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

Patrick Hartigan[1] and Jonathan Hambur[2].

1 Australian Department of the Treasury.
2 Reserve Bank of Australia.

Over the 2010s, wage growth for younger workers was soft, with real wages for workers aged 15 – 35 declining between 2008 and 2018.[1] In real terms, people who graduated in 2009 earned more on average in each of the first five years post-graduation than those who graduated in 2013 (see Figure 1 below).

One potential explanation for this decline is that it reflected a compositional shift in the characteristics of those undertaking bachelor's degrees, in part reflecting policy changes. In particular, the shift to 'demand-driven' Commonwealth higher education funding may have led to people with lower earnings potential undertaking and graduating with bachelor's degrees. The reforms saw a large increase in bachelor's degree enrolments and improved access for people from under-represented groups.[2] Many of these 'additional' graduates had on average lower prior educational outcomes (Figure 2) and potentially lower earnings potential.

This paper uses detailed university administrative and tax return microdata to understand the role of compositional change in aggregate graduate outcomes. Specifically, we separate out changes in real wages due to changes in graduates' characteristics ('cohort' effects) from changes due to other 'macro' factors by using new machine learning-based matching techniques to compare outcomes similar graduates before and after the reforms.

Our study draws on the broadest possible dataset of bachelor's graduates to assess the impact of the reforms on real wages, using administrative data on university enrolments and earnings. It also incorporates extremely detailed information on graduate characteristics in order to best match similar graduates.

To make best use of this powerful and detailed information we use a *causal forests* approach. [3] This is a cutting-edge machine learning method that allows for flexible and data-driven matching on observables, as well as for sub-sample analysis. As far as we are aware, this paper is the first to apply causal machine learning methods to Australian public policy analysis and is almost certainly the first to do so in an Australian setting with such highly detailed administrative data.

Overall, we find little evidence that cohort effects can explain the decline in real wages, and if anything, cohort effects may have led to higher aggregate outcomes, potentially reflecting increased enrolment in honours and postgraduate studies (Figure 3). We also find evidence that increases in the supply of graduates may have placed some downward pressure on wages, with the macro effects tending to weigh more heavily on wages in labour markets with a larger increase in graduates. Estimated macro effects were also, unsurprisingly, more negative where labour markets were weaker.

Taken together, the results suggest that poor wage outcomes for graduates over the 2010s are not driven by changes in the *type* of people who attend university. The results also highlight the importance of targeting higher education and training systems towards areas of skills demand and reinforce the role of counter-cyclical policy in supporting outcomes for young workers, who tend to be more exposed to the economic cycle.

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[1] Productivity Commission (2020).
[2] Productivity Commission (2019).
[3] See Athey and Wager (2021), and Athey and Wager (2018).

Figure 1: Real average wages for bachelor's degree graduates from 2009 and 2013, five years post-graduation
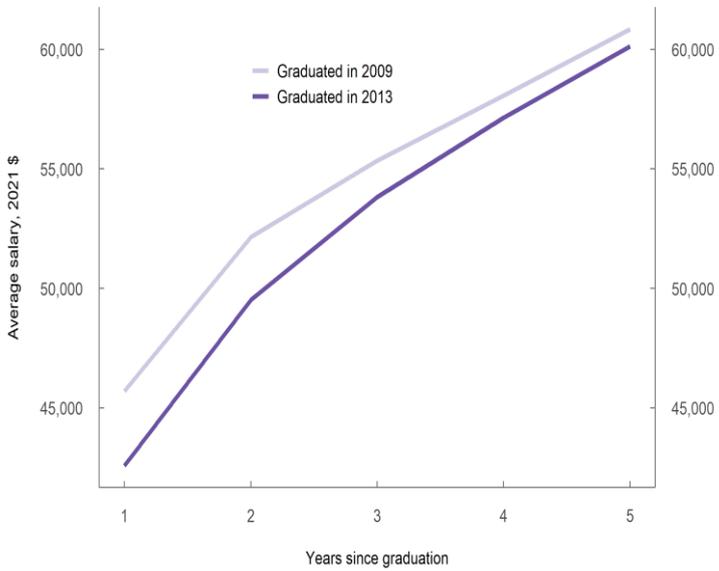

Figure 2: Percentage of bachelor's graduates with an ATAR equal to or less than 60, ten largest universities vs. rest
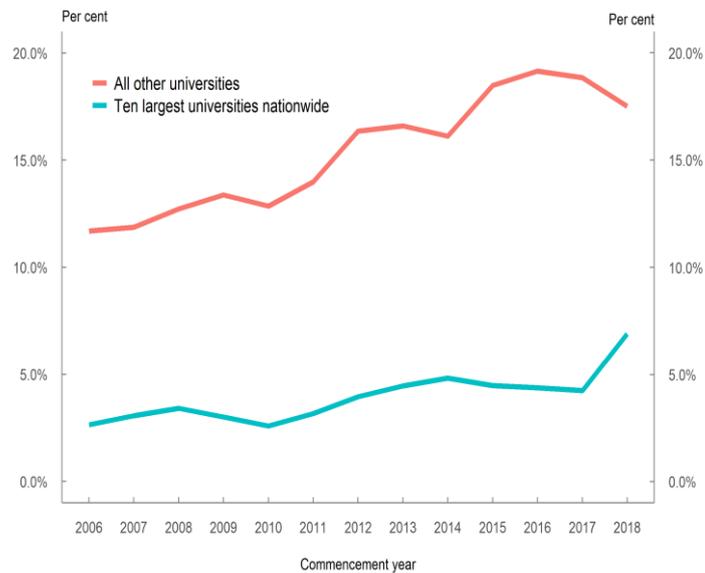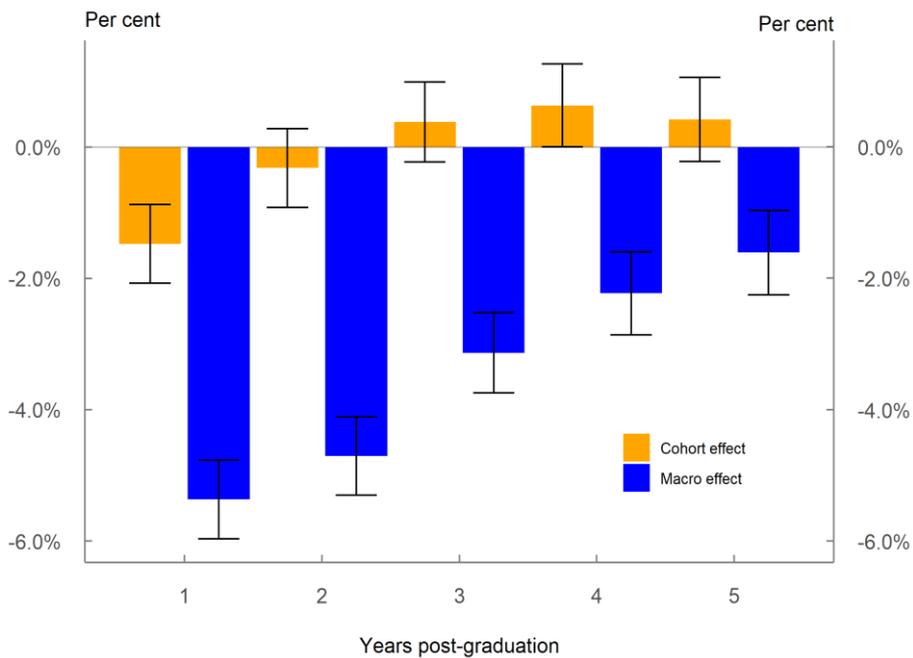

Figure 3: Decline in graduates' real wages due to macro and cohort characteristic effects, 2013 versus 2009 graduates

Notes: Blue bars and black error bars show mean estimate of macro effects on real wages and 95% confidence interval, respectively, for all graduates, 2013 versus 2009. Orange bars and black error bars show estimated cohort effects, calculated as (unconditional) total effect minus estimated macro effect, and 95% confidence intervals, 2013 versus 2009.
Source: Treasury analysis using the Labour Market Tracker, including HEIMS data from DESE and personal income tax filings from the ATO.

References

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Key Words

Educational reform, university graduates, administrative microdata, machine learning, causal forests.