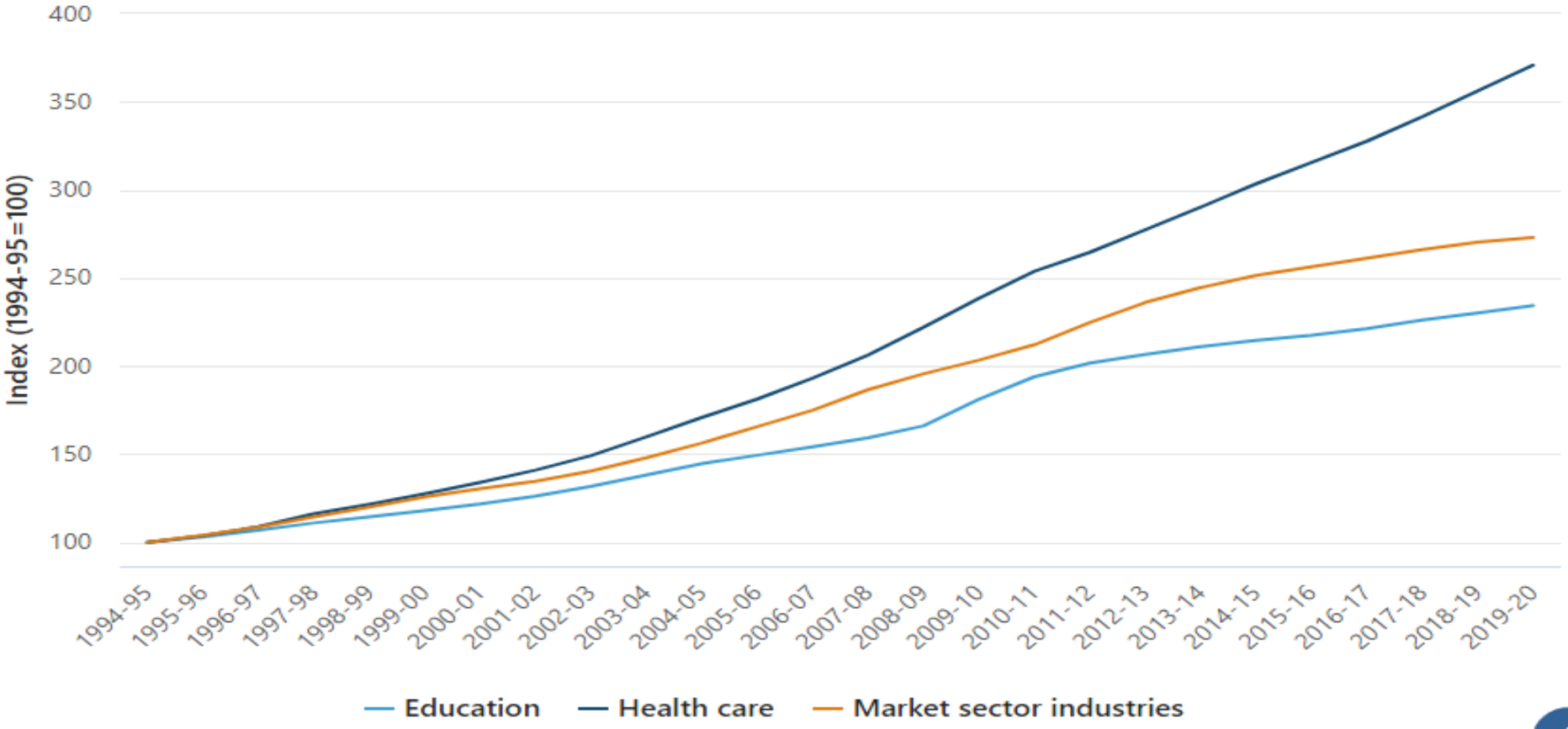
$\Delta P_t = P_t - P_{t-1}$ is the capital gain/loss due to revaluations;

$T_t$ is the income tax parameter; and

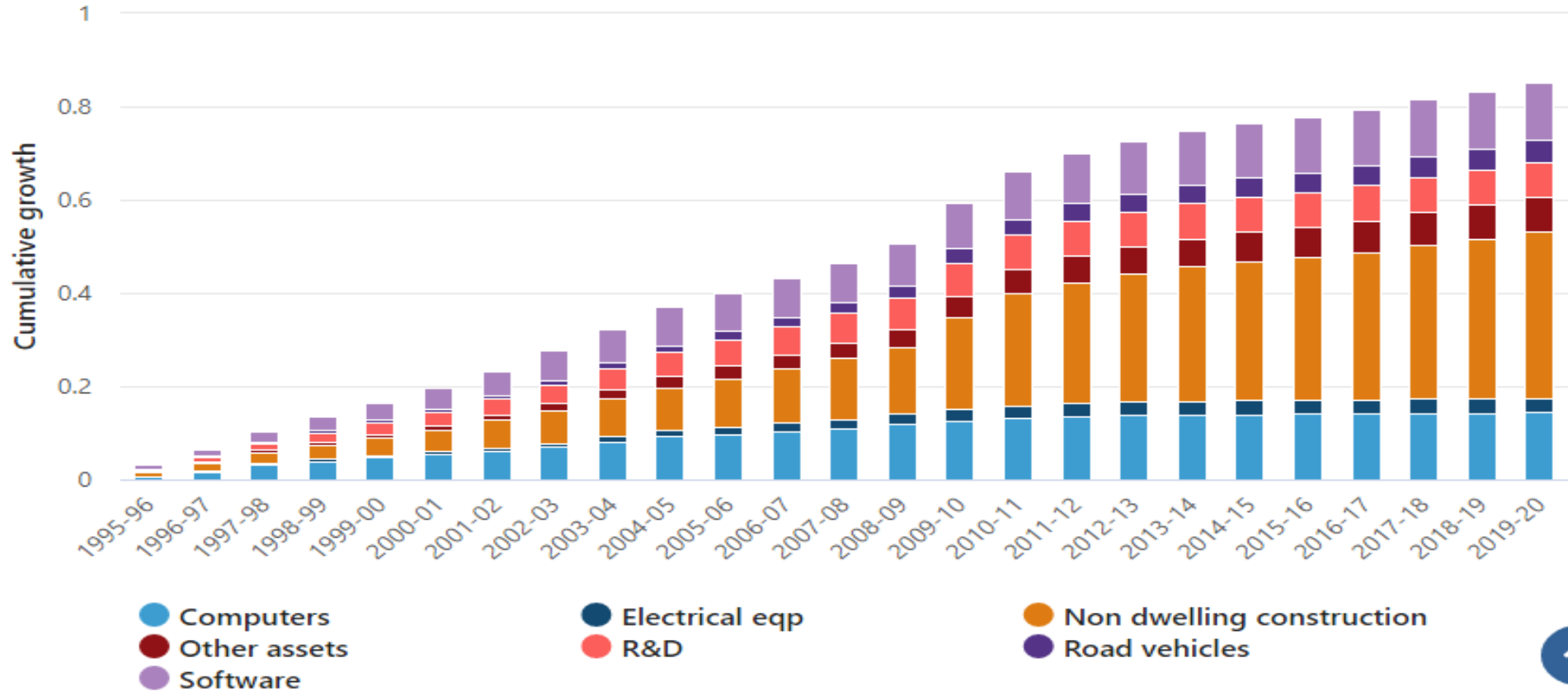
$x_t$ is the effective net indirect tax rate on production.

- Same basic formula for rental prices as for 'market sector' industries with two amendments:
  - Rate of return: CPI + 4%
  - Tax parameter 'donated' from Division M (professional, scientific, technical)

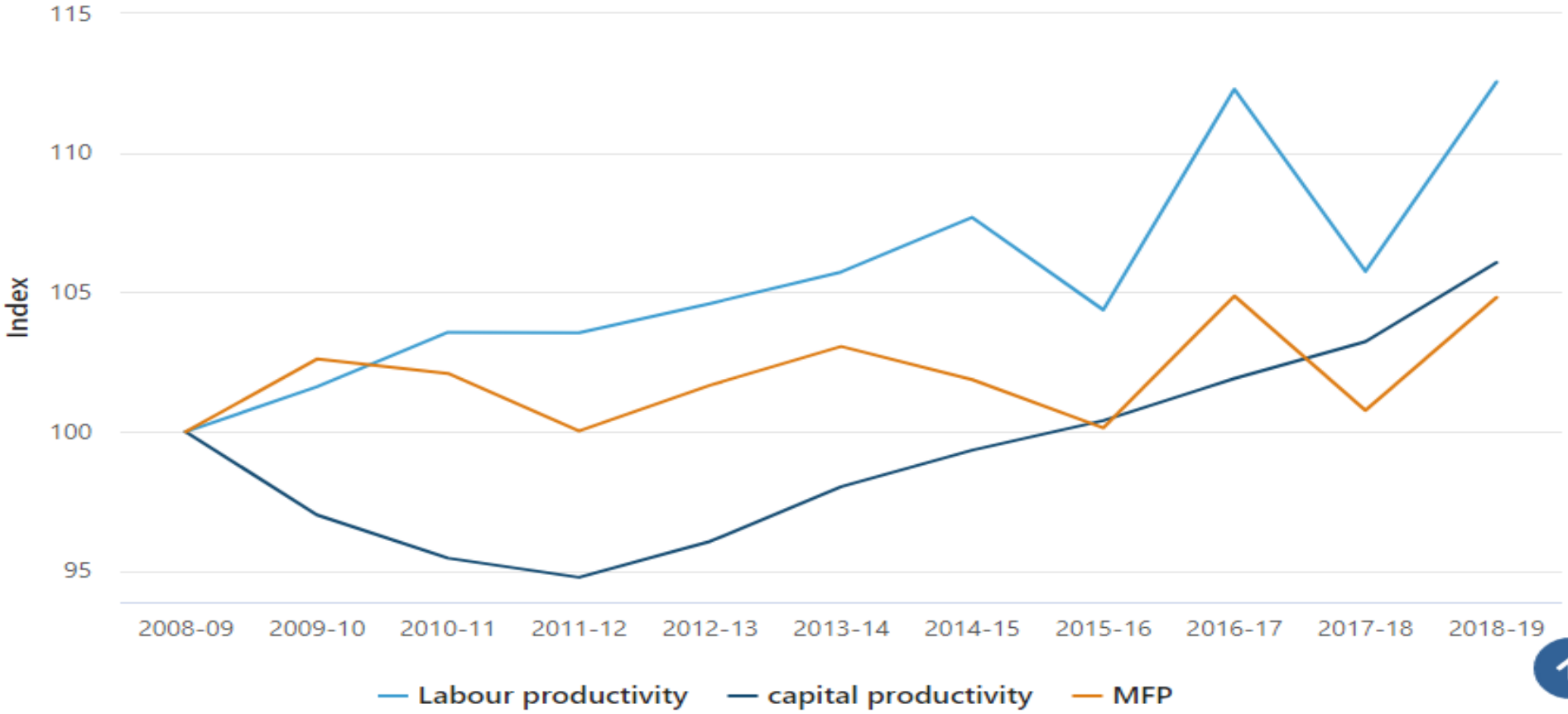
# Capital services indexes



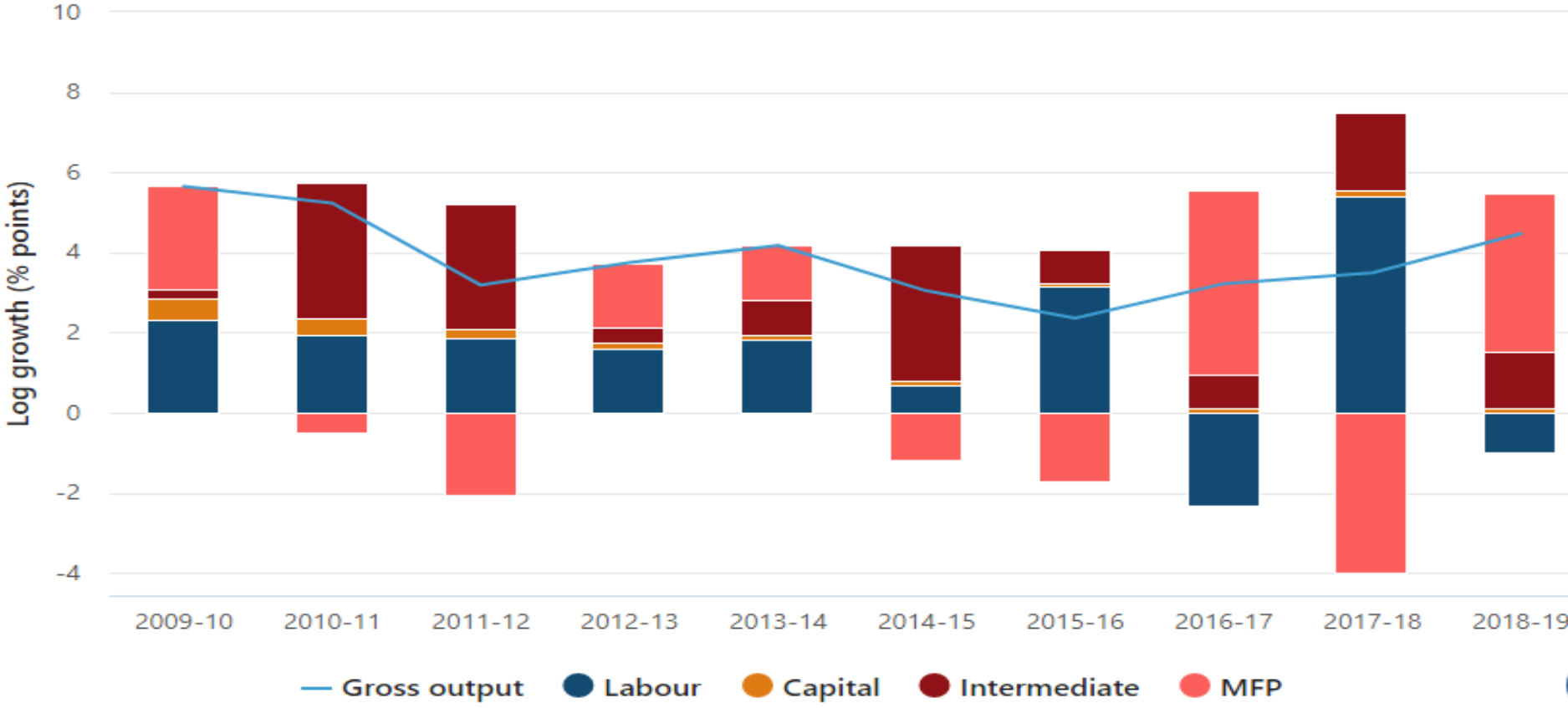
# Contributions to growth in capital services – education



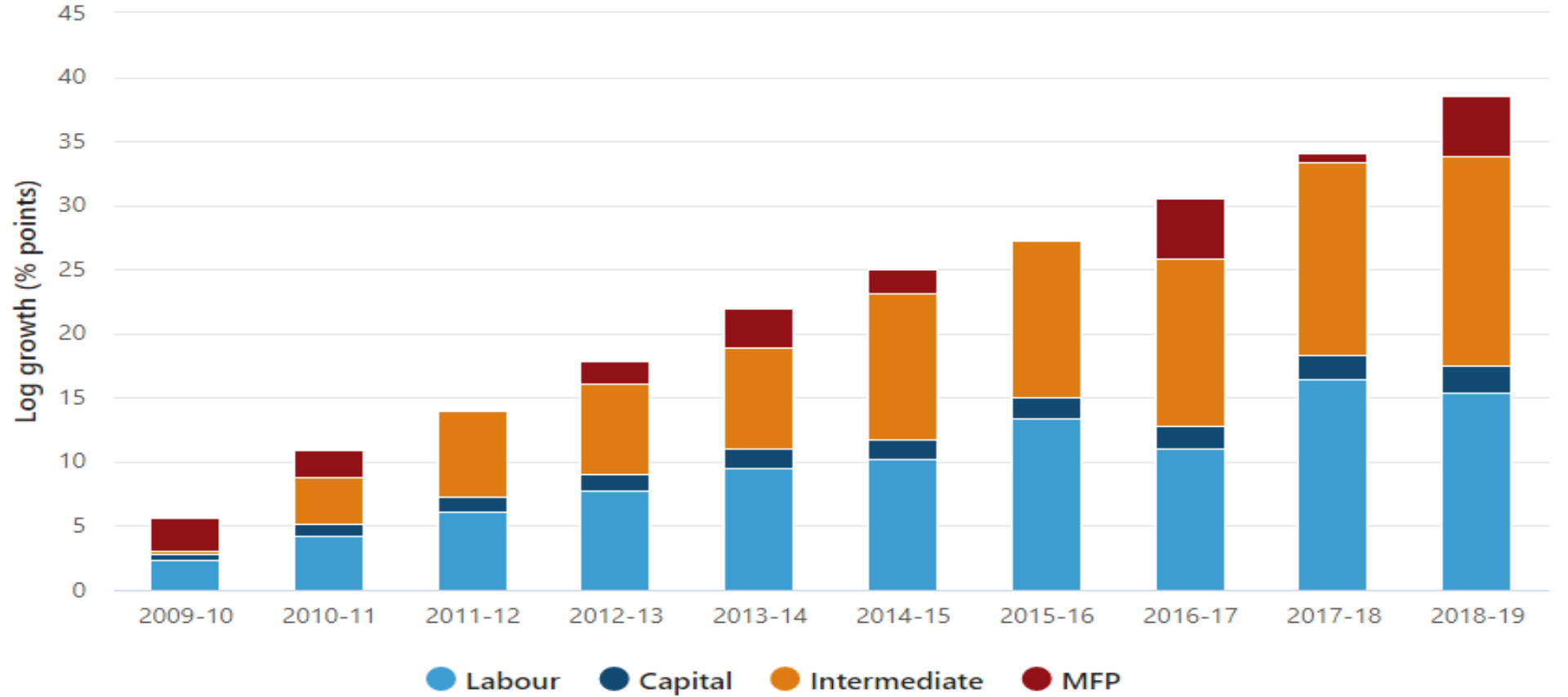
# Productivity growth – higher education



# Contributions to output growth



# Contributions to cumulative output growth



# Limitations – output (1)

- Assumption that universities provide two outputs, teaching and research
- Difficulties around deriving aggregation weights (teaching v research) – sensitivity testing
- Assumption that research output ‘funded’ by government and the private sector has commensurate economic value
- Teaching output not weighted by discipline
- Price information ignored

# Limitations – output (2)

- Annual data only
- Research publications not incorporated into research output
- University ranking data not used (rankings are ordinal, not cardinal)
- Quality adjustment by degree types (e.g. link to earning capacity) not attempted

# Limitations - inputs

- Labour input: use of labour accounts data as published at the time (not the recently revised estimates)
- Capital: constructed at industry division level (but higher education is labour intensive)
- Intermediate use: deflators used may not be optimal

# The future?

- Experimental MFP growth measures for education industry as a whole (scheduled for late 2022)
- Potential to re-run the higher education analysis to highlight medium term impacts of COVID and to pick up labour accounts revisions

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# Thank you!
# Questions and discussion

# Links to papers (1)

- Measuring output growth of Australian public universities
  - https://www.abs.gov.au/statistics/research/university-output-measures-australian-national-accounts-experimental-estimates-2008-2017
- Experimental measures of MFP growth for higher education in Australia
  - https://www.abs.gov.au/statistics/research/experimental-higher-education-multifactor-productivity-estimates

# Links to papers (2)

- Experimental measures of capital services
  - https://www.abs.gov.au/statistics/research/experimental-capital-service-indexes-non-market-industries
- Conceptual arguments and frameworks
  - https://www.abs.gov.au/statistics/research/non-market-output-measures-australian-national-accounts-conceptual-framework-enhancements-2020