



Australian Government

Australian Bureau of Agricultural and
Resource Economics and Sciences

Public R&D and Extension and Productivity in Australian Broadacre Agriculture

Yu Sheng, Emily Gray and John Mullen

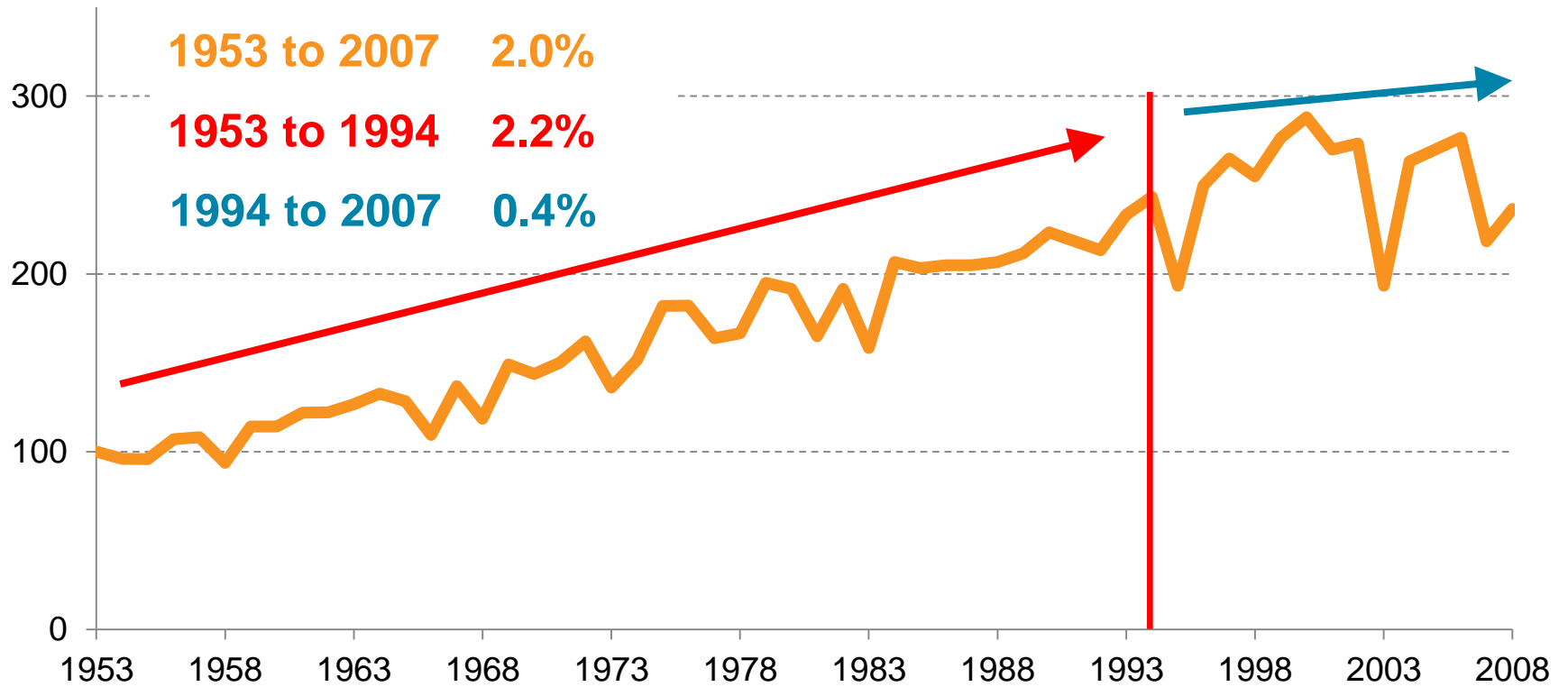
AARES 55th Annual Conference, Melbourne, 8–11 February 2011

Research objectives

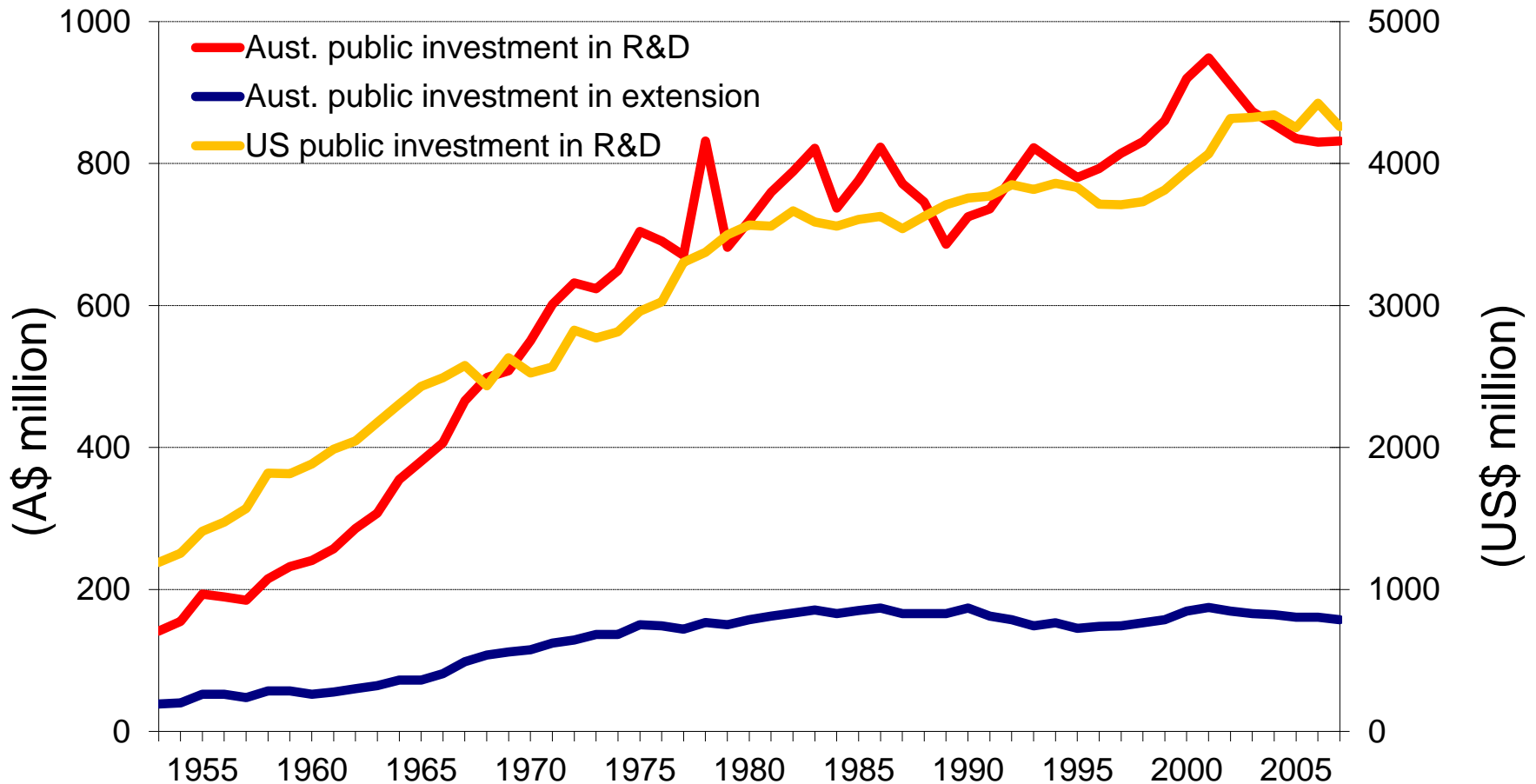
To re-examine the relationship between public agricultural RD&E investments and broadacre total factor productivity

- What is the return to public investment in agricultural research?
- How do technology 'spill-ins' from foreign R&D influence Australian broadacre productivity?
- What are the relative contributions of Australian R&D and extension activities, and foreign R&D to Australian broadacre productivity?

Broadacre TFP trend



Trends in real public RD&E investment



Linking Broadacre TFP and RD&E investment

Following Alston, Andersen, James & Pardey (2010)

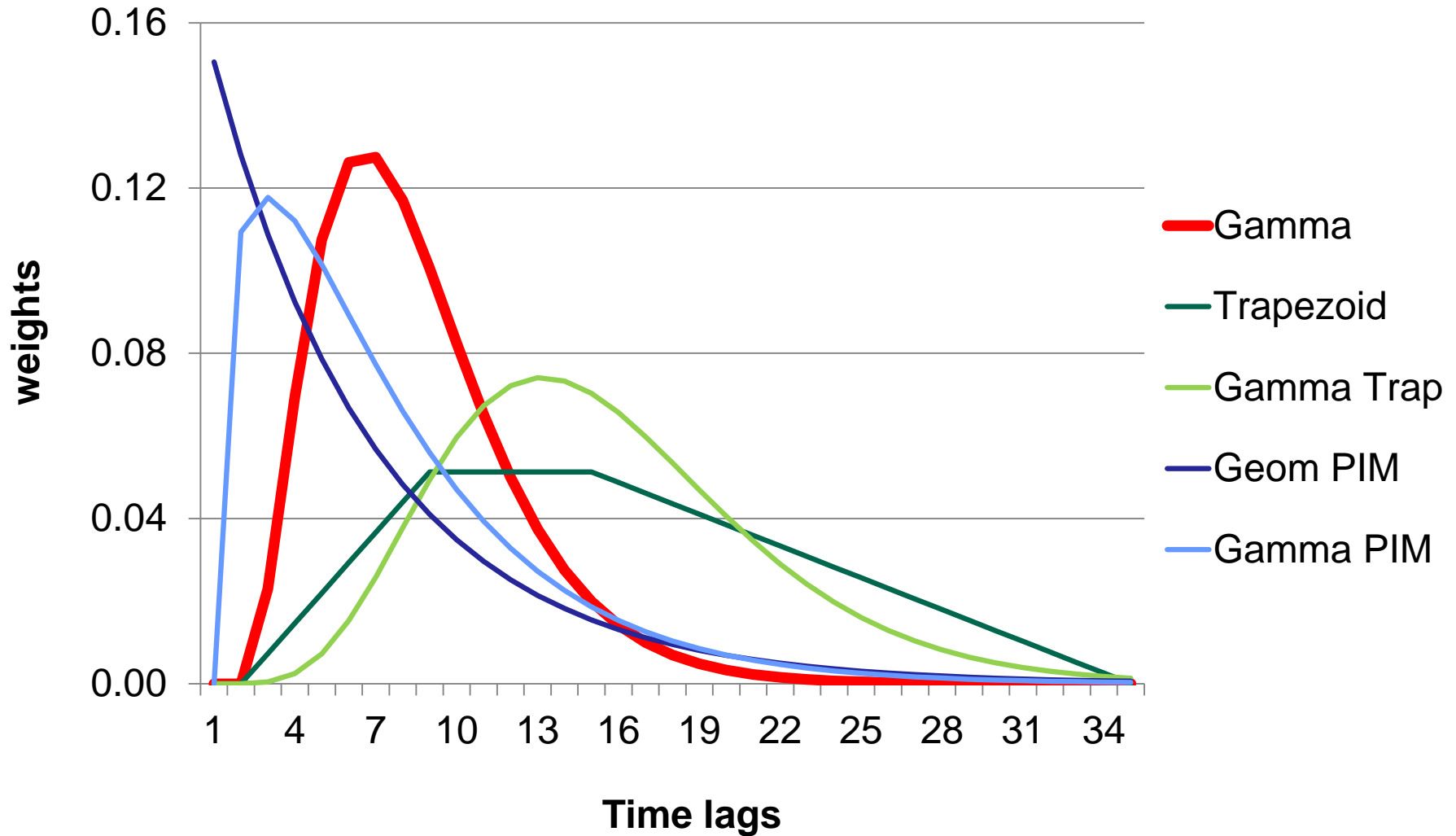
TFP depends on the **stock** of usable knowledge, not current RD&E expenditures

- Long lags before RD&E investment → useful knowledge and technology available for farmers to use

Lag relationship

- Dynamics of knowledge creation, utilisation and depreciation

Knowledge Stocks: assumed time profiles



Model specification

$$\ln TFP_t = \alpha + \beta_1 \ln TS_t^{kj} + \beta_2 \ln EXT_t + \gamma_1 \ln WEA_t + \gamma_2 \ln EDUC_t + \gamma_3 \ln TOT_t + \varepsilon_t$$

Informed by:

- Lack of private research expenditure data
- Total public research knowledge stock
- Control variables
- Econometric model (log-linear model; ARIMA)
- Estimating the relationship between broadacre TFP and knowledge stocks

Data and variable definitions

Public R&D data

- ABS Aust. Research and Innovation Survey (1994–2007)
- Mullen et al. 1996 (1953–94)
- ‘Backcast’ (1918–53)

Public extension data

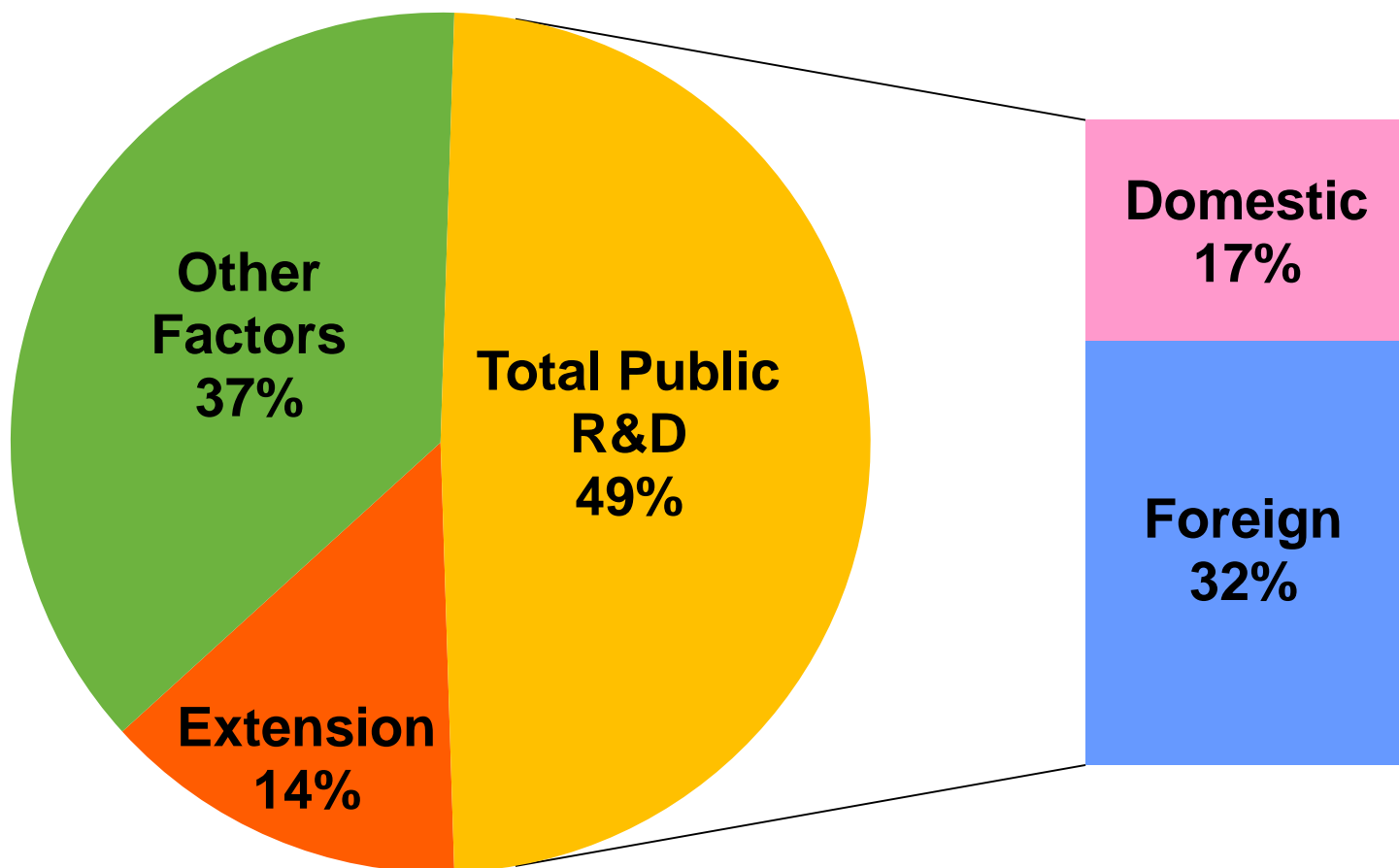
- Estimated from State departments’ RD&E (1994–2007)

Control variables

- Seasonal conditions
- Broadacre farmers’ education

Sources of annual TFP growth 1953–2007

Broadacre TFP growth 1.96% a year...



Returns to public investment in RD&E

- A measure of the benefits from a one-time increase in public investment in agricultural research and extension
- 1953–2007
 - Public R&D **28.4%**
 - Public extension **45.3%**
- 1978–2007
 - Public R&D **47.5%**
- Comparable to other studies

Concluding remarks

- High rates of return to public agricultural RD&E
 - Efficient public R&D system is important for continued agricultural productivity growth
- Foreign and domestic research contributions roughly equal
- Limitations and opportunities for future research
 - Private RD&E
 - ‘Backcasting’ expenditures
 - Human capital stock and climate proxies
 - Total public research knowledge stock



Thank you and Questions?

Science and economics for decision-makers

