OXFORD ECONOMICS AUSTRALIA

HIGHER EDUCATION QUALIFICATION DEMAND

REPORT PRODUCED FOR DEPARTMENT OF EDUCATION

JULY 2023

Oxford Economics Australia

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July 2023

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To discuss the report further please contact:

Emily Dabbs: edabbs@bisoxfordeconomics.com.au

Oxford Economics Australia

Level 6, 7 Macquarie Place, Sydney, 2000, NSW

Tel: +61 2 8458 4200

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An additional 5.8 million jobs requiring higher education are expected to be added to the labour force over the next 30 years increasing higher educated employment – jobs requiring a worker with higher education –from 5.0 million jobs in 2022 to 10.8 million jobs in 2052.

The share of employment requiring higher education is forecast to increase from 36% of all employed persons in 2022 to 55% in 2052 continuing strong historic trends. Higher educated employment has grown at almost triple the rate of total employment growth over the past decade and this is expected to continue for the next 30 years, however the growth rate differential will narrow.

Australia's higher education system is expected to supply the domestic labour market with 388,000 graduates on average per year over the next 30 years. Labour market supply of higher education graduates consists of both domestic students and international students who remain in Australia to work after they complete their degree. International graduates are expected to contribute roughly 17% of the supply of higher education graduates over the forecast period. By 2052, roughly one in two domestic completions will be in a postgraduate degree.

Without skilled arrivals, there is an average labour market deficit of 215,000 qualifications per year over the next 30 years. Australia's labour market is expected to require an additional 603,000 higher education qualifications every year on average over the forecast period due to growing demand for higher educated employment, skills deepening within roles, and churn within the labour market. The industries with the greatest projected qualification shortage without skilled arrivals are professional services, public administration, manufacturing, wholesale trade and education.

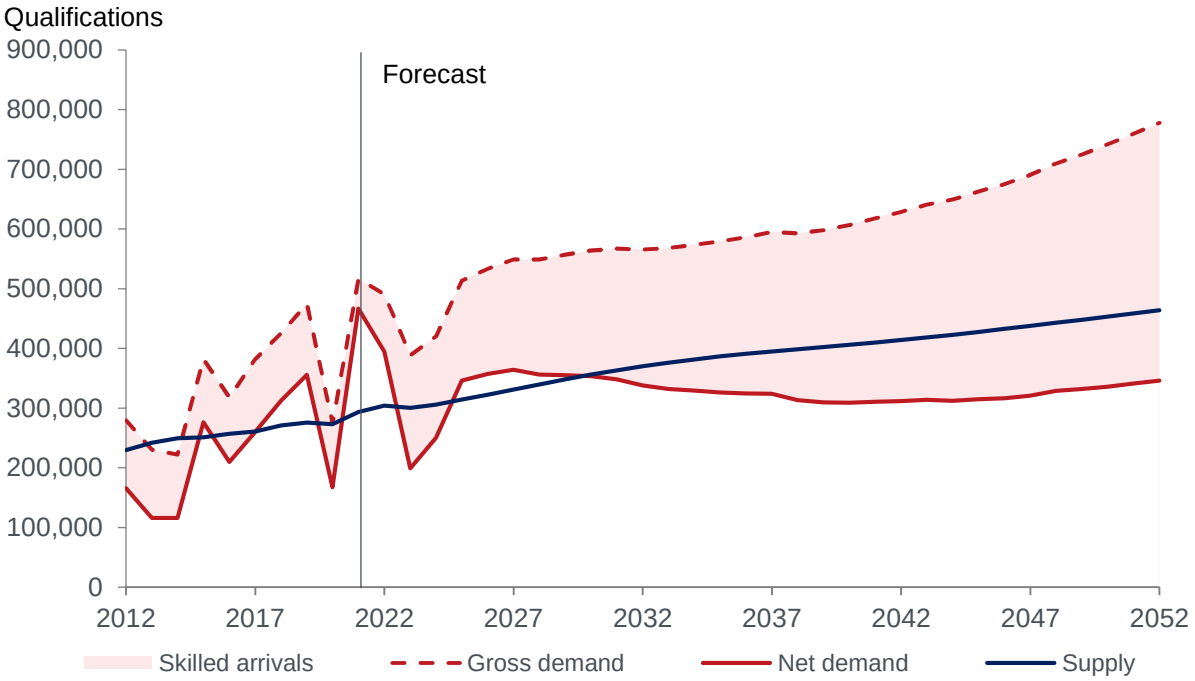
However, migration supports Australia's population growth, stimulates economic activity, and is a key source of higher educated labour. In the decade prior to COVID-19 pandemic, skilled arrivals supported labour market demand for higher educated workers by an estimated 108,000 workers per year on average. Migrant arrivals entering Australia have higher rates of employment and are more likely to hold a higher education degree than the general population.

Taking into account the outlook for skilled arrivals and the trends in their skills levels, there is an average labour market surplus of 62,000 qualifications per year over the next 30 years. As Australia's population growth slows and net overseas migration plays a greater role in population growth, higher educated arrivals are expected to play a larger role in meeting the labour market demand for higher educated workers.

Despite an aggregate net surplus of qualifications there are imbalances at the industry and field of education level. Education remains an industry and field of education in significant shortage. There is an average annual deficit of 36,000 qualifications per year in education and this is potentially exacerbated by gender imbalances in the supply of these qualifications.

While migrant arrivals provide the qualifications demanded by the labour market in aggregate, there is a mismatch in their allocation to industries in shortage that mean there are still significant gaps at the industry level. Historic trends in skilled arrivals will not be sufficient to support the significant and increasing shortages in the public administration and professional services industries. Large net surpluses in other industries show a significant leakage of the qualifications held by skilled migrants from their optimal allocation in the labour market.

Figure E.1 Headline forecasts – Gross & net demand, supply and skilled arrivals, 2012 to 2052



Source: Department of Education, Oxford Economics Australia
Note: The historic series in this chart are estimated.

Figure E.2 Table of key figures

	2012	2022	2032	2042	2052
Employment Demand					
Higher educated employment	3,046,000	4,964,000	7,308,000	9,243,000	10,785,000
Higher educated employment as a share of total employment	27%	36%	44%	51%	55%
Qualification Demand					
Gross labour market demand for additional qualifications	279,000	491,000	566,000	629,000	778,000
Employment of higher educated arrivals	113,000	96,000	227,000	317,000	431,000
Net labour market demand for additional qualifications	166,000	395,000	338,000	312,000	346,000
Qualification Supply					
Domestic students	197,000	261,000	308,000	342,000	384,000
International students remaining for work	33,000	43,000	62,000	72,000	80,000
Gap					
Gross projected gap (excl. arrivals)	- 50,000	- 187,000	- 195,000	- 215,000	- 314,000
Net projected gap (incl. arrivals)	+ 63,000	- 91,000	+ 32,000	+ 102,000	+ 118,000

Source: Oxford Economics Australia
Note: The historic series in this table are estimated.

1. INTRODUCTION

The purpose of this report is to provide an evidence base for the 2023 Review of Australia's Higher Education System by forecasting future labour market demands for higher education qualifications and comparing demand to current trends in supply to identify potential gaps in the higher education system.

BACKGROUND TO THIS REPORT

The Government has established an Australian Universities Accord to drive lasting reform in Australia's higher education system. The Accord is a review (the review) of Australia's higher education system, led by the Minister for Education with advice from a panel of eminent Australians (the panel).[1]

The panel will make recommendations for Government, the sector and other relevant stakeholders to deliver a higher education system that meets the current and future needs of the nation, and targets to achieve this. The panel will report to the Minister for Education, providing an interim report on priority actions by June 2023, with a final report to be delivered by December 2023.[2]

The Panel has been asked to make recommendations for new targets and reforms, to address Australia's needs now and into the future, and to deliver a system that is fit for purpose. This task includes proposing a new long-term target for Australia's rates of higher education participation and attainment.[3]

This is the first broad review of the higher education system since the 2008 Review of Higher Education (the Bradley Review). The Bradley Review of Higher Education recommended that Australia set a target that by 2020, 40% of 25 to 34 year old Australians have a university degree.[4]

However, the economy has undergone significant transformation since 2008 and the emergence of new technologies and industries has had a profound impact on the demand for tertiary educated labour and the higher education sector in general.

In 2022, 44.6% of Australian's aged 25 to 34 held a bachelor degree or higher - well above the 40% target from the 2008 review.[5] Australia's higher education providers - including universities, university colleges and private institutes - educate more than 1.6 million students per year.[6]

The type of qualifications and skills the labour market demands are rapidly changing. Jobs and Skills Australia estimates that more than 90% of new jobs in the workforces between 2021 and 2026 will require post-school qualifications including 50% which require a bachelors degree or higher.[7]

[1] Australian Universities Accord (2002). Terms of Reference.
[2] Ibid.
[3] Ibid.
[4] Bradley, D., Noonan, P., Nugent, H., & Scales, B. (2008). Review of Australian higher education: Final report.
[5] Australian Bureau of Statistics (2022, May). Education and Work, Australia, ABS Website, accessed 21 April 2023.
[6] Department of Education. (2023, April 18). Selected Higher Education Statistics – 2021 Student data. DOE Website, accessed 21 April 2023.
[7] National Skills Commission. (2021). Employment outlook: Industry and occupation trends over the five years to November 2026.

There is therefore a need to undertake contemporary forecasting to understand the demand and supply of higher educated qualifications under these changed conditions.[8] This work will help the Panel of the Australian Universities Accord to make informed recommendations about the capacity of the Australian higher education system to meet future labour market demands over the next 30 years.

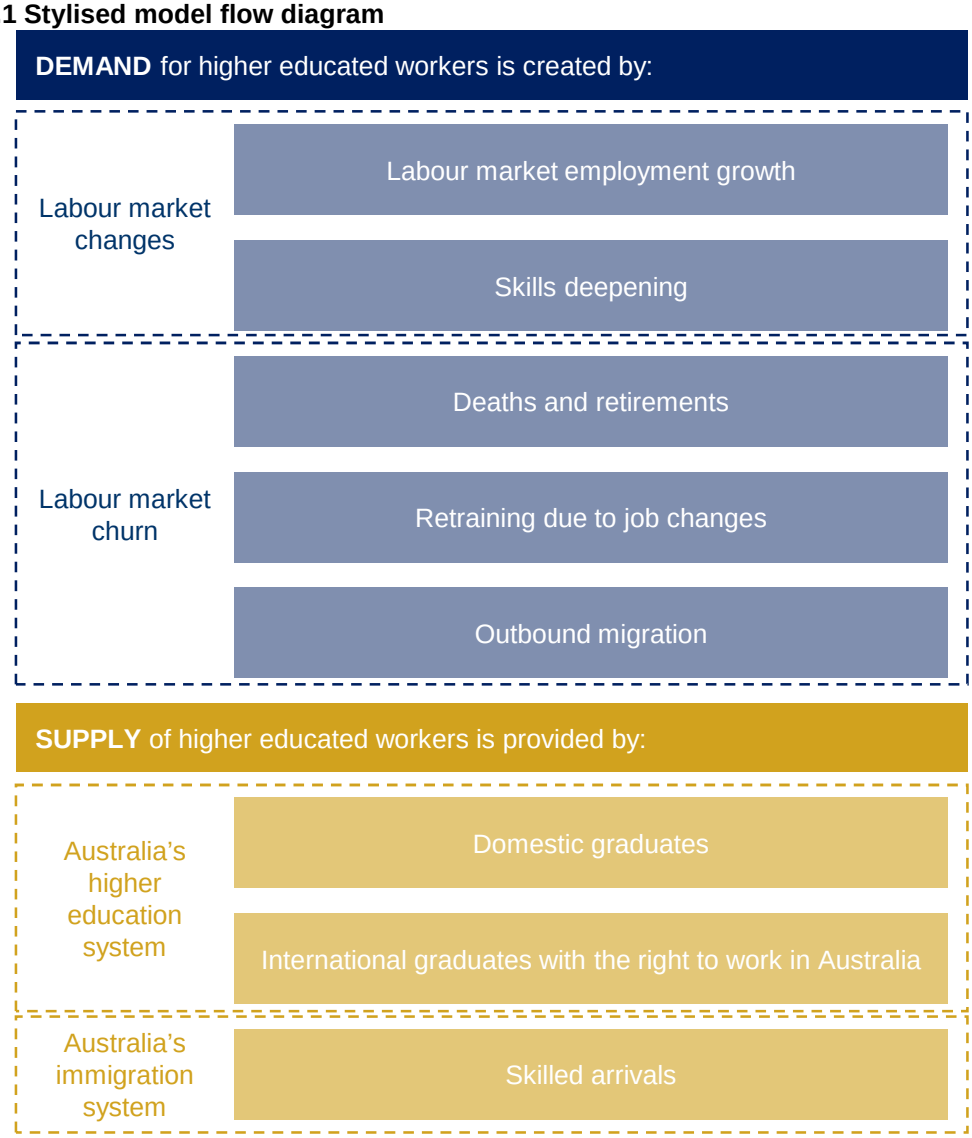
DEFINING DEMAND AND SUPPLY OF HIGHER EDUCATION

We developed a stock and flow model of the demand for higher educated labour to forecast the supply of additional higher education qualifications required to meet labour market demand. For the purposes of this report:

- **Demand** refers to the number of qualifications that the labour market needs to fill jobs requiring higher education. For example, a worker with a masters degree who moves overseas increases the labour market demand for a higher educated worker and two higher educated qualifications.
- **Supply** refers to students who complete a bachelor degree or higher at a higher education institution and are available to enter the domestic labour market. This includes domestic students and any international students who graduate from Australia's higher education system and have the right to work in our labour market.
- **Higher education** consists of bachelors degrees and above i.e. bachelor degrees (including honours); graduate certificates; graduate diplomas; masters degrees and doctoral degrees.
- **Skills deepening** includes the labour market demand for a higher education qualification in a role which previously did not require higher education and the labour market demand for a postgraduate degree in a role which previously required only a bachelor level qualification.

[8] Jobs and Skills Australia will build and maintain a national supply and demand model to continue this work in the future.

Figure 1.1 Stylised model flow diagram



Source: Oxford Economics Australia

We were tasked with modelling the labour market demand for higher education rather than undertaking a detailed bottom up analysis of the number of roles that 'need' a degree to perform them. When we use the term 'require' in this report, we are referring to the qualifications demanded, or 'required' in labour market as a whole, rather than what a role 'needs'.

There are a number of reasons why the labour market demands more higher education than it strictly 'needs' and why high skill workers may end up in lower skill occupations, including:

- The higher level industry (ANZSIC level 1) and occupation (ANZSCO level 2) is comprised of a range of roles where some require higher education (e.g. in retail, logistics managers).
- Employees and employers use qualifications as a signal for quality regardless of whether the role strictly 'needs' that qualification, and this leads to changes in market demand over time.
- Workers choose jobs for many reasons (salary, location, job satisfaction, flexibility etc.) and therefore may choose a role which doesn't 'need' their degree.

At an aggregate level this leads to significant leakage of qualifications from their most efficient allocation and this leakage needs to be accounted for when considering gaps in supply.

Demand for higher educated labour is created through five channels:

1. **Employment growth** - holding all else equal, if the stock of labour grows the level of higher educated labour demanded by the labour market will increase.
2. **Skills deepening** – where the labour market demands a higher education qualification for a role which did not previously require it this will increase the share of the stock of labour which is required to be higher educated.
3. **Deaths & retirements** – the natural attrition of the labour force will result in employees which are higher educated being either unable or unwilling to continue contributing to the stock of labour.
4. **Retraining due to job changes** – internal churn within the labour market will result in individuals taking up jobs that require higher education where they previously did not or retraining to a more suitable field of education. Higher education may not be a prerequisite to start the role but may be required in the longer term and is prompted through a change in the education of a specific employee and not in the size of the stock of labour.
5. **Outbound migration** – a share of the higher educated stock of workers will leave the economy each year in the form of outbound departures. These outbound departures will include citizens, and those on visas leaving the country.

The supply of higher educated labour comes through two channels:

1. **Graduates from Australia's higher education system** – these graduates will be both domestic students, and a share of international students who after graduating from university transition onto alternative visas to stay in Australia and find work post study.
2. **Skilled arrivals** – includes both returning citizens and those arriving on a visa which allow them to work. We have excluded from inbound migration students and visitors due to the limitations of their working rights.

STRUCTURE OF THIS REPORT

The rest of this report follows the structure below:

2. ECONOMIC OVERVIEW - provides an overview of the economic outlook in Australia. It analyses the historic conditions, short run trends and the longer run trajectory of the Australian economy which contribute to the modelling of higher education demand and supply.

3. LABOUR MARKET DEMAND FOR HIGHER EDUCATION – provides a forecast of the number of jobs which will require higher educated workers over the next 30 years as well as how many qualifications will be required fill these jobs.

4. SUPPLY OF HIGHER EDUCATION GRADUATES - estimates the number of higher education graduates expected over the forecast period based on current trends in commencements and completions by age and field of education.

5. GAP ANALYSIS – explores gaps between aggregate demand and supply based on analysis from chapter 3 and 4 as well as gaps at the industry and field of education level.

6. SCENARIO ANALYSIS – explores the key uncertainties through scenario development, comparing results to the baseline including headline results for demand, supply and the projected gap.

A1: TECHNICAL APPENDIX – provides an overview of the modelling approach for each modelling task used in the analysis.

A2: SENSITIVITY ANALYSIS – presents the results of sensitivity modelling for key assumptions used and their impact on the results.

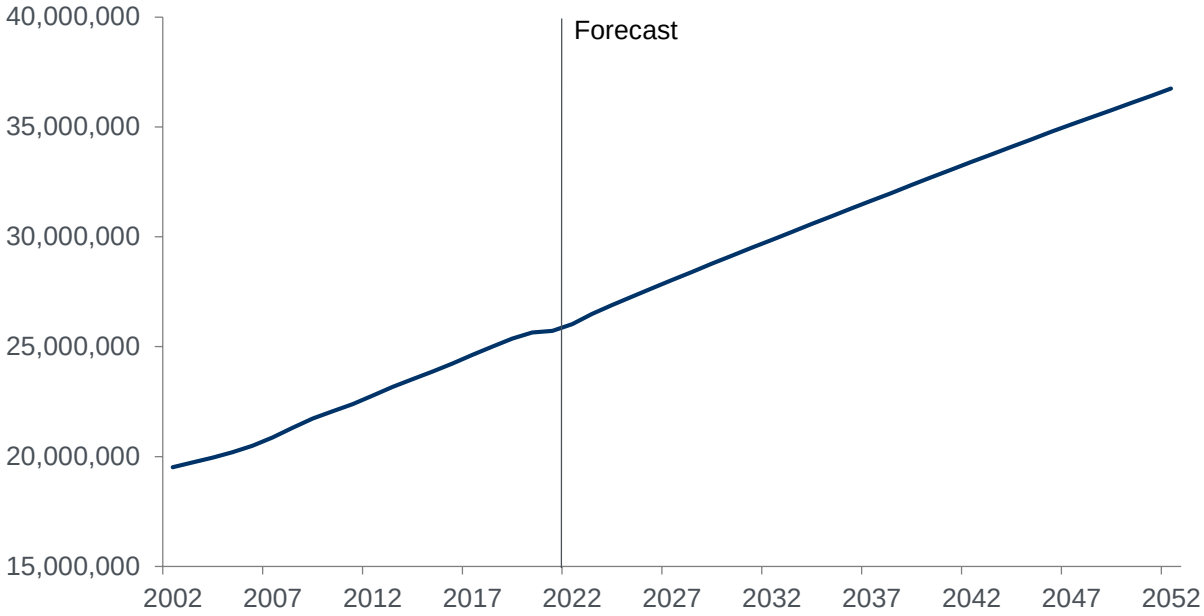
2. ECONOMIC OVERVIEW

This section provides an overview of the economic outlook in Australia. It analyses the historic conditions, short run trends and the longer run trajectory of the Australian economy which contribute to the modelling of higher education demand and supply.

DRIVERS OF AUSTRALIA'S LONG RUN GROWTH

Population, labour market participation and Australia's future industrial structure will determine the outlook for the economy in the long run, driving outcomes for the labour market and the demand and supply of higher education.

Figure 2.1 Population, 2002 to 2052
Persons



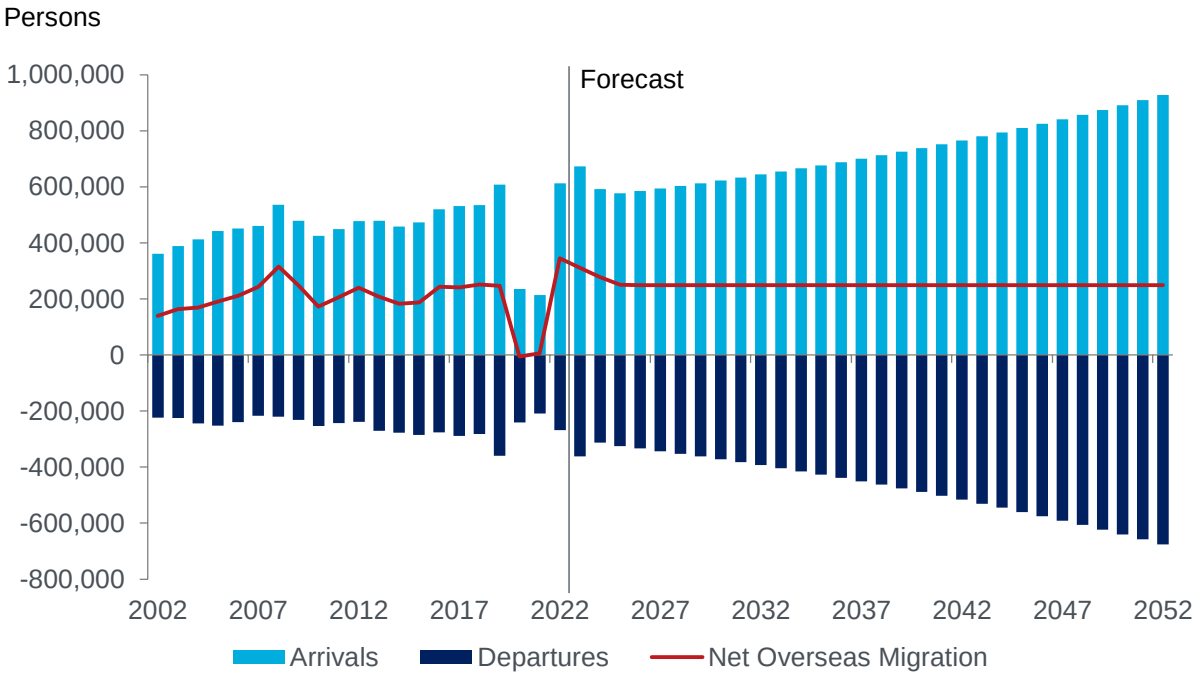
Source: ABS, Oxford Economics Australia

Australia's population has grown at an average of 1.4% per annum over the past two decades, driven by strong net overseas migration (NOM). The fall in overseas migrant arrivals during the pandemic reduced Australia's population growth to 0.3% in 2021. Overseas migration flows have largely normalised and are expected to drive population growth of 1.8% in 2023, the peak over the forecast period.

Australia's population is expected to reach 29.3 million by 2030 and 36.9 million people by 2052. With migration trends normalising, the pace of population growth is expected slow to an average of 1.2% per annum in the 2030s, reaching 0.9% by 2052. This is primarily driven by the birth rate declining to 1.6 children per women by 2025, comfortably below the replacement rate of 2.1.

Australia's declining birth rate increases the significance of net overseas migration as a source of population and economic growth over the long-term.

Figure 2.2 Migration arrivals and departures, 2002 to 2052



Source: ABS, Oxford Economics Australia

Net overseas migration supports population growth, stimulates economic activity, and is a key source of skilled labour. Federal Treasury estimates that migrants deliver a significant lifetime fiscal benefit of $127,000 more per person than the population overall.[9]

From 2002 to 2019 Australia's net overseas migration flows averaged 202,000 persons per annum. Over the pandemic, NOM turned negative for the first time in two decades with outflows of 5,000 persons in 2020 and 6,000 in 2021. Pent-up demand over the pandemic is driving a near-term overshoot in NOM, reaching an estimated 345,000 in 2022 and a forecast 310,000 in 2023.

In the lead up to the 2023/24 Budget, the Federal Government released its Migration System Final Report. Policy actions have been flagged for later in the year, specifically around ensuring there are transparent and competitive pathways from temporary to permanent migration. It is difficult at this point to conclude how Australia's NOM trajectory will be impacted however it is likely that our forecasts underestimate NOM especially in the short run. We now expect NOM to overshoot these forecasts in 2023 before returning to near long-run trend by 2025 at 250,000 per-annum and remain stable over the forecast horizon.

Overseas arrivals hit 165,740 in Q3 2022, a record that is certain to be surpassed in the front half of 2023. In the overseas movements data, total permanent and long-term arrivals hit 328,460 in March quarter, almost 50,000 higher than the same period in 2019.

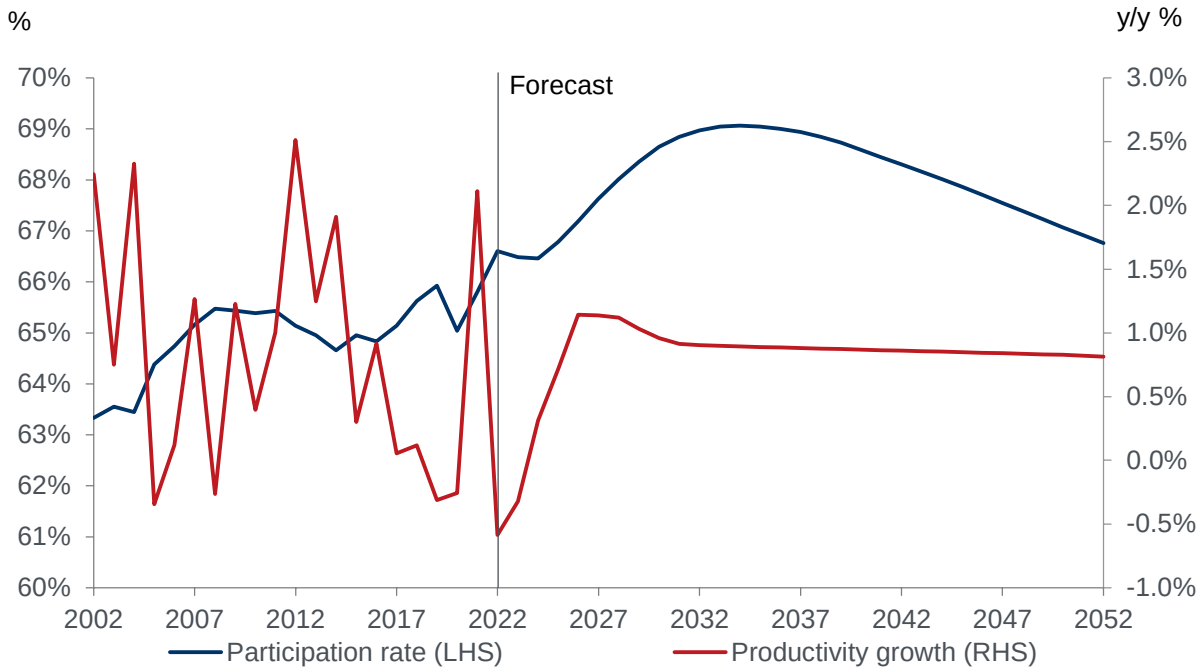
In the latest visa data, student visas granted outside Australia reached 97,024, 41% higher than Q1 2019. The underlying growth profile for the international student market, combined with stored demand from when borders were closed, and increased work rights, underpin the surge. Support from

[9] Australian Federal Treasury (2021). The lifetime fiscal impact of the Australian permanent migration program.
[10] Productivity Commission (2022). 5-year Productivity Inquiry: From learning to growth, interim report.

the depreciation of the Australian dollar also cannot be understated. Currently trading in the mid-60s, it is encouraging student demand. Our expectation is that the exchange rate will hold at a favourable level below $0.70US in coming years.

While arrivals are overshooting, departures are undershooting. The Q3 2022 figure of 59,538 departures remains well below the pre-pandemic level, 34% lower than Q3 2019. The lower stock of temporary residents that emerged through the closed border period now anchors a lower departure rate. Nonetheless, we have been surprised by how low departures have been given the strong lead set by international travel movements data. Departures will inevitably catch up, but this process is likely to stretch well into 2024.

Figure 2.3 Productivity growth and participation rate, 2002 to 2052



Source: ABS, Oxford Economics Australia

An increasing participation rate drives long run economic growth as it is a key factor in determining Australia's potential economic output.

With the exception of the GFC period, the participation rate has trended upwards over the previous two decades. We expect that the current global slowdown and inflationary pressures we will lead to a small decline out to 2024, before returning to growth. Oxford Economics forecast the participation rate to peak at 69% in the 2030s driven by the continued rise of female participation rates and a decline in retirement rates as work shifts away from more physically demanding occupations. Beyond this, we forecast the ageing population to begin making a larger impact, reducing labour market participation as a greater proportion of the population enter the older age cohorts.

Productivity growth will be driven by changes to the capital labour mix. Productivity growth is forecast to remain subdued over the next few years as uncertainty within the economy dampens business investment. Productivity growth is expected to return to trend by 2025 as investment picks up, averaging 1.1% over the back half of the decade, and slowing to 0.8% by 2052.

The forecasts for the demand and supply of higher education contained in this report are consistent with this view of productivity and not the higher education that would be required to reach an 'optimal' level of productivity growth. In the long run increasing rates of education are likely to play an

increasing role in productivity growth. The Productivity Commission have found that increasing workforce education and experience have accounted for 19% of labour productivity in recent decades with the share it contributes to productivity growth increasing over time.[10]

Figure 2.4 GDP and employment growth, 2002 to 2052

Source: ABS, Oxford Economics Australia

Strong headwinds from rising interest rates and high inflation have slowed the pace of economic growth in 2023. Despite these headwinds, the fundamentals for economic growth are well supported. Interest rates are near their peak and consumption will receive a boost from the tight labour market and strong overseas migration. We expect Gross Domestic Product (GDP) growth to slow but remain resolutely positive at 1.6% in both and 2024. Employment growth is expected to soften after a period of strong growth over the last two years to 1.9% in 2023 and 1.3% in 2024.

Employment growth has been very strong in Australia, growing 1.8% per year on average over the last decade. Strong economic activity in the aftermath of the COVID-19 crisis has helped to drive demand for labour, with the unemployment rate dropping to a historic low of 3.4% in late 2022 as supply failed to keep up with the rebound in activity.

Job vacancies were 92.4% higher in early 2023 than they were prior to the start of the pandemic [11] as labour shortages persist and Australia's economy operates beyond its potential. While this is likely to take time to unwind in the short term due to the stickiness of the labour market, in the longer term we expect the unemployment rate to return to its long term trajectory triggering vacancy rates to fall. There is a level of vacancy rate in the long run which represents the churn within the labour market as workers and businesses take time to match skills to suitable roles.

[10] Productivity Commission (2022). 5-year Productivity Inquiry: From learning to growth, interim report.

[11] Australian Bureau of Statistics (February 2023), Job Vacancies, Australia.

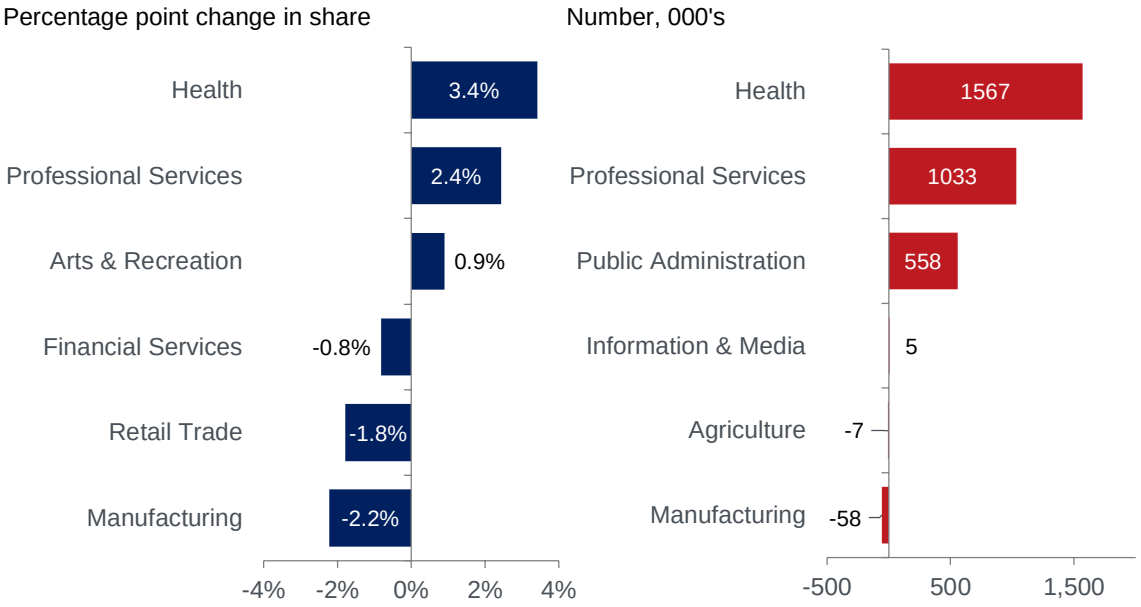
As inflation normalises, we expect the RBA's policy rate to drift back to a long-run policy rate of 2.6%, driving a consumption and investment cycle out to 2026 where GDP and employment growth are expected to peak at 3.5% and 2.3% respectively. Beyond this, GDP growth is expected to slow in line with slowing population growth to average 1.8% p.a. from 2030 to 2052. Similarly, employment growth is expected to slow to an average annual rate of slow to average 1.0% per annum from 2030 to 2052 as economic growth and productivity stabilises in the long run.

AUSTRALIA'S LONG-RUN INDUSTRIAL MIX

Australia's industry employment mix will continue to shift towards service sector industries which have historically had a greater proportion of higher educated workers, supporting demand for higher education.

Australia's industry employment mix has changed substantially over the past two decades, shifting away from goods dominated industries towards the service sector. Large increases in employment have come from health and professional services while fewer workers are employed in manufacturing and agriculture whose shares of employment have declined 5.2% and 2.2% respectively.

Figure 2.5 Top 3 largest and smallest growth in industry employment, 2022 to 2052



Source: ABS, Oxford Economics Australia

Over the long-term, the structural decline of goods focused industries as a share of employment will continue. Employment in health is forecast to increase its share of employment by 3.4 percentage points to 18.5% by 2052 as the population ages and the care requirement continues to increase. Similarly, professional services are expected to represent 11.8% of employment by 2052 on the back of strong investment in intellectual property product investment (which includes research & development) and an increased share of service consumption.

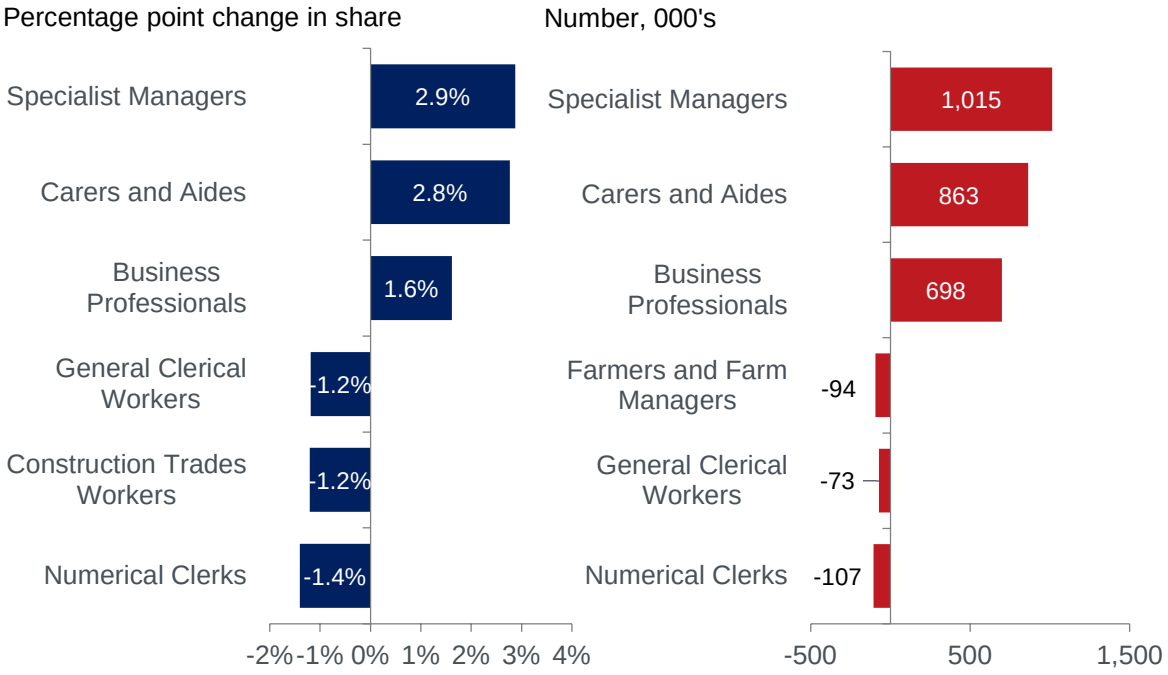
Employment in manufacturing is expected to continue declining and markedly slowing, although positive, growth in retail trade will result in its share of employment reducing by 1.8 percentage points to 7.9% by 2052.

Information & media is expected to have minimal employment growth over the forecast period. However, strong employment growth in ICT occupations is forecast since these occupations are

employed across all industries and do not necessarily coalesce in the information and media industry specifically.

These changes to the industry mix, as well as occupational trends within industries, will drive growth in employment in occupations. Occupations that represent a higher proportion of employment in growing industries such as specialist managers in the professional services sector and, carers and aides in the health sector represent a higher proportion of employment growth over the forecast period.

Figure 2.6 Top 3 largest and smallest growth in occupation employment, 2022 to 2052



Source: ABS, Oxford Economics Australia

3. LABOUR MARKET DEMAND FOR HIGHER EDUCATION

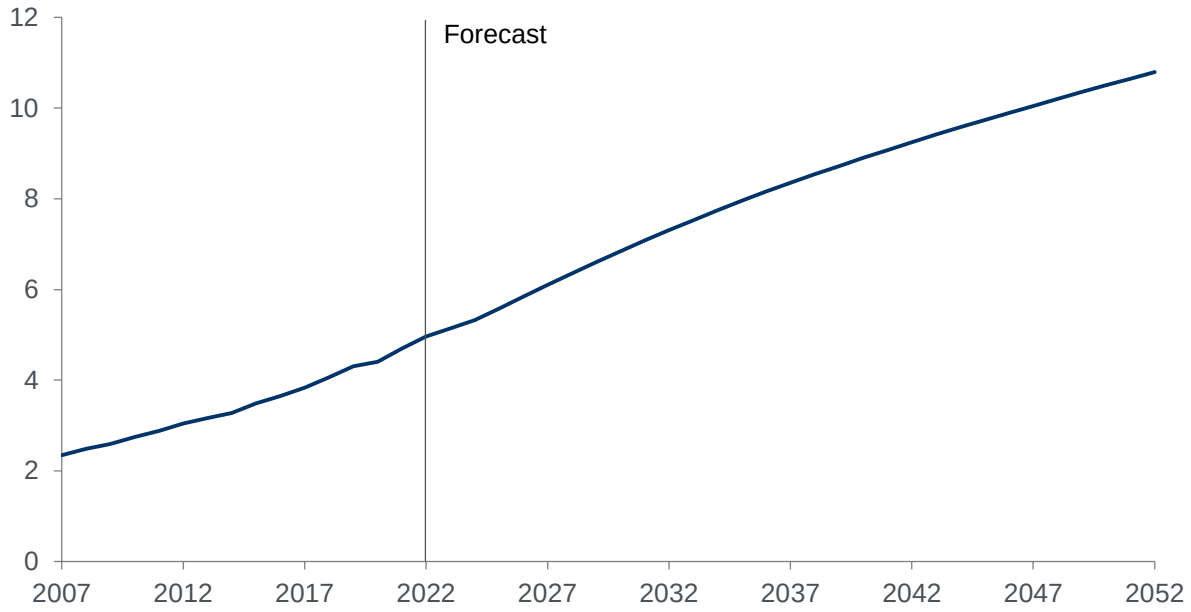
This chapter provides a forecast of the number of jobs which will require higher educated workers over the next 30 years as well as how many qualifications will be required fill these jobs.

For the purposes of this report, 'demand' refers to the number of qualifications that the labour market needs to fill jobs requiring higher education.

OUTLOOK FOR HIGHER EDUCATED EMPLOYMENT

An additional 5.8 million jobs requiring higher education will be added to the labour force over the next 30 years increasing higher educated employment – jobs requiring a worker with higher education – from 5.0 million jobs in 2022 to 10.8 million jobs in 2052.

Figure 3.1 Higher educated employment, 2007 to 2052
Millions

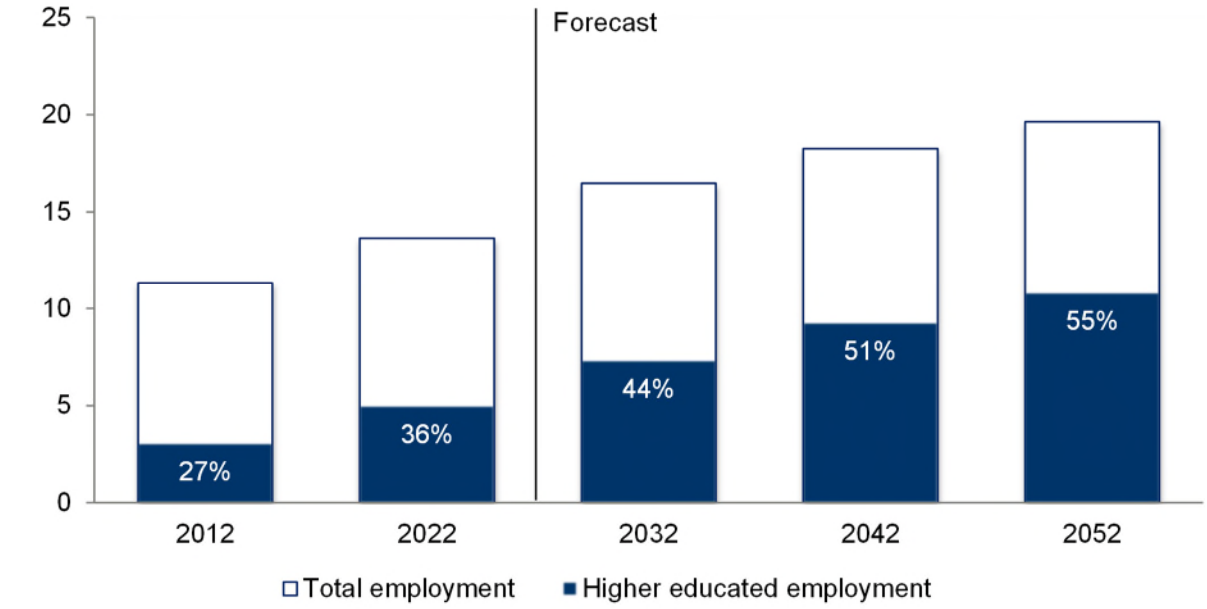


Annual average 2012-2022	2022-2032	2032-2042	2042-2052	2022-2052
3,900,000	**6,103,000**	**8,319,000**	**10,035,000**	**8,144,000**

Source: ABS, Oxford Economics Australia
Note: The historic series between Census years is estimated.

Higher education employment is forecast to increase from 36% of all employed persons in 2022 to 55% in 2052 continuing strong historic trends; just 27% of those employed in 2012 were higher educated.

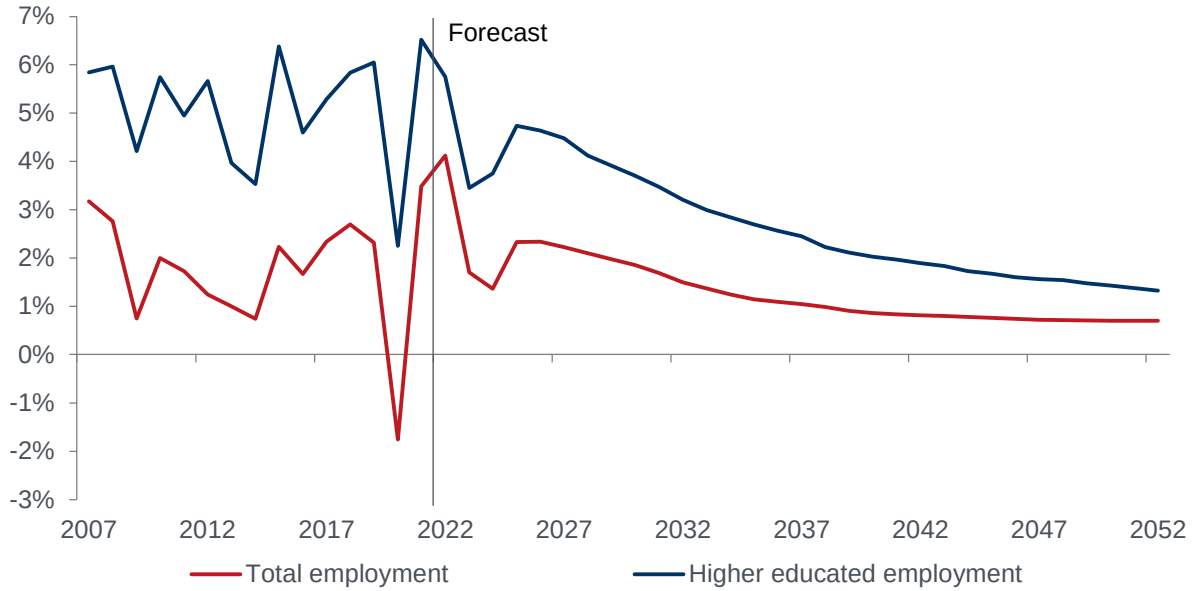
Figure 3.2 Higher educated employment as a share of total employment, 2012 to 2052
Millions



Source: ABS, Oxford Economics Australia
Note: The historic series between Census years is estimated.

Higher educated employment has grown at almost triple the rate of total employment growth over the past decade, averaging 5.0% a year relative to 1.8% growth in total employment. Future higher educated employment growth is still expected to outpace total employment however the growth rate differential is expected to narrow over the next 30 years.

Figure 3.3 Growth in total employment and higher educated employment, 2007 to 2052
Annual growth



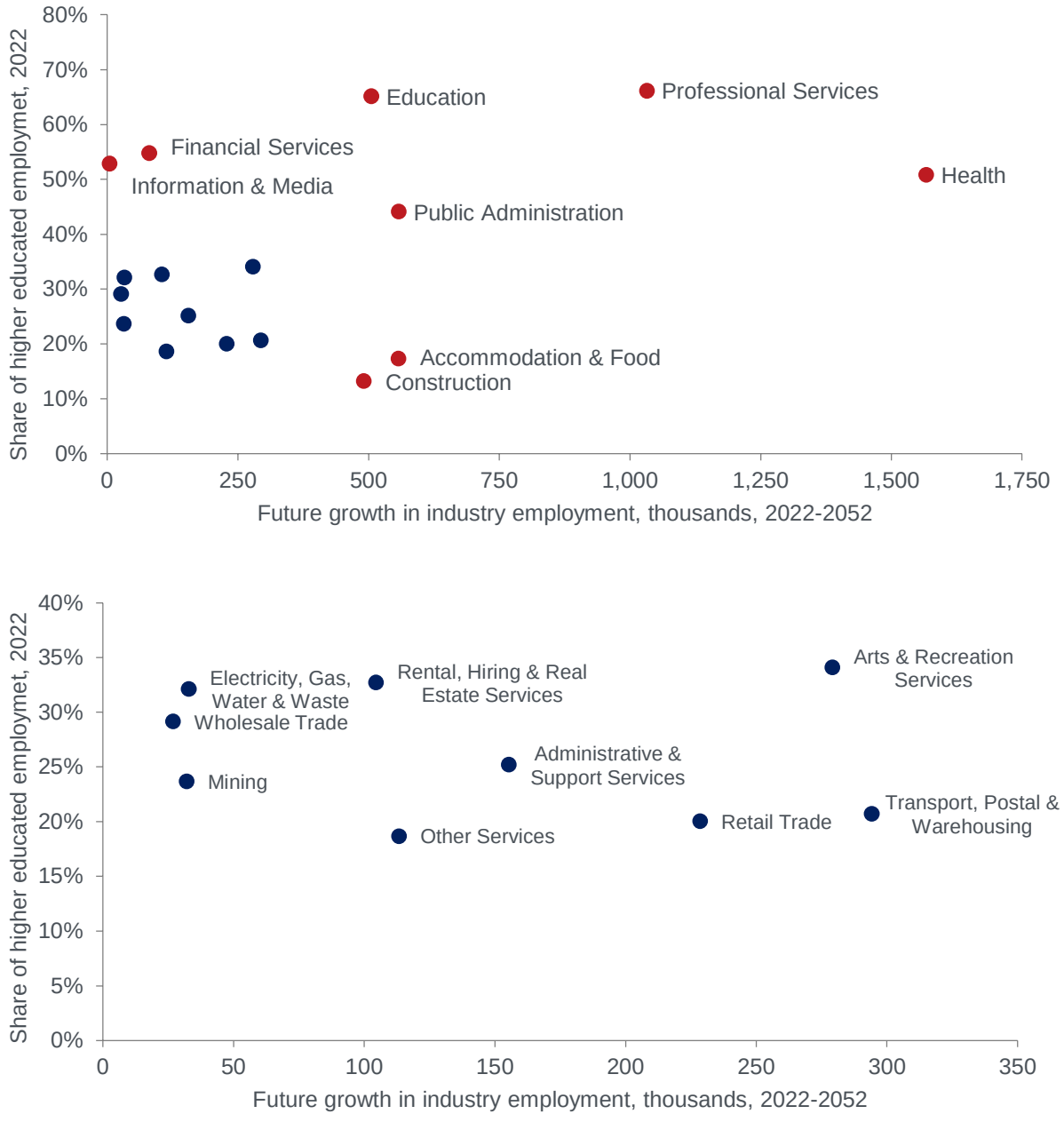
Source: ABS, Oxford Economics Australia

Long run growth in higher educated employment is expected to slow to an average annual rate of 2.0% between 2032 and 2052. The slowdown in long run growth is driven by the interaction between:

- industry employment growth; and
- slowing rates of skills deepening as occupations reach a 'saturation point' of higher educated workers.

The industries expected to add the most jobs to Australia's labour market over the next 30 years already have high shares of higher educated workers and the growth in higher educated employment within the labour market is expected to slow as occupations reach a 'saturation point' or peak level of higher educated labour.

Figure 3.4 Share of higher educated employment in 2022 vs. Future growth in industry employment, 2022 to 2052



Source: ABS, Oxford Economics Australia

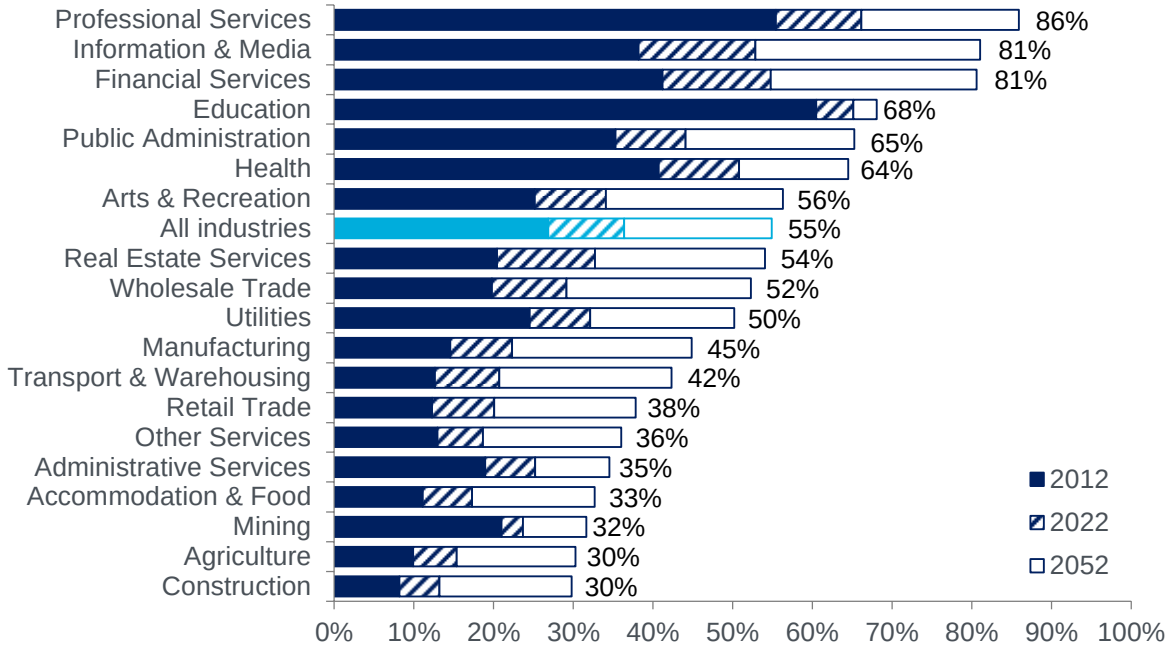
Professional services and the education industry have high rates of higher educated labour, both above 60% in 2022, with health, financial services, and information & media not far behind. Going forward, growth in higher educated employment in industries which already have a high proportion of higher educated labour is limited almost exclusively to industry growth (rather than both employment growth and skills deepening as in earlier decades).

Between 2022 and 2052 the rate of skills deepening is expected to gradually slow as occupations within these industries reach their 'saturation point'. The share of higher educated employment in education and health is expected to increase by only 3 and 14 percentage points respectively, in part due to the high rates of higher education already present in these industries. Comparatively, the average industry increases by 19 percentage points.[12]

Industries with a large share of higher educated workers are forecast to contribute significantly to employment growth over the next 30 years. Professional services and health and are expected to add respectively 1.0 million and 1.6 million jobs to the economy by 2052. Together they will account for 43% of the increase in employment, and 42% of the increase in higher educated employment.

Information & media is expected to face the largest increase in the share of higher educated labour, up from 53% in 2022 to 81% in 2052. However, this only represents 1.0% of total higher educated labour growth given the weaker employment outlook, and the smaller size of the workforce.

Figure 3.5 Share higher education employment by industry, 2012, 2022 and 2052

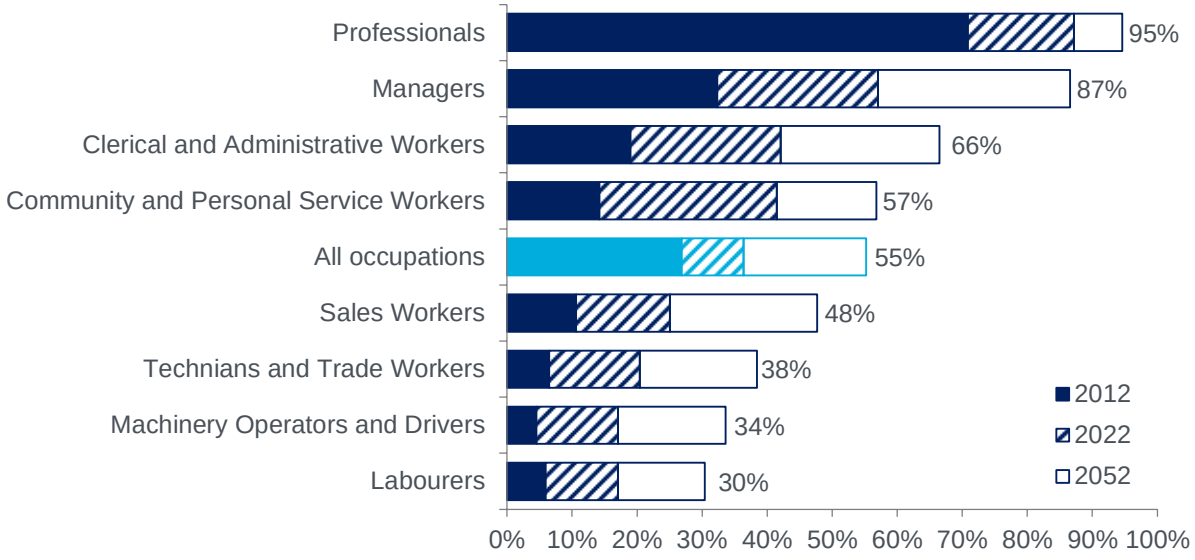


Source: ABS, Oxford Economics Australia

[12] Skills deepening - the forecast share of higher education - within industries is driven by the distribution of skills level within each 6-digit occupation and the distribution of occupations within each industry.

At an occupation level, professionals have experienced significant growth in the share of higher educated employment over the past decade leaving little room for further deepening. For example in 2022, 88% of legal, social and welfare professionals held a higher education degree which is only expected to increase by 6 percentage points over the forecast period.

Figure 3.6 Share of higher educated employment by occupation, 2012, 2022 and 2052



Source: ABS, Oxford Economics Australia

LABOUR MARKET DEMAND FOR ADDITIONAL HIGHER EDUCATION QUALIFICATIONS

Labour market demand for additional higher education qualifications is driven by both the growth in higher educated employment as well as flows of workers within the labour market which trigger the need for additional qualifications.

The three key drivers of demand for higher education qualifications are:

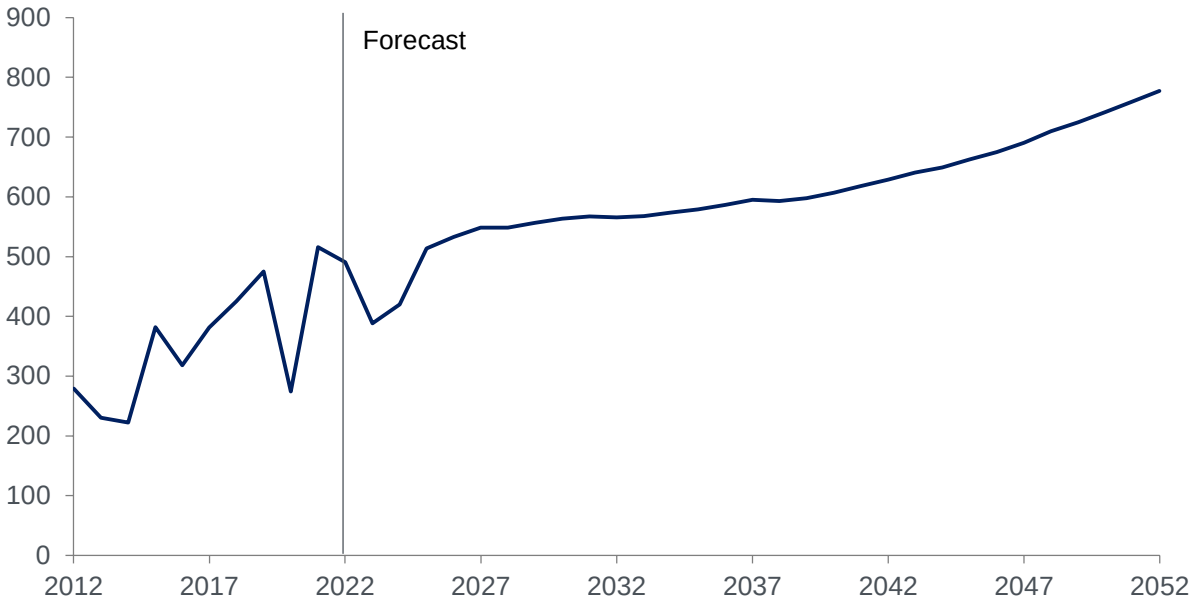
1) employment growth in higher educated roles,
2) labour market churn due to retirements, deaths, departures or people changing jobs, and
3) skills deepening where the labour market demands a higher education qualification for a role which previously did not require higher education, or the labour market demands a postgraduate degree for a role which previously required only a bachelor level qualification.

The total number of additional qualifications required by the labour market is referred to as ‘gross demand’.

Australia’s labour market demanded an additional 491,000 higher education qualifications in 2022. This figure is expected to grow at an average annual growth rate of 1.9% over the next 10 years, before accelerating to 2.1% after 2042. The pick-up in the long run growth rate is due to employment growth no longer slowing at such a strong rate and labour market churn continuing to rise. From 2042 to 2052 we expect the labour market to require 696,000 additional qualifications on average every year.

Figure 3.7 Gross number of additional higher education qualifications required to meet labour market demand, 2012 to 2052

Qualifications



Annual average 2012-2022	2022-2032	2032-2042	2042-2052	2022-2052
363,000	**518,000**	**592,000**	**696,000**	**602,000**

Source: Oxford Economics Australia

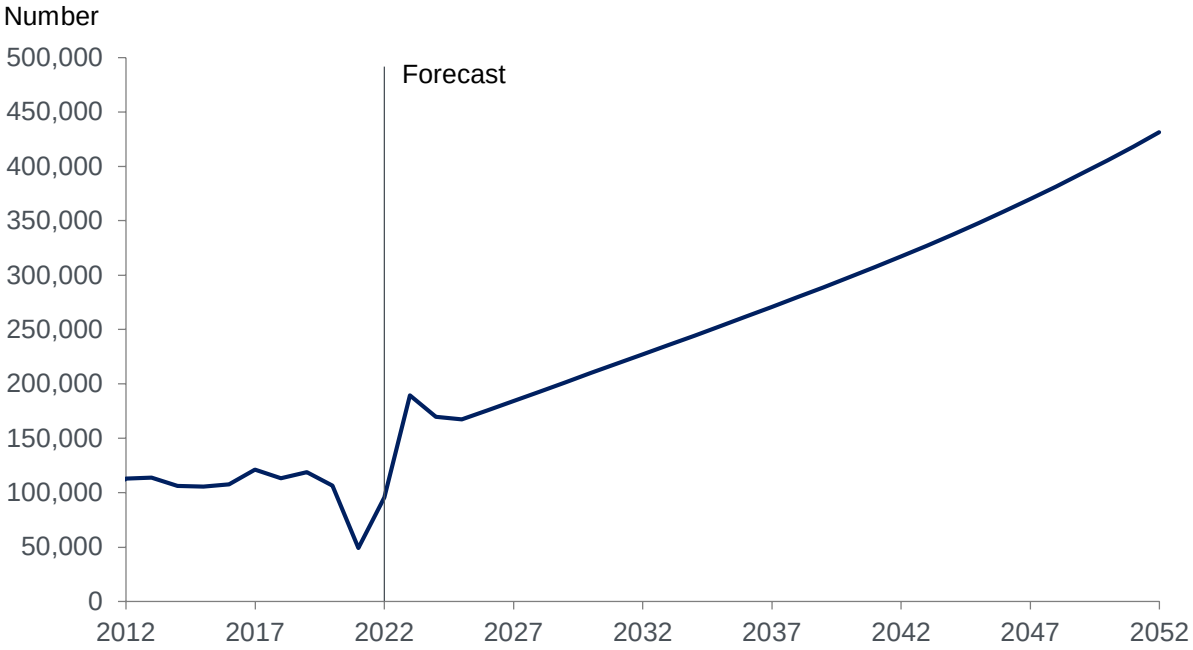
Note: The historic series in this chart is estimated. Job movement estimates are unavailable prior to 2015.

Labour market demands for additional higher educated workers are filled either by people completing additional qualifications through the higher education system or through skilled arrivals. Skilled arrivals refers to both:

1) Australia and New Zealand citizens with higher education qualifications, and
2) new immigrants with higher education qualifications arriving via Australia's immigration system.

Migrants entering Australia have higher rates of employment and are more likely to hold a higher education degree than the general population. Australian migration policy is largely demand-based, setting targets on permanent arrivals for those on skilled, family and humanitarian visas and allowing temporary arrivals to be determined by the level of labour market demand for certain occupations and skills. Therefore, new immigrants fill a significant proportion of Australia's labour market demand for additional higher education qualifications each year.

Figure 3.8 Employment of higher educated arrivals, 2012 to 2052



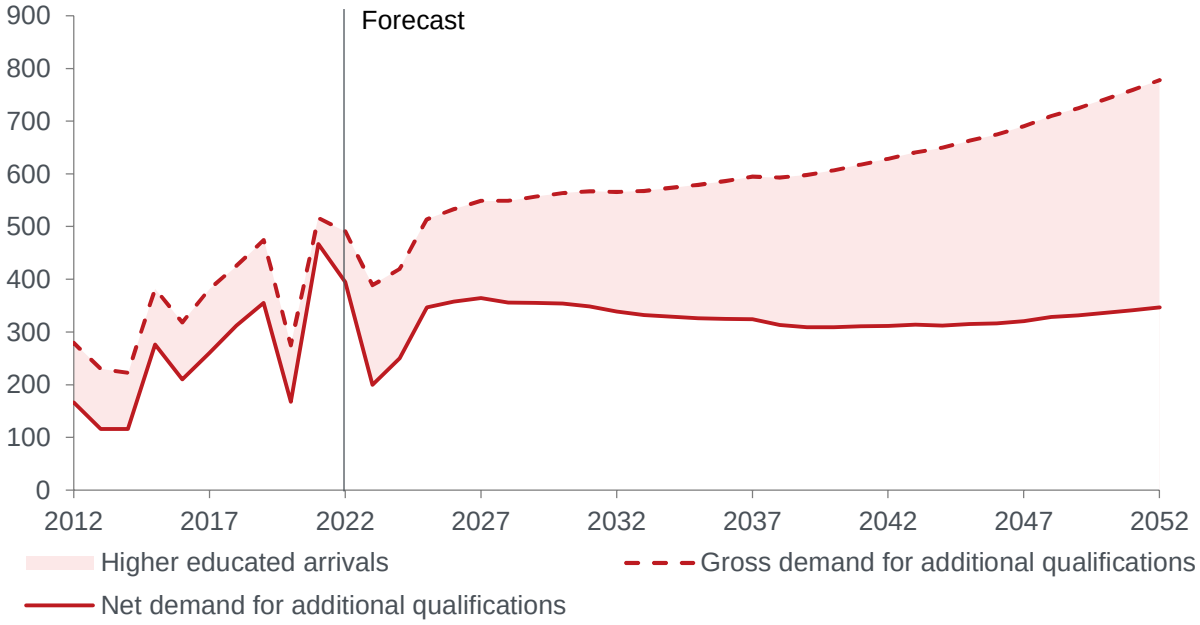
Source: Oxford Economics Australia
Note: The historic series in this chart is estimated. Higher educated arrivals are assumed to fill one instance of demand for a higher education qualification.

In 2019, prior to the COVID-19 pandemic, there were an estimated 167,000 higher educated arrivals entering Australia's labour market, larger than the loss of available higher educated workers due to retirements, deaths and departures combined.

Oxford Economics forecasts that based on migration policy settings[13] and trends in education and employment, higher educated arrivals could support labour market demand for 514,000 higher educated workers by 2054, an annual average growth rate of 3.5% over the forecast period.

[13] Given the policy changes flagged by the current government it is difficult at this point to conclude how Australia's NOM trajectory will be impacted however it is likely that our forecasts underestimate NOM especially in the short run.

Figure 3.9 Net number of additional qualifications required to meet labour market demand if trends in higher educated arrivals continue, 2012 to 2052
Qualifications



Annual average 2012-2022	2022-2032	2032-2042	2042-2052	2022-2052
258,000	**333,000**	**321,000**	**325,000**	**326,000**

Source: Oxford Economics Australia
Note: The historic series in this chart are estimated.

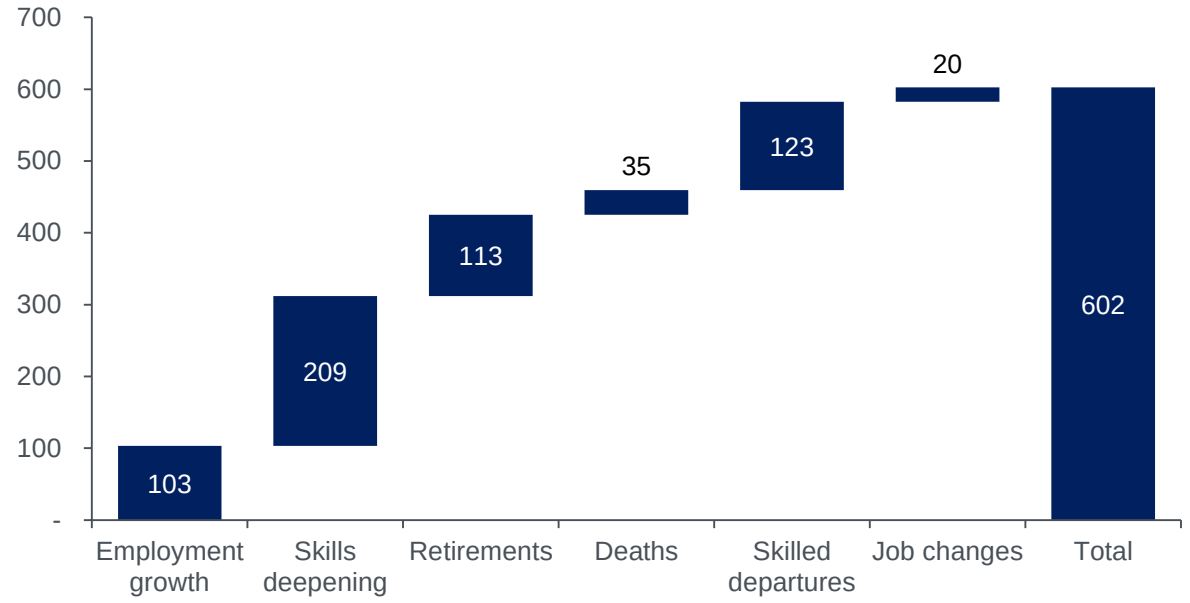
'Net demand' represents the number of higher education qualifications required to satisfy labour market demand if trends in skilled arrivals continue.

Once skilled arrivals are accounted for, labour market demand is expected to moderate from 294,000 additional qualifications per year over the next decade, to 253,000 additional qualifications in the long run.

Based on historic trends, higher educated arrivals are expected to support an increasing proportion of gross demand for qualifications each year. This is driven by slowing population growth and net overseas migration playing a greater role in population growth.

Figure 3.10 Change in average annual gross labour market demand for additional qualifications by driver of demand, 2022 to 2052

Qualifications, 000's



Source: Oxford Economics Australia

Labour market changes – which includes both employment growth and skills deepening – account for roughly half of future demand for additional higher education qualifications as the expansion of the Australian economy requires not only a larger, but more educated workforce.

The other half of additional qualification demand is generated by the churn of workers within the labour market which includes retirements, deaths, departures and job changes.

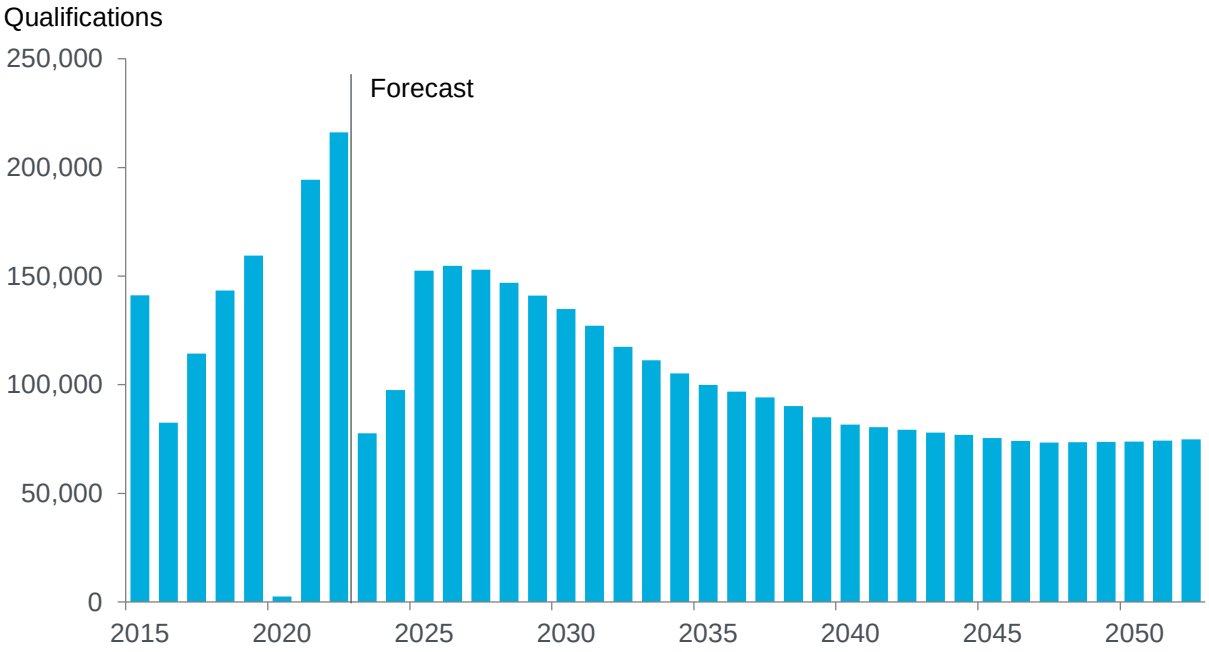
As the population ages, a greater number of jobs requiring higher education will be left vacant by those exiting the labour market due to retirement or death. Further, on the back of slowing population and employment growth, migration is expected to make up a larger proportion of net population changes. The growth in departures will make an increasing contribution to additional demand for qualifications as a larger proportion of the higher educated labour force moves overseas each year.

Job changes - movements within the labour market from one job to another - are expected to contribute only a small and decreasing amount to demand for qualifications over the forecast period.

3.1.1 Labour market changes

As the level of employment grows in roles that currently require higher education, additional qualifications are required for workers to fill these new roles.

Figure 3.11 Labour market demand for additional qualifications due to employment growth, 2015 to 2052



Source: Oxford Economics Australia
Note: The historic series in this chart is estimated.

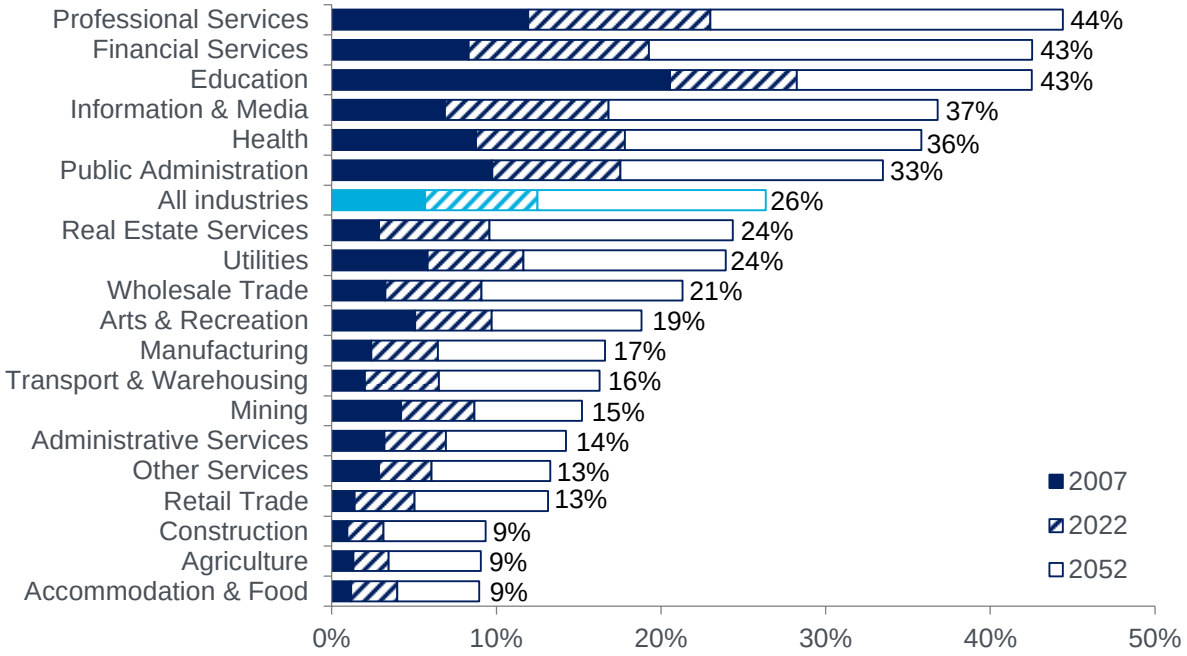
Higher educated employment growth experienced significant disruptions through 2020 to 2022 due to the initial COVID-19 pandemic hit to employment and the subsequent rebound in the recovery period. We expect qualification demand due to employment growth to decline over 2023 and 2024 as the economy slows before peaking in 2026. Over the forecast horizon, qualification demand due to employment growth is expected to slow to around 75,000 additional qualifications a year by 2052 mirroring the profile in higher educated employment growth.

Overall, labour market changes including employment growth and skills deepening drives demand for an additional 300,000 qualifications over the forecast period. Of this, 68% is driven by skills deepening.

The proportion of roles that require a postgraduate degree has doubled from 6% in 2007 to 12% in 2022, increasing to 26% by 2052. Professional services, financial services and education have seen the most significant increases in demand over the last decade and are expected to have the highest rates of demand for postgraduate education over the forecast period.

Additionally, industries which will experience strong employment over the next three decades will contribute significantly to demand for postgraduate qualifications. Health, professional services, and public administration will contribute 52% of the growth in employment from 2022 to 2052 (3.2 million) and will contribute to 57% of the growth in demand for employees with postgraduate qualifications (2.0 million).

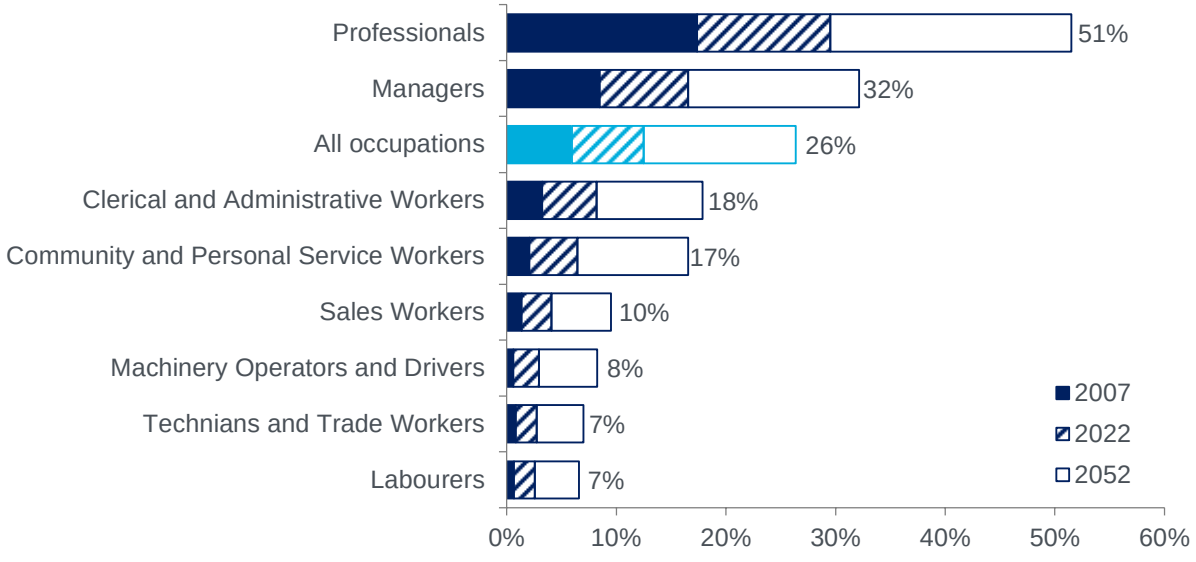
Figure 3.12 Share of postgraduate employment by industry, 2007, 2022 and 2052



Source: Oxford Economics Australia

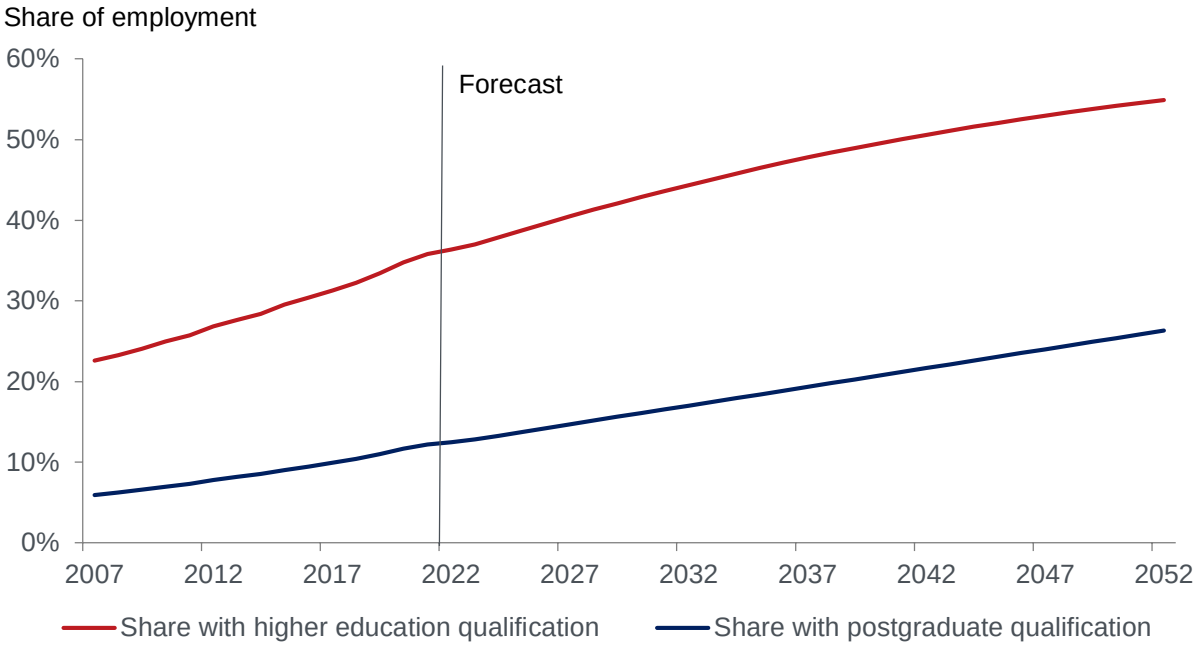
Occupations which have a postgraduate requirement for the most part will be confined to professionals and managers. These occupations will contribute strongly to both employment growth from 2022 to 2052 (58%) and will contribute 74% of the growth in demand for employees with a postgraduate degree, with professionals alone contributing to over half the growth (54%). Community and personal service workers are forecast to also contribute strongly to growth in demand for postgraduate qualifications. This is a result of the robust level of employment growth which will occur in this occupation (1.5 million), but it will require a smaller share of its employees to have postgraduate qualifications.

Figure 3.13 Share of postgraduate employment by occupation, 2007, 2022 and 2052



Source: Oxford Economics Australia

Figure 3.14 Share of employment holding a higher education and postgraduate qualification, 2007 to 2052

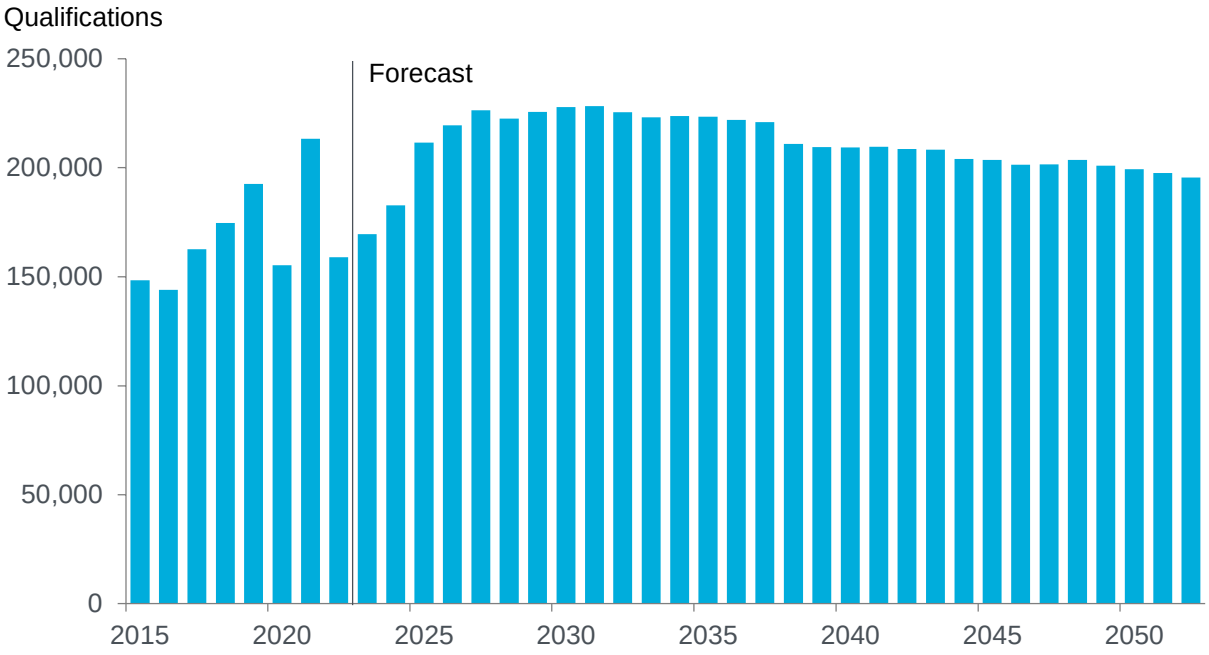


Source: ABS, Oxford Economics Australia
Note: The historic series between Census years are estimated.

We expect similar trends to continue over the forecast period. The share of employment holding a higher education degree is expected to continue growing, although at a decreasing rate. As the share increases, specific industries within the labour market are expected to approach a 'saturation point' for which they do not require a greater proportion of employment to be higher educated. Part of this slowing will contribute to the contrived growth in the labour market demand for postgraduate qualifications as deeper, rather than more skills are required by the labour market.

These trends represent the deepening of skills required by the labour market and create demand for additional qualifications in order to fulfil these requirements.

Figure 3.15 Labour market demand for additional qualifications due to skills deepening, 2015 to 2052

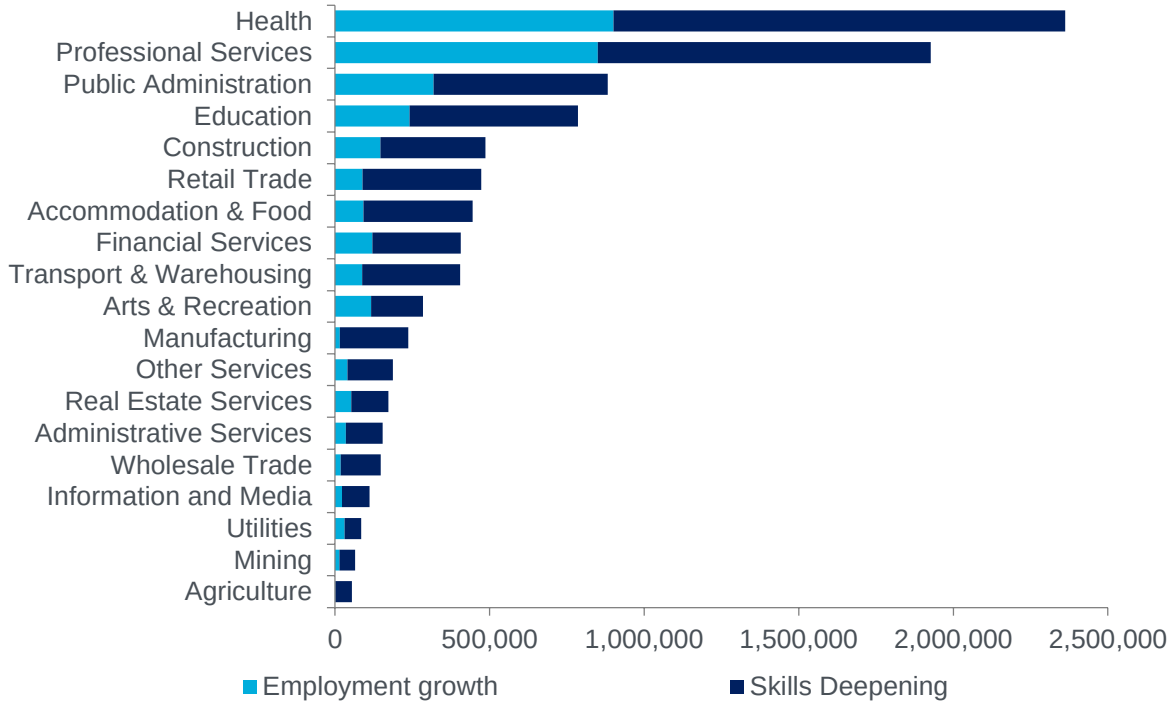


Source: Oxford Economics Australia
Note: The historic series in this chart is estimated.

Labour market demand for additional qualifications due to skills deepening is expected to continue increasing significantly. A peak of 228,000 is expected to be reached in 2031. This will be driven by a forecast continuation of the rapid increase in the share of the labour market requiring a higher education degree and compounded by employment growth concentrated in industries that are experiencing the highest level of growth in the higher educated proportion of employment.

From this peak, labour market demand for additional qualifications due to skills deepening is expected to slow as many industries approach a ‘saturation point’ and overall employment growth slows. From 2022 to 2052 qualification demand is forecast to average 210,000.

Figure 3.16 Labour market demand for additional qualifications by employment growth and skills deepening, 2022 to 2052



Source: Oxford Economics Australia

This result differs across industries based on their current and projected skills composition. Many of Australia's largest employing industries are forecast to experience less skills deepening in the forecast period as they approach the industry 'saturation point' relatively quicker due to historically rapid growth. Higher educated employment growth in the three largest industries (health, professional services and public administration) is driven to a greater extent by the general industry conditions with skills deepening accounting for relatively less of the qualification demand due to labour market changes. Employment growth is responsible for 38%, 44% and 36% of higher educated employment growth respectively for these three industries compared to the median of 23% among all industries.

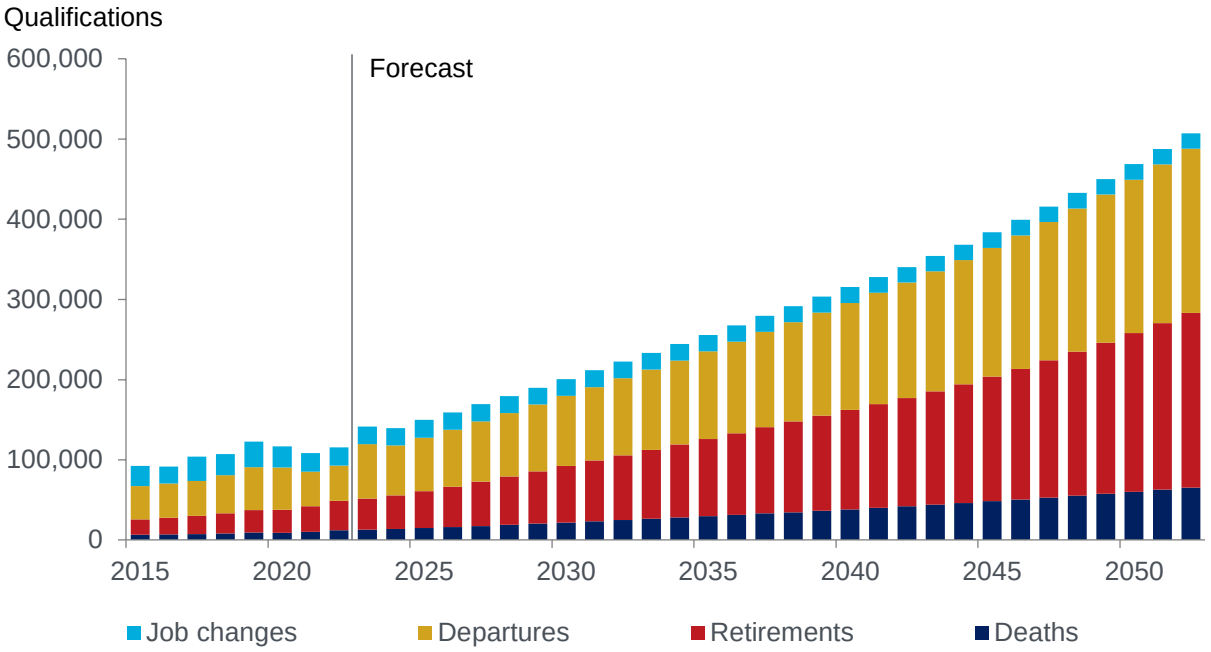
3.1.2 Labour market churn

There are four key components to labour market churn that create demand for additional qualifications – retirements, deaths, outbound migration and job changes. As higher educated workers exit the labour market due to retirement, death or outbound migration their role requires someone with a similar skill set and education level to fill it, creating demand for an additional qualification.

Movement within the labour market from one job to another may create demand for an additional qualification if the worker moves into a role which requires a different level or type of qualification. For example, an engineer in the mining industry who moves to a new job as a specialist manager in the professional services industry may require an additional qualification.

Overall, labour market churn provides a positive and increasing contribution to labour market demand for additional higher education qualifications. In 2022 there was an estimated 117,000 additional qualifications demanded by the labour market due to labour market churn. This is expected to increase over the forecast period, reaching 507,000 by 2052.

Figure 3.17 Labour market demand for additional qualifications due to labour market churn by source, 2015 to 2052



Source: Oxford Economics Australia
Note: The historic series in this chart are estimated.

Australia's ageing population will increase the rate of deaths and retirements. Retirements in particular will grow strongly and overtake skilled departures as the largest source of demand for additional qualifications. By 2052, retirements will trigger demand 218,000 additional qualifications and 205,000 additional qualifications will be required due to skilled departures. Deaths remain a relatively small component of additional qualification demand rising from 9,000 in 2019 to 65,000 in 2052.

Job changes are one of the smallest drivers of demand for additional higher education qualifications. The number of job changes resulting in additional demand for higher education qualifications is expected to slowly decrease over time from 23,000 in 2022 to 19,000 in 2052.

4. SUPPLY OF HIGHER EDUCATION GRADUATES

This chapter estimates the number of higher education graduates expected over the forecast period based on current trends in commencements and completions by age and field of education.

For the purposes of this report, supply of higher education graduates refers to students who complete a bachelor degree or higher at a higher education institution and are available to enter the domestic labour market.

OUTLOOK FOR HIGHER EDUCATION GRADUATES

The outlook for higher education graduates is based on forecast population and trends in commencement and completion rates across each age cohort and field of education.

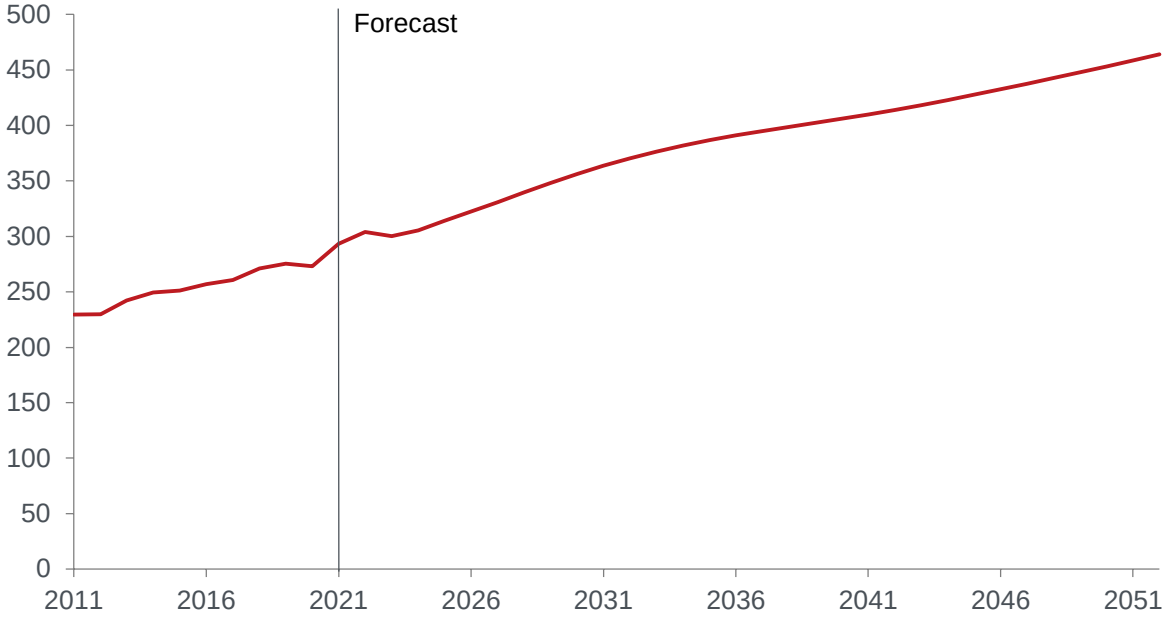
If trends in commencement and completion rates continue, Australia's higher education system is expected to supply the domestic labour market with 389,000 graduates on average per year over the next 30 years.

Over the last decade, the number of domestic graduate completions inclusive of bachelor and postgraduate degrees has grown at 2.5% a year on average, driven by increased commencement rates. International completions experienced rapid growth over the same time period growing 4.1% a year on average. At an aggregate level when combining both domestic and international student's completions have grown at 2.9% per year over the last decade. Over the next 10 years growth in the number of completions at an aggregate level is expected to average 2.0% per year, before slowing to 1.4% in the long term.

The slowdown in the growth of graduate completions is driven by declining trends in completion rates across most age cohorts and fields of education. Overall, the completion ratio is forecast to fall from 47% in 2019 to 41% by 2052.[14] Additionally, the two largest cohorts which commence and complete university will experience a slowdown in population growth beyond 2032. The population of 15–19-year-olds will grow at 1.8% p.a. over the next decade, but slow in the long-run to average 0.6% p.a. from 2033-2052. Similarly, the population of 20-24-year-olds will grow at 2.4% p.a. over the next decade, and at 0.4% p.a. over the two decades beyond that. The decline in completion rates and the slowdown in population growth amongst key age demographics will be a drag on the growth in the supply of graduates in the long run.

[14] A completion rate is the share of students that commence studying in a certain year who will complete their studies in the next three to nine years. These rates are estimated at an age and field of education level for modelling purposes. A completion ratio is a ratio of completions in a single year to commencements in that same year. This ratio is used to identify aggregate trends in completions across age groups and fields of education.

Figure 4.1 Supply of higher education graduates, 2011 to 2052
Graduates, 000's



Annual average 2012-2022	2022-2032	2032-2042	2042-2052	2022-2052
265,000	**332,000**	**394,000**	**438,000**	**389,000**

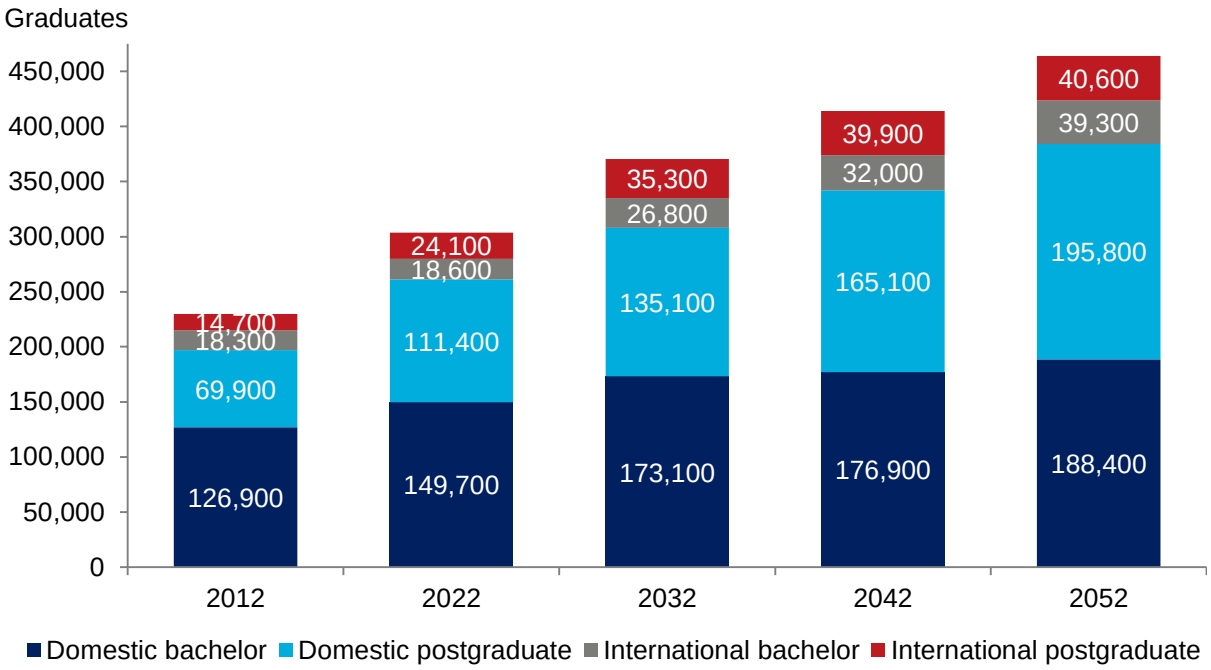
Source: Department of Education, Oxford Economics Australia

Labour market supply of higher education graduates consists of both domestic students and international students who remain in Australia to work after they complete their degree.[15] International graduates are expected to contribute roughly 17% to the supply of higher education graduates over the forecast period.

From 1 July 2023, international higher education graduates with eligible qualifications will be granted an extra two years of post-study work rights. This is a significant increase from the current 2-4 year base (depending on qualification). The Federal Government has earmarked further reforms to address migrant worker exploitation (including of students) later in 2023, which are likely to impact the international graduate supply estimated below to the upside.

[15] We estimate international students who remain in Australia to work after they complete their degree using the historic ratio of Temporary Graduate visa (subclass 485) within the Post-Study Work stream relative to international student completions.

Figure 4.2 Supply of higher education graduates by type, 2012 to 2052



Source: Department of Education, Oxford Economics Australia

Domestic graduates are expected to grow at an annual rate of 1.3% over the forecast period. The growth in postgraduate degrees is expected to outpace the growth in bachelor's degrees and by 2052, roughly one in two domestic completions is expected to be a postgraduate degree. The largest contributing fields of education to the number of postgraduate completions are forecast to be health and society & culture, contributing on average 1.2 and 0.6 percentage points p.a. to total domestic postgraduate completions over the forecast period.

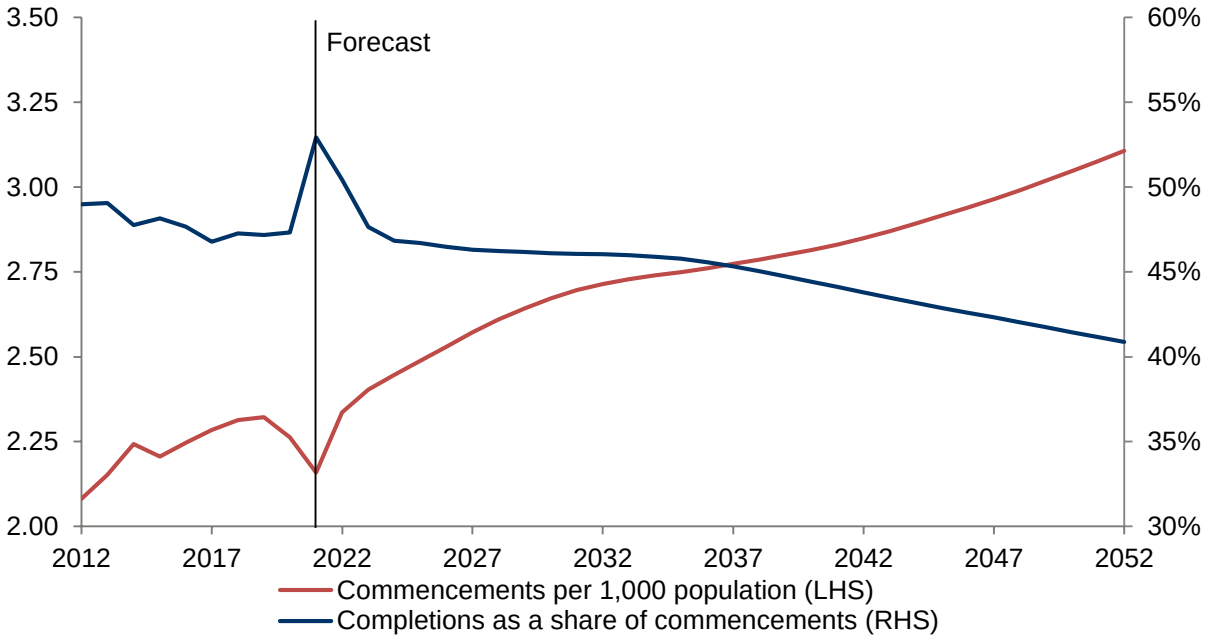
There is an increasing number of people commencing higher education in Australia and contributing to the supply of higher educated graduates. For every 1,000 persons, roughly 2.08 commenced higher education in 2012. By 2019, this number had increase to 2.32 before falling during the COVID-19 pandemic.[16]

While commencements are increasing, completion rates across age cohorts and fields of education are either stable or declining. Declining completion rates are especially significant in education, information technology and natural and physical sciences.

For the purposes of this study, in order to understand the long run implications of current trends, trends in completion rates are continued even when their levels would be low enough to trigger a policy intervention. For example, the completion ratio in education has fallen from 57% in 2011 to 53% in 2021 reflecting a general downward trend in completion rates across age cohorts. This trend implies a 41% completion ratio in education in 2052. However, this would certainly prompt a policy response long before reaching such a critical level.

[16] This figure includes international students who remain in Australia to work. Years affected by the COVID-19 pandemic, are excluded from the trend analysis.

Figure 4.3 Commencement rate and completion ratio, 2012 to 2052



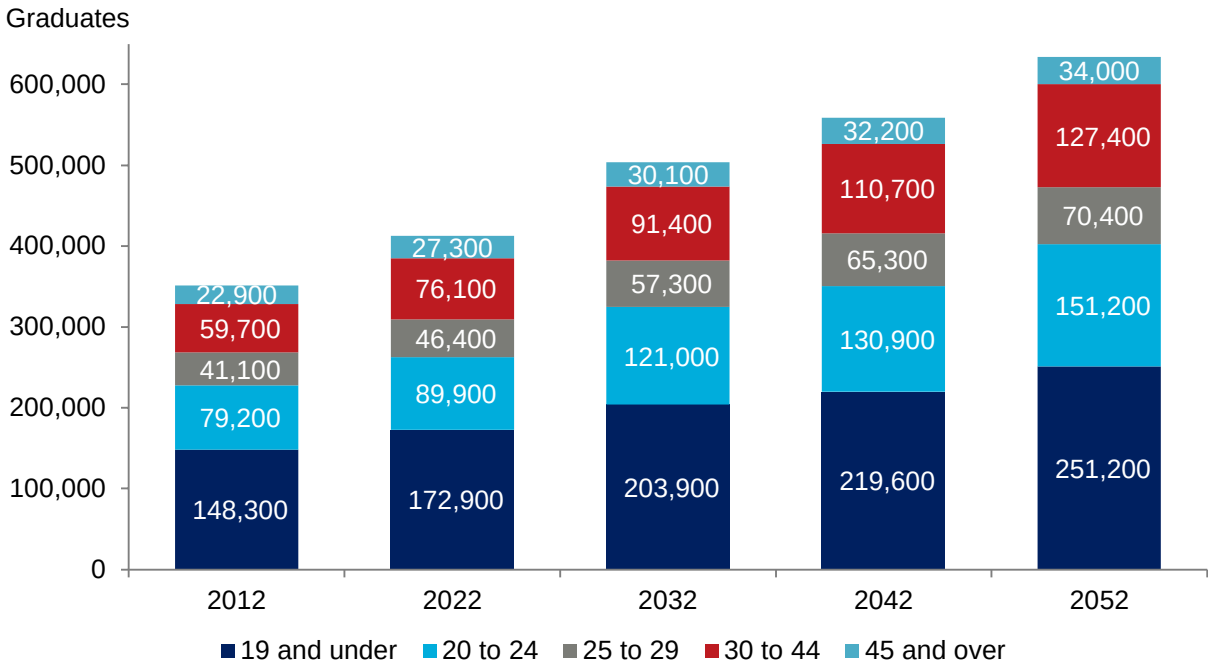
Source: Department of Education, Oxford Economics Australia

Commencements are expected to grow significantly over the next 10 years driven by strong population growth in 15-19 year old cohort whose commencment rates are much higher than the broader population and form a signficant proportion of all commencements.

Those aged 24 and under represent the majority of students commencing higher education at 65% as of 2021, slighty below their peak of 68% of all commencemnts in 2019. Over the forecast period this group will increase the number of commencements by almost 450,000 and will account for 71% of all commencements by 2052 driven by increasing rates of higher education commencements by this section of the population.

Commencements for mature age students are forecast to grow at a slower rate than their younger peers and as a result will occupy a smaller share of commencements by 2052. However there is strong growth expected amongst the 30 to 44 year old ago cohort who are expected to increase their share of commencements from 17% in 2012 to 20% by 2042.

Figure 4.4 Domestic higher education commencements by age bracket, 2012 to 2052



Source: Department of Education, Oxford Economics Australia

5. GAP ANALYSIS

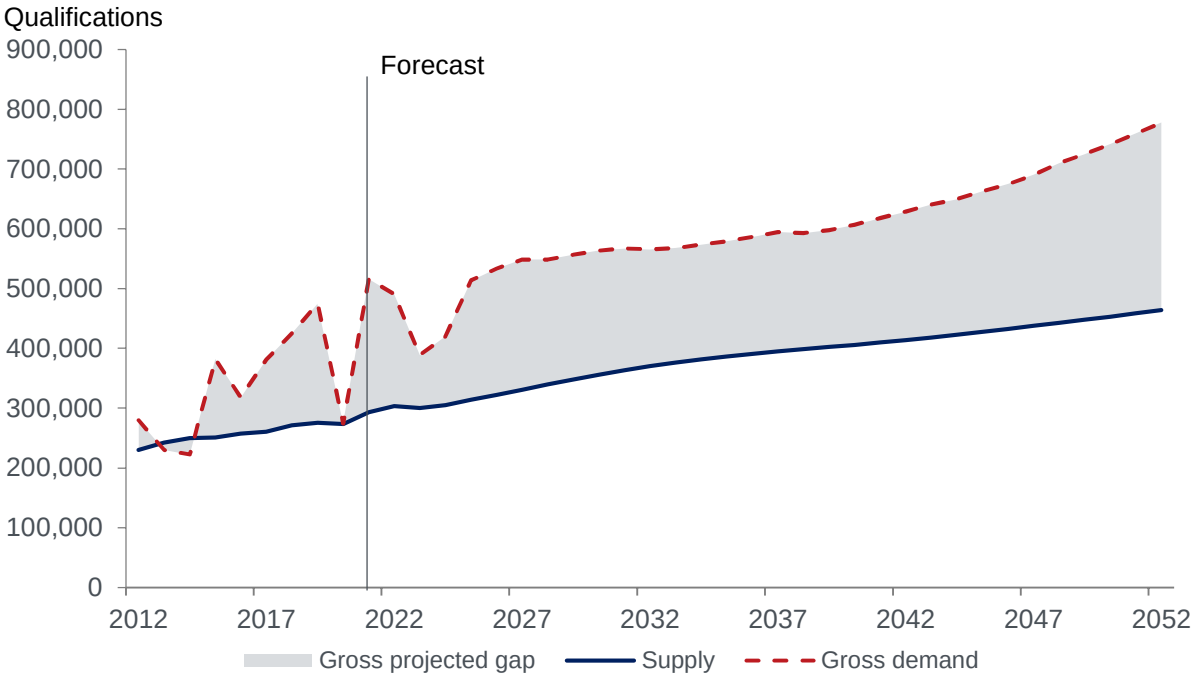
This chapter explores gaps between demand and supply based on analysis from chapter 3 and 4.

GROSS PROJECTED GAP IN THE DEMAND AND SUPPLY OF HIGHER EDUCATION

Over the next 30 years, there is an average deficit of 215,000 qualifications per year required to meet gross demand (labour market demand for additional qualifications when skilled arrivals are not accounted for).

In the near-term, slower employment growth will reduce gross demand, and in-turn the qualifications deficit will reduce. By 2026, economic activity and employment growth is expected to return to trend and gross demand for additional qualifications is forecast to grow at a faster rate than supply, resulting in a growing qualifications deficit, projected to reach 314,000 by 2052.

Figure 5.1 Projected gap in higher education qualifications without higher educated arrivals, 2012 to 2052



Gross projected gap, annual average				
2012-2022	2022-2032	2032-2042	2042-2052	2022-2052
-99,000	**-186,000**	**-198,000**	**-258,000**	**-215,000**

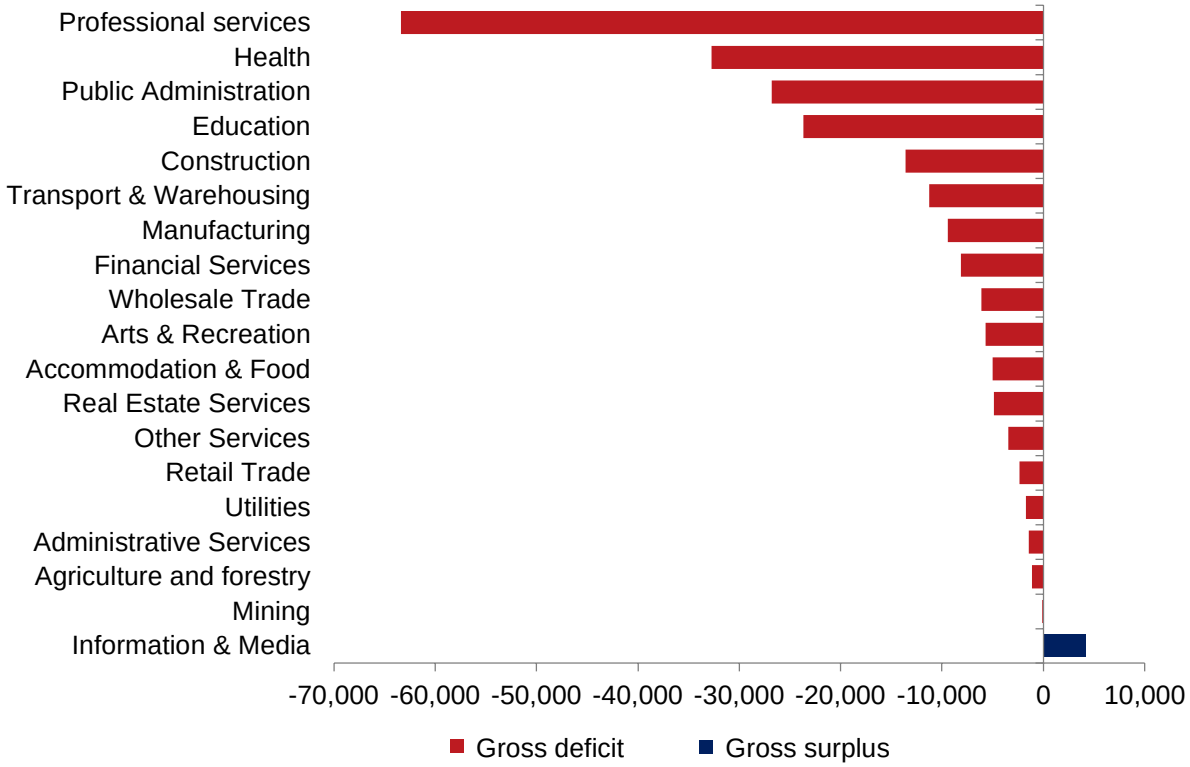
Source: Department of Education, Oxford Economics Australia
Note: The historic series in this chart are estimated.

There are often mismatches between labour market demands and the qualifications that are supplied by Australia's higher education system. The aggregate level of qualification demand as shown above hides imbalances at an industry, occupation and field of study level.

There are expected to be significant gaps between gross demand and supply across the majority of industries over the forecast period. Increasing gross shortages are expected to be driven by a combination of changing demand flows, the continuation of current trends in completions and labour market mismatching between supply and demand. Higher education completions continuing on

current trends will not be sufficient to keep up with demand from the labour market in all industries except information & media.

Figure 5.2 Gross projected gap in higher education qualifications by industry, average 2022 to 2052



Source: Department of Education, Oxford Economics Australia

The largest qualification shortages are expected in industries that experience the strongest growth in gross demand; professional services and health. As the population ages and Australia continues to shift towards a more service focused economy, strong employment growth and continued skills deepening in the health and professional services industries is expected to drive an average gross projected gap of 63,000 qualifications per annum in professional services and 33,000 qualifications per annum in health per annum from 2022 to 2052.

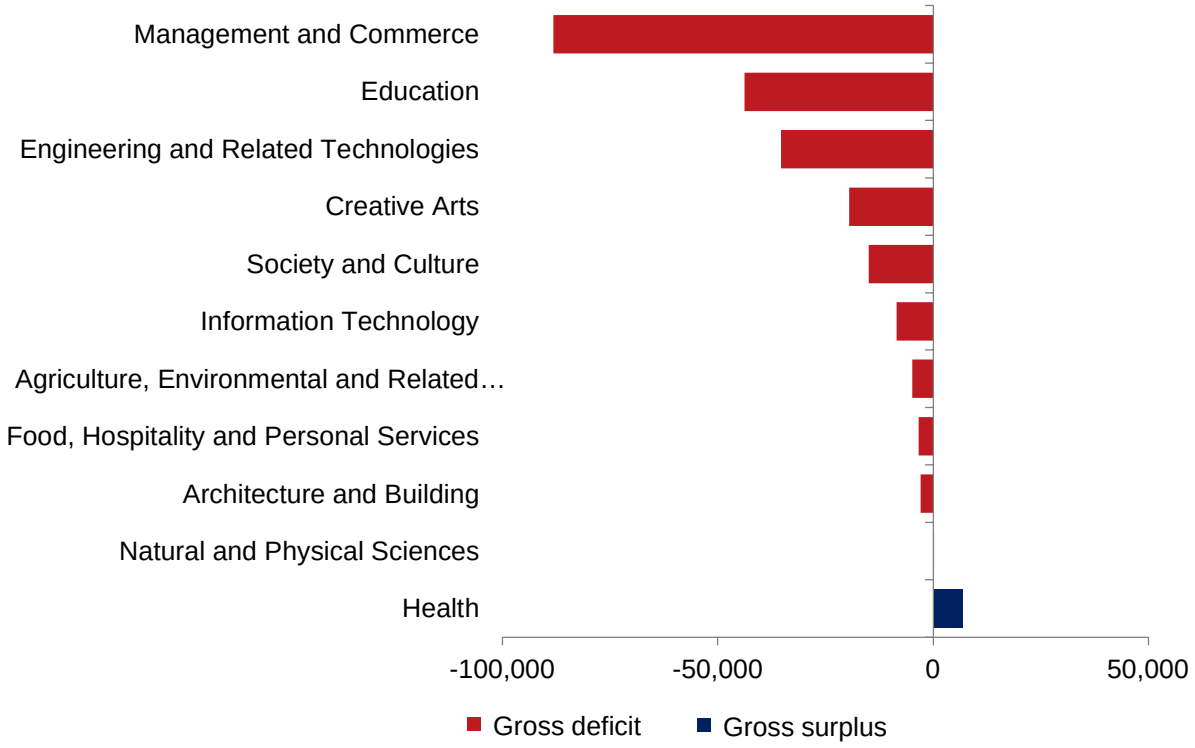
Information & media is the only industry forecast to average a gross projected surplus from 2022 to 2052, with supply expected to surpass gross demand from 2027 onwards. A strong increase in the uptake of information technology qualifications over the past five years is expected to boost higher educated qualifications supplied to the information & media industry. Weak employment growth in media sub-sectors[17] and therefore lower demand for qualifications over the forecast period, leads to a small annual average surplus.

[17] Information & media sub-sectors are expected to experience weak growth over the forecast period (Publishing, Motion picture and sound recording activities, Broadcasting, Library and other information services) detracting from stronger growth in telecommunications services, internet service providers, web search portals and data processing services.

Similarly, qualifications across almost all fields of education are expected to be in shortage over the forecast period.

Information technology qualifications are demanded across all industries in the economy, and so, despite a gross surplus in the information & media industry, there remains an expected shortage in the information technology field of education. As of 2021 only 5.3% of higher education graduates holding a qualification in the information technology field of education are estimated to be employed in the information & media industry. The remaining 94.7% qualifications are demanded across all other industries with professional services, financial services and public administration representing 31.7%, 11.4% and 7.8% of IT qualifications respectively.

Figure 5.3 Gross projected gap in higher education qualifications, by field of study, average 2022 to 2052



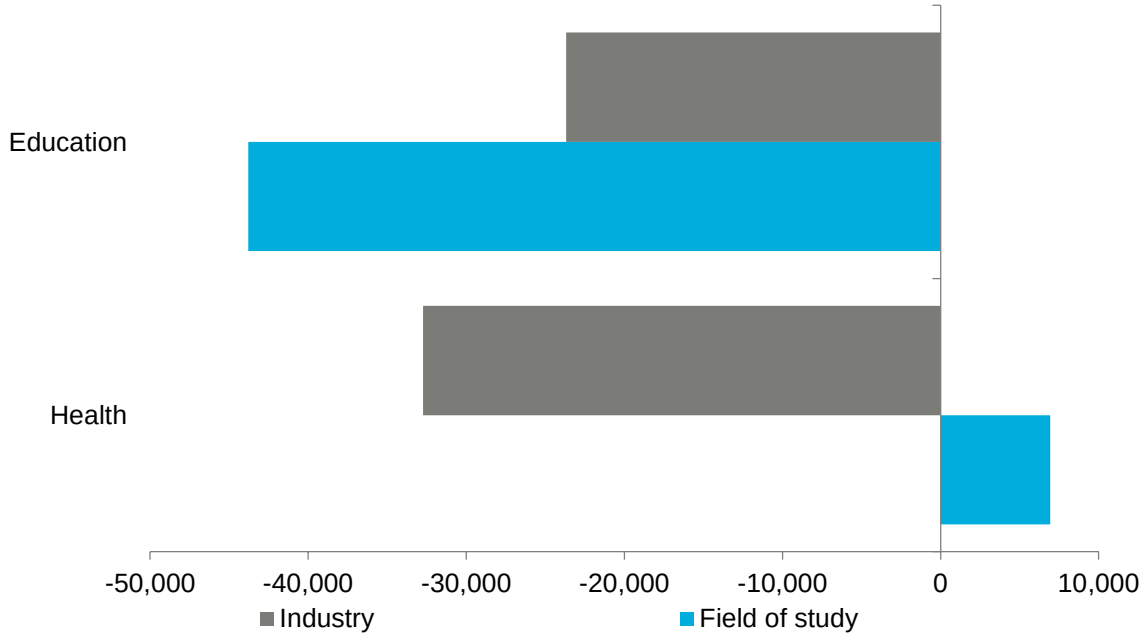
Source: Department of Education, Oxford Economics Australia

Management & commerce and education qualifications are expected to be in the greatest shortage over the next 30 years, averaging annual deficits of 88,000 and 44,000 qualifications respectively.

Management & commerce qualifications are demanded by a range of industries in the economy and demand is supported by strong forecast growth in services sectors, professional services in particular. Supply of management & commerce is also contributing to the shortage as completion rates in this field of education are declining.

Health and education have a significant difference between the shortage of qualifications at the industry level and the shortage of qualifications at the field of study level. These results suggest that there are a number of policy responses which could be utilised to support industries experiencing skills shortages in addition to increasing the supply of higher education qualifications.

Figure 5.4 Gross projected gap in higher education qualifications for health and education, by industry and field of study, average 2022 to 2052



Source: Department of Education, Oxford Economics Australia

The education industry is expected to have an average gross deficit of 24,000 qualifications per annum between 2022 and 2052. However, the leakage of education qualifications to other industries, predominately the health sector, is driving a much greater shortage in the education field of study, averaging 44,000 qualifications per annum over the same period.

An estimated 75.5% of employees holding an education degree work in the education industry. However, this proportion has been declining over the last 15 years and is expected fall to 70.2% by 2052. There is a significant number of workers in the health industry who hold education qualifications. For example, 20.4% of carers and aides and 6.1% of specialist managers have an education qualification. If historic trends continue, those holding an education degree but working in the health industry are expected to increase from 8.1% in 2021 to 15.2% in 2052.

The health industry is expected to be in shortage despite there being a surplus of health qualifications in the economy. The health field of education is expected to average a modest gross surplus of 7,000 whilst the health industry is expected to average a supply shortage of 33,000 over the same period as workers with health qualifications are increasingly employed in professional services, public administration and education.

Over the last 15 years the proportion of higher educated employees in the health industry that hold a health qualification has decreased from 68.6% to 62.3% in 2021. As the sector continues to transform and previously auxiliary occupations begin to represent a larger share of overall employment there has been an increase in workers who hold education, society & culture and management & commerce qualifications.

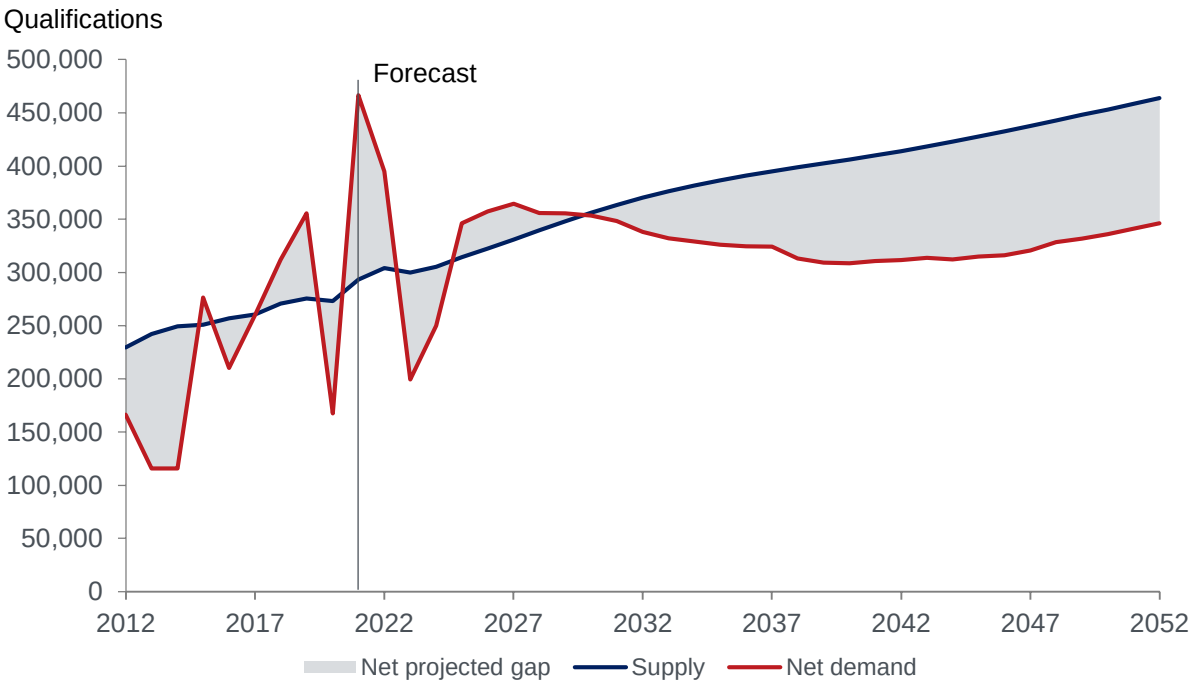
NET PROJECTED GAP IN THE DEMAND AND SUPPLY OF HIGHER EDUCATION

While gross demand captures how many qualifications are required in the labour market overall Australia's immigration system is largely demand-based and skilled arrivals play an important role in supporting our labour market and filling our skills gap.

'Net demand' represents the number of higher education qualifications required to satisfy labour market demand if trends in skilled arrivals continue.

Historic estimates of gross and net demand show the significant role skilled arrivals have played in supporting the labour market. Skilled arrivals have transformed a historic annual deficit of 99,000 qualifications into a surplus of 6,000 qualifications over the last 10 years. If current trends in skilled arrivals continue this surplus is expected to average 62,000 qualifications over the forecast period.

Figure 5.5 Net projected gap in higher education qualifications if trends in higher educated arrivals continue, 2012 to 2052



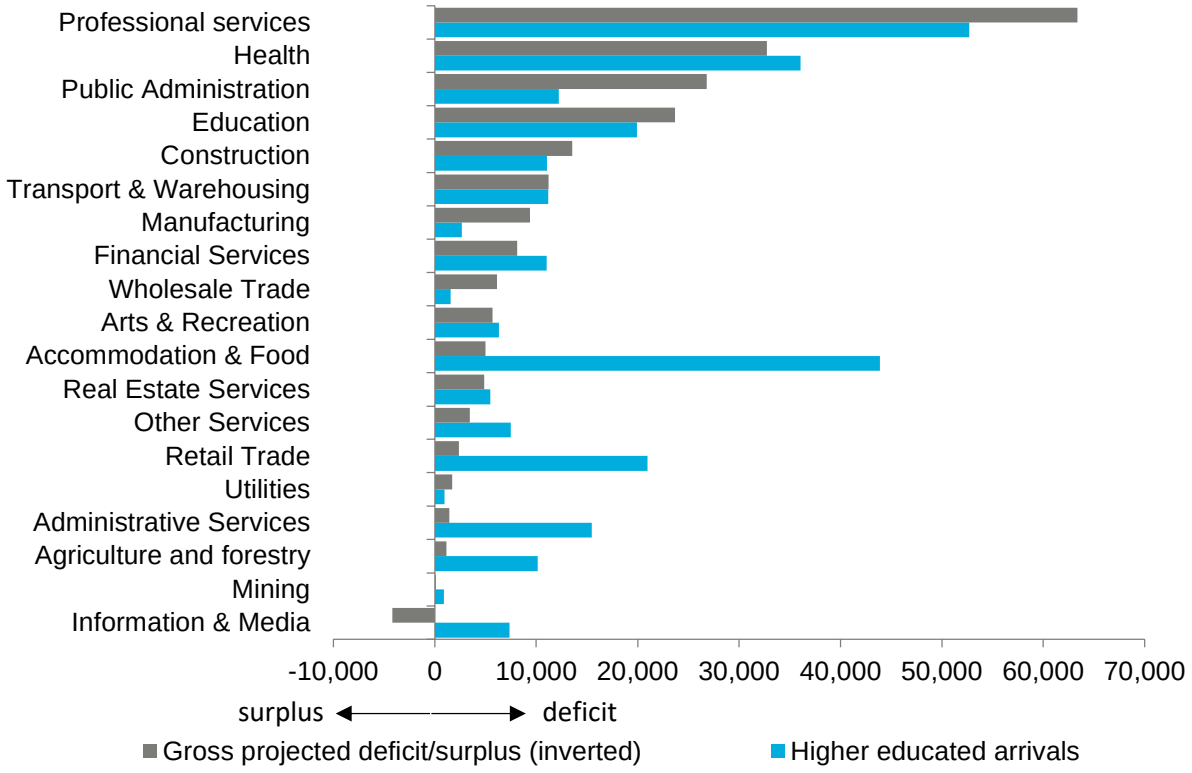
Net projected gap, annual average				
2012-2022	2022-2032	2032-2042	2042-2052	2022-2052
6,000	**-1,000**	**73,000**	**113,000**	**62,000**

Source: Department of Education, Oxford Economics Australia
Note: The historic series in this chart are estimated.

At an aggregate level, higher educated migrant arrivals are expected to exceed the gross projected gap between labour market demand and the supply of graduates from Australia's higher education system. However, as with gross demand, there are imbalances in net demand at the industry and field of education level. These imbalances differ to the gross demand picture because skilled arrivals have different qualifications to the supply from Australia's higher education system and work in different industries.

Figure 5.6 shows the gross shortage qualifications demanded by industry relative to qualifications held by higher educated arrivals who work in that industry. It shows the degree to which skilled arrivals are expected to fill skill shortages if trends in the qualifications and employment outcomes of skilled arrivals continue.

Figure 5.6 Skilled arrivals relative to the gross projected gap in higher education qualifications, by industry, average 2022 to 2052



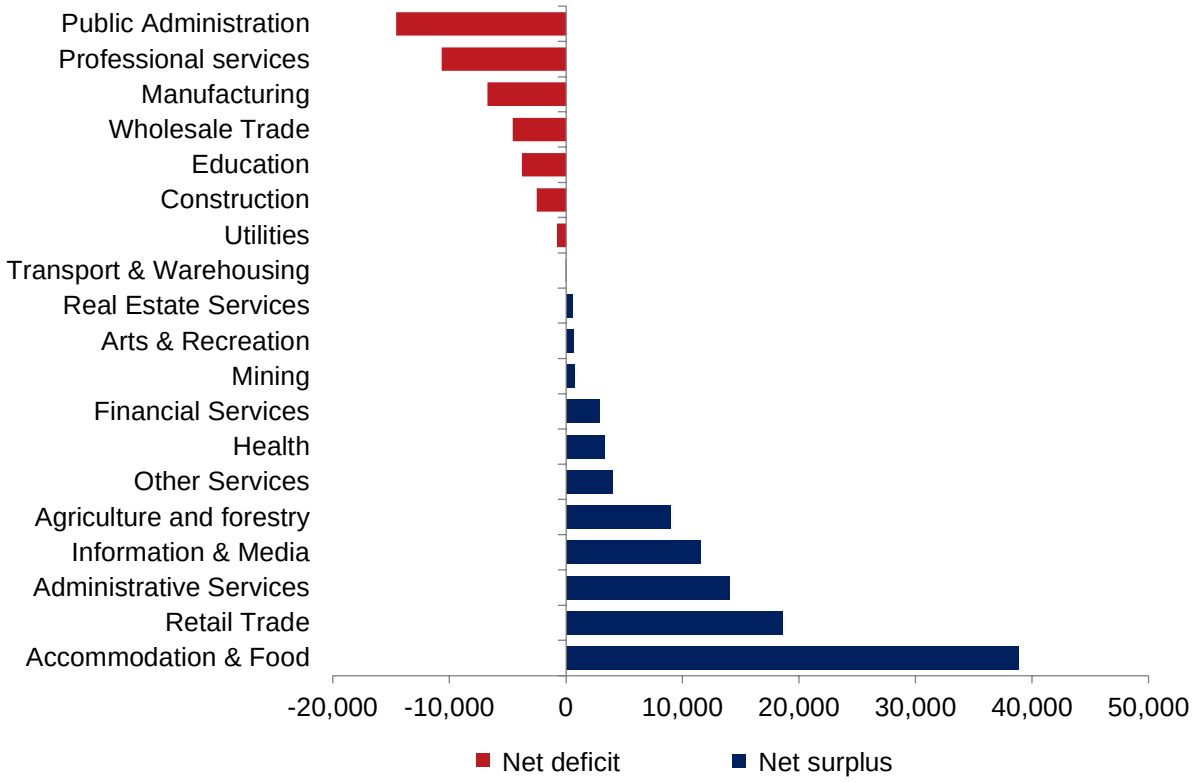
Source: Department of Education, Oxford Economics Australia

While migrant arrivals provide the qualifications demanded by the labour market in aggregate, there is a mismatch in their allocation to industry likely due to other factors that mean there are still significant gaps across industry.

Based on current migration trends, the proportion of skilled arrivals to Australia working in the accommodation & food industry is disproportionate to the industry's demand for higher education and this trend has been growing over the last 15 years. Retail trade and administrative services also show a significant leakage of the qualifications held by skilled migrants from their optimal allocation in the labour market.

Conversely, historic trends in skilled arrivals will not be sufficient to support the significant and increasing shortages in the public administration and professional services industries. The net deficit in qualifications in public administration and professional services is forecast to average 15,000 and 11,000 qualifications per annum respectively over the forecast period.

Figure 5.7 Net projected gap in higher education qualifications, by industry, average 2022 to 2052

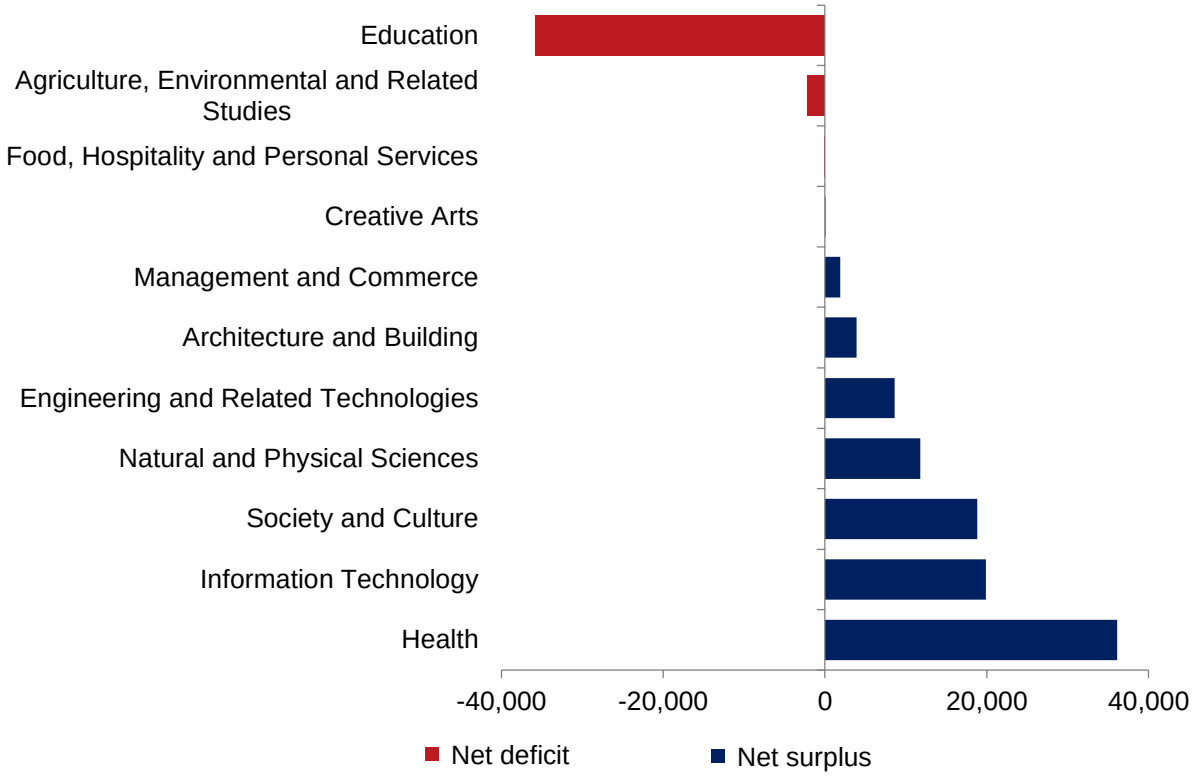


Source: Department of Education, Oxford Economics Australia

The mismatch between industry demand and migrant labour market allocation is further highlighted when considering the net projected gap at the field of education level. Despite net deficits being present in seven industries, there is a net surplus in all but two fields of education. This indicates that the current trends in skilled migration are supplying qualifications in the fields of education demanded by the labour market but there is a significant mismatch in their allocation to industry shortages.

Education remains an industry and field of education in shortage even when accounting for skilled arrivals. If trends in skilled arrivals continue the industry has a shortage of 4,000 qualifications on average per year and with a shortage of 36,000 qualifications in the education field of education on average per year.

Figure 5.8 Net projected gap in higher education qualifications, by field of study, average 2022 to 2052



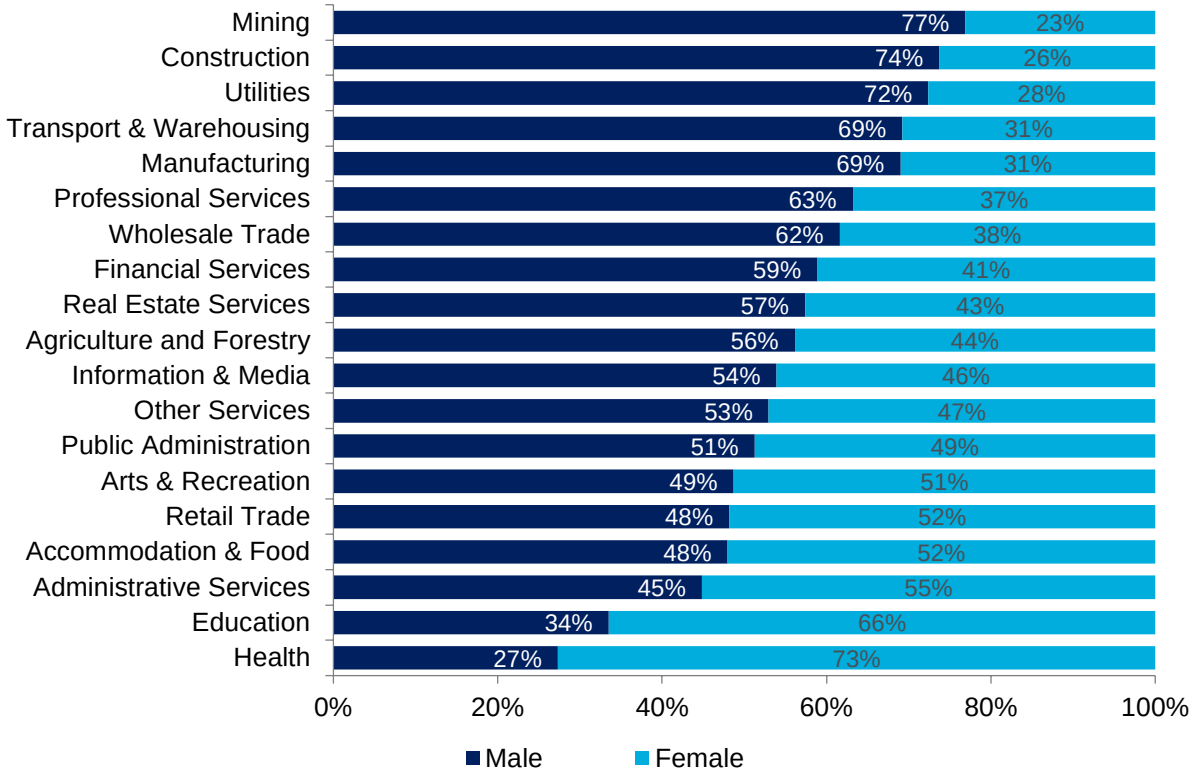
Source: Department of Education, Oxford Economics Australia

GENDER TRENDS IN THE DEMAND AND SUPPLY OF HIGHER EDUCATION

For industries that are dominated by a particular gender, looking to attract and retain the less dominant gender in that industry can be an effective method of filling gaps and reducing the overall mismatch within the Australian economy.

Education, construction and utilities are all industries in net shortage with significant skews towards one gender. These imbalances are an opportunity for industry and the labour market to address skills shortages.

Figure 5.9 Male and female share of higher educated employment by industry, 2021



Source: ABS, Oxford Economics Australia

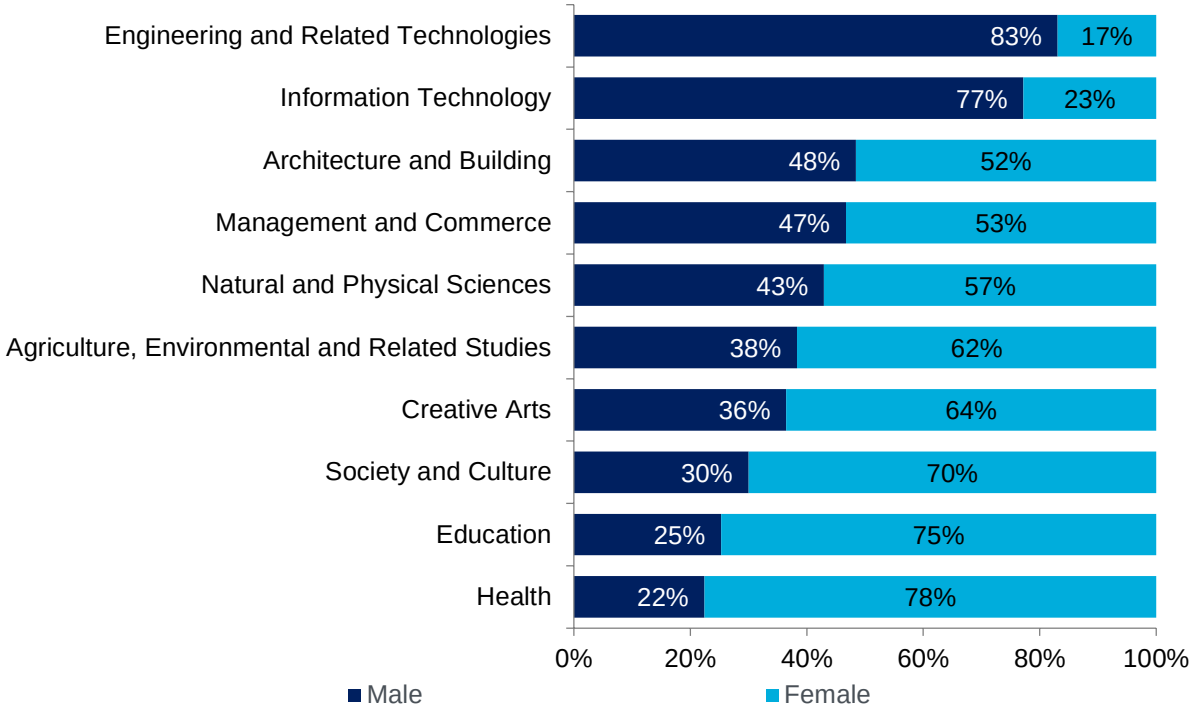
The education industry overwhelmingly employs women, has high rates of higher education and high future employment growth prospects (see Figure 3.4). If current gender imbalances in field of education completions are maintained over the next 30 years the skills shortages presented in preceding chapters could be further exacerbated and more challenging to solve.

Differences in enrolments by gender can also create imbalances in the labour market and exacerbate existing gaps.[18] Female completions have grown by an annual average 3.2% over the past decade compared to 2.4% per year for males. As of 2021, females represent approximately 59% of supply. This share is largest in the health field of education, where females represent 78% of completions. Conversely, the engineering field of education has the largest share of male completions.

Industries including construction, utilities and education all exhibit a significant gender skew with more than 65% of the workforce in these industries being of the same gender. In addition, all three industries are projected to have a net shortage of higher educated qualifications over the forecast period. Improving the attractiveness of these industries to a wider pool of labour may be a potential solution to alleviating net shortages in the future.

[18] For this analysis the share of male/female completions by each field of education and age cohort are held constant at pre-pandemic 2019 levels. Note this is applied following the main forecast exercise and so this assumption does not affect the aggregate supply results quoted in other chapters.

Figure 5.10 Supply of higher education graduates, by gender and field of education, average 2022 to 2052



Source: Department of Education, Oxford Economics Australia

6. SCENARIO ANALYSIS

Scenario analysis is designed to explore key uncertainties which may impact the supply and demand of higher education which differ from our baseline view of the future trends in higher education. They explore other possible pathways which could eventuate if we deviate from our baseline results in a plausible and not insignificant way.

The first scenario; a *Disruptive transition* looks at the impact a more energised global push to reach net zero emissions by 2050 and limit warming to 1.5 degrees would have on Australia's higher education supply and demand. Scenario two; a *Mobile workforce* comes about from a prolonged period of labour market tightness which motivates employers to switch en masse from hiring based on qualifications to skills- based hiring.

SCENARIO 1 – DISRUPTIVE TRANSITION

The *Disruptive transition* scenario is a pathway under which early policy action, technological advances and global coordination are adopted to limit warming to around 1.5 degrees by 2050. This contrasts with the baseline where global ambitions are not enough to limit warming to 1.5 degrees by the middle of the century.

Higher taxes including a government carbon tax on revenues are required under a more aggressive transformation policy, business profitability and household wealth are both impacted by the higher tax regime. High levels of investment and its benefits to productivity will soften the impact of increased taxes, and sustained inflation above the RBA's mid-point target of 2.5%.

The robust policy support and adoption of new green technology at the expense of traditional more carbon intensive alternatives cause significant inflationary pressure as key commodity markets struggle to transition to supplying the required inputs.

We assume achieving net zero emissions by 2050 solely by reducing fossil fuel demand may be unrealistic. We therefore assume a low-to-medium level availability of carbon capture technologies to make up the deficit.

A more rapid transition to net zero than we assume in our baseline will cause a greater degree of employment dislocation in the short term. Under this scenario some avenues of employment are rapidly scaled down, with others taking additional time to ramp up.

Demand for higher educated labour will fall marginally under the scenario because of the general decrease in employment within the economy compared to baseline employment levels. As the economy pivots towards being more sector oriented than under the baseline in the long run the labour market will demand an increased level of higher educated labour. The elevated levels of higher educated employment are only present across the last five years of the forecast period but will be sustained over a longer time horizon as the market for higher educated labour benefits from the opportunities presented by the net zero economy which is increasingly service oriented.

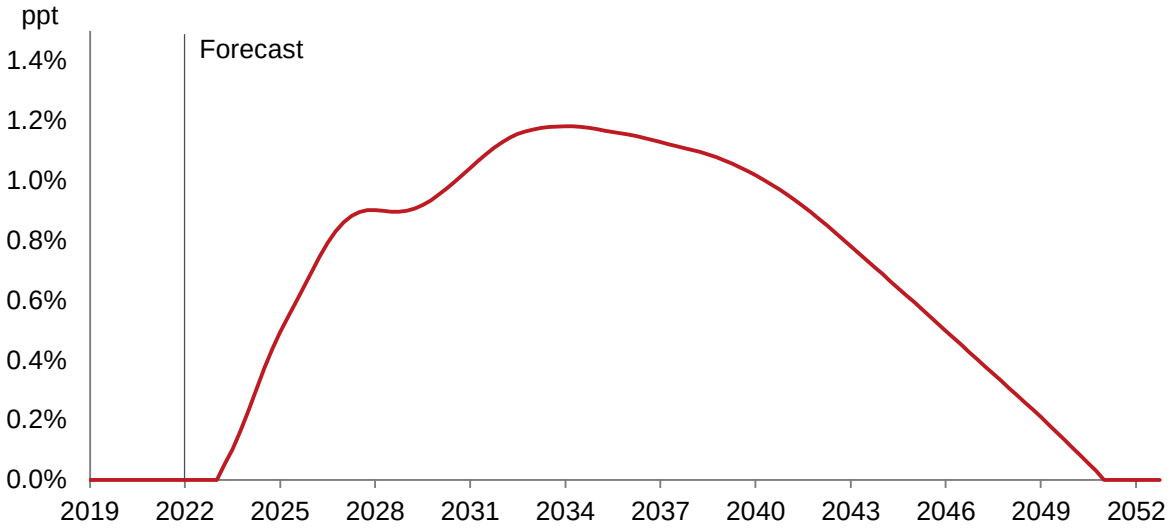
A higher rate of unemployment within the economy will promote an increase in the supply of higher educated labour as employees transitioning between industries require retraining, and as a result of the reduction in the opportunity cost of higher education in a softening labour market. These two forces will result in an increase in the completions of both bachelors, and postgraduate degrees with stronger growth in postgraduate completions resulting from the elevated unemployment rate.

6.1.1 Key scenario assumptions

Under the *Disruptive transition* scenario, the industrial makeup of those employed across Australia will be impacted with some industries increasing their total employment and their share of employment, although the two are not mutually exclusive.

The misalignment in employment opportunities from an accelerated net zero transition creates a divergence in total employment and unemployment compared to the baseline with the deficit being the most severe across the 2030's. Excess employment above the baseline is only realised by 2051, with unemployment rate reverting to our baseline after a sustained period of elevation.

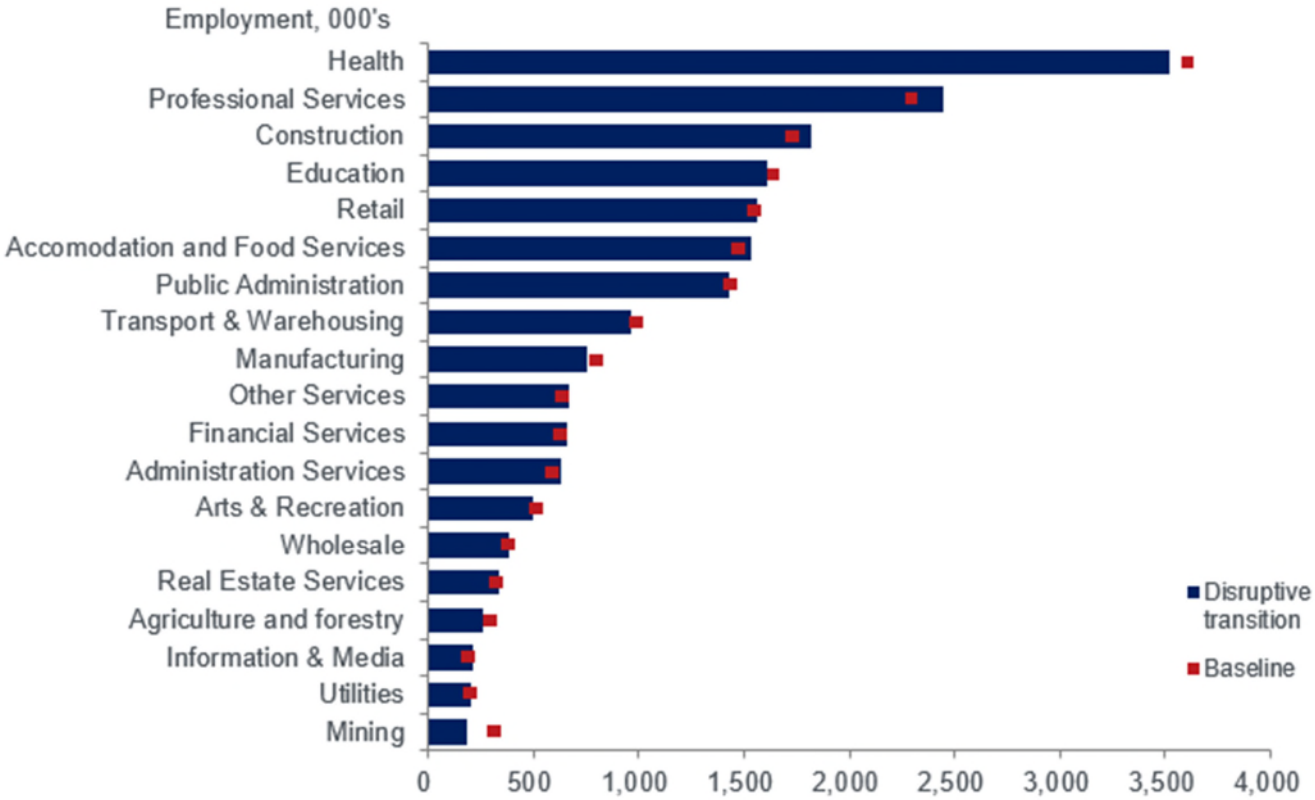
Figure 6.1 Deviation in unemployment rate to baseline, 2019 to 2052



Source: Oxford Economics Australia

Changes to the industrial employment mix compared to our baseline will result in changes to the demand for higher educated labour. We assume the demand for higher education within industries remains consistent with our baseline. Additionally, we assume that the occupational mix within an industry remains consistent and as such changes in higher education demand will be driven by industry employment levels.

Figure 6.2 Industry employment, *Disruptive transition* vs. baseline, 2052



Source: Oxford Economics Australia

The mining industry will undergo a considerable transformation with gross value added of Australian fuel exports significantly impacted due to the global co-ordinated nature of the transition. Non-fuel exports are expected to be the beneficiaries of the global demand for commodities required to transition. The increase in non-fuel exports is not enough to completely offset the decrease in commodity exports resulting in lower employment within the mining industry.

Agriculture, manufacturing, and utilities are likewise all adversely impacted but, to a lesser degree than mining. Gross values added of professional services will exceed the baseline across the entire forecast period, while construction will benefit from the transition beyond the short term, however there will be a lag as investment enters the economy to aid the transition where employment in the construction industry will be below baseline in the short term.

Despite the economy becoming increasingly service oriented employment will still come under pressure in some service industries due to the more challenging economic conditions which result from a more rapid transition to a low carbon economy. Employment in both health and education industries decrease as a result of the impacts to private consumption, with employment still below baseline levels by 2052. These two industries are less cyclical compared to other service industries which rely more heavily on discretionary consumption and investor confidence and therefore employment is not as quick to rebound despite GDP catching up to baseline by 2052.

By 2035 the share of employment within the mining sector will only be 1.5% compared to 1.9% in the baseline scenario, with employment in health down from 16.0% to 15.5%.[19] Industries which substantially increase their share of employment are professional, scientific, and technical services up from 10.6% to 11.1% as services make up an increasing share of the economy. The construction sector will likewise play a more pronounced role in a faster transition to net zero with its share of employment rising from 9.4% to 9.7%. Beyond 2035 the changes to the shares of employment within the economy have mostly stabilised with the exception being mining which continues its decline from 1.6% to 0.9% by 2050.

Changes to our industry employment mix will prompt elevated instances of retraining compared to baseline. The mismatch in qualifications held and demanded by the labour market will increase under the *Disruptive transition* as industry employment trends shift more rapidly to meet the requirements of limiting warming to 1.5 degrees. These changes in the industry employment mix will result in a higher level of job mobility as the uneven impact of the transition induces increased movements out of some industries and into others, prompting increased demand for higher education in the fields of education which align with the growth industries in a more rapidly transitioning economy.

A softer labour market will reduce the opportunity cost of higher education. Based on research by Long (2014) we assume that a 1 ppt change in the unemployment rate leads to a 2% increase in university commencements.[20] The change in the unemployment rate includes the change from the prior period less any change which would have occurred in our baseline assumption to remove cyclical changes in commencements included in the baseline assumptions. Alongside an increase in commencements, student preferences will be altered by the weaker economic conditions which they find themselves in resulting in a flight to safety. Research conducted by Blom et al. (2020) demonstrated that in previous periods of heightened unemployment a greater share of commencements converged around degrees which offer better employment prospects and higher average wages.[21] Trends in completion rates are consistent with the baseline assumptions.

6.1.2 Results

Under the *Disruptive transition* scenario by 2052 gross demand will be elevated above baseline levels resulting in a larger deficit of higher education when relying only on our domestic supply of higher educated labour. The increase in gross demand feeds through net demand with our net surplus of higher educated labour reducing. Changes to supply are the most modest by the end of the forecast period with the convergence of the unemployment rate in our scenario and baseline reducing commencements back to baseline levels. Supply remains marginally elevated in 2052 as a result of the lagged effect of the elevated unemployment rate still flowing through to completions.

[19] The lower share of employment for the health industry is driven by both a lower level of employment compared to baseline (a relatively small 3.3% lower by 2052 compared to the 26.1% lower level of employment in mining) as well as relatively higher shares of other industries which reduce the health industry's total share of the labour market.

[20] Long, B. (2014). The Financial Crisis and College Enrolment: How Have Students and Their Families Responded? *University of Chicago Press,* 209-233.

[21] Blom, E., Cadena, B., & Keys, B. (2020). Investment over the Business Cycle: Insights from College Major Choice. *Journal of Labour Economics, 39*(4), 1043-1082.

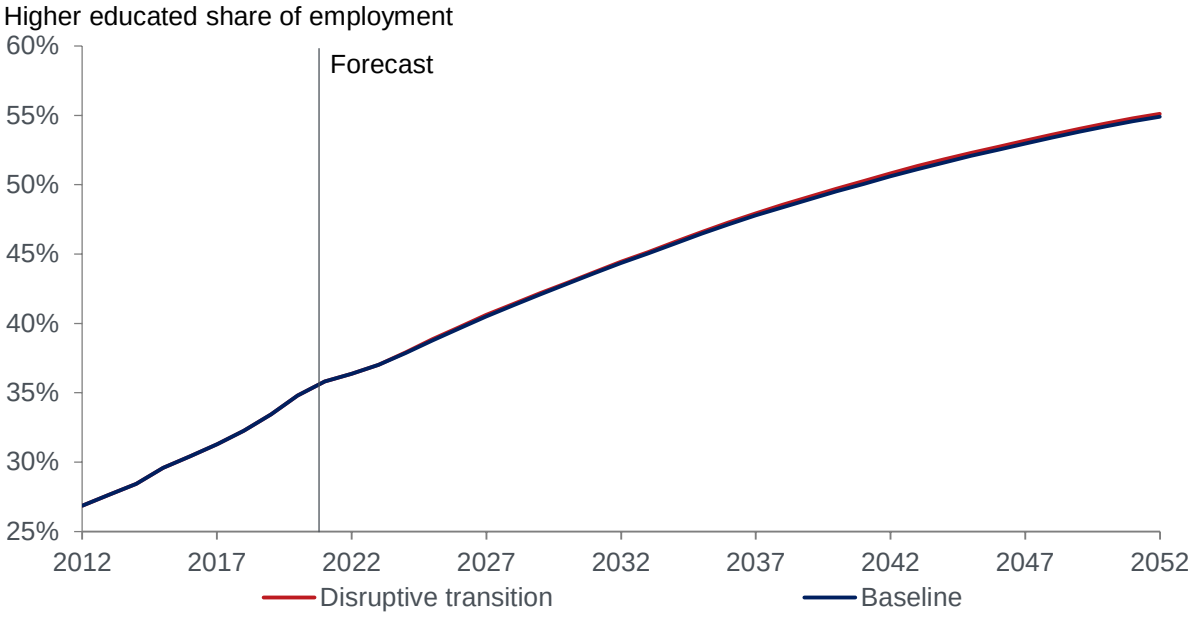
Figure 6.3 Key results under the *Disruptive Transition* scenario and baseline analysis, 2052

2052	Baseline	Sensitivity
Qualification Demand		
Gross	778,000	803, 000
Higher educated arrivals	431,000	434, 000
Net	346,000	369, 000
Qualification Supply		
Supply	464, 000	466,000
Gap		
Gross projected gap (excl. arrivals)	-314, 000	-337, 000
Net projected gap (incl. arrivals)	118,000	97, 000

Source: Department of Education, Oxford Economics Australia

The share of employment which is higher educated will grow at a modest incremental rate compared to the baseline scenario rising from 54.9% to 55.1% by 2052. This slight increase is driven by the fact that in the years that total employment falls below baseline, the share of this fall which is higher educated is less than the actual share of higher educated labour employed.

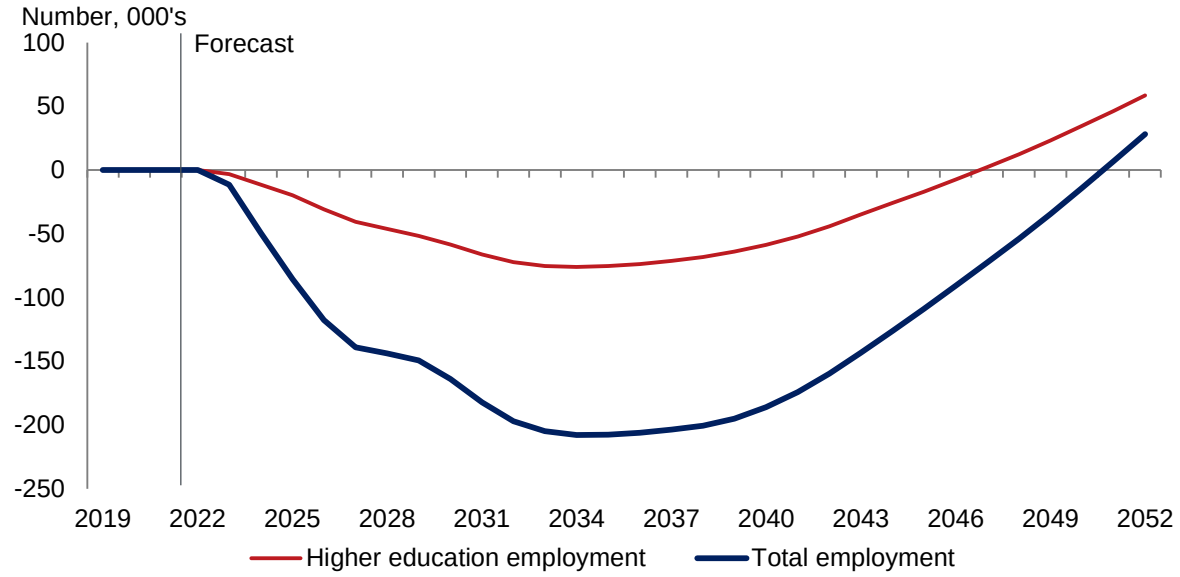
Figure 6.4 Higher educated share of employment under the Disruptive Transition scenario and baseline analysis, 2012 to 2052



Source: Oxford Economics Australia, ABS

On average total employment declines by 117,000 over the forecast period, while higher educated employment declines by an average of 28,000 representing only 24% of the decline in employment. This is despite the share of higher educated labour already representing 36% of employment in 2022 and reaching 55.1% by 2052. The mining and health industries make up the majority of the decline in higher educated employment, with an average of 60,000 and 59,000 fewer roles respectively. Conversely professional services offsets some of this decline with an average of 59,000 higher educated roles over the forecast period.

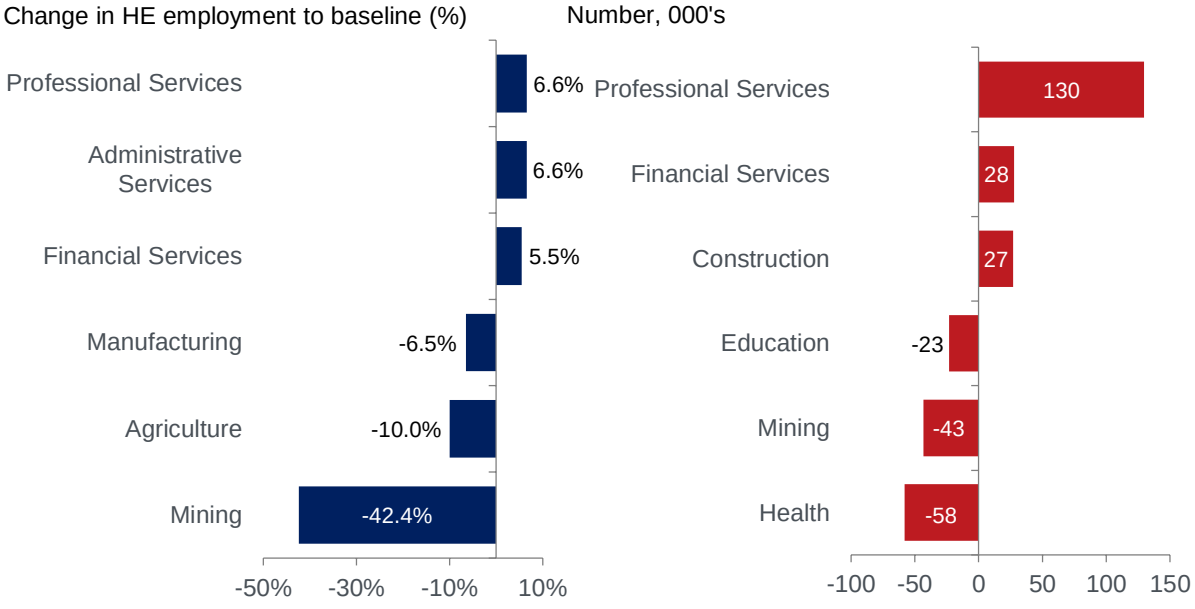
Figure 6.5 Deviation in employment from baseline, 2019 to 2052



Source: ABS, Oxford Economics Australia

Initially demand for higher education will be slightly depressed compared to baseline levels for the first half of the forecast period bottoming out in 2034 with the labour market demanding 76,000 fewer higher educated roles. This trend reverts throughout the second half of the forecast period with the labour market demanding additional 59,000 higher educated roles by 2052.Total employment will experience a similar trend with 207,000 less roles demanded by the labour market in 2034 compared to baseline. However, it will take an additional four years for total employment to rise above employment levels in the baseline compared to higher educated employment which crosses this threshold in 2047.

Figure 6.6 Deviation in industry demand for higher education qualifications by 2052, *Disruptive Transition* compared to baseline



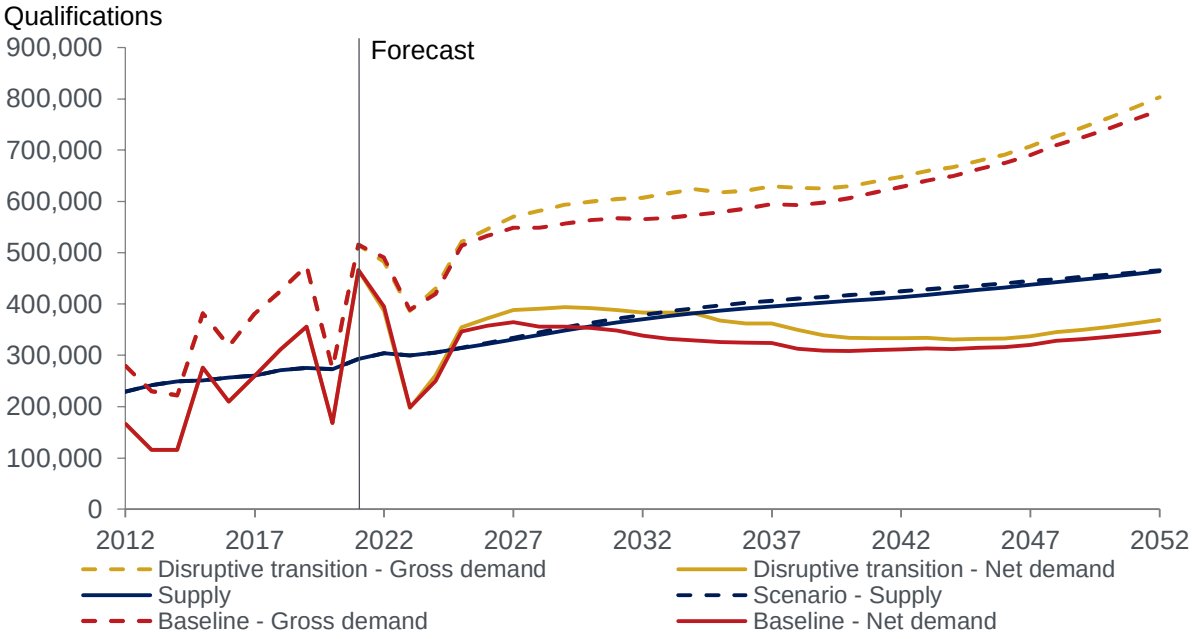
Source: ABS, Oxford Economics Australia

Growth in higher education demanded by the labour market will primarily be driven by professional services, with the financial services and construction industries also playing a role. Declines in demand for higher education in levels will be led by health, mining, and education. It should be noted however that the high-level declines in education and health are partially a result of the large industry share which they occupy. When looking at declines in demand for higher education within industries mining, agriculture and manufacturing will experience the greatest percentage declines in higher education within industry compared to baseline.

The increase in demand for higher educated labour in professional services and construction will further aggravate the projected net gap in higher education for these industries and will reduce the net surplus of qualifications in financial and administrative services as shown in figure 5.8. The decline in demand for higher educated qualifications would help alleviate the net projected gap in qualifications in manufacturing and education, while increasing the surplus of qualifications in the mining, health, and agriculture industries.

Gross demand for higher education qualifications will be larger by 2052 rising to 803,000, up 25,000 from our baseline scenario. The increase in the gross demand for qualifications increases the deficit of qualifications compared to supply which is only up by 1,000 qualifications. Growth in gross demand flows through to net demand for qualifications with the surplus of higher educated qualifications having shrunk by 20,000 to 98,000 qualifications.

Figure 6.7 Gross demand, supply & net demand under the *Disruptive Transition* scenario and baseline analysis, 2012 to 2052



Deviation in gross demand baseline vs. disruptive transition			
2022-2032	2032-2042	2042-2052	2022-2052
21,000	**34,000**	**19,000**	**24,000**

Source: Department of Education, ABS, Oxford Economics Australia

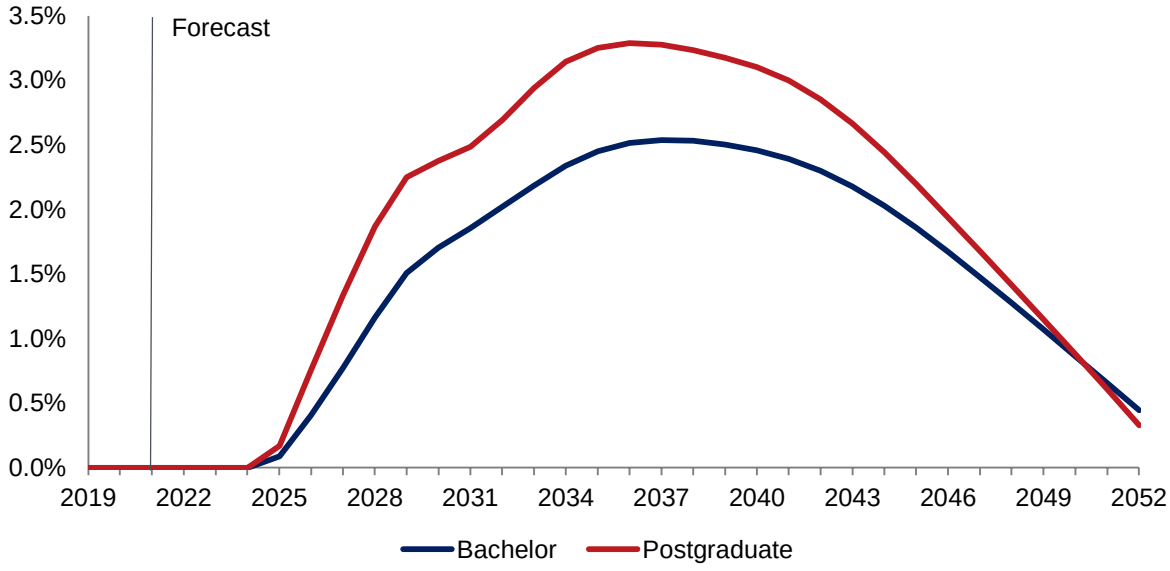
Gross demand for higher education will be raised compared to baseline levels, with the greatest deviation between the *Disruptive transition* and scenario coming in the middle decade of the forecast period. The primary drivers of the deviation in demand for higher educated qualification are the decline in employment, however this decline in employment is offset by the demand for additional qualifications which comes because of the rapid change in the industry employment mix. The increase in the divergence of industry employment levels from baseline will prompt more instances of

retraining due to mismatches in the FOE a worker possesses and what is demanded by the market. Instances of retraining will average 42,000 compared to 20,000 under our baseline scenario with the deviation in instances of retraining demanded by the labour market peaking in 2032 at 52,000.

The gap between net and gross demand is relatively stable compared to baseline. The gap between the two grows marginally by an average of 1,000 qualifications over the forecast period. The widening of this gap is a result of the increase in commencements of higher education amongst the wider Australian population. Australian citizens who have been abroad and are returning home are assumed to have the same proportion of higher educated persons among them as the general population. A greater share of arrivals entering the country with higher educations will result in the gap between net and gross demand widening.

The deviation between the unemployment rate under the *Disruptive transition* scenario compared to baseline results in elevated commencements. The increase in commencements tracks the increase in the deviation of the unemployment rate from baseline peaking in 2034 at 1.2% above baseline resulting in an additional 24,000 commencements. Completions are in turn elevated with a lag as students flow through the higher education system with additional completions peaking at 11,000 in 2038.

Figure 6.8 Deviation in completions, Disruptive transition compared to baseline, bachelor vs. postgraduate, 2019 to 2052

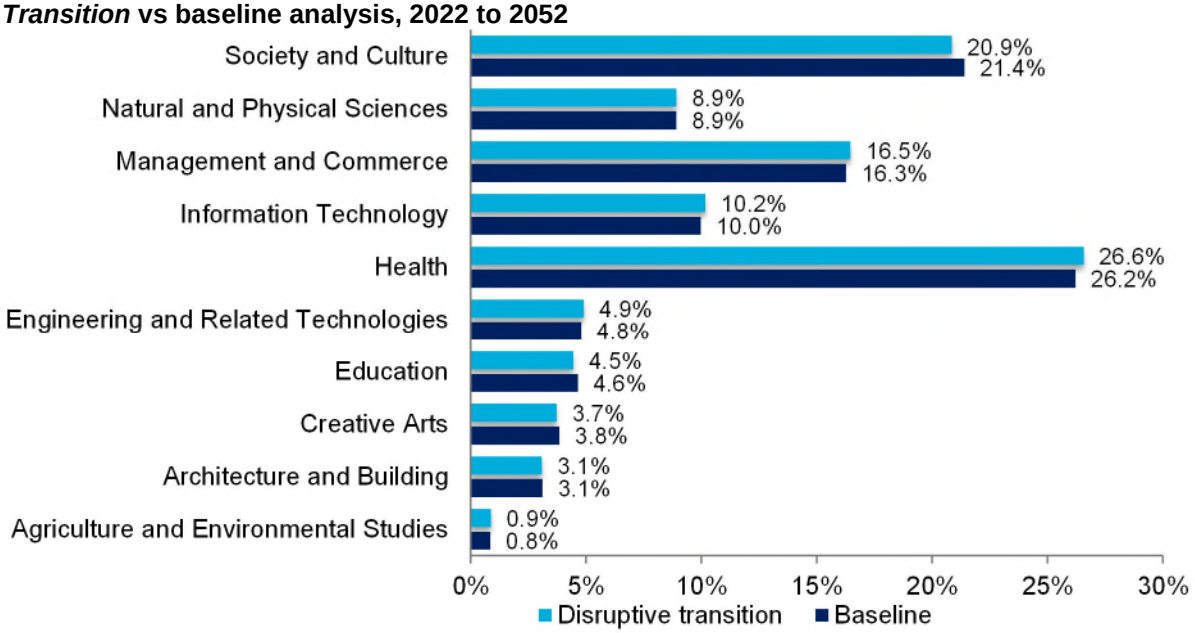


Source: Department of Education, Oxford Economics Australia

Postgraduate completions increase more substantially than their peers who are studying a bachelor's degree. The interaction of postgraduate and bachelor commencements with the unemployment rate does not differentiate. Instead, the superior increase in completions of postgraduates comes from their higher completion rates which allows for a greater share of the increasing commencements to translate into completions boosting the supply of qualifications. An additional 4,000 postgraduate completions occur each year across the forecast period compared to the baseline with growth in completions peaking at 3.3% above baseline in 2036, compared to only 3,000 additional bachelors peaking at 2.5% in 2037. Differences in the peaks in completions are the result of the difference in the time required to complete degrees, postgraduate degrees have a smaller lag from commencements due to the smaller full-time equivalent workload required.

FOE shares are impacted in the *Disruptive transition* scenario with weaker economic conditions prompting a flight to degrees which are considered safer due to superior average wages and employment prospects.

Figure 6.9 Average deviation in share of commencements by field of education, *Disruptive Transition* vs baseline analysis, 2022 to 2052

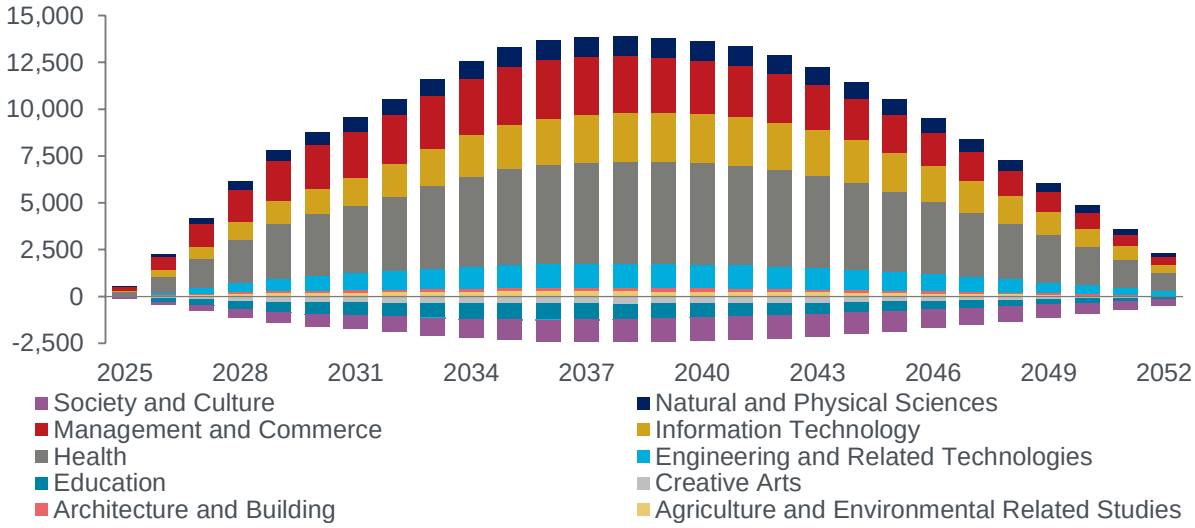


Source: Department of Education, Oxford Economics Australia

The change in the share of commencements by FOE is likewise tied to the unemployment rate with these shares fluctuating depending on the deviation of the unemployment rate from baseline. FOEs including Society and culture, education, and creative arts experience a reduction in their share of commencements, with degrees including health, management and commerce, IT and engineering increasing their share of commencements on average across the forecast period.

Deviations in the unemployment rate will drive commencements higher, while at the same time changing the FOE share. The interaction between these two effects has the largest positive impact on average commencements in health (5,000) and management and commerce (5,000). For both education (-1,000) and society and culture (-1,000) the general increase in commencements is more than offset by the reduction in the share of commencements which flow to their FOE.

Figure 6.10 Deviation in completions by field of education, *Disruptive Transition* vs. baseline analysis, 2025 to 2052



Source: Department of Education, Oxford Economics Australia

The conversion of elevated commencement to completions does not play out evenly across all FOEs due to differing initial completion rates, and their subsequent trends across the forecast period. This result in elevated completions for health with 3,000 additional completions compared to 2,000 for management and commerce despite the two FOEs having an approximately equivalent average increases in commencements across the forecast period. Education (-500) and society and culture (-800) have the largest average annual decrease in completions compared to baseline, as a result of the changes to their FOE share.

SCENARIO 2 – MOBILE WORKFORCE

Under the *Mobile Workforce* scenario, a healthy economic outlook supports continued strong labour market conditions. Strong employment growth and labour market tightness creates difficult hiring conditions for employers. As employers begin to find it difficult to fill higher educated roles, there is a short-term slowdown in higher education employment growth. This prompts employers to shift toward hiring on the basis of skills rather than formal qualifications.

Skills based hiring refers to a move from employers away from formal qualifications towards hiring on the basis of demonstrated skills. This could be for more generalised skills (such as soft skills, marketing) or more specialised skills that are developed on the job (such as coding). This is prompted by the employers looking to widen their labour pool. This generally reduces the barrier to mobility across sectors as the labour force can move in and out of job sectors without formal retraining.

Individuals continue to preference higher education qualifications early in their career given the income and employment benefits relative to other avenues of training. However, given the lower barriers of movement, individuals become more mobile throughout their career and reskilling is increasingly supported by short courses and employer-led training initiatives rather than formal higher education qualifications. The increased job movement and reskilling doesn't necessarily lead to increased demand for higher education.

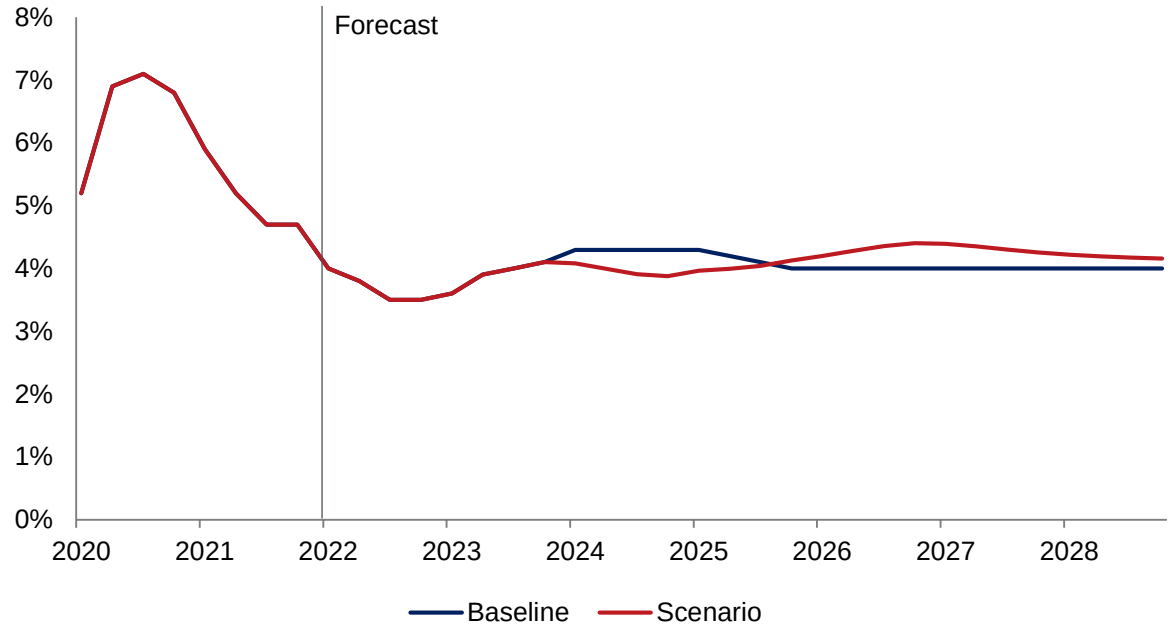
The tight labour market conditions support strong employment and wage growth. This, alongside the more skill-based hiring practices makes Australia a more attractive location to employees. In response, more overseas skilled migrants are attracted to the country. This lifts NOM and further feeds the economic cycle.

6.1.3 Key input assumptions

Under the *Mobile Workforce* scenario, the labour market demand for higher education decreases as employers shift to skills-based hiring and away from hiring based on formal higher education qualifications. The higher educated share of total employment demanded by the labour market decreases, returning to 2011 levels by 2052 across all industry occupation pairs. By 2052, the higher educated share of total employment demanded by the labour market is 22 percentage points below baseline. Across industries, those industries that have experienced the greatest growth over the past decade see the largest reversion, taking 2011 as a benchmark for all industry occupation pairs. The reversion to 2011 higher educated shares of employment occurs gradually over the forecast period.

Continued employment growth and strong labour market conditions results in the unemployment rate remaining near record lows for longer than anticipated. We use estimates of the impact of changes in GDP per capita and the unemployment rate derived by Lewis & Swannell (2018) to infer the increase to inbound migration.[22]

Figure 6.11 Unemployment rate under the Mobile Workforce scenario and baseline analysis, 2020 to 2028

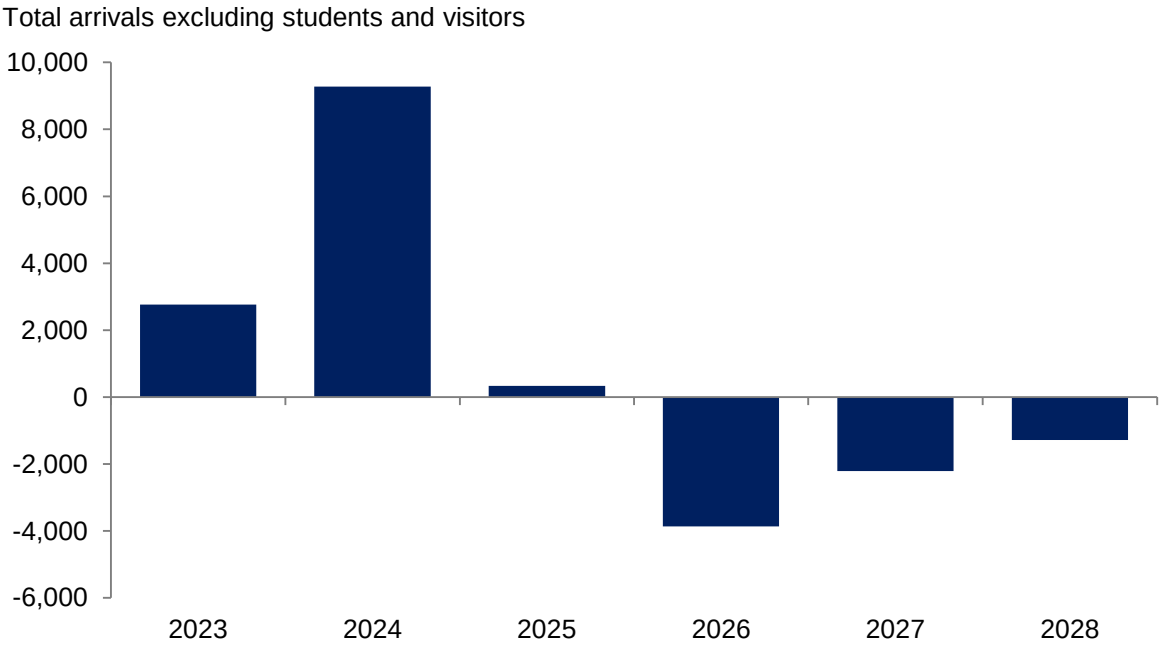


Source: Oxford Economics Australia

A cumulative 9,000 additional migrants arrive in Australia in 2023 and 2024 while the unemployment rate remains below baseline. As the unemployment rate overshoots baseline from 2025, Over this period a cumulative 13,000 fewer migrants arrive in Australia. Beyond 2027, the unemployment rate cycle overshoots baseline, peaking at 4.5% in 2027 before reverting back towards baseline. The unemployment rate returns to baseline in 2029 and remains there over the remainder of the forecast period.

[22] Lewis, J., & Swannell, M. (2018). *The macroeconomic determinants of migration*. Bank of England.

Figure 6.12 Cumulative change under the Mobile Workforce Scenario from baseline analysis in total arrivals excluding students and visitors, 2023 to 2028



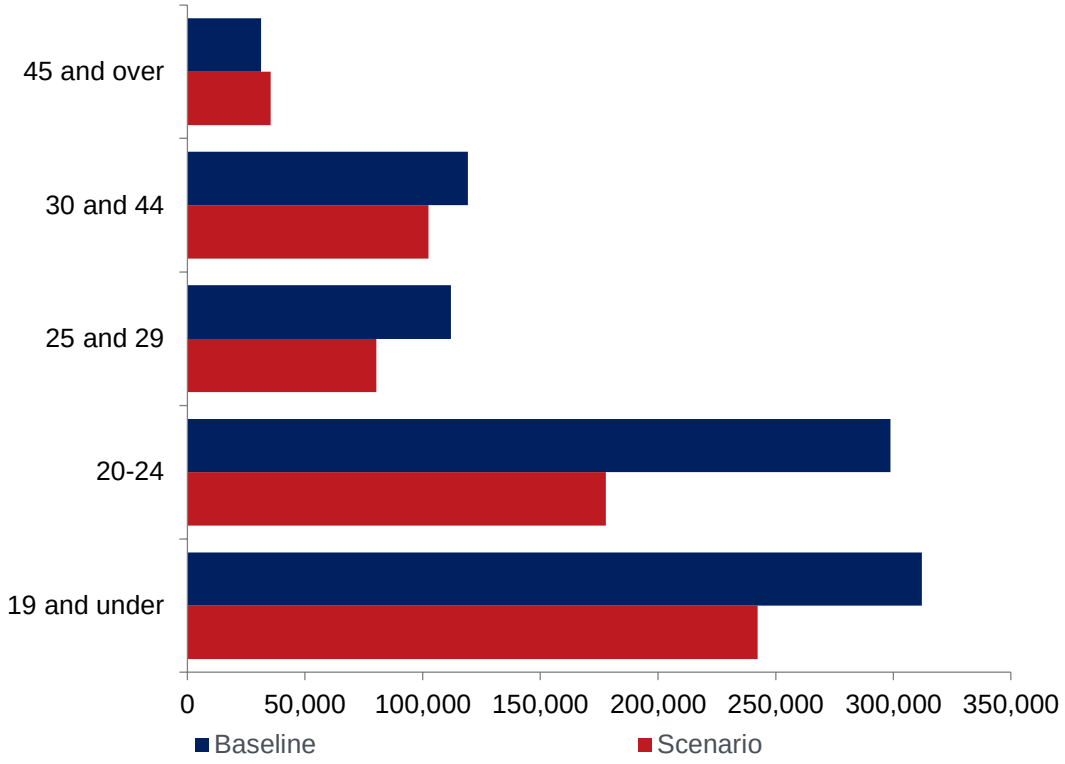
Source: Oxford Economics Australia

As individuals respond to the change in hiring practices, there is a significant reduction in higher education commencements. As higher education is still viewed as a beneficial form of training for those early in their career given the historical income and employment effects, commencement rates are less impacted for undergraduate qualifications compared to postgraduate.

Undergraduate commencement rates are fixed at a constant share of population equal to that in 2021 for all age cohorts and fields of educated. Postgraduate commencement rates revert to the 2011 share of population by 2031 for each age cohort and field of education and remain at this rate over the remainder of the forecast period.[23] Completion rates remain unchanged across all age cohorts and fields of education.

[23] Postgraduate commencements for people aged 45 and over have declined between 2011 and 2021 and only increased marginally for 30-44 year olds. Under this scenario we assume reversion to 2011 rates which results in a slight increase compared to baseline for those aged 45 and over and a relatively small decrease for 30-44 year olds. The majority of the impact is felt for 20-24 year olds where there has been significant increase in postgraduate degree commencements over the past 10 years which is reversed under this scenario.

Figure 6.13 Number of higher education commencements by age cohort under the Mobile Workforce scenario and baseline, average 2022 to 2052

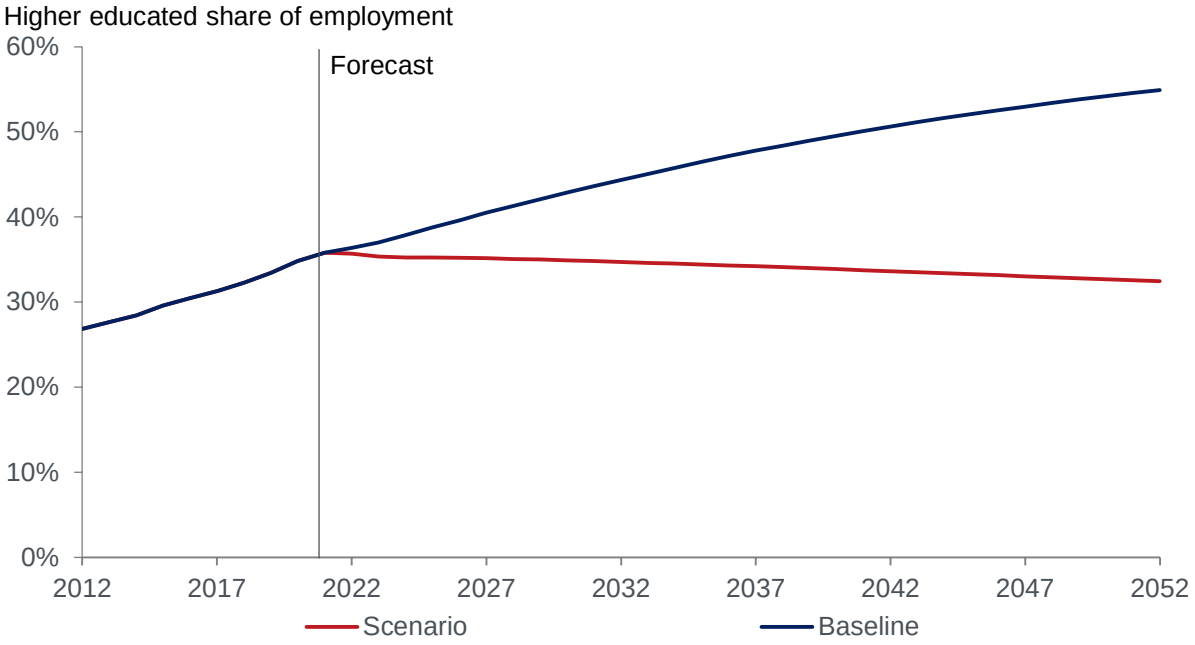


Source: Department of Education, Oxford Economics Australia

6.1.4 Results

Under the *Mobile Workforce* scenario, the higher educated share of employment is forecast to decrease from 36% as of 2022 to 32% by 2052, 22.5 percentage points below the baseline analysis proportion. The shift in labour market hiring practices away from higher education qualifications and towards skills-based hiring significantly impacts gross demand.

Figure 6.14 Higher educated share of employment under the Mobile Workforce scenario and baseline analysis, 2012 to 2052

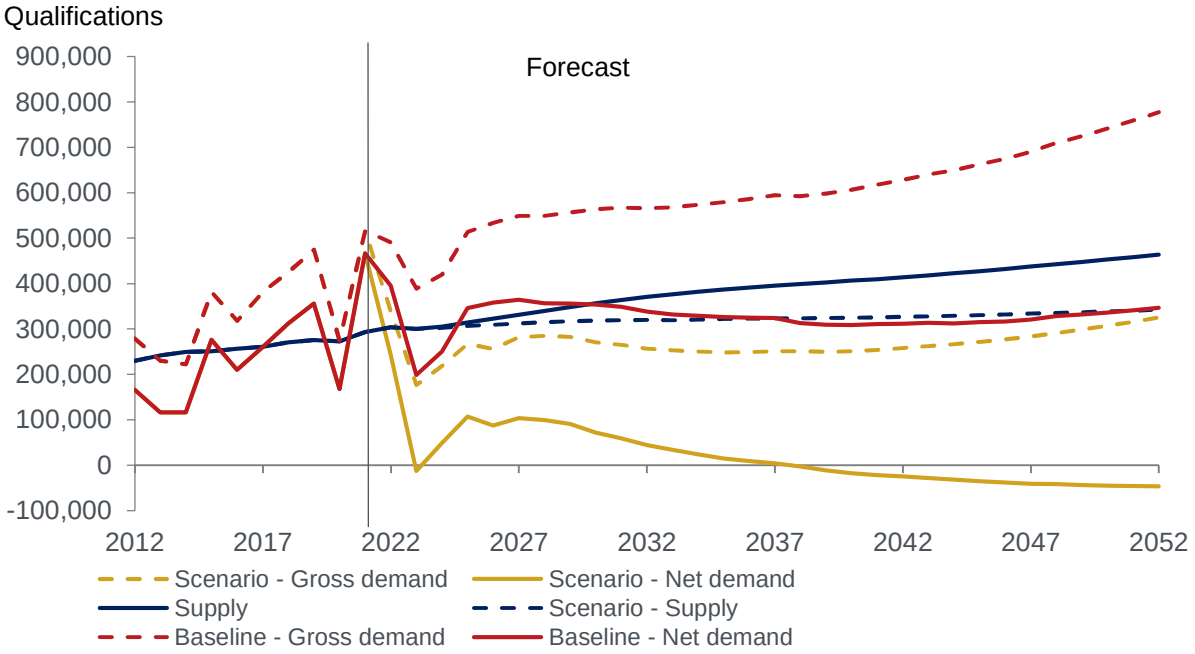


Source: ABS, Oxford Economics Australia

Whilst there is also a reduction in supply as individuals' preferences for higher education decrease in response to the new labour market landscape, this response is not as large in magnitude as the demand impact. As a result, under the *Mobile Workforce* scenario, domestic completions are sufficient to fulfil labour market demand for additional qualifications at an aggregate level without the need for skilled migration to plug the holes as was the role of migration historically. Since domestic completions is already sufficient to fulfil gross demand, the continuation of current trends in higher educated migration simply add to the projected surplus of qualifications resulting in a significantly larger net projected than under baseline analysis. At an industry level, the impacts of this scenario are expected to be relatively uniform as the change in hiring practices towards skills-based hiring is not forecast to be industry specific.[24]

[24] This scenario does not model job specific requirements for higher education degrees with the analysis focused at the 1-digit industry and 2-digit occupation level. There are many jobs that will continue to require higher education degrees, but these are not explicitly modelled as part of the scenario.

Figure 6.15 Gross demand, supply & net demand under the *Mobile Workforce* scenario and baseline analysis, 2012 to 2052

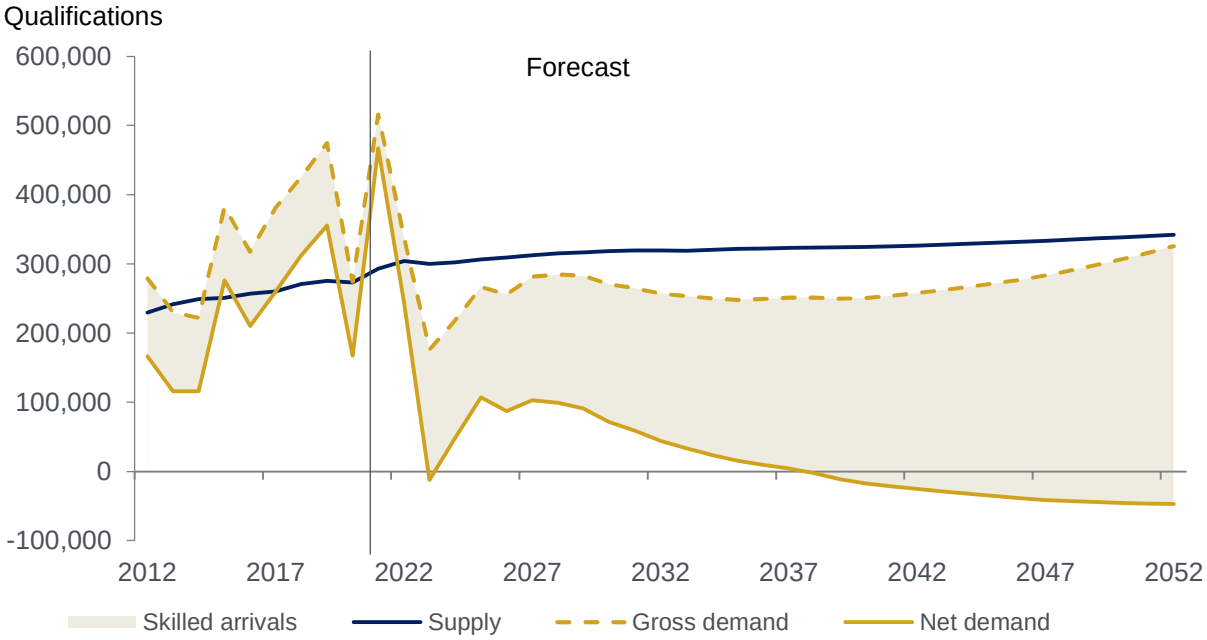


Source: Department of Education ABS, Oxford Economics Australia

A rapid fall in gross demand under the *Mobile Workforce* scenario compared to baseline results in a gross surplus of higher education which averages 55,000 qualifications across the forecast period. The gross surplus is primarily driven by the skill shallowing which is taking place across the economy as demand for qualification at an industry occupation pair level regresses to 2011 levels. The deterioration in the supply of higher educated labour is much less sudden and takes longer to play out before stabilising. This is driven by two factors, the first being that a lag exists between commencements and completions resulting in the decoupling of baseline and scenario supply only occurring as changes in commencements begin to flow through to completions. The second factor is that under this scenario the changes in supply are not as extreme as demand. The share of each industry occupation pair which is higher educated regresses to 2011 levels resulting in skill shallowing contrasting against the skill deepening of the baseline scenario. While on the supply side we hold commencements of bachelors at 2021 levels, and only regress postgraduate commencements to 2011 levels resulting in smoother profile moving away from baseline supply.

By 2052 gross demand is approaching supply as employment growth and trends in the industry employment mix shifts more heavily towards industry occupation pairs with larger shares of higher education. At the same time this is occurring changes to commencement rates on the supply side have played out across the first decade of the forecast period, causing the gross surplus of higher educated qualifications to begin shrinking across the second half of the forecast period reducing to a gap of only 17,000 qualifications by 2052.

Figure 6.16 Gross demand, supply, skilled arrivals & net demand under the *Mobile Workforce* scenario, 2012 to 2052



Source: Department of Education ABS, Oxford Economics Australia

Figure 6.17 Key results under the *Mobile Workforce* scenario and baseline analysis, 2052

2052	Baseline	Sensitivity
Higher educated share of employment	55%	32%
Qualification Demand		
Gross	778,000	326,000
Higher educated arrivals	431,000	372,000
Net	346,000	-47,000
Qualification Supply		
Supply	464,000	342,000
Gap		
Gross projected gap (excl. arrivals)	-314,000	17,000
Net projected gap (incl. arrivals)	118,000	389,000

Source: Department of Education ABS, Oxford Economics Australia

Under the *Mobile Workforce* scenario, gross demand is expected to average 268,000 per annum from 2022 to 2052, compared to an average of 602,000 p.a. under the baseline analysis. Whilst employment growth, retirement and deaths continue to contribute to labour market demand, the impact of skills deepening reverses to create skills shallowing. Under these conditions, for each newly created job, the labour market demands a smaller proportion to be higher educated. This means that despite the total number of employed persons increasing, each additional job created as the economy grows is less and less likely to be a higher educated role moving forward. The impact of this skills shallowing is compounded as it is a reversal of the trends expected under the baseline scenario.

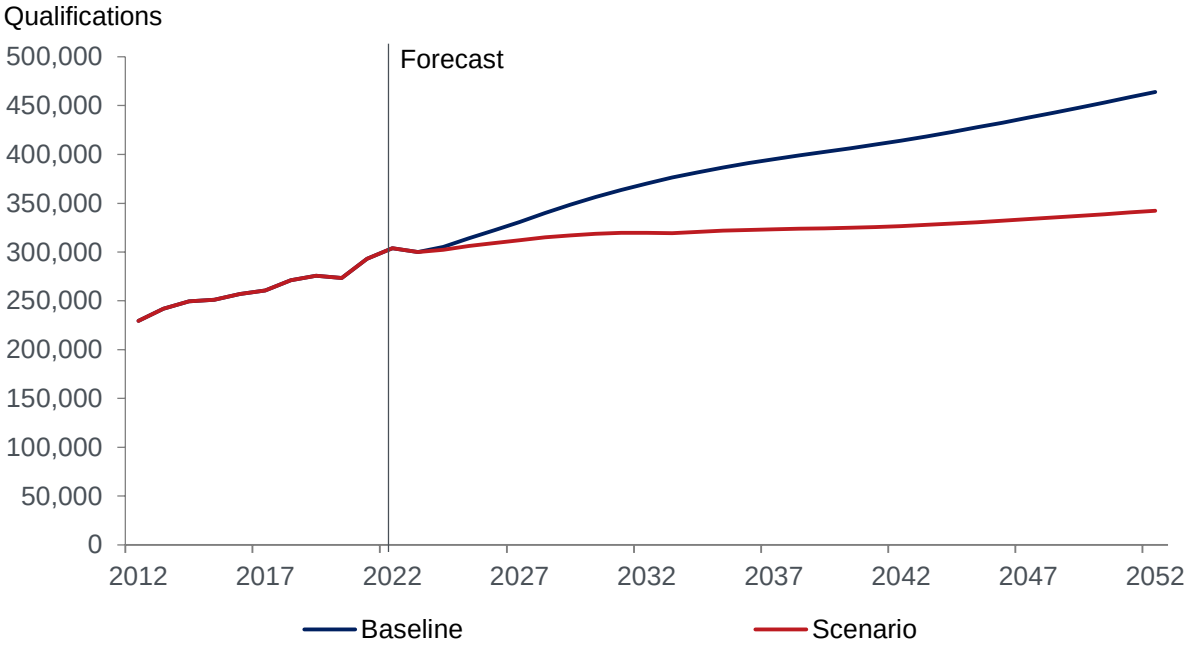
Additionally, a decreasing proportion of reskilling and upskilling is demanded to occur in the form of a higher education qualification by the labour market, reducing the contribution of demand for postgraduate degrees moving forward. Overall, gross demand is expected to reach 326,000 by 2052, less than half that forecast under the baseline scenario.

Figure 6.18 Gross demand under the *Mobile Workforce* scenario and baseline analysis, 2012 to 2052

Source: ABS, Oxford Economics Australia

Individuals are expected to respond to the new labour market characteristics by valuing higher education less. This results in a reduction in commencements compared to baseline, flowing through to similarly reduced completions. Total supply is forecast to stall, growing at an average of only 0.4% p.a. over the forecast period to reach 342,000 by 2052, compared to 464,000 under the baseline analysis.

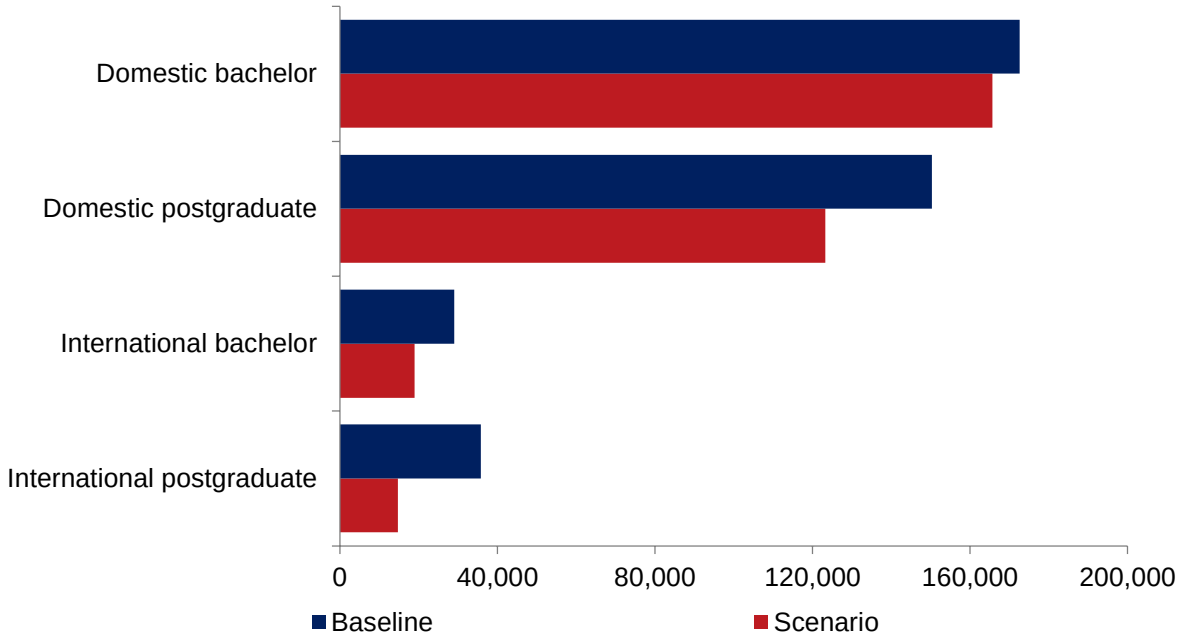
Figure 6.19 Domestic supply under the *Mobile Workforce* scenario and baseline analysis, 2012 to 2052



Source: Department of Education, Oxford Economics Australia

Supply is expected to decrease across both bachelors and postgraduates for domestic and international students. However, postgraduate supply is expected to be hit harder as reskilling later in a career is more likely to take the shape of short courses of employer led internal initiatives. Domestic postgraduate completions are expected to average 123,000 from 2022 to 2053, compared to 150,000 under baseline analysis, the largest decrease of the supply segments.

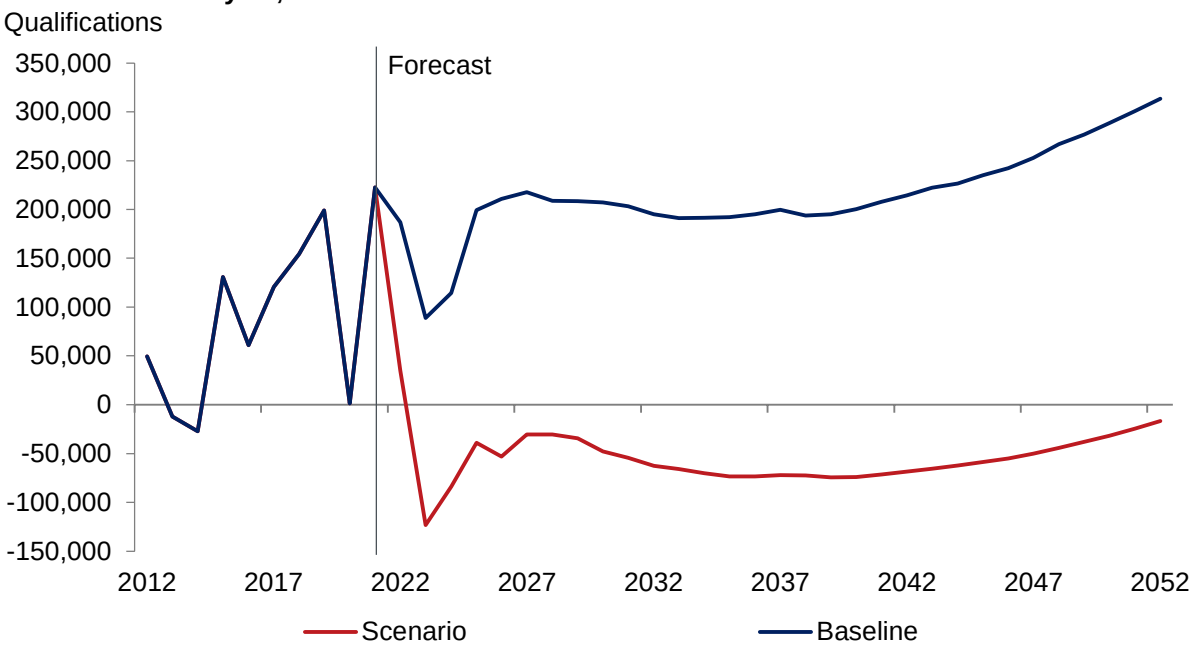
Figure 6.20 Domestic supply under the *Mobile Workforce* scenario and baseline analysis by type, average from 2022 to 2052



Source: Department of Education, Oxford Economics Australia

On balance, the expected decrease in gross demand is significantly larger than the decrease in domestic supply. As a result, under the *Mobile Workforce* scenario, domestic completions are able to fulfil labour market demand for additional qualifications without the need for skilled migration. A gross projected surplus is expected under this scenario across the entire forecast period averaging 55,000 p.a. compared to a forecast gross projected deficit of 215,000 under baseline analysis.

Figure 6.21 Gross projected gap in higher education qualifications under the *Mobile Workforce* and baseline analysis, 2012 to 2052

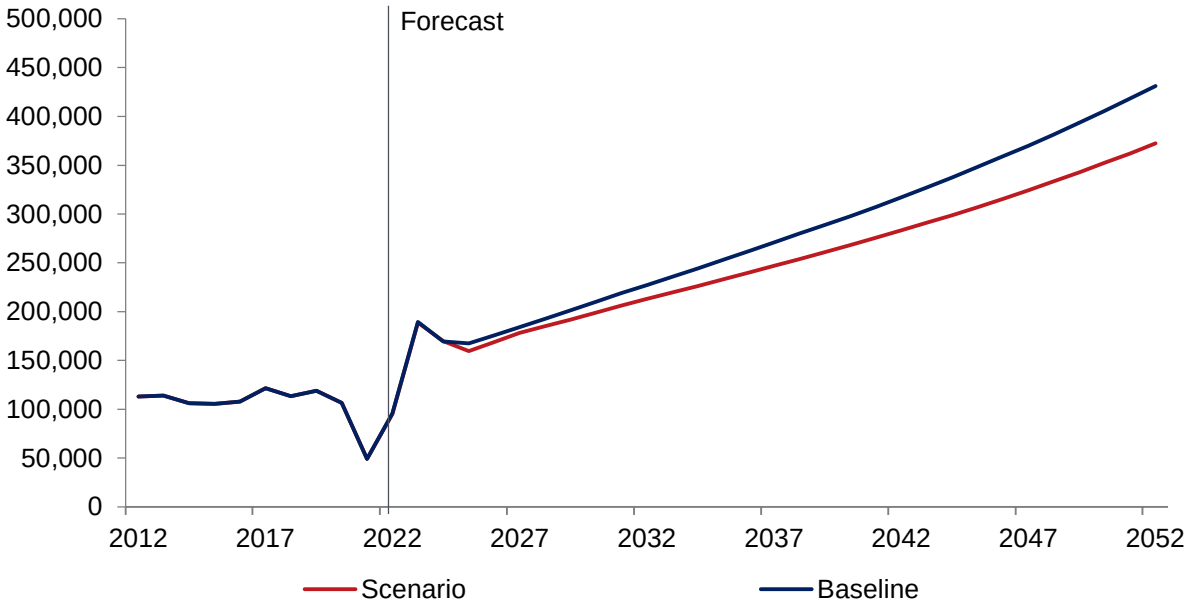


Source: Department of Education, ABS, Oxford Economics Australia

Assuming the continuation of current migration trends, overall higher educated arrivals continue to increase over the forecast horizon, although at a slower rate than under baseline. Citizen arrivals, which represents approximately 40% of total arrivals excluding students and visitors, are expected to experience the same skills shallowing as the wider Australian labour market. As the share of the Australian labour market that is higher educated decreases, the proportion of citizen arrivals that are higher educated is also expected to reduce, contributing less to total skilled migration. This results in a marginal reduction in total higher educated arrivals. The proportion of total non-citizen arrivals excluding students and visitors does not experience the same decrease relative to baseline it is assumed that higher education trends on a global scale remain the same as under baseline.

Figure 6.22 Higher educated arrivals under the Mobile Workforce scenario and baseline analysis, 2012 to 2052

Higher educated arrivals

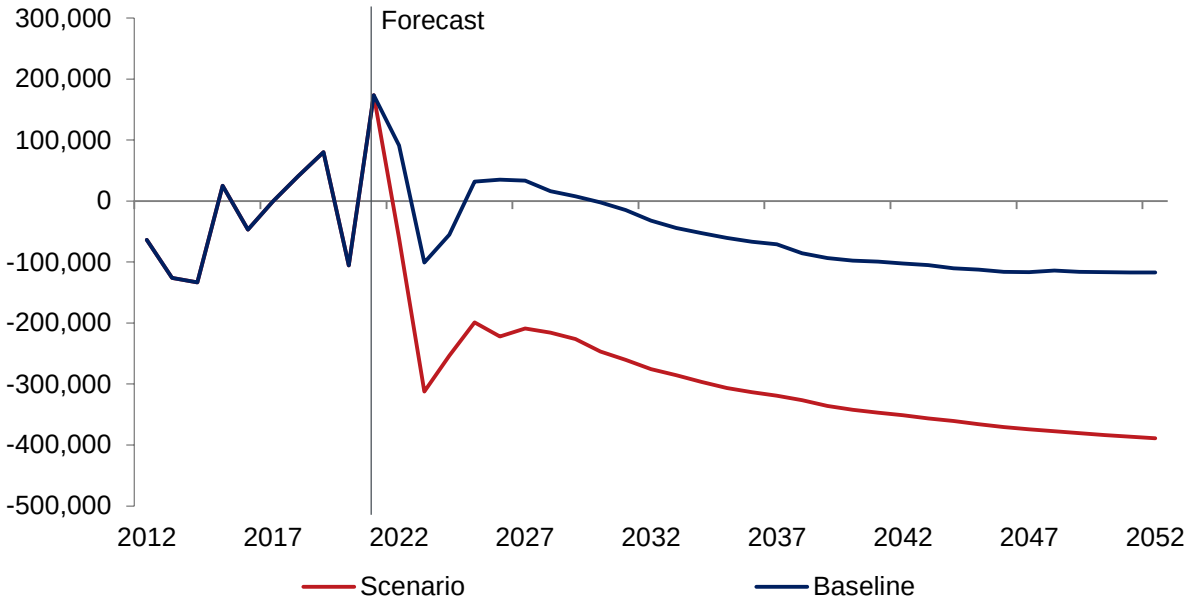


Source: ABS, Oxford Economics Australia

Since domestic supply is already sufficient to fulfil gross demand, higher educated migration simply adds to the expected surplus of domestic supply. This results in a net projected gap which is significantly larger under this scenario compared to baseline. The net projected surplus is forecast to average 305,000 p.a. over the forecast period compared to 62,000 under baseline analysis.

Figure 6.23 Net projected gap in higher education qualifications under the *Mobile Workforce* Scenario and baseline analysis, 2012 to 2052

Qualifications



Source: Department of Education, ABS, Oxford Economics Australia.

A1. SENSITIVITY ANALYSIS

The purpose of the sensitivity analysis is to assess the impact of variations to inputs or assumptions which have been made through the modelling process.

Sensitivities have been conducted on the following key model variables:

1. Caps applied to 'saturation' rates, impacting the ceiling of skills deepening by occupation
2. Volume and education characteristics of higher educated arrivals and departures
3. Commencement rates
4. Completion rates

DEMAND SENSITIVITY ANALYSIS

A1.1.1 Skills deepening 'saturation' rates

Sensitivity analysis of saturation rates was undertaken by altering or removing entirely the higher education cap which was placed on each occupation in the baseline analysis. The higher education cap chosen in the baseline assumption is the 90th percentile of higher education by skill level as classified by the ABS at the six-digit occupation level based on 2021 higher education rates. It is then applied to the two-digit occupations undertaken in the analysis. A more detailed explanation of the methodology can be found in the technical appendix A1.1.2.

Three sensitivities were selected to capture a bandwidth around the baseline assumption:

1. **Unbound** – no cap is applied to the trends in higher education across the forecast period with all occupations able to cap out at the maximum of 100% higher educated workers if current trends allow. The unbound sensitivity would be considered the absolute upper bound of our trend analysis as it will contain shares of higher education which are unlikely to be compatible with the requirements of many occupations.
2. **80th percentile** – the higher education cap is selected at the 80th percentile for each skill level instead of the 90th percentile as in the baseline, resulting in a lower saturation point of higher education for all occupations.
3. **Constant** – higher education levels are held constant at 2021 levels for all industry occupation pairs for the duration of the forecast period.

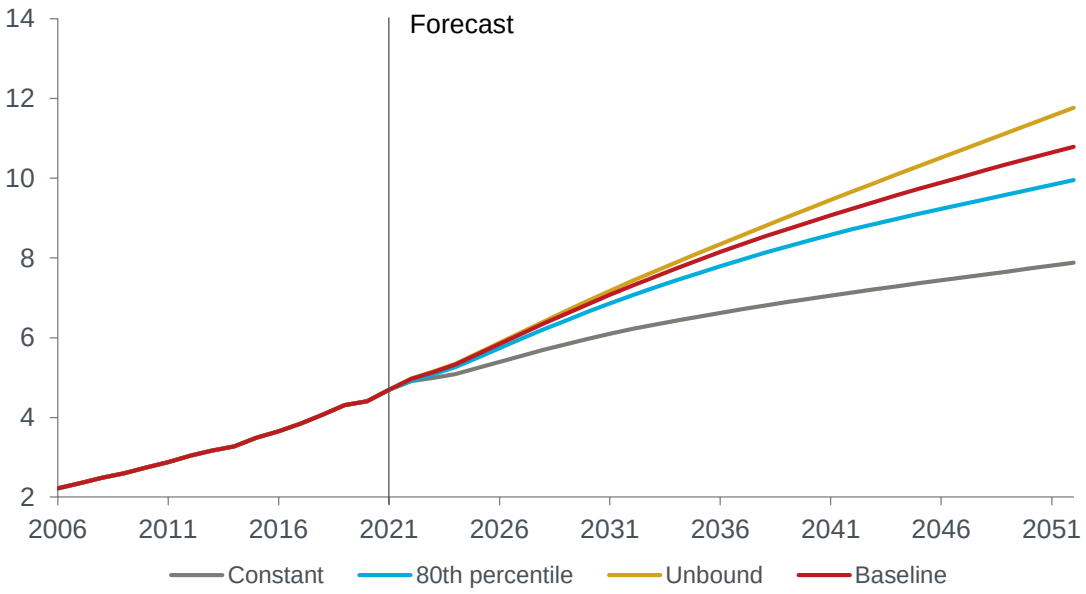
Demand for higher educated labour is forecast to grow under all sensitivities as a result of the continued growth in employment. The magnitude of this growth is dependent on the cap which is imposed on all industry occupation pairs across each sensitivity.

Figure A.1 Share of occupation, which is higher educated by 2052

Occupation	Baseline	Sensitivity analysis: Unbound	Sensitivity analysis: 80th percentile	Sensitivity analysis: Constant
Chief Executives, General Managers and Legislators	76.4%	76.6%	75.8%	56.1%
Farmers and Farm Manager	29.3%	29.3%	29.3%	14.9%
Specialist Managers	81.5%	82.5%	80.4%	57.2%
Hospitality, Retail and Service Managers	48.3%	51.0%	43.5%	27.1%
Arts and Media Professionals	83.4%	84.6%	82.1%	55.5%
Business, Human Resource and Marketing Professionals	93.4%	97.5%	89.4%	71.5%
Design, Engineering, Science and Transport Professionals	92.9%	97.3%	88.7%	76.9%
Education Professionals	95.7%	99.4%	91.3%	85.7%
Health Professionals	94.9%	98.3%	90.8%	86.8%
ICT Professionals	95.2%	98.3%	91.4%	74.9%
Legal, Social and Welfare Professionals	90.1%	91.1%	88.3%	83.3%
Engineering, ICT and Science Technicians	45.5%	54.5%	40.5%	29.7%
Automotive and Engineering Trades Workers	6.5%	6.5%	6.5%	2.8%
Construction Trades Workers	6.9%	6.9%	6.9%	3.1%
Electrotechnology and Telecommunications Trades Workers	8.8%	8.9%	8.7%	4.3%
Food Trades Workers	42.0%	42.7%	34.9%	17.2%
Skilled Animal and Horticultural Workers	22.0%	22.2%	19.9%	11.3%
Other Technicians and Trades Workers	19.1%	21.6%	16.0%	10.6%
Health and Welfare Support Workers	52.6%	53.5%	45.7%	31.9%
Carers and Aides	35.3%	51.3%	27.4%	22.1%
Hospitality Workers	32.0%	33.0%	26.9%	15.3%
Protective Service Workers	41.5%	43.6%	33.5%	23.0%
Sports and Personal Service Workers	34.2%	36.5%	26.8%	20.3%
Office Managers and Program Administrators	52.0%	62.8%	45.3%	37.1%
Personal Assistants and Secretaries	44.0%	44.0%	44.0%	22.5%
General Clerical Workers	34.9%	46.8%	28.3%	23.3%
Inquiry Clerks and Receptionists	34.3%	37.3%	27.9%	19.3%
Numerical Clerks	35.3%	63.6%	26.5%	31.3%
Clerical and Office Support Workers	24.1%	35.4%	19.0%	16.5%
Other Clerical and Administrative Workers	36.3%	52.9%	29.2%	27.6%
Sales Representatives and Agents	36.0%	53.6%	27.0%	26.6%
Sales Assistants and Salespersons	22.1%	27.9%	18.0%	12.8%
Sales Support Workers	24.8%	30.1%	20.1%	13.5%
Machine and Stationary Plant Operators	11.2%	11.6%	10.9%	5.5%
Mobile Plant Operators	14.9%	14.9%	14.9%	6.0%
Road and Rail Drivers	28.8%	30.4%	23.7%	12.7%
Store persons	31.9%	32.3%	26.9%	13.4%
Cleaners and Laundry Workers	23.9%	38.1%	19.0%	15.7%
Construction and Mining Labourers	10.7%	10.7%	10.7%	4.7%
Factory Process Workers	24.7%	31.6%	19.8%	13.4%
Farm, Forestry and Garden Workers	20.3%	20.4%	18.0%	8.9%
Food Preparation Assistants	18.8%	19.9%	18.3%	8.7%
Other Labourers	21.2%	21.9%	18.7%	9.5%

Source: ABS, Oxford Economics Australia

Figure A.2 Higher educated employment, sensitivity analysis, 2006 to 2052
Millions

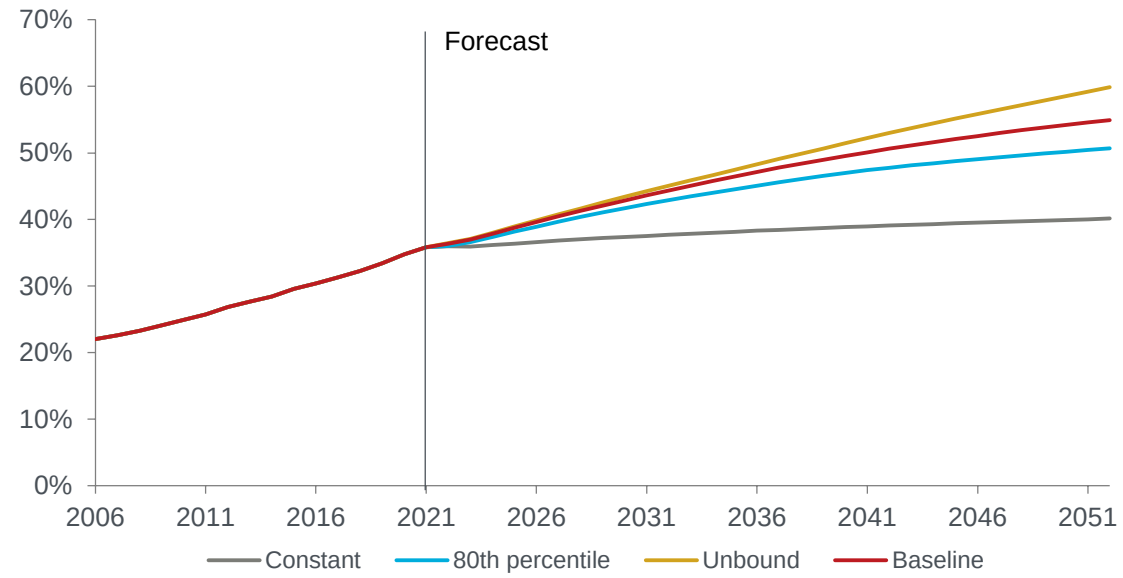


Source: ABS, Oxford Economics Australia

When there is no cap placed on saturation rates, the labour market demands 11.8 million higher educated jobs in 2052, compared to 10.8 million in the baseline. This equates to employers demanding an additional 6.8 million higher educated employees by 2052 compared to 2021 levels. This is an additional 1 million higher educated employees demanded compared to our baseline results.

Conversely, when saturation rates are held constant at 2021 levels, 7.9 million higher educated jobs are required to meet labour market demand, with the labour market demanding an additional 3.0 million higher educated employees by 2052. At the 80th percentile 10.0 million higher educated jobs are demanded by 2052, resulting in an increase of 5.0 million higher educated roles being demanded.

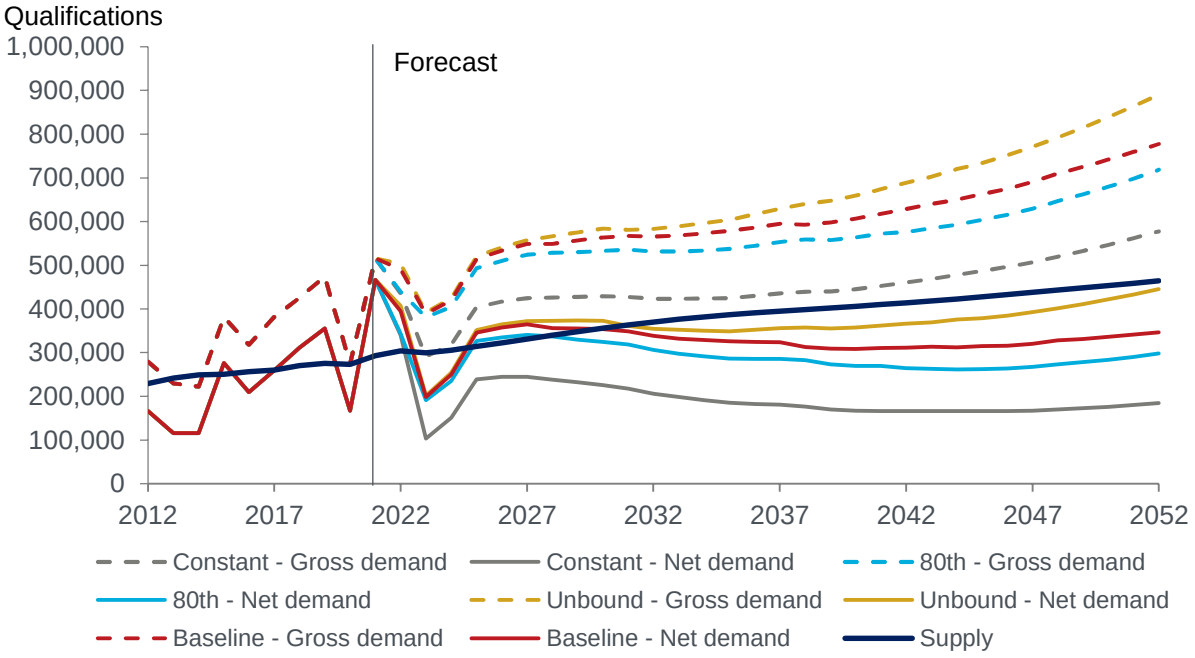
Figure A.3 Higher educated employment as a share of total employment, sensitivity analysis, 2006 to 2052



Source: ABS, Oxford Economics Australia

Higher educated employment is forecast to increase from 36% of all employed persons in 2021 to 60% of all employed persons under the unbound sensitivity and 51% under the 80th percentile sensitivity. When higher education is held constant by industry occupation pair, we see a much smaller change in the higher educated share of employment, increasing from 36% to 40% by 2052. Despite being held constant for each industry occupation pair, the total share of higher educated employment still grows in this sensitivity due to changes in the industrial makeup of employment. This is driven by stronger forecast employment growth in industries with greater proportions of higher education over the forecast period.

Figure A.4 Projected gap in higher education qualifications, sensitivity analysis, 2012 to 2052



Source: Department of Education, ABS, Oxford Economics Australia

Under all sensitivities there is expected to be a deficit in the supply of qualifications required to meet gross demand (labour market demand for qualifications when skilled arrivals are not accounted for).

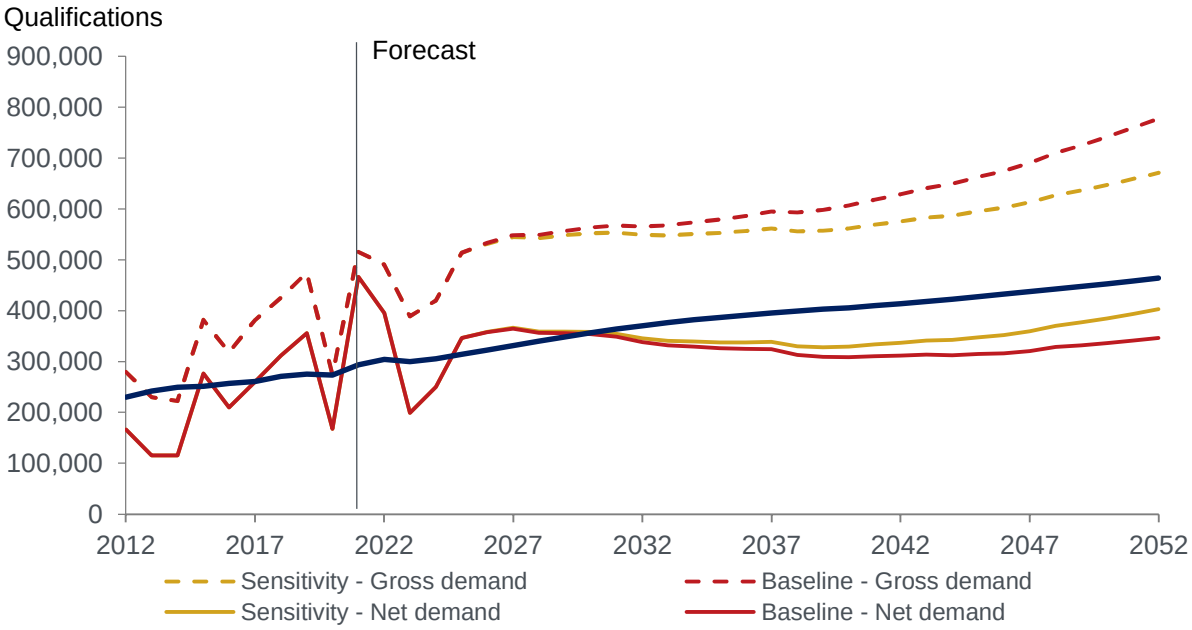
The deficit between gross demand and supply increases under sensitivities with higher the saturation points for each occupation. The average yearly deficit across the forecast period under the unbound, 90th percentile and constant higher educated share sensitivities are 259,000, 215,000 and 63,000 respectively, compared to 173,000 in the baseline analysis.

Net demand remains in a surplus under all sensitivities in the long run. The average yearly surplus across the forecast period under the unbound, 80th percentile and constant higher educated share sensitivities are 21,000, 62,000 and 199,000 respectively, compared to 99,000 in the baseline analysis. This suggests that skilled arrivals will still be required to play an important role under all sensitivities tested. However, this role is likely to vary depending upon the true saturation point of occupations, which will be driven by demand from the labour market.

A1.1.2 Higher educated arrivals and departures

Holding the number of arrivals and departures constant at 2019 levels while maintaining the NOM profile used in our baseline results in a reduction in the gap between supply and net demand. Gross demand exceeds supply across the forecast period similarly to baseline analysis. Under this sensitivity gross demand is forecast to reach 671,000 qualifications by 2052 resulting in a gross deficit, with supply reaching 464,000. In terms of net demand, the inclusion of arrivals results in a net qualifications surplus of 61,000 by 2052, compared to a net surplus of 118,000 in our baseline.

Figure A.5 Arrivals and departures held constant at 2019 levels, sensitivity analysis, 2012 to 2052



Source: Department of Education, ABS, Oxford Economics Australia

There is no profile of arrivals and departures which is consistent with a stable NOM in line with the Australian government view of NOM of 235,000 persons per year[25] which results in net demand equalling supply under our modelling assumptions. To close the gap between supply and net demand one departure the change in departures must not equal the change in arrivals which is inconsistent with keeping NOM stable, this can be classified as a non-transfer event.

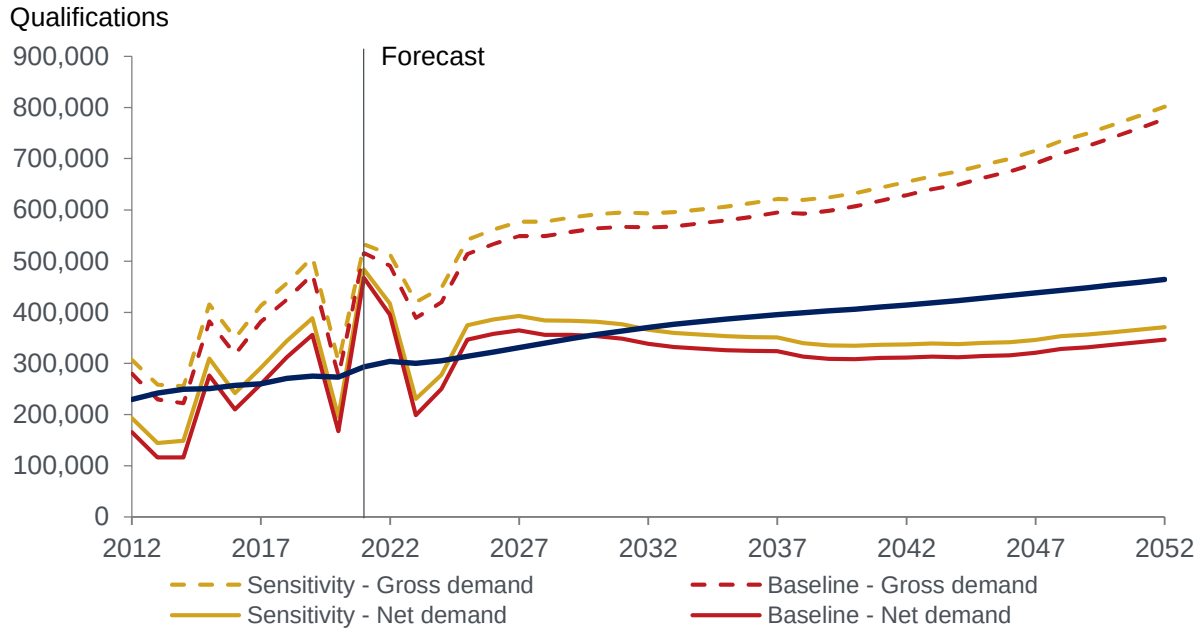
Over the entire forecast period the share of departures that are higher educated is less than the share of arrivals which are higher educated. However, the share of departures which are higher educated increases at a faster rate than our arrivals meaning the gap between the two closes across the forecast period. The closing of this gap has a knock-on effect of making each non-transfer event less impactful than in previous years as one non-transfer event occurring reduces the number of higher educated qualifications by a smaller amount than the previous year. The number of non-transfer events required to have net demand equal supply in the long run is greater than the number of arrivals and departures which Australia has each year over this period making it infeasible in our model when holding NOM stable.

Applying the characteristics of arrivals share of higher education to those departing Australia was tested to determine the model's sensitivity to the assumption that departures were reflective of the broader Australian population. Instead, it assumes they are more representative of a mobile but temporary workforce that transitions through Australia. Under baseline assumptions the higher educated share of arrivals is greater than the share of departures. This is reflected in the data with gross demand for qualifications increasing to 802,000 by 2052, an increase of 24,000 qualifications demanded compared to the baseline. The strengthening of gross demand is the result of increased flows of higher educated qualifications out of Australia, which in turn increases labour market demand to replace these qualifications. Net demand and the gap between it and supply are impacted to the

[25] Centre for Population (2023). 2022-23 Budget: Australia's future population.

same degree as gross demand. Net demand reaches 371,000 and the qualification surplus reduces to 93,000 by 2052.

Figure A.6 Departures having the same higher education profile as arrivals, sensitivity analysis, 2012 to 2052



Source: Department of Education, ABS, Oxford Economics Australia

SUPPLY SENSITIVITY ANALYSIS

A1.1.1 Commencement and completion rates

Sensitivity analysis was conducted on the supply side through the variation of assumptions for both commencements and completions. Inputs have been varied to compare average commencement and completion rates over history (excluding the COVID-19 period) compared to trends analysis which have been modelled in our baseline assumptions.

Commencements in the baseline assumptions were broken down by age cohort and field of education over the period from 2011 to 2019. The share of commencements was measured as the number of commencements over the total population of that age cohort. The trends in these shares were then applied over the forecast period. Under the baseline analysis, completion rates by age cohort and field of education were forecast using the trends in 4-year completion rates over the period from 2011 to 2016.

Three sensitivities were conducted, the first changed the commencement assumption to take the average proportion of population for each age cohort and field of education over the period from 2011-2019 and holding this share constant over the forecast period which maintaining the baseline assumption for completion rates. The second maintained the baseline analysis assumption for commencements and altered the completion rate assumptions, holding the rates at a constant for each age cohort and field of education at the average from 2011 to 2016. Finally, the third sensitivity altered both the commencement and completion rate assumptions consistent with the above descriptions of the changes in supply sensitivity 1 and 2. The table below outlines a summary of the three supply sensitivities conducted.

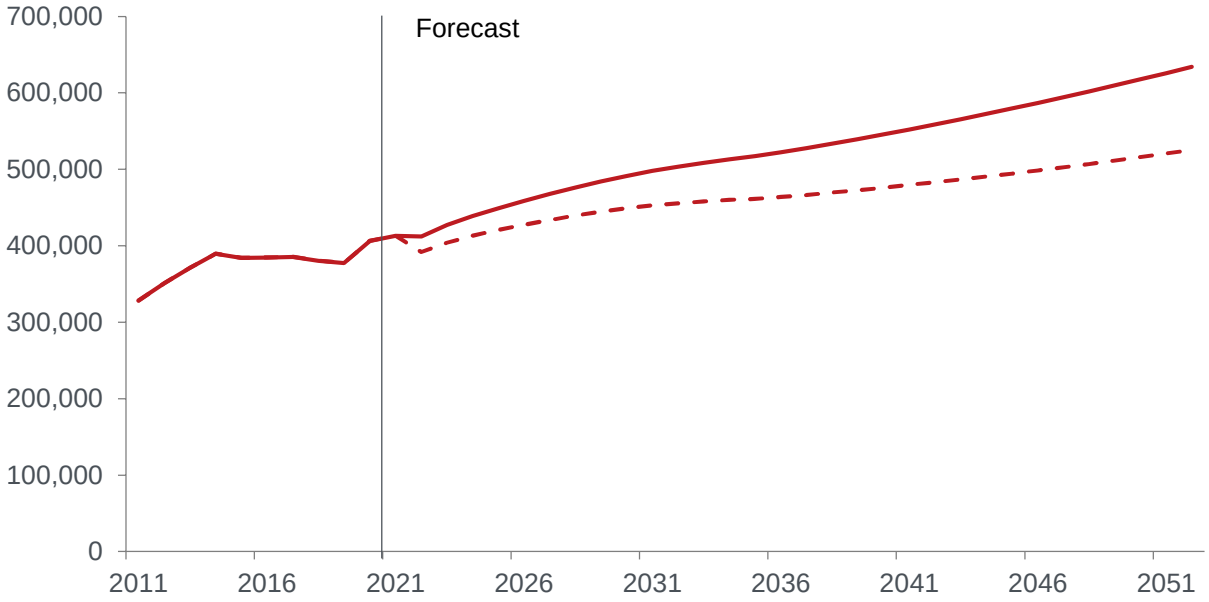
Figure A.7 Supply sensitivity analysis outline

Supply sensitivity	Commencements	Completions
Supply sensitivity 1 - Commencements	Number of commencements taken as a proportion of population for each age cohort and field of education held stable at the average proportion from 2011-2019	Baseline – Trend analysis
Supply sensitivity 2 – Completions	Baseline – Trend analysis	Completion rates by age and field of education held constant at the average from 2011 to 2016
Supply sensitivity 3 – Commencements & completions	Number of commencements taken as a proportion of population for each age cohort and field of education held stable at the average proportion from 2011-2019	Completion rates by age and field of education held constant at the average from 2011 to 2016

Source: Department of Education, ABS, Oxford Economics Australia

Under the commencements sensitivity (supply sensitivity 1) total domestic commencements are lower than baseline, reaching 525,000 by 2052 compared to 633,000 under our baseline analysis. The 19 and under cohort, which represents roughly 40% of commencements, have 33,000 fewer places compared to baseline in 2052, with 99% of this decrease a result of the reduction in bachelors being taken up. For the 20- to 24-year-old cohort, despite being approximately 40% smaller than the 19 and under cohort, 39,000 fewer commencements are expected in 2052 under supply sensitivity 1 compared to baseline. Unlike the 19 and under cohort, this decrease is primarily driven by a reduction in postgraduate commencements. The decrease in postgraduate commencements is even starker for 30- to 44-year-olds with 29,000 fewer total commencements in 2052 and 97% of this decrease being postgraduate. Stronger historic trends in postgraduate commencements compared to bachelor commencements results in the commencement profile of postgraduates being more responsive to this sensitivity analysis. As a result of this, 59% of the decrease in commencements by 2052 are postgraduates, despite only 34% of total commencements being postgraduates in our baseline forecast.

Figure A.8 Domestic higher education commencements, nine-year average share of population vs. baseline (supply sensitivity 1), 2011 to 2052
Commencements



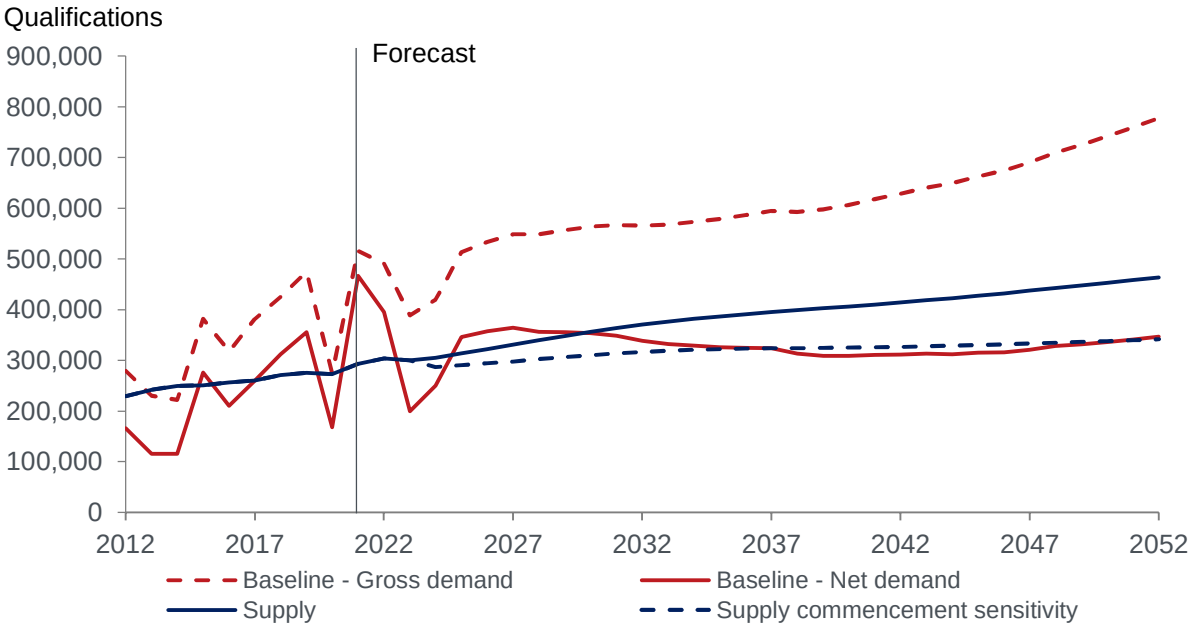
Source: Department of Education, Oxford Economics Australia

Over the period from 2037 to 2052 net demand remains roughly in line with supply under the commencement sensitivity (supply sensitivity 1). The reduction in commencements flows through to completions, with supply forecast to be 342,000 qualifications in 2052 compared to 464,000 under our baseline.

The number of domestic bachelor completions under supply sensitivity 1 is down 11% on baseline by 2052, while domestic postgraduate completions are down by 30%. The larger decrease in postgraduate completions again stems from the strong trends in postgraduate commencements under the baseline being significantly curtailed in the commencement sensitivity analysis. Similarly, for international students', postgraduate completions decrease by 60% compared to a 49% decrease in international bachelor completions. The substantial decrease in international completions relative to baseline under supply sensitivity 1 is a result of a strong upward trend in the commencement of international students over the years leading up to the pandemic in the baseline analysis, growing at an average of 4.2% p.a.

The fall in completions by age under the commencement sensitivity is consistent with the profile of the reduction in commencements. Amongst the two youngest cohorts which make up the majority of completions (69%), 46,000 fewer completions are forecast for 20- to 24-year-olds, and 45,000 fewer for those 19 and under. This result is despite the significantly smaller size of the 20- to 24-year-olds cohort, representing 75% of the 19 and under cohort.

Figure A.9 Projected gap in higher education qualifications, commencements sensitivity analysis, 2012 to 2052

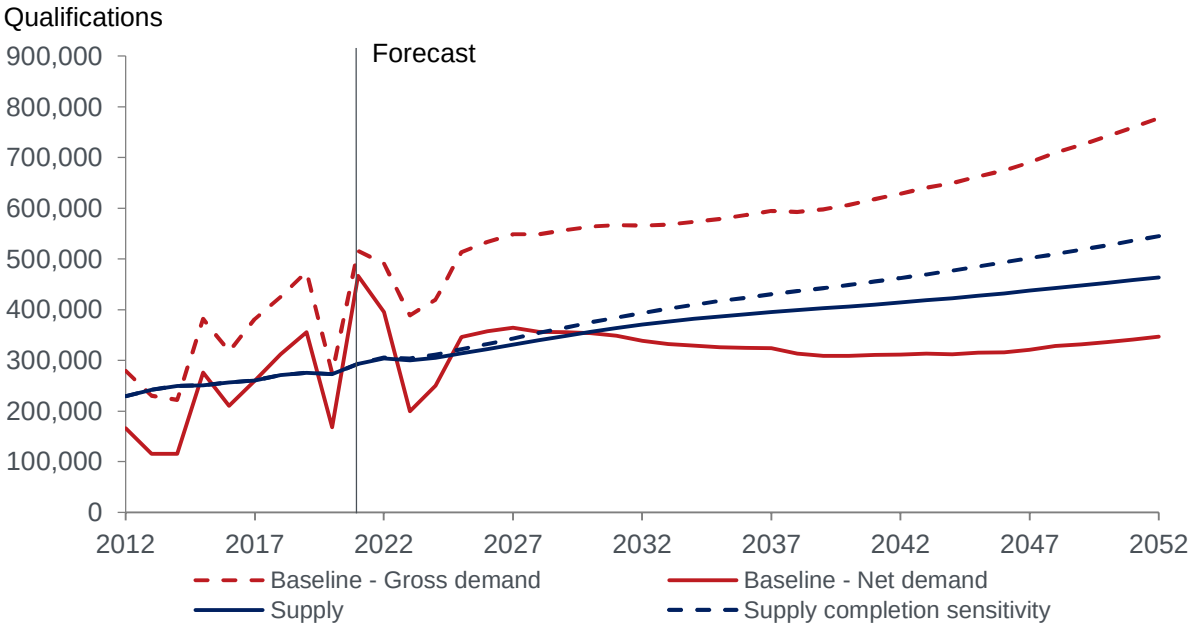


Source: Department of Education, ABS, Oxford Economics Australia

Under the completions sensitivity (supply sensitivity 2) the average 4-year completion rates by age and field of education from 2011 to 2016 are applied over the forecast horizon. The supply of graduates under sensitivity analysis 2 increases to 545,000 in 2052 up from 464,000 under baseline.

Domestic bachelors contribute 44% of the increase in supply. The fields of education making the most significant contribution for domestic bachelors are health (21,000), society and culture (14,000), and management and commerce (7,900). International postgraduates likewise contributed 44% to the increase in supply, with much of this coming from management and commerce (84,000) and information technology (24,000). The large increase in management and commerce completions compared to baseline stems from the sharp historical fall in completion rate trends which becomes more pronounced across the forecast period in our baseline model and does not occur under supply sensitivity 2.

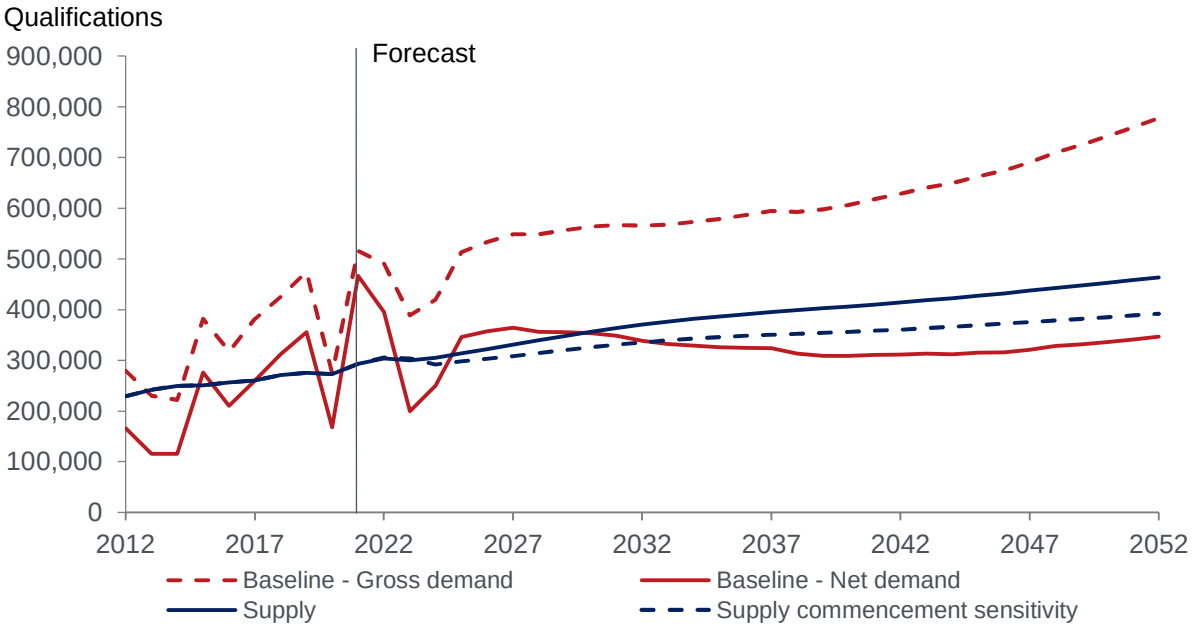
Figure A.10 Projected gap in higher education qualifications, completions sensitivity analysis, 2012 to 2052



Source: Department of Education, ABS, Oxford Economics Australia

When testing both the commencements and completions assumptions simultaneously, the supply of graduates falls below our baseline analysis over the forecast period. By 2052 the supply of graduates is 392,000 compared to 464,000 in our baseline assumptions. The overall rise in the share of commencements which convert to completions is more than offset by the decrease in overall commencements which is occurring when setting commencements as a fixed share of the population by age cohort. No age cohort sees an increase in completions. However, domestic bachelors students as a share of total completions increases by 6 percentage points compared to baseline while all other categories decrease. This is a result of the combination of the commencement sensitivity having larger effects on postgraduate and international student commencements and the strong downward trends in domestic bachelors' completions under baseline not occurring under supply sensitivity 3.

Figure A.11 Projected gap in higher education qualifications, commencement and completion sensitivity analysis, 2012 to 2052



Source: Department of Education, ABS, Oxford Economics Australia

A2. TECHNICAL APPENDIX

HIGHER EDUCATED EMPLOYMENT METHODOLOGY

The technical appendix provides an overview of the modelling approach used for each modelling task used in the analysis. The aim of the technical appendix is to outline the key inputs and assumptions used to underpin the modelling which was undertaken.

A2.1.1 Occupation shares of industry employment

Occupation shares of industry employment are measured by taking the total number of jobs per occupation within an industry over the total number of jobs within an industry.

Key inputs:

- Oxford Economics Australia's employment by industry forecasts from 2022 to 2052
- Share of 2-digit occupation within each 1-digit industry

For each occupation industry pair, the share of workers by occupation is forecast at trend growth.

Key assumptions:

2-digit occupations include the classifications "Inadequately described" and "Not stated" which include a share of persons employed within each industry. We assume that these workers are independent and identically distributed and do not skew to any occupations. We scale our occupation shares for each industry by the sum of all occupation share in the industry less those listed as either inadequately described or not stated.

A2.1.2 Higher educated employment share

Higher educated labour share measures the total number of employed persons who have a higher education over the total number of employed persons.

Key inputs:

- Share of 2-digit occupation within each 1-digit industry

For each occupation industry pair, the share of workers who are higher educated is forecast at a trend growth.

Key assumptions:

The proportion of employed persons within an industry occupation pair with a higher education is capped at an estimated saturation point based on the skill level determined by the ABS which is required to complete an occupation. Higher education labour caps are estimated in a two-stage process.

1. We estimate skill level caps based on the distribution of higher educated rates within skill levels.
    i. Each occupation at a 6-digit level is classified into a skill level from 1 to 5 (1 being the highest skilled, 5 the lowest).
    ii. The proportion of higher educated labour is calculated for all 6-digit occupations.
    iii. A distribution of the proportion of higher educated labour by each 6-digit occupation is produced for each skill level from 1 to 5, with the 90th percentile value choses as the cap for that particular skill level.
2. Skill level caps are then applied to 2-digit occupations.

i. Each 2-digit occupation has a makeup of skill levels based on the 6-digit occupations it is comprised of.
ii. The higher education cap for a 2-digit occupation is then calculated as the weighted average of the skill levels within that 2-digit occupation.

Figure A.12 Estimated skill level caps

Skill level	Caps
Skill level one	**96.3%**
Skill level two	**53.2%**
Skill level three	**35.4%**
Skill level four	**35.3%**
Skill level five	**24.1%**

Source: ABS, Oxford Economics Australia

A2.1.3 Higher educated employment

Higher educated employment measures the number of jobs requiring a bachelor's degree or higher within the Australian economy.

Key inputs:

- Oxford Economics Australia's employment by industry forecasts from 2022 to 2052
- Share of 2-digit occupation within each 1-digit industry
- Share of workers with a bachelor's degree or higher by occupation industry pair

Higher educated employment is calculated by multiplying Oxford Economics Australia's industry forecasts by the share of workers within the occupation industry pair by the share of higher educated workers in each occupation industry pair.

DEMAND FOR HIGHER EDUCATION QUALIFCATIONS METHODOLOGY

The demand for higher education graduates measures the number of people graduating with a higher education degree needed to meet labour market demand.

Demand is driven by two main factors; changes in the stock of higher educated labour demanded as calculated above and changes in the flows in and out of the higher educated labour market, represented by attrition, migrant arrivals and departures and job changes which result in additional demand for higher educated graduates. The sum of these flows can a positive or negative identity,

A2.1.4 Higher educated retirements

Higher educated retirements estimate the volume of higher educated labour which leaves the labour market each year.

Key inputs:

- ABS Retirement and Retirement Intentions, Australia, 2018-19
- ABS Census
    - QALLP Non-School Qualification: Level of Education
    - AGE5P: Age in five-year age cohorts
- Oxford Economics Australia forecast from 2022 to 2052
    - Population projections by five-year age cohorts
    - Participation rate
    - Higher educated labour demand by occupation industry pair

The number of higher educated retirements is calculated by estimating the age profile of higher educated labour for each occupation industry pair and calculating the proportion who intend to retire in a given year.

Key Assumptions:

We assume that retirement intentions are the same across industry and occupation pairs, and don't change over the forecast period.

A2.1.5 Higher educated deaths

Higher educated deaths estimate the volume of higher educated labour which is lost to the labour market each year.

Key inputs:

- ABS Death rate, 2006-2021
- ABS Census
    - QALLP Non-School Qualification: Level of Education
    - AGE5P: Age in five-year age cohorts
- Oxford Economics Australia forecasts from 2022 to 2052
    - Population projections by five-year age cohorts
    - Participation rate
    - Higher educated labour demand by occupation industry pair
    - Death rate by five-year age cohort

The number of higher educated deaths is calculated by estimating the age profile of higher educated labour by each occupation industry pair and calculating the proportion who are likely to die in a given year.

Key Assumptions:

We assume that the death rate for each age cohort does not differ by industry or occupation.

A2.1.6 Higher educated migrant departures

Higher education migrant departures estimate the volume of higher educated labour which leaves the Australian labour market in a given year.

Key inputs:

- Oxford Economics Australia's forecasts from 2022 to 2052
    - Overseas departures
    - Total population
    - Higher educated labour demand by occupation industry pair

The number of higher educated migrant departures is calculated by multiplying total departures by the higher educated labour for each occupation industry pair over total population.

Key Assumptions:

We assume that migrant departures have the same labour market characteristics as the Australian resident population including occupation industry pair makeup.

A2.1.7 Higher educated migrant arrivals

Higher education migrant arrivals estimate the volume of higher educated labour which arrives in the Australian labour market in a given year.

Key inputs:

- Oxford Economics Australia forecasts, 2022 to 2052
    - Migrant arrivals

    - Higher educated labour demand by industry and occupation pair
    - Total population
- ABS characteristics of recent migrants
    - Employment rate
    - Higher educated rate

The number of higher educated migrant arrivals is calculated by estimating citizen higher educated arrivals based on the current makeup of the Australian labour market. Non-citizen higher educated labour is estimated by multiplying the non-citizen arrivals by the migrant employment rate by the migrant higher education rate.

Key Assumptions:

We assume that citizen migrant arrivals have the same labour market characteristics as the Australian resident population. Non-citizen arrivals are assumed to have different labour market outcomes but are just as likely to enter an industry occupation pair as citizens. We don't include student visa holders in the migrant arrivals given they are not adding completely to the labour market.

A2.1.8 Job changes resulting in demand for higher education graduates

Job changes which result in demand for higher education graduates estimates the number of job changes which induce demand for higher educated labour as a result of workers moving between jobs.

Key inputs:

- Oxford Economics Australia's forecasts, 2022 to 2052
    - Higher educated labour demand by occupation industry pair
- Australian Taxation Office (ATO), 2012 to 2020
    - Job movements between occupations
- ABS
    - Job Mobility, Job Separations by Industry
    - Job Mobility Job Engagements by Industry
    - Qualifications and Employment, Extent to which qualifications are relevant to current job by Occupation
- Number of higher education graduates by occupation industry pair, 2022 to 2052

The number of higher educated job changes is calculated by estimating the number of job changes between industry occupation pairs and the proportion of these changes that would require a new higher education qualification. The proportion of job changes between each occupation industry that induces a new higher education qualification is assumed to be determined by the difference in the proportion of higher educated labour in those occupation industry pairs and the difference in the field of study between the occupation industry pairs for higher educated labour.

Key Assumptions:

We assume that the relevance of a qualification to a job is the same across all occupation industry pairs. The proportion of movements into an industry is assumed to be proportional to the size of that industry. Within each occupation, the distribution of the number of movements out of each industry is assumed to be proportional to the size of that industry. The proportion of job changes between each occupation industry pair that induces a new higher education qualification is assumed to be determined by the difference in the proportion of higher educated labour in those occupation industry pairs.

SUPPLY OF HIGHER EDUCATION GRADUATES

A2.1.9 Higher educated commencements

Higher education commencements estimate the number of higher education degrees which are commenced each year.

Key inputs:

- Oxford Economics Australia's forecasts, 2022 to 2052
  - Population projections by five-year age cohorts
- Department of Education
  - Commencement data by bachelor/postgraduate, domestic/international, age and field of study, 2011 to 2021

For each type of student, the commencement rate is calculated as the number of commencements over the relevant population age cohort. Each share is forecast at trend growth. Each category is scaled to total commencements by age cohort.

A2.1.10 Higher educated completions

Higher education completions estimate the number of higher education degrees which are completed each year.

Key inputs:

- Higher educated commencements
- Department of Education
  - 4,6- and 9-year completion rate cohort analysis by bachelor/postgraduate, domestic/international, age and field of study 2011 to 2018

4-year completion rates for each type of student are forecast at trend growth with the average difference between 4- and 6-year, & 6- and 9-year completion rates held across the forecast period. 5, 7- and 8-year completion rates are estimated by interpolating between the 4, 6- and 9-year rates. The difference between 4- and 5- year completion rates are applied to the 3-year completion rate.

The number of completions is estimated as the difference between that the current years completion rate and the prior year's completion rate.

Key assumptions:

We assume that after 9 years no additional individual who commenced their higher education degree complete it.

There is no significant difference in the level difference between 4- and 5- year completion rates and 3- and 4-year completion rate.

A2.1.11 International students that remain in Australia post study

International student completions were transformed into an estimation of how many international students stay on each year in Australia as a source of graduate supply.

Key inputs:

- Department of Education
  - International student completions, 2013 to 2021
- Department of Home Affairs
  - Student visa and temporary graduate visa program reports, 2015 to 2022

The number of international students who remain in Australia after completing their studies (34%) was calculated by the number of Temporary Graduate visas granted (subclass 485) within the Post-Study Work stream over the number of higher education completions.

OXFORD
ECONOMICS

Global headquarters
Oxford Economics Ltd
Abbey House
121 St Aldates
Oxford, OX1 1HB
UK
Tel: +44 (0)1865 268900

London
4 Millbank
London, SW1P 3JA
UK
Tel: +44 (0)203 910 8000

New York
5 Hanover Square, 8th Floor
New York, NY 10004
USA
Tel: +1 (646) 786 1879

Singapore
6 Battery Road
#38-05
Singapore 049909
Tel: +65 6850 0110

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Asia Pacific

Singapore
Hong Kong
Tokyo
Sydney
Melbourne

Email:
mailbox@oxfordeconomics.com

Website:
www.oxfordeconomics.com

Further contact details:
www.oxfordeconomics.com/about-us/worldwide-offices