

# Issues in productivity modelling

Associate Professor Janine Dixon

Centre of Policy Studies, Victoria University

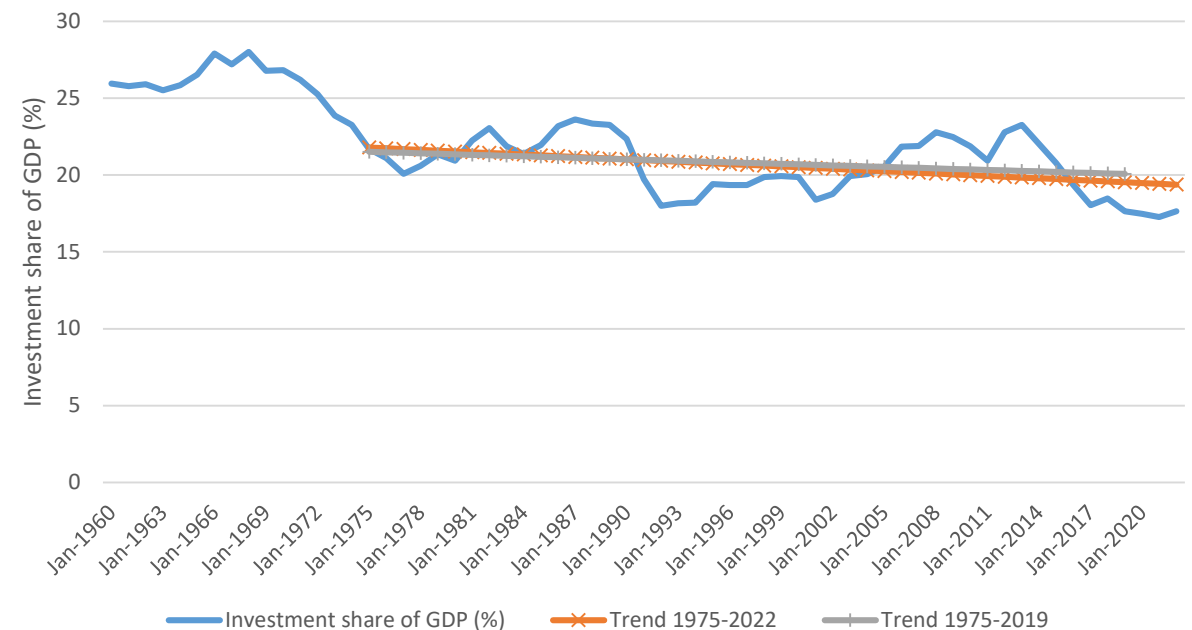
Presentation to the Melbourne Economic Forum, April 17, 2023

- Keynes - *unemployment due to our discovery of means of economizing the use of labour outrunning the pace at which we can find new uses for labour*
  - Economic Possibilities for our Grandchildren, 1930
- Brookings Institute - *Digitalization is associated with increased pay and job resiliency in the face of automation but also vastly uneven trends for job growth and wages.*
  - Muro, Liu, Whiton and Kulkarni (2017), Digitalization and the American workforce

# Simple model of productivity

- 2 factors of production: labour and capital
- Perfectly elastic demand
- Productivity growth is labour-augmenting only
- Capital stocks adjusts to maintain fixed rates of return
- Participation rates and hours worked are fixed
  
- 1% productivity growth leads to:
  - 1% growth in capital stocks
  - 1% growth in output
  - 1% growth in wage

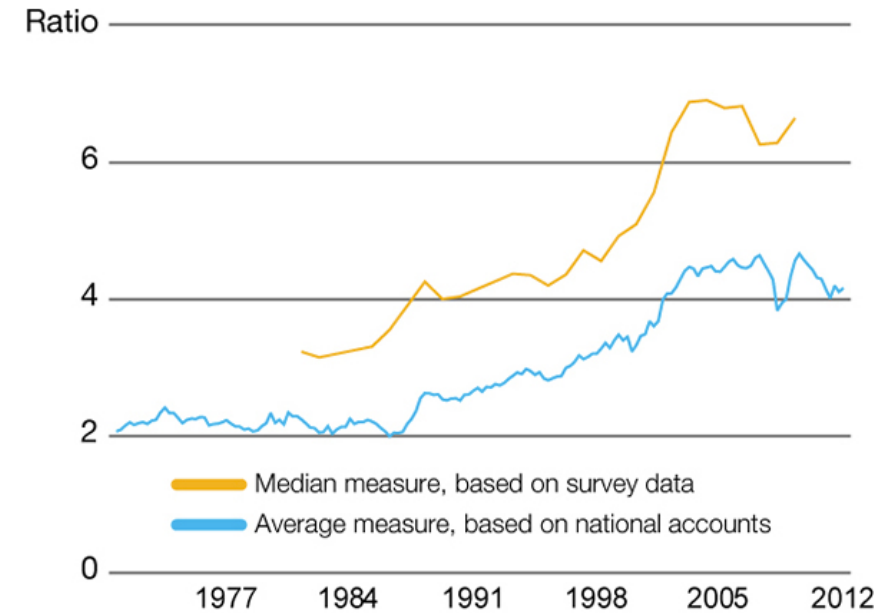
- Question: Is labour-only productivity growth justified?
  - Yes – if investment to GDP ratio is steady
  - Inconclusive
    - 1975-2022 statistically significant decline
    - 1975-2019 no statistically significant decline



# Extended model

- 3 factors of production: labour, capital and land
- Perfectly elastic demand
- Productivity growth is labour-augmenting only
- Land supply is fixed
  - “Land” may be any fixed factor
- Now, 1% productivity growth leads to:
  - Less than 1% growth in capital stocks
  - Less than 1% growth in output
  - Less than 1% growth in wage
  - More or less than 1% growth in land price
  - Wage falls relative to land price
  - Workers incomes go further in purchasing consumer goods (e.g. bicycles) but not land

Figure 1: Dwelling Price-to-Income Ratio



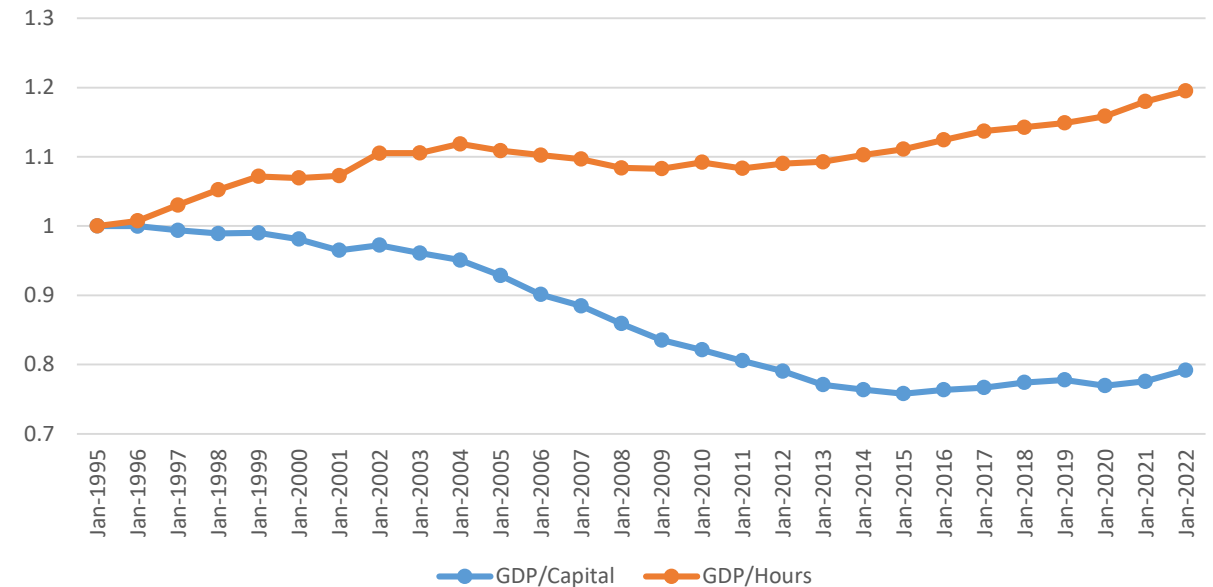
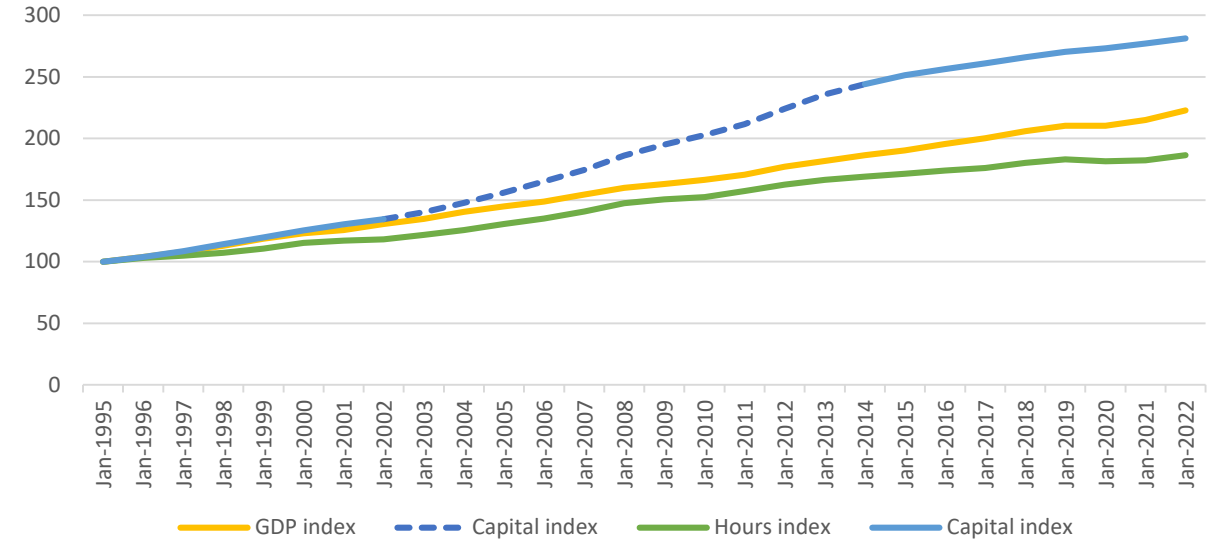
Sources: Abelson and Chung (2005); ABS; APM; ATO; CBA/HIA; RBA; REIA; RP Data-Rismark

Source: R Fox and R Finlay, *Dwelling prices and household income*, RBA Bulletin, December Quarter 2012.

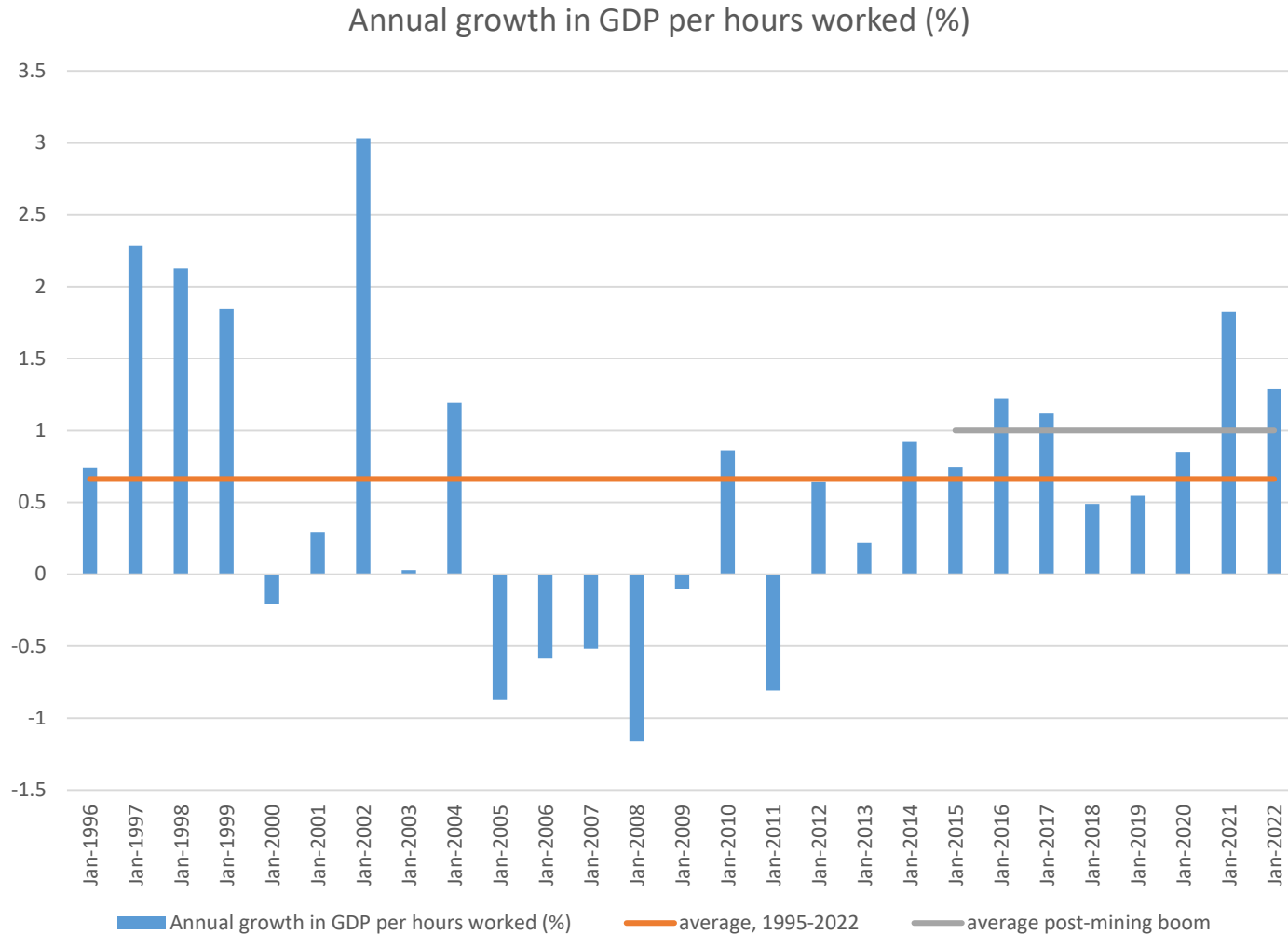
# Recent performance

- GDP growth and capital growth mostly in alignment
  - Structural change during mining boom years is an anomaly
  - Before 2002 and after 2014, the GDP to capital ratio is fairly constant
- GDP growth outpaces hours input except during mining boom years
  - Before 2002 and after 2014, the GDP to hours worked ratio is increasing

GDP and input indexes (1995=100)



# Recent performance

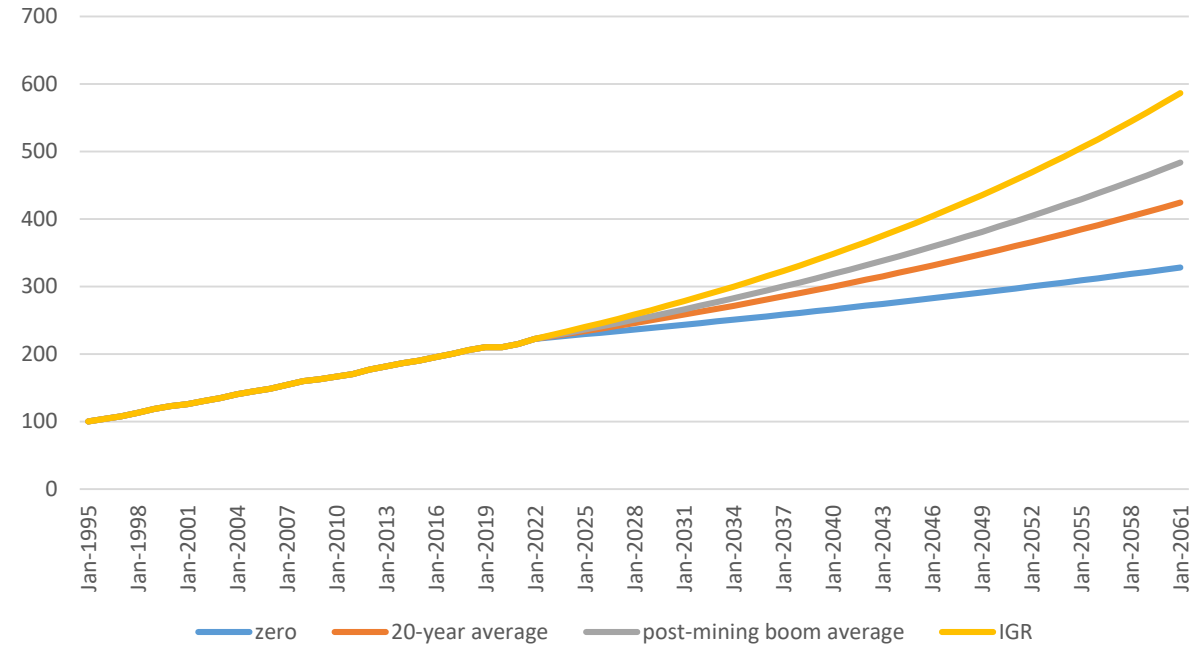


- Productivity growth from 1995-2022 averages 0.66% per annum
- Post mining-boom the average is 1.0% per annum
- The IGR assumes growth of 1.5% per annum in the forecast period

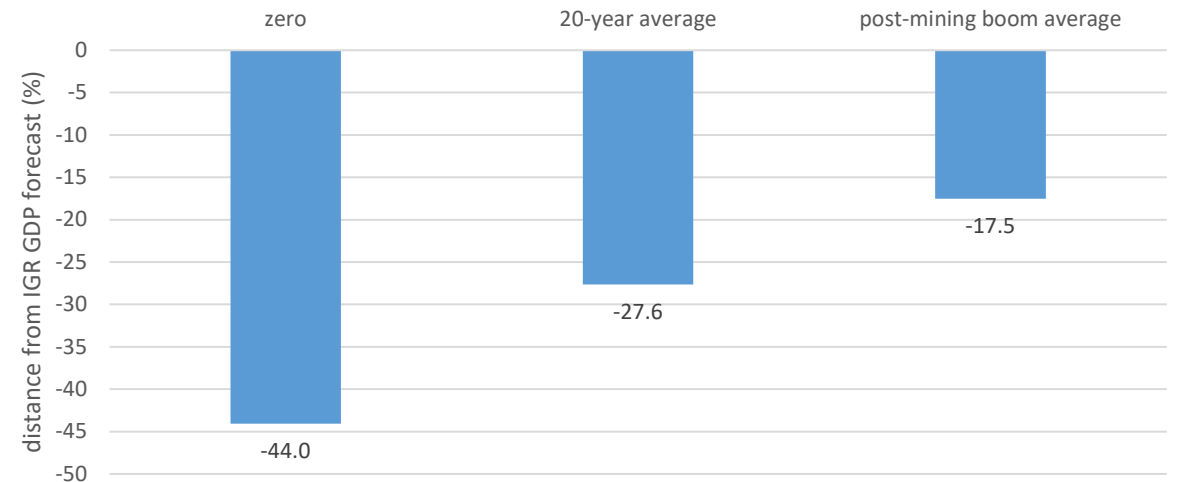
# Forecasts

- Assuming the basic model
  - Demand is sufficient to absorb output growth
  - Fixed hours and participation rates
- 4 scenarios for productivity growth
  - Zero growth
  - 0.66% per annum (20-year recent average)
  - 1.0% per annum (post-mining boom average)
  - 1.5% per annum (IGR)
- Compounded over 40 years the differences are large

GDP forecasts under various productivity assumptions



Comparison to IGR GDP forecast at 2062



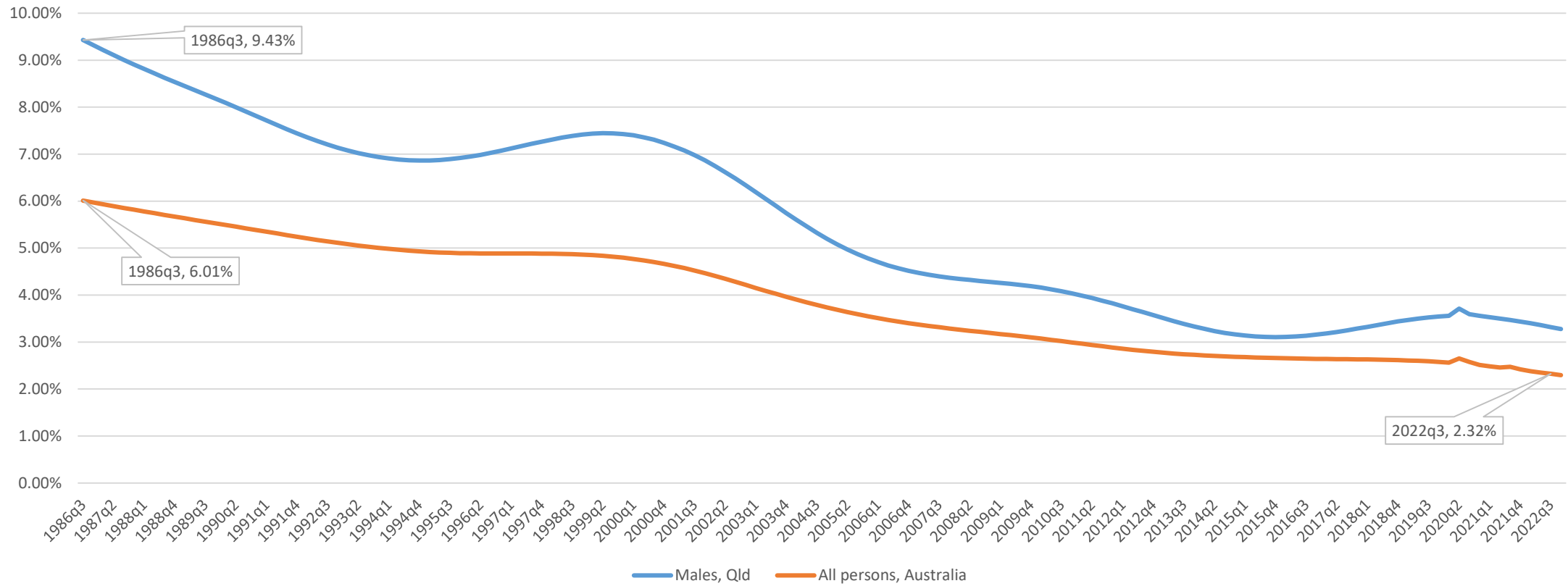
# Distribution of productivity

- More output per labour hour overall can mean:
  - More output and income and/or more leisure
  - More resources to devote to other areas e.g. environmental protection
  - Higher land prices (if land supply is fixed or growing slower than population)
- Industry specific responses depend on demand structure
  - Agriculture – productivity improvements lead to less labour input (low expenditure elasticity and low price elasticity)
  - Productivity improvements release labour to other uses
    - E.g. Professional services, Health care and social assistance
- Other types of productivity
  - Productivity outside the measured economy
    - Household appliances → labour supply (especially women), better quality of life
    - Technology, administration, entertainment
  - Medical



# Employment in agriculture

Agriculture share of employment



# Sources of productivity growth

- Education:
  - several simulations in the PC inquiry deal with improvements to the quality of school and university education
  - also several simulations in NSW PC white paper (2021?)
- Removal of inefficiencies: this could be argued to be improvements in allocative efficiency rather than genuine productivity growth, nonetheless it is growth enhancing
  - better matching of immigration program
  - occupational licensing (harmonisation between states?)
  - NSW restrictive building regulations – improvement in land productivity
- Uptake of technologies: ultimately enhancements to labour-saving productivity
  - PC models uptake of digital technology in agriculture and mining
- Genuinely new innovation

# Conclusions

- Productivity is the driver of economic growth, or more accurately, utility improvements
- Productivity growth does not have to translate into GDP growth
  - Leisure
  - Less environmental exploitation
- Productivity growth underpins growth in wages and returns to other fixed factors such as land
  - Wage growth will outpace general price growth but not growth in land prices
- Productivity growth destroys some jobs and creates others
- Based on the productivity growth of the last 20 years, GDP in 40 years time will be 27% lower than forecast by the IGR, but still almost twice what it is today