



# Why have bachelor's graduates' real wages fallen? A machine learning approach

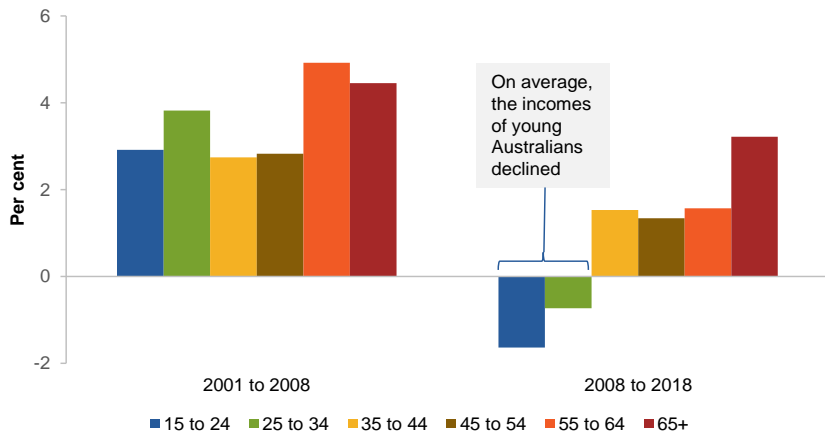
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*The views in this presentation are those of the authors and do not necessarily reflect those of the Australian Treasury or the Australian Government.*

# Motivation and research question

# Young peoples' real wages fell pre-COVID, especially for university graduates

**Figure 1 Young people's incomes have declined**  
Annual growth in average disposable incomes by age<sup>a</sup>

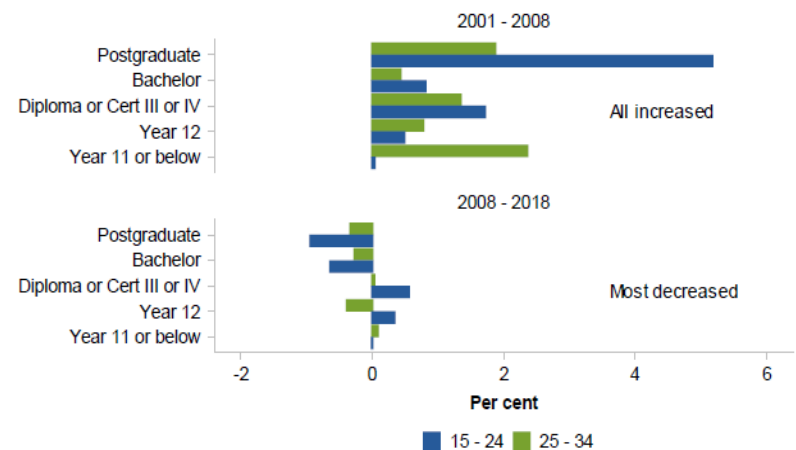


<sup>a</sup> In real terms; adjusted by the CPI.

Data source: Commission estimates based on HILDA data.

Source: Productivity Commission 2020 – Why did young people's incomes decline

**Figure 4.4 Young people's wage rates mostly declined after 2008**  
Average growth in real wage rate, by highest level of education, 2001–2018



Data source: Commission estimates based on HILDA data.

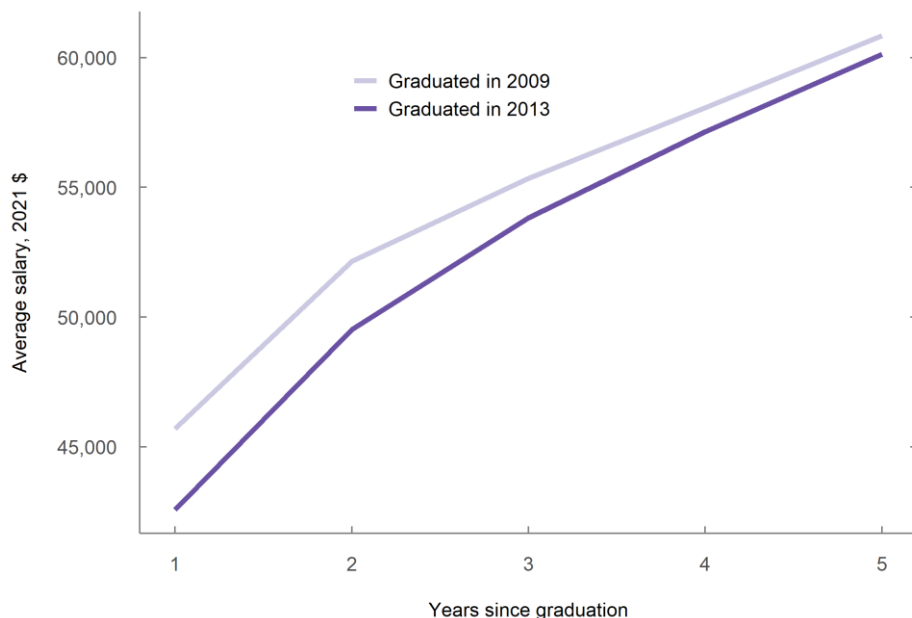
Source: Productivity Commission 2020 – Why did young people's incomes decline

# Commonwealth 'demand-driven' funding reforms

- Commonwealth Government removed caps on support for most domestic bachelor students after Bradley Review:
  - Announced late 2009, phased in from 2010 to begin in 2012.
  - Bachelor enrolments increased from 195,000 in 2009 to 260,000 in 2015.
- Previous research has investigated the impact of the reforms.
  - PC used Longitudinal Study of Australian Youth (LSAY), found 'additional' students much more likely to become professionals, but also to drop out.

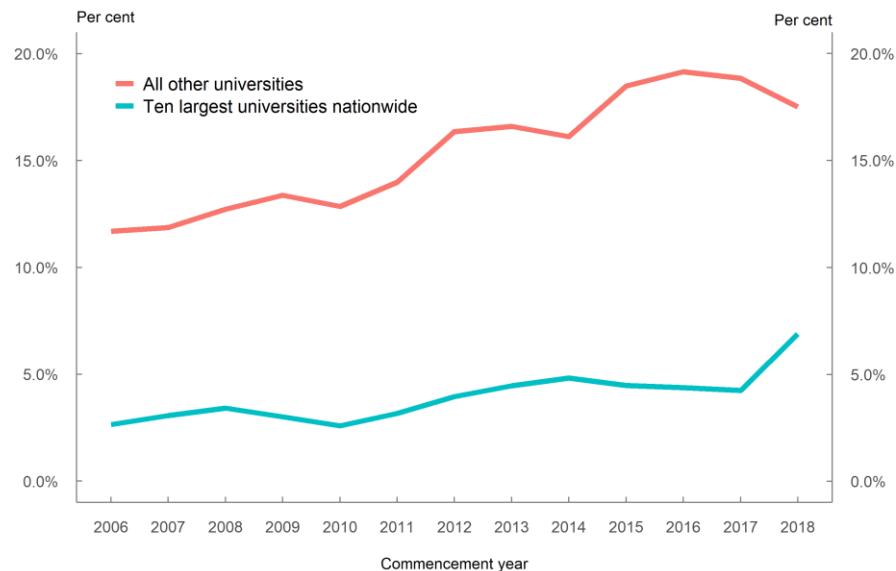
# Did compositional change drive the fall in bachelor's graduates' real wages?

Chart 1: Average real wages, 2009 and 2013 cohorts.



Source: Treasury research using the Labour Market Tracker

Chart 2: Percentage of graduates with an ATAR at or below 60.



Source: Treasury research using the Labour Market Tracker

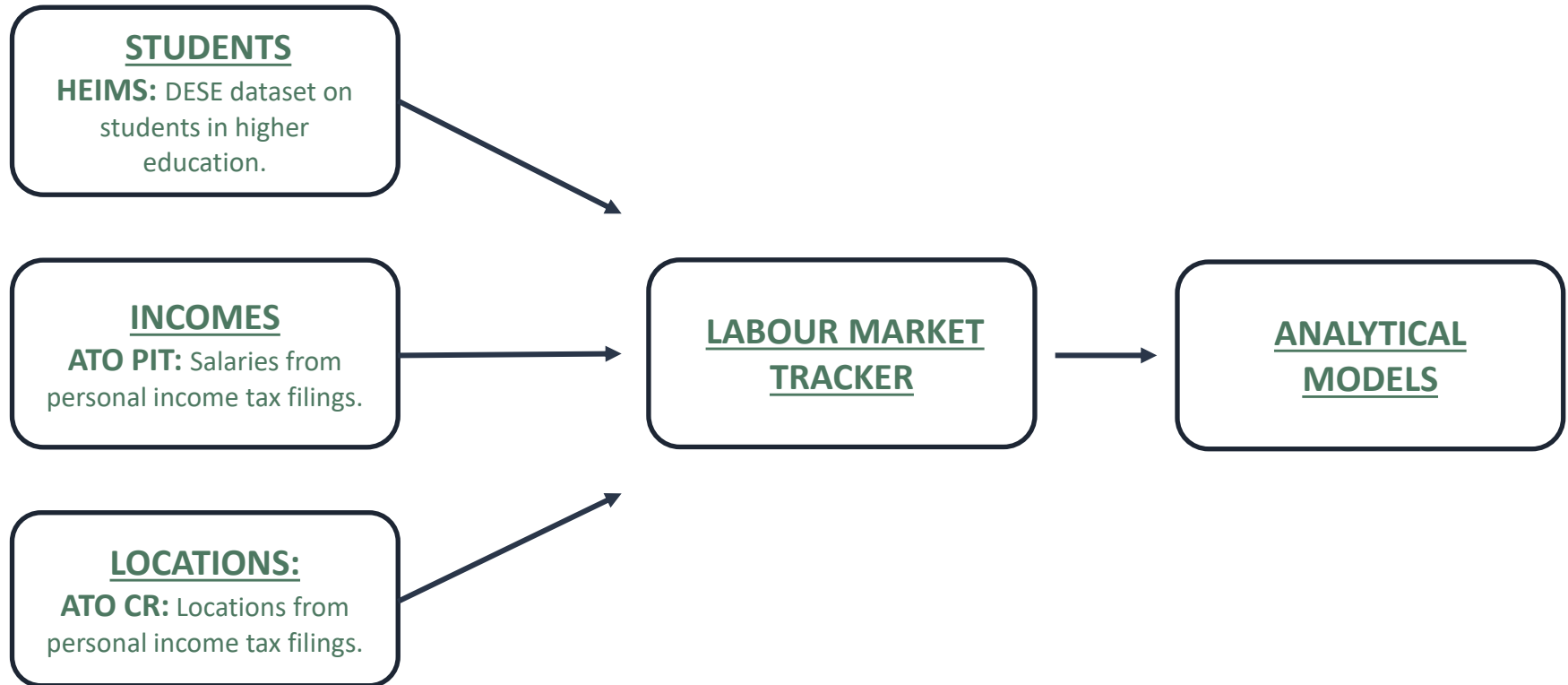
Some argue that falling real average wages are due to changes in the cohort of bachelor's graduates – are graduates post-reforms with lower earning potential reducing the average?

**Challenge:** To separate the effect of compositional changes in graduate characteristics from other factors.

# Theoretical and empirical strategy

# Data: Labour Market Tracker

Integrated administrative data available via the ABS.



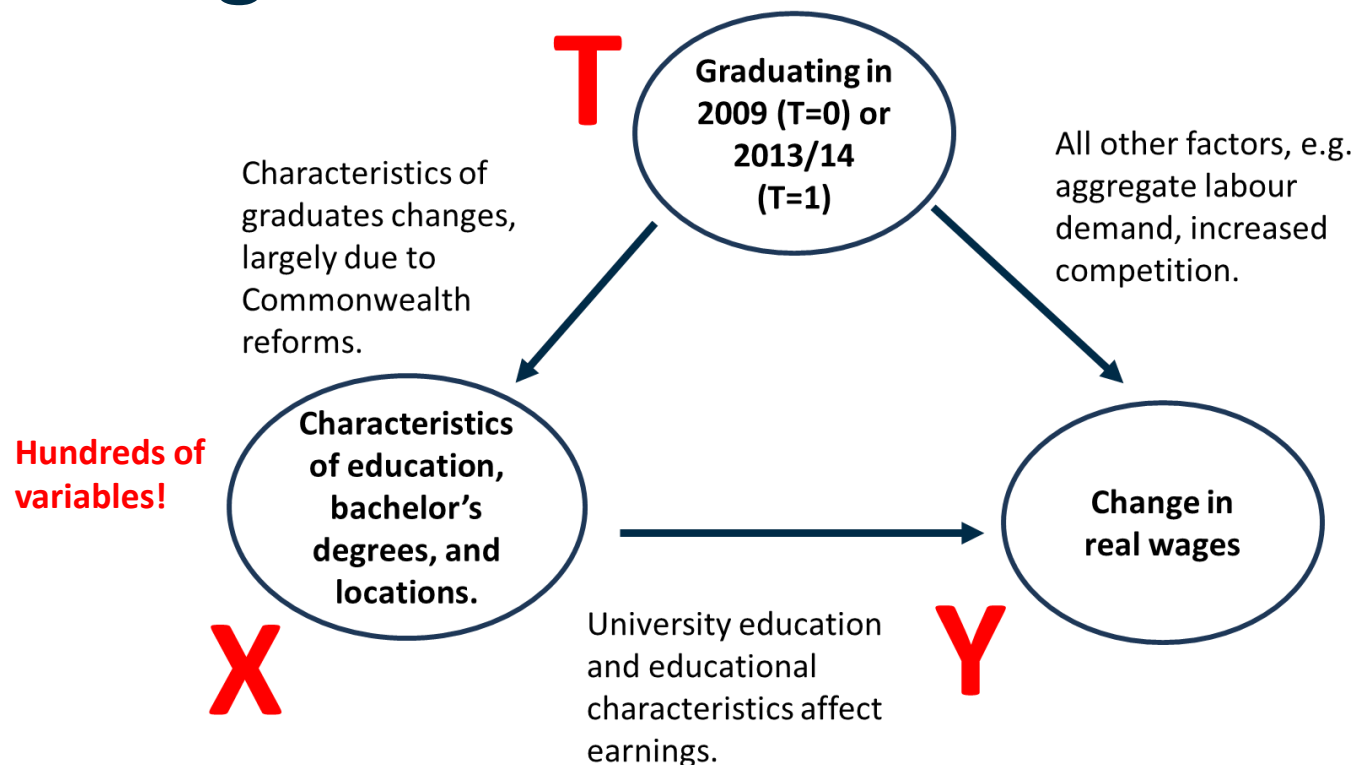
HEIMS: Higher Education Information Management System, PIT: Personal Income Tax, CR: Client Register.

# Changes in the economy or the cohort of graduates?

- Two broad categories of potential types of decline in average graduate salaries:
  - **Cohort characteristic effects:** Changes in the characteristics of graduates that affects average earning potential.
  - **Macro effects:** Changes in the demand and supply of graduates, independent of individuals' characteristics.
    - For example, recessions, changes in industry composition, more competition from a greater number of graduates.
- Mathematically, macro effects are the CATE:  $E[Y(T = 2013|X = x) - Y(T = 2009|X = x)]$
- **Identify similar people from before and after the reforms (control for changes in cohort characteristics) and calculate how their real average wages changed.**



# Causal forests can estimate adjusted wages where nearest-neighbour matching fails



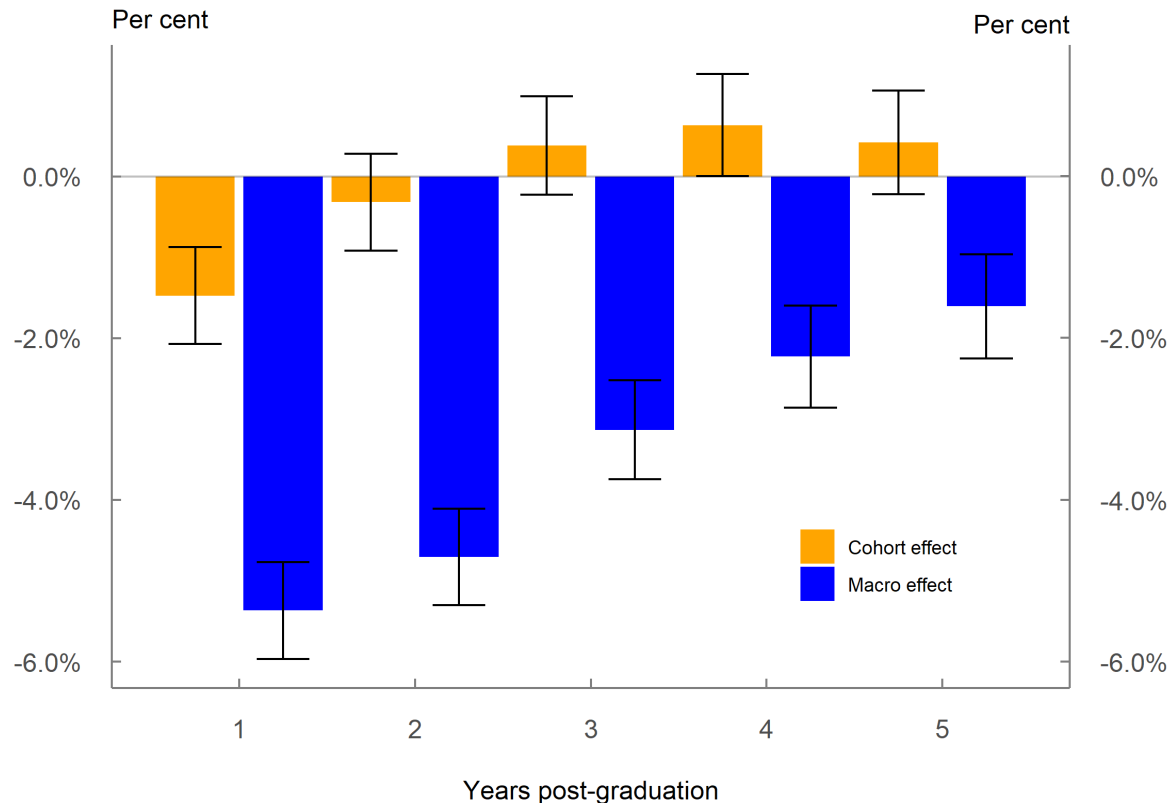
Classic nearest-neighbour matching requires us to **pre-judge important relationships** and makes sub-group analysis difficult. Causal forests are a **data-driven** approach that **tells us what variables are important** and easily allows for sub-group analysis.

# Results and analysis

# Results: Impact of changes in cohort of graduates has small, declining effect.

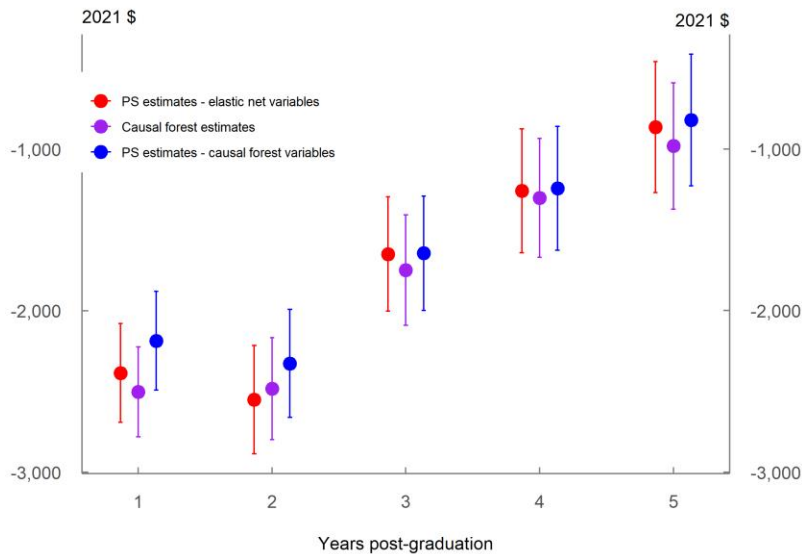
Could be result of negative signalling, on the job training, waning influence of degree as career progresses.

**Chart 3: Estimates of macro and cohort effect on salaries for all bachelor's graduates, 2013 vs 2009.**



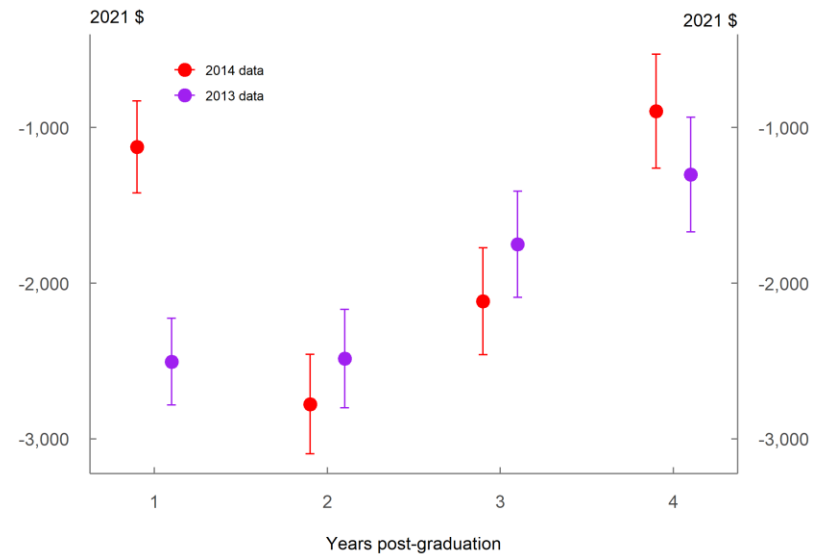
# Our results are robust to choice of model and time period.

**Chart 4: Comparison of causal forest and PSM macro effect estimates, entire sample**



Source: Treasury research using the Labour Market Tracker

**Chart 5: Comparison of macro effect estimates, 2013 vs 2014 comparison cohorts**

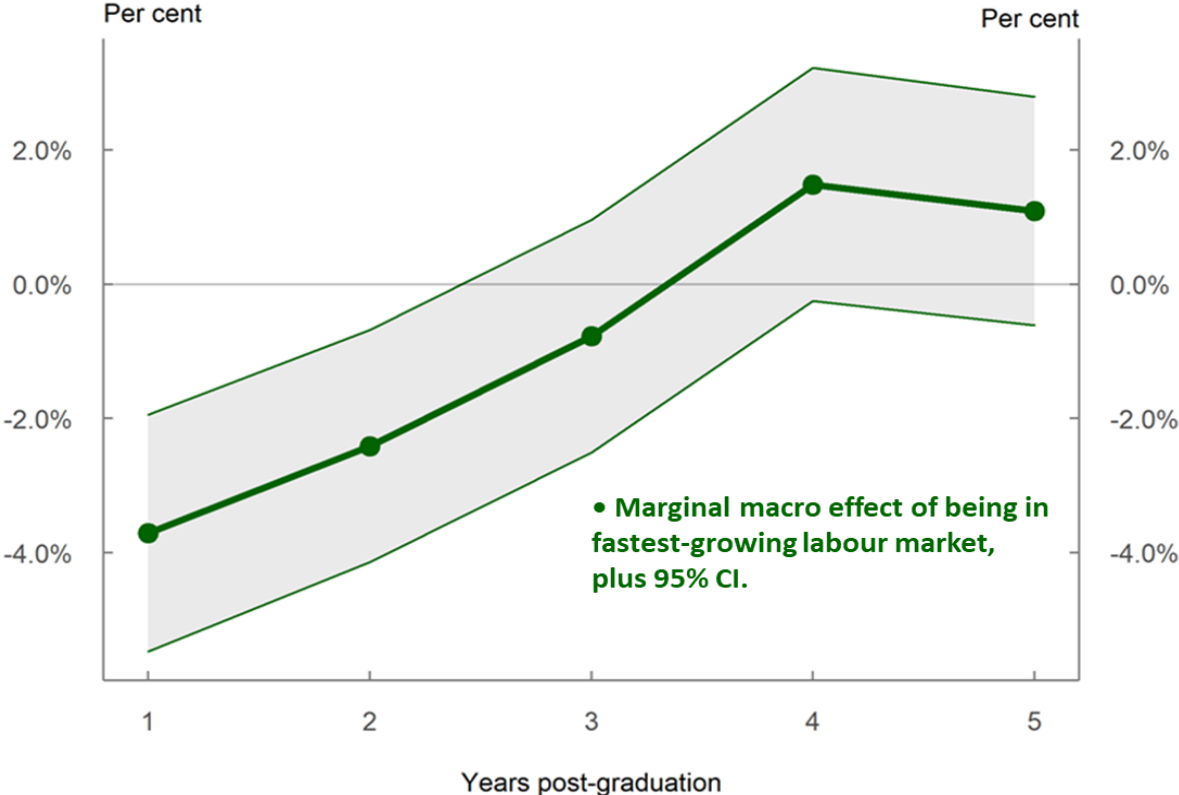


Source: Treasury research using the Labour Market Tracker

# Results: Increased competition for jobs associated with lower adjusted wages

Fall in real wages due to macro factors was worse in fifty fastest growing local labour markets.

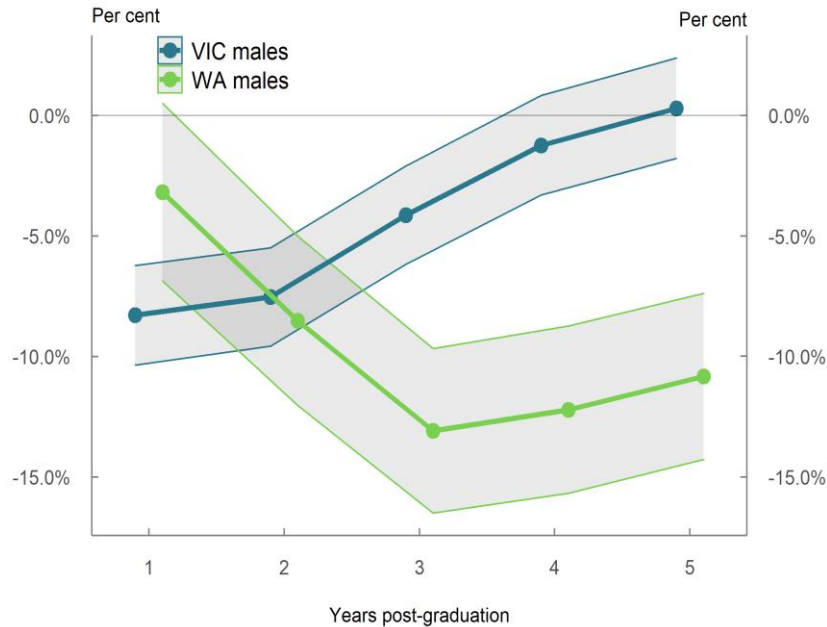
Chart 6: Adjusted wages for graduates in the fifty fastest growing labour markets versus outside them



# Understanding macro effects - Demand

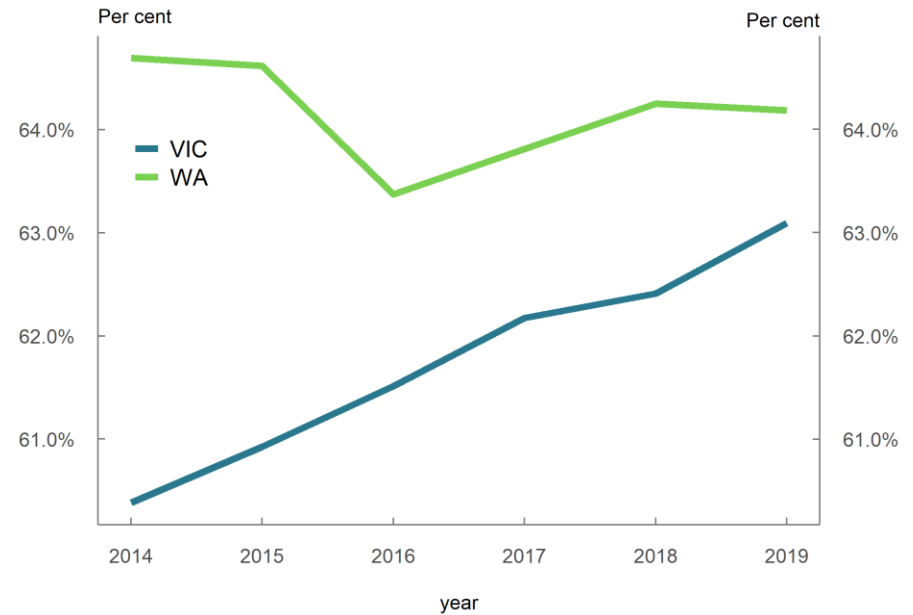
End of construction phase of mining boom and start of VIC infrastructure program impact macro effects.

**Chart 7: Macro effect on salaries, males, VIC and WA, 2013 vs 2009**



Source: Treasury research using the Labour Market Tracker

**Chart 8: Employment to population ratio, ages 18-24, VIC and WA, 2014 to 2019**



Source: Treasury research using the Labour Market Tracker

# Summary

- Bachelor's graduates' average real wages fell in the decade before COVID.
- We investigate whether this was due to the change in the composition of graduates after the Commonwealth Government's 'demand driven' funding reforms.
- We use machine learning models to allow us to control for compositional change in a data-driven way.
- We find little evidence that the changing composition of graduates accounted for the decline. We instead identify changes in the demand for and supply of graduates as being responsible.