ACCESS ECONOMICS

Economic modelling of skills demand

22 October 2009

Report by Access Economics Pty Limited for

Skills Australia

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Executive Summary

Skills Australia commissioned Access Economics to undertake research and analysis on the future demand for post-school skills and qualifications to 2025. The task involves examination of both the labour supply of skills (demand by prospective students) and the labour demand for skills (demand by industry).

The **projections are presented within the context of three scenarios** being examined by Skills Australia, termed **open doors**, **low-trust globalisation** and **flags**.

Scenario parameters

Key economic parameters for these scenarios are presented in Table i. Parameter values for average global GDP growth were provided in *Three Global Scenarios* (Skills Australia 2009a), while the other key economic parameters have been developed for this report.

Table i: Summary assumptions by scenario

Variable	Open doors	Low-trust globalisation	Flags
Global growth rate[1]	3.80%	3.10%	2.60%
Assumptions			
Australian growth rate[1]	3.93%	3.00%	2.20%
Annual net migration to Australia[1]	250,000 or 1.00%	200,000 or 0.80%	100,000 or 0.40%
Labour productivity growth[1]	1.75%	1.50%	1.30%
Implied results			
Population growth[1]	1.70%	1.47%	1.02%
Employment growth[1]	2.15%	1.48%	0.89%
Unemployment rate[2]	4.5%	5.1%	6.0%
Participation rate[2]	68.8%	64.2%	63.1%

1 – Average growth rate 2010-2025 (% per annum). 2 – Level as at 2025.

Source: Skills Australia, Three Global Scenarios; Access Economics

Open doors sees Australia's economy grow at an average rate a little above global GDP growth. This is no mean feat given that rapidly growing China and India are forming larger shares of the overall global economy. Net migration to Australia is at a very strong rate, providing strong support to population growth, while labour productivity growth is in line with ambitious long term projections from Commonwealth Treasury. Overall labour force participation rises with notable increases in age specific labour force participation rates. Australia becomes a more trade exposed country, while global agreement to mitigate climate change moderates employment growth in key affected industries such as coal mining and electricity generation.

Low-trust globalisation sees Australia's economic growth moderate from its performance over the past decade, roughly in line with the expected moderation in working age population growth over time. The rate of net migration steps down from recent levels to around the

average over the past decade, while labour productivity growth is more moderate, in line with the performance over recent years.

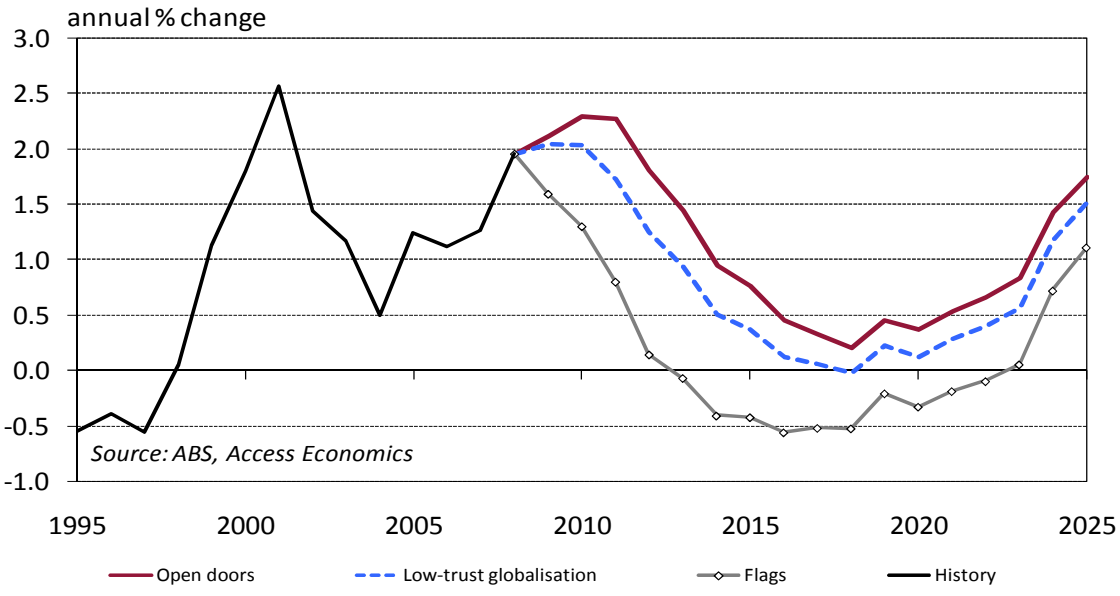
Flags sees low economic growth for Australia and a significant curtailment of Australia's migration program. Productivity growth still occurs, but at a more moderate rate compared with other scenarios. The unemployment rate in this scenario remains above that of recent experience. A move to protectionism produces a change in Australia's industry structure towards production for the domestic market and away from exports, particularly service exports. That produces stronger growth in Australia's manufacturing sector and a decline in education to foreign students and tourism.

Projected student demand

The projections of the number of students expected to be seeking to undertake qualifications are demographically driven, but are also influenced by the state of the broader labour market and expected year 12 completion rates. Therefore, scenario assumptions on the rate and composition of population growth, and the unemployment rate, influence projected student demand. The key result of the demographic modelling is that unless migration rates are in line with the **open doors** scenario (250,000 or more net migrants each year in the short-term, with that number rising further out as the total population rises) then Australia's population growth rate will gradually decline across the forecast period.

There will also be a **notable change in the age composition of Australia's population within all scenarios**. The critical demographic challenge facing Australia is the retirement of the baby boomers (and the lack of replacements in the workforce for them unless we see notable rises in age specific labour force participation rates). We are now at the point where retirements are about to surge and there is a dearth of population about to reach working age (caused partly by the moderation in birth numbers of the 1990s). Chart i shows projected growth in the prime student cohort (age 18-22) over time.

Chart i: Projected growth in prime student cohort (age 18-22)



Even with the strong swing provided by higher migration, past trends in national birth rates imply a decline in the growth of the prime student cohort (18-22). In **flags** the size of this group actually declines while the scenarios with greater migration still see more modest growth in this age cohort over the next decade.

Table ii shows the level of projected student completions over time by scenario. Differences in rates of growth across different education levels are driven by the course of population growth across the next 15 years. Undergraduate and diploma courses will see far slower growth in the middle years as the moderation in birth numbers of the late 1990s translates to a relatively weak growth rate in the key age groups for early tertiary qualifications at the end of the next decade. Student demand for postgraduate qualifications is less affected as it has an older demographic.

Overall there are differences between the scenarios in the project level of student completions, though with these projections largely demographically driven the difference in the number of students between **open doors** and **flags** only reaches around 20% by 2025.

Table ii: Projected student completion level by scenario

Average, 5 years to:	2015	2020	2025
Open doors			
Postgraduate	62,099	69,332	78,726
Undergraduate	140,892	155,978	171,190
Diploma/Advanced Dip.	50,526	56,057	63,008
Certificate III/IV	187,547	206,788	232,107
Certificate I/II	92,106	101,000	114,377
Total	533,169	589,155	659,408
Low-trust globalisation			
Postgraduate	61,390	67,132	74,299
Undergraduate	138,033	148,983	159,926
Diploma/Advanced Dip.	49,686	53,896	59,151
Certificate III/IV	184,513	199,172	218,563
Certificate I/II	90,644	97,475	108,076
Total	524,266	566,659	620,016
Flags			
Postgraduate	59,203	62,269	66,222
Undergraduate	132,217	136,459	141,482
Diploma/Advanced Dip.	47,989	50,049	52,936
Certificate III/IV	178,607	185,773	196,805
Certificate I/II	87,931	91,452	98,177
Total	505,947	526,002	555,622

Source: Access Economics

In 2025, **open doors** sees a total post-school education sector of 2.85 million students (in a total population of 28.5 million). This compares with 2.66 million students in **low-trust globalisation** in 2025 (in a total population of 27.5 million), and 2.36 million students in **flags** (in a 25.6 million population).

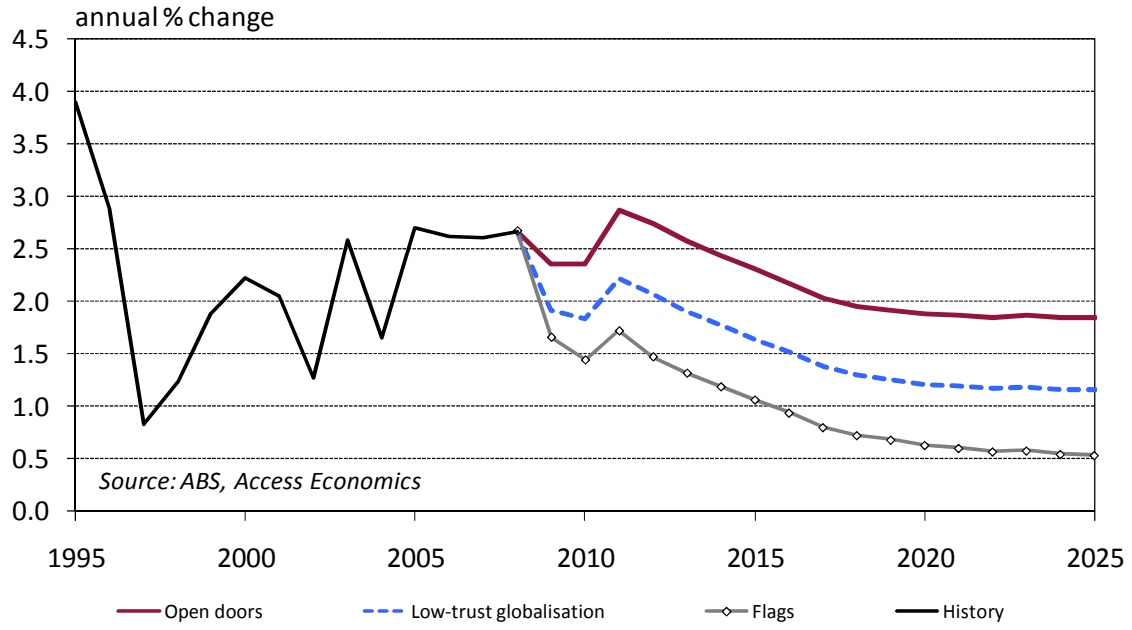
More significant supply side differences arise when accounting for the qualifications acquired via **net migration** – that is, the qualifications migrants bring with them, less those lost when Australians emigrate permanently. In 2025 it is estimated that in **open doors** some 124,000 qualifications would be acquired via net migration, compared with 96,000 in **low-trust globalisation** and just 45,000 in **flags**.

Projected employment growth

The projections of industry demand for skills/qualifications are driven by detailed labour market projections of employment by industry and occupation, and then assessing the skill/qualification requirements of that labour market demand. The qualification profile of the workforce will also tend to rise over time. Scenario assumptions on the overall level of employment growth, the rate of labour productivity growth and the composition of that growth influence projected industry demand for skills.

Over the 15 years to 2025, total employment growth averages 2.1% per annum in **open doors**, 1.5% per annum in **low-trust globalisation** and 0.9% per annum in **flags**. **In all scenarios this is lower than the rate of employment growth seen in the recent past**, thanks to our demographic profile which will ensure a slowing in the rate of Australia's working age population over time. For that same reason as well, the rate of employment growth is expected to moderate over the course of those 15 years, as shown in Chart ii. A lower rate of employment growth over time, other things equal, translates into a reduced number of additional qualifications required over time.

Chart ii: Total employment growth



Over the longer term, trend employment growth in **open doors** is strongest in areas such as business services (finance, real estate, professional services) and social services (health care, education and public administration). That follows a similar trend experienced over recent

years where services have accounted for the bulk of new jobs created. **Low-trust globalisation** shows a similar industry employment structure to **open doors** but with a lower rate of growth on average.

Table iii: Projected employment growth by industry by scenario

Average annual growth, 15 years to 2025	Open doors	Low-trust globalisation	Flags
Agriculture, Forestry and Fishing	1.1%	-0.2%	-1.8%
Mining	1.0%	0.5%	-0.7%
Manufacturing	0.0%	-1.0%	2.3%
Electricity, Gas, Water and Waste Services	-0.3%	-0.6%	3.2%
Construction	1.8%	1.0%	0.5%
Wholesale Trade	1.2%	0.2%	-1.2%
Retail Trade	2.2%	1.7%	0.6%
Accommodation and Food Services	2.3%	1.6%	0.5%
Transport, Postal and Warehousing	3.1%	2.3%	1.1%
Information Media and Telecommunications	2.4%	1.7%	1.1%
Financial and Insurance Services	2.3%	1.6%	0.5%
Rental, Hiring and Real Estate Services	2.8%	2.2%	1.1%
Professional, Scientific and Technical Services	3.1%	2.5%	1.3%
Administrative and Support Services	2.7%	2.1%	1.0%
Public Administration and Safety	2.8%	2.2%	1.0%
Education and Training	2.2%	1.5%	1.0%
Health Care and Social Assistance	2.9%	2.4%	1.3%
Arts and Recreation Services	2.4%	1.8%	-0.4%
Other Services	1.9%	1.2%	0.3%
Total	**2.1%**	**1.5%**	**0.9%**

Source: Access Economics

Flags presents a somewhat different industry growth pattern with stronger growth for manufacturing and utilities as Australia's economy moves back towards one based more on domestic production. The services sectors (which have generated the bulk of jobs created over the past decade) show only modest employment growth in this scenario.

While there is considerable dispersion within scenarios of employment growth by industry, the projections for employment growth by occupation form a much tighter band. The broad occupational types required are similar across industry sectors.

In **open doors** those broad occupational categories which are expected to show faster than average employment growth are professionals, community and personal service workers, clerical and administrative workers and sales workers. Technicians and trade workers are the broad occupation with the most modest employment growth in both **open doors** and **low-trust globalisation**, though in **flags** they are equal to the broader rate of employment growth.

Table iv: Projected employment growth by occupation by scenario

Average annual growth, 15 years to 2025	Open doors	Low-trust globalisation	Flags
Managers	2.0%	1.2%	0.7%
Professionals	2.4%	1.7%	1.0%
Technicians and Trades Workers	1.7%	1.0%	0.9%
Community and Personal Service Workers	2.3%	1.7%	0.9%
Clerical and Administrative Workers	2.3%	1.7%	0.8%
Sales Workers	2.4%	1.8%	0.8%
Machinery Operators And Drivers	1.9%	1.1%	0.9%
Labourers	1.9%	1.2%	1.1%
Total	**2.1%**	**1.5%**	**0.9%**

Source: Access Economics

The projected replacement rates (replacing workers who permanently exit the labour force) are broadly similar across the three scenarios. They are a little lower in **open doors** as the higher labour force participation rate is in part driven by a delayed retirement for some workers.

Qualification profile

To assess the future qualification implications of labour market demand, we utilise **a profile of the typical qualification mix that is associated with specific industries and occupations**. This represents recent information on average propensities to hold qualifications – in most cases these are not necessarily a strict requirement in order to undertake a particular job.

How have qualification shares changed over time, and how are they likely to change in the future?

An increase in the share of those employed who hold post-school qualifications has been evident over recent years. **The share of those employed with post-school qualifications was 55.7% in 2003. By 2008 it was 59.7% - an increase of four percentage points over five years**.

As the Australian economy heads down the path of being a higher skill / higher productivity economy over time, the level of qualifications within particular occupations tends to rise over time. Going forward, Access Economics' assumptions are that the share of those employed holding post-school qualifications will be influenced by two key drivers - the observed trend change in the qualifications profile between 2001 and 2008, and the assumed overall rate of productivity growth for the scenario.

Open doors sees the highest rate of skills deepening, linked to the faster productivity growth in that scenario. Aggregate results are:

- Under **open doors** in 2025 74.9% of those employed hold a post-school qualification (and 25.1% hold no post-school qualification).
- Under **low-trust globalisation** in 2025 73.2% of those employed hold a post-school qualification (and 26.8% hold no post-school qualification).
- Under **flags** in 2025 71.2% of those employed hold a post-school qualification (and 28.8% hold no post-school qualification).

Projected labour market demand for qualifications

The implied labour market demand for qualifications is driven by the projected labour force growth aggregates and the projected qualification profiles, yielding the following projections:

- In **open doors** by 2025 there are projected to be 11.6 million people employed holding a post-school qualification, an annual average increase of 3.4% from 2010.
- In **low-trust globalisation** by 2025 there are projected to be 10.1 million people employed holding a post-school qualification, an annual average increase of 2.6% from 2010.
- In **flags** by 2025 there are projected to be 9.0 million people employed holding a post-school qualification, an annual average increase of 1.9% from 2010.

Further, accounting for the share of workers who hold more than one post-school qualification (and trend growth in such) yields the following projections for total qualifications:

- In **open doors** by 2025 there are projected to be 18.0 million post-school qualifications held by those employed, an annual average increase of 3.8% from 2010.
- In **low-trust globalisation** by 2025 there are projected to be 15.6 million post-school qualifications held by those employed, an annual average increase of 3.0% from 2010.
- In **flags** by 2025 there are projected to be 13.7 million post-school qualifications held by those employed, an annual average increase of 2.2% from 2010.

Table v shows the projected labour market demand for qualifications over time (including allowance for multiple qualification holders and replacement demand). Given that these projections are largely based on expected employment needs there are notable differences between the scenarios. In 2025 the difference in the number of qualifications demanded between **open doors** and **flags** amounts to around 70%.

Table v: Projected labour market demand for qualifications by scenario

Average, 5 years to:	2015	2020	2025
Open doors			
Postgraduate	106,620	106,949	112,978
Undergraduate	244,237	247,113	261,466
Diploma/Advanced Dip.	138,341	137,130	144,425
Certificate III/IV	190,348	193,171	202,416
Certificate I/II	91,199	96,441	106,511
Total	770,745	780,804	827,795
Low-trust globalisation			
Postgraduate	92,703	89,929	91,102
Undergraduate	209,332	204,590	207,717
Diploma/Advanced Dip.	116,125	110,713	113,003
Certificate III/IV	155,519	152,271	153,876
Certificate I/II	71,999	73,814	79,631
Total	645,679	631,317	645,328
Flags			
Postgraduate	78,161	71,919	69,246
Undergraduate	174,413	162,738	157,323
Diploma/Advanced Dip.	96,513	89,169	90,604
Certificate III/IV	133,415	125,962	121,479
Certificate I/II	57,215	57,904	61,399
Total	539,716	507,691	500,051

Source: Access Economics

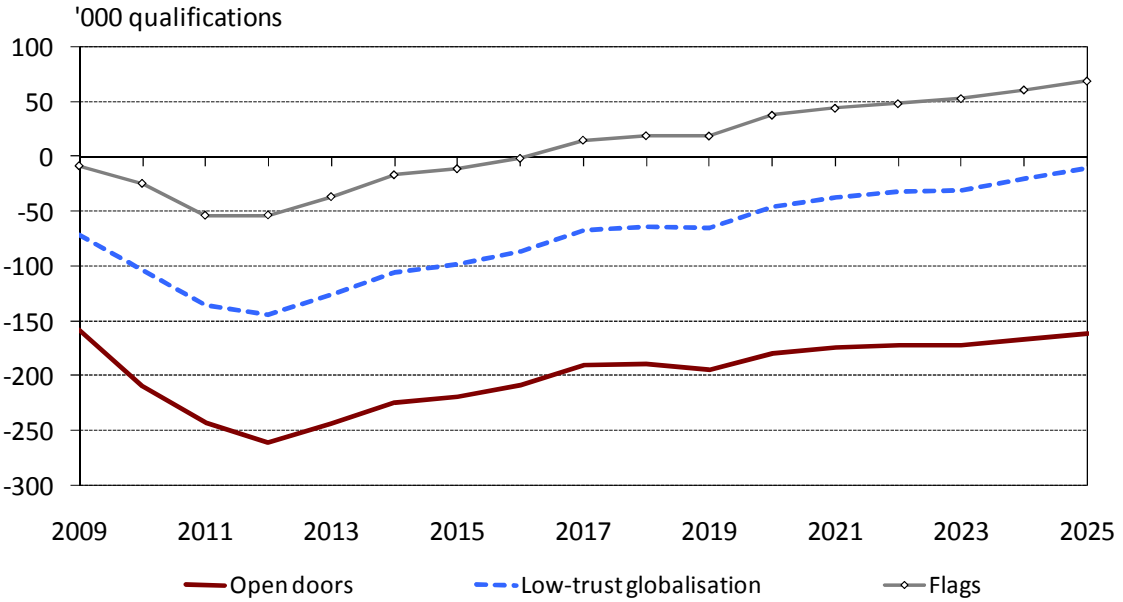
Balance of student demand and labour market demand

The following chart shows student demand less labour market demand projections over time for each of the scenarios with a notable gap between the scenarios. A value less than zero implies an excess of demand over supply, while a value above zero implies an excess of supply over demand.

Open doors produces a demand for skills which is not likely to be met based on existing demographic trends in the supply of students, particularly at the higher education end of the spectrum. For **flags** the labour market demand for skills is likely to be far less over time than the demographically-driven projection for the number of students. The outcome for **low-trust globalisation** falls in the middle.

In all scenarios the gap between supply and demand narrows from 2012 onwards. This is largely underlying demographics at work. Slower working age population growth over time produces slower employment growth over time (see Table iiChart ii), reducing the number of additional qualifications demanded by employers over time. Against that, the supply of students gradually rises as there is an increased growth rate from the prime 18-22 age cohort (see Chart i).

Chart iii: Projected student demand less projected labour market demand for total qualifications



Source: Access Economics

The projections shown above suggest that to meet employers' projected demand for skills over time in **open doors** (and to a lesser extent in **low-trust globalisation**), a significant skills contribution is required from net migration and/or a structural lift in student participation rates is required.

Net migration is currently making a notable contribution towards the stock of qualifications held in Australia, and in **open doors** net migration is projected to continue at a high level. Expected qualifications from net migration close much of the gap shown above for **open doors**, though a significant skills deficit still remains over time. For **low-trust globalisation** and **flags**, the supply of qualifications exceeds demand over time after accounting for likely qualifications from net migration.

COAG targets

The projected demand for qualifications can be compared with some of the stated **COAG and Australian government targets** for skill development.

As some of these targets are framed with an age dimension, and the labour market demand projections do not include an age dimension the targets cannot be specifically checked, but by implication the following is suggested.

- Target: by 2020 the proportion of persons aged 20-64 without qualifications at the Certificate III and above level would be halved.
  - This change would require the share of those aged 20-64 without a Certificate III qualification to halve from 50% in 2007 to 25% in 2020. Based on this modelling the **open doors** scenario comes closest to achieving this target. Using employed persons as the base some 48.4% of those employed were without a Certificate III

qualification or higher in 2007. In **open doors** this is projected to fall to 33.6% in 2020 and 30.4% in 2025 – a very substantial reduction, though not quite achieving the halving of the proportion without such qualifications.

- In short the target is not achieved under these projections, even for the **open doors** scenario. The shortfall to the target in **open doors** in 2020 amounts to approximately 1,298,000 additional people who would require a Certificate III or above qualification (and are not otherwise projected as having one in 2020).
- To achieve the target on the demand side would require either still further skills deepening beyond that allowed for in these projections and/or a different industry/occupational profile of employment skewed further towards those industries and occupations which have a higher propensity to require Certificate III and above qualifications.

- Target: by 2020 the number of diploma and advanced diploma completions would be doubled.
  - This target implies an additional 45,000 diploma and advanced diploma completions per annum (based on 2007 completion levels). The demographically based student demand projections show that the target would not be met under each of the scenarios. However, under the implied labour market demand projections the demand exists under each of the scenarios for the target to be achieved. The latter accounts for significant skill deepening over time, as well as taking into account the extent to which those with higher qualifications tend to also hold diplomas or advanced diplomas with that trend projected to continue in the future.
- Target: by 2025 the proportion of those aged 25-34 with a degree will increase to 40%.
  - In 2007 around 30.6% of this target group held a degree or higher qualification. Applying these percentage point increases based on persons employed to the target group suggests the target would be achieved under **open doors** and **low-trust globalisation** but not under **flags**.

Conclusions

Australia's demographic profile means that we face some challenges going forward in its skills development. We will see slower growth in the key post-school student cohort (aged 18-22) which can only partly be stemmed by migration.

Compared with what is a reasonably certain path for our demographics, the future path for Australia's economy over the next 15 years is subject to considerable uncertainty. This report considers three quite different paths for the economy. They range from **open doors** which incorporates both global economic success and success at home in lifting labour force participation rates, the steady as she goes **low-trust globalisation** where economic growth fades gradually in line with Australia's working-age population, and the underperforming **flags** which sees both low economic growth and a sectoral switch back in favour of manufacturing and related activities.

Against those paths for the economy there is the risk of a significant skills deficit remaining over time within **open doors** and **low-trust globalisation**. However, net migration may close that gap over time in the latter and provide a decent offset in the former.

Beyond the contribution of migration, any further addition to skills development may require a further lift in year 12 completion rates beyond that allowed for in this report (as the key feeder group to post-school skills development) and/or a greater focus on training or retraining for those aged over 24. Of course, along with these developments would go a significant resourcing requirement in order to deliver a greater amount of skills development.

More broadly a mis-match between supply of skills and demand for skills can create incentives for other actions to occur. These actions could include a change in relative wages, different demographics and pathways for post-school education, changes to international and interstate migration levels, a change in movements in and out of the labour force, demand side changes which may seek better technology, changes in the concordance between occupations and qualifications, and changes in the depth of skill required for occupations.

Access Economics
22 October 2009

1 Introduction

Skills Australia commissioned Access Economics to undertake research and analysis on the future demand for post-school skills and qualifications to 2025. The task involves examination of both the labour supply of skills (demand by prospective students) and the labour demand for skills (demand by industry). The assessment is conducted at both the national level and for each State/Territory with the focus of results in this report at the national level.

The reporting of projected qualification demand covers both higher education and vocational education and training (VET), and uses the following categories:

- Postgraduate qualifications;
- Undergraduate qualifications;
- Advanced diploma / Diploma;
- Certificate III / Certificate IV; and
- Certificate I / Certificate II.

This report examines only education delivered to domestic students, not that provided in Australia to overseas students. The analysis of student enrolments in this report are consistent with the DEEWR Higher Education and NCVER VET statistical collections for domestic students.

The projections are presented within the context of three scenarios being examined by Skills Australia. Scenario planning is being used by Skills Australia as a means of considering a range of workforce development issues. A description of these scenarios is provided in *Three Global Scenarios* and they have formed the basis for a range of stakeholder consultation. The scenarios are termed:

- Open doors;
- Low-trust globalisation; and
- Flags.

The research will inform Skills Australia in its general advice to the Australian government and in its preparation of a National Workforce Development Strategy.

2 Calibrating the scenarios

2.1 Key modelling parameters

There are two important aspects in translating *Three Global Scenarios* to a quantifiable form:

- What **assumptions** (in terms of modelling parameters) the various modelling scenarios will allow to vary; and
- How those scenarios outlined in *Three Global Scenarios* would best be represented in terms of **numerical values** for those parameters.

The final results of these considerations are contained in a number of tables which show the assumptions adopted for each of the parameters, as well as some of the resultant broad economic results that these assumptions would imply.

A key element in modelling the demand for skills in the Australian economy is the expected performance of the Australian labour market over the next two decades. Specifically, we need to determine:

- The **size** of the labour market (in terms of the total number of people employed); and
- The **distribution** of employment (in terms of industries and occupations).

The model structure we have adopted estimates different possible outcomes for the labour market based primarily on assumptions for five key variables. These are:

- Total economic output – both globally and nationally;
- The level of net migration to Australia;
- Labour productivity growth in the Australian economy;
- Exports as a share of Australian GDP; and
- The capital to labour ratio in the Australian economy.

These parameters are not independent of each other – so we cannot just choose their values without providing some realistic and coherent reason for how they will move. The most obvious example of this would be global economic growth and Australian exports – we could not have terrible world growth but assume Australian exports would somehow be a major boost to our economy.

These five assumptions also work together to vary the size and distribution of the Australian labour market. However, the first three are more important for the size of the market while the final two are more important in determining the make up of labour demand by industry.

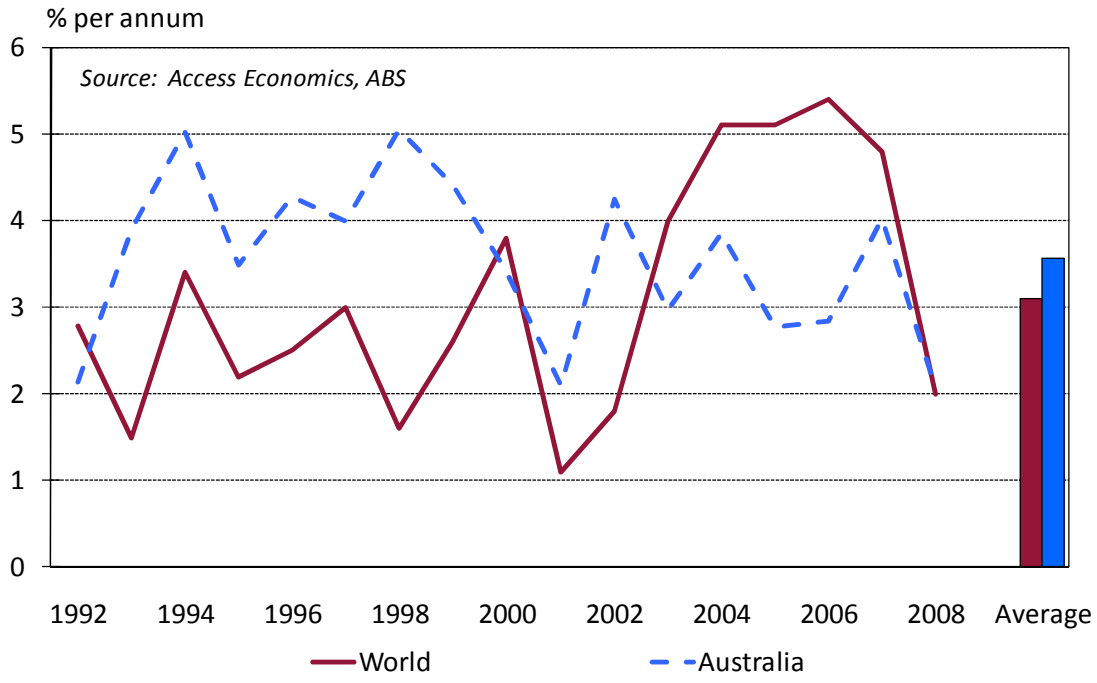
Note that there are other assumptions involved in the modelling (such as birth rates and mortality for estimating population and a number of key economic assumptions that drive the industry make up of the future Australian economy) but these are not as important as the five key parameters outlined above.

2.2 GDP growth rates

The assumed rates of global economic growth are taken from *Three Global Scenarios*. The key point of this assumption is to determine how that over-arching criteria will be reflected in local growth rates.

To determine the likely relationship between the rate of global economic growth and local rates, we have considered the historical relationships as well as emerging trends in relative growth rates.

Chart 2.1: World and Australian GDP growth



The three scenarios have set values for average global GDP growth to 2025 as shown in Table 2.1. The Australian output growth rates are below the equivalent global growth rates in **low-trust globalisation** and **flags**. That reflects the period of recent economic history where China and India have accounted for a larger share of global growth and their prospects remain strong. **Open doors**, as a scenario where there is a further strong move towards globalisation, sees Australian GDP growth increase at a slightly faster rate than global GDP growth.

Table 2.1: GDP growth rate assumptions by scenario (average 2010-2025)

	Open doors	Low-trust globalisation	Flags
Global GDP growth rate	3.80%	3.10%	2.60%
Australian GDP growth rate	3.93%	3.00%	2.20%

1 – Average growth rate 2010-2025 (% per annum). 2 – Level as at 2025.

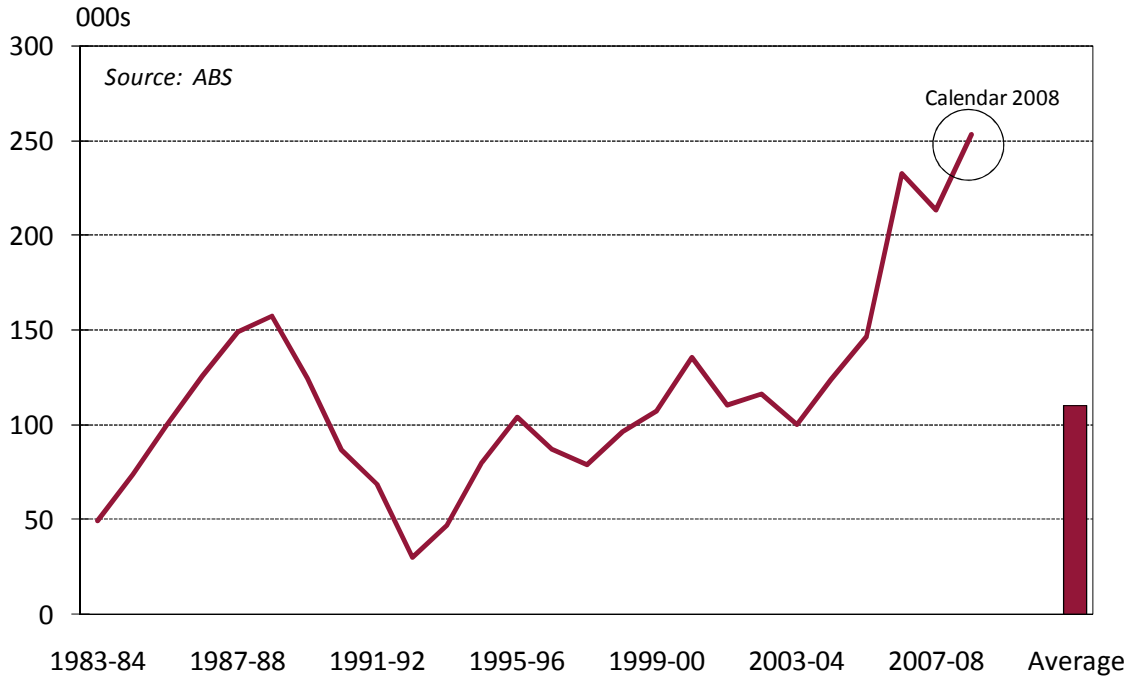
Source: Skills Australia, Three Global Scenarios; Access Economics

Note that the key parameters for **open doors** are calibrated in a slightly different manner to the other two scenarios. For **low-trust globalisation** and **flags**, an average GDP growth rate is assumed which is consistent with the global GDP growth rate. Following further assumptions on population growth, productivity growth and the unemployment rate, the labour force participation rate is derived by implication. For **open doors** the labour force participation rate is targeted (discussed further in section 2.7), leaving overall GDP growth as the free variable.

2.3 Net migration to Australia

Migration rates are likely to be the key driver of changing population growth within Australia. Australia's level of net migration has varied sharply over recent years as Chart 2.2 shows – with very significant rises apparent as the economy surged. However, recent changes to Federal Government policy suggest that, at least in the short term, levels will decline.

Chart 2.2: Net migration to Australia



This recent change to migration targets, driven (at least partially) by relatively negative community attitudes towards migration in a time of economic downturn, reflects some of the thinking embodied in the **low-trust globalisation** and **flags** scenarios. As such, it is likely that the three scenarios will result in differing rates of migration to Australia.

In the main we would not anticipate migration levels moving back down to the last cyclical lows as long as Australia's economy does well relative to the rest of the developed world.

There are a couple of secondary assumptions related to the demographic model. These include:

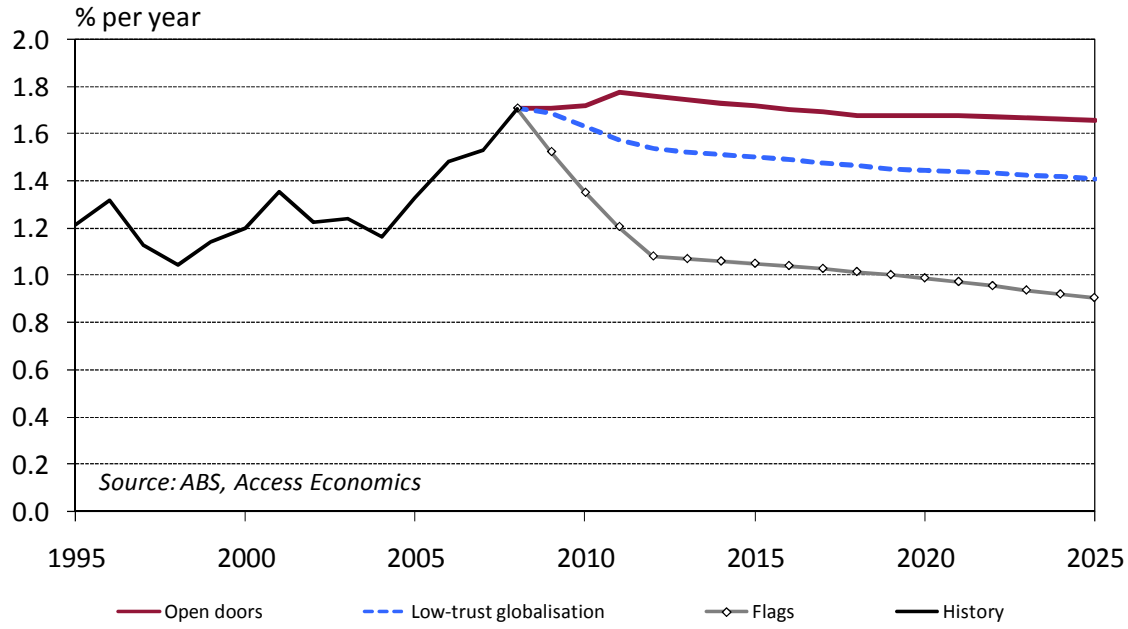
- **The birth rate**. This is measured by the total fertility rate (or TFR). Because we are only modelling out to 2025, there is little impact from changing birth rates in the short term

on the latter end of the model[1] – and this is more likely to be relevant for the size of the student body (supply of students) than on the workforce (demand for skills). As a result, we adopt our standard assumption of a TFR of 1.8 lifetime births per woman.

- **Mortality rates**. These are the same across all scenarios as they have very little impact on the labour market over a two decade period – particularly across the range of likely values for mortality. In all scenarios male life expectancy at birth rises from 79.0 years in 2007 to 83.4 years by 2025, and for females from 83.7 to 87.7 years over the same period.

The scenarios produce final population levels (for 2025) ranging from just under 25.6 million in the **flags** scenario to just under 28.5 million in the **open doors** scenario. They result in the differing annual population growth rates shown in Chart 2.3.

Chart 2.3: Population growth in Australia



2.4 Productivity growth

The ABS and Federal Treasury typically use GDP (or output) per hour worked to measure productivity. This can also be termed labour productivity as it is the amount of output you achieve for a given amount of labour input. Productivity growth can them be split into components of:

- **capital deepening** – the relative increase in capital per worker employed. To put it simply, one worker can often watch two machines just as easily as one, so adding a second machine to a process (and doubling output) implies a 'different' sort of productivity increase; and

[1] As even changes put into the first year of the model will only change the number of 15 year olds in the very last year of the modelling.

- **multi-factor productivity (MFP)** – the greater efficiency in production that is not attributable to more machines. In essence, MFP reflects improvements in efficiency in its most broad sense. Its growth occurs because of investments in research and development, skill improvements, changes to more productive management practices and so on. However, because it is often calculated as a residual factor – after all the other sources of output growth have been accounted for – its importance is sometimes understated.

Note that MFP does not necessarily grow just because we work harder or longer hours or work with more machines – it is best described as occurring when we 'work smarter'. It can result from new technologies (better machines), improved worker skills and work practices (better workers), shifts in production towards higher value-added products (better composition), and microeconomic and competitive reforms which encourage all of the above.

Productivity growth rates across the 1990s averaged above 2% per year, although including the previous downturn (when productivity growth tends to suffer) and measuring since the early 1980s sees an average just below 1.5% per year.

Federal Treasury has used a consistent measure of productivity growth, of 1.75% growth per year, since the release of the first *Intergenerational Report* in 2002, which was fairly close to the rates seen in the cycles preceding the report's result. Growth rates since that time have been slightly less impressive.

The productivity growth rates assumed for these scenarios are:

- 1.75% per annum for **open doors**;
- 1.5% per annum for **low-trust globalisation**; and
- 1.3% per annum for **flags**.

2.5 Export intensity

While the assumptions in the three previous sections drive the size of the labour market, exports are more important in driving the type of employment growth Australia is likely to see.

Obviously, the faster the rate of world economic growth the greater is our likely rate of export growth and the faster is the rate of national economic growth – both directly (more exports equals more GDP) and indirectly (better world economy means better local confidence and economic performance).

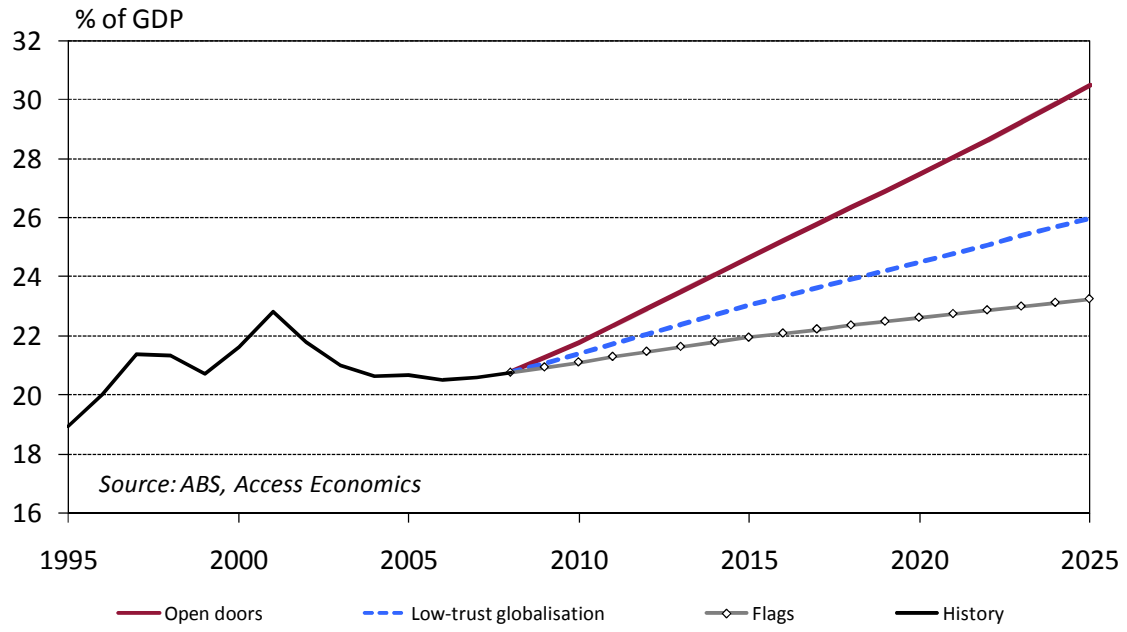
However, once national GDP is set, the level of exports within that will affect employment growth by industry. Higher exports may come from traditional export sectors such as mining and agriculture, though in a scenario such as **open doors**, greater global openness may produce further export opportunities for high end services.

Our underlying employment model allocates employment changes by industry on the changes in the components of final demand, with the relationships based on the relative contributions of various types of spending to employment and the flows of money between industries.

Chart 2.4 shows the increase in exports in importance to the Australian economy across the 1990s, with a stalling in growth across this decade (although that is partly due to the strength

seen in investment – much of which has been built to enhance Australia's long term export potential).

Chart 2.4: Ratio of exports to GDP



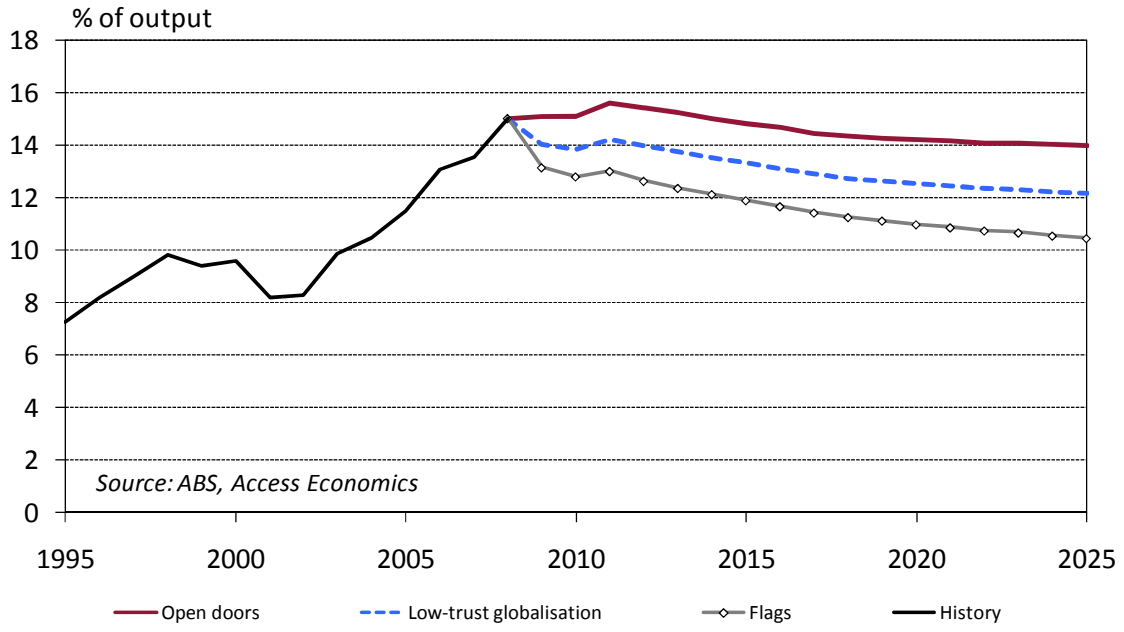
Each scenario sees the share of exports to the size of the economy rise – although for slightly different reasons. In the faster growth scenarios Australia's growth is to a large extent driven by the engagement with the rest of the world that the scenario envisages – that is, a relatively buoyant external sector. This is less true in the **flags** scenario, although there it is the limits of the size of the domestic market (as population growth rates slow drastically) that sees exports shares grow – that is, a relatively moribund domestic sector.

2.6 Investment intensity

Similarly, the relative importance of investment and consumption within Australia's economic output levels will affect the relative demand for employment within the economy. Changing the assumed capital to labour ratio changes the required level of investment in the economy (shifting away from consumption) and hence changes employment demand for capital intensive sectors.

This flows through most importantly to the relationship between business investment and output – which has a strong inverse relationship to the unemployment rate. Chart 2.5 shows how sharply that indicator has risen since the mid 1990s and the projections in the three scenarios. The ratio is particularly strong at the moment and will very likely decline as the large pipeline of resource investment projects currently underway are completed. The decline in the **flags** scenario is commensurate with a moderate rise in unemployment rates while the **low-trust globalisation** scenario would suggest little change on average across the period.

Chart 2.5: Business investment as a share of output



The **open doors** scenario sees the share that business investment contributes to the economy decline slightly as well, but this is also reflective of the increasing importance of exports in the economy noted above, compared to the domestic economy. In **open doors**, business investment is stronger and will help place further downward pressure on unemployment rates.

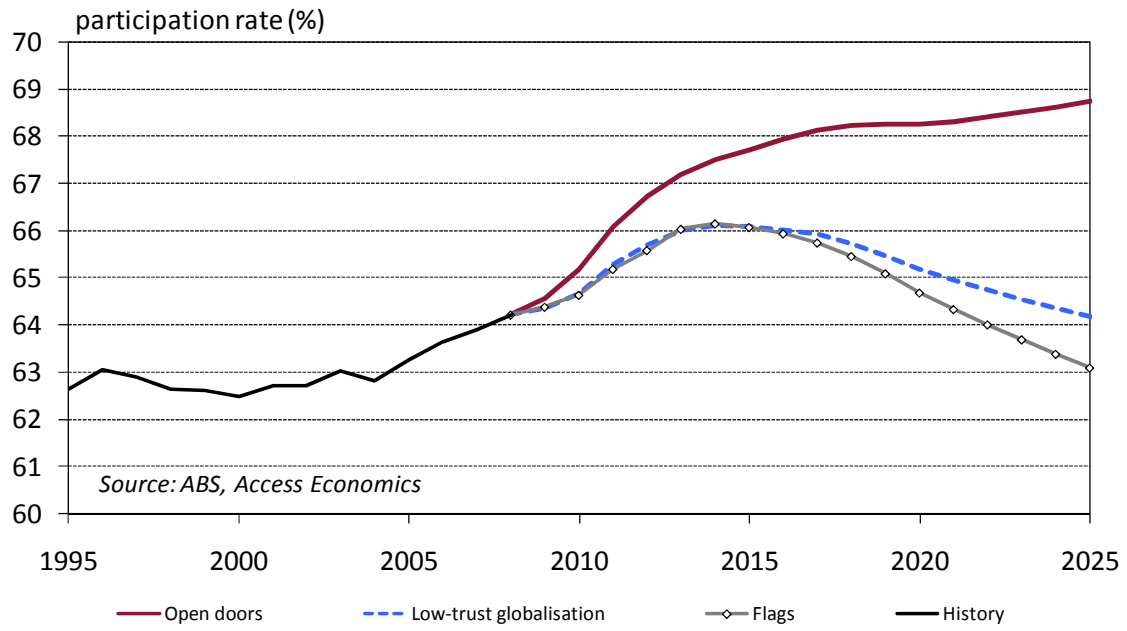
2.7 Labour force characteristics

The **unemployment rate** is a key indicator of the strength of the economy at any given time. At present the Australian unemployment rate is rising after a prolonged period of decline.

The short term trends are driven by current economic developments which have already driven the unemployment rate up from early lows. The difference between the scenarios lies with where we go next. In **flags** the unemployment rate will move back to the average result for the past decade at around 6.0% - not a bad result compared with the 1980s and early 1990s. **Low-trust globalisation** sees an unemployment rate of around 5% in the longer term – a rate often regarded as 'par' for unemployment. **Open doors** is far more effective at creating sustainable levels of employment growth and sees the unemployment rate move back down to 4.5%, which is around the best achieved in the last cycle.

For the economist, economic strength is determined by the size of output – which is driven by the size of the workforce and levels of productivity. **Labour force participation** is an important measure in this context. Recent results and the projected levels of the labour force participation rate are shown in Chart 2.6.

Chart 2.6: Labour force participation rate



The different scenarios are affected by a number of competing factors that will raise or lower the overall workforce participation rate:

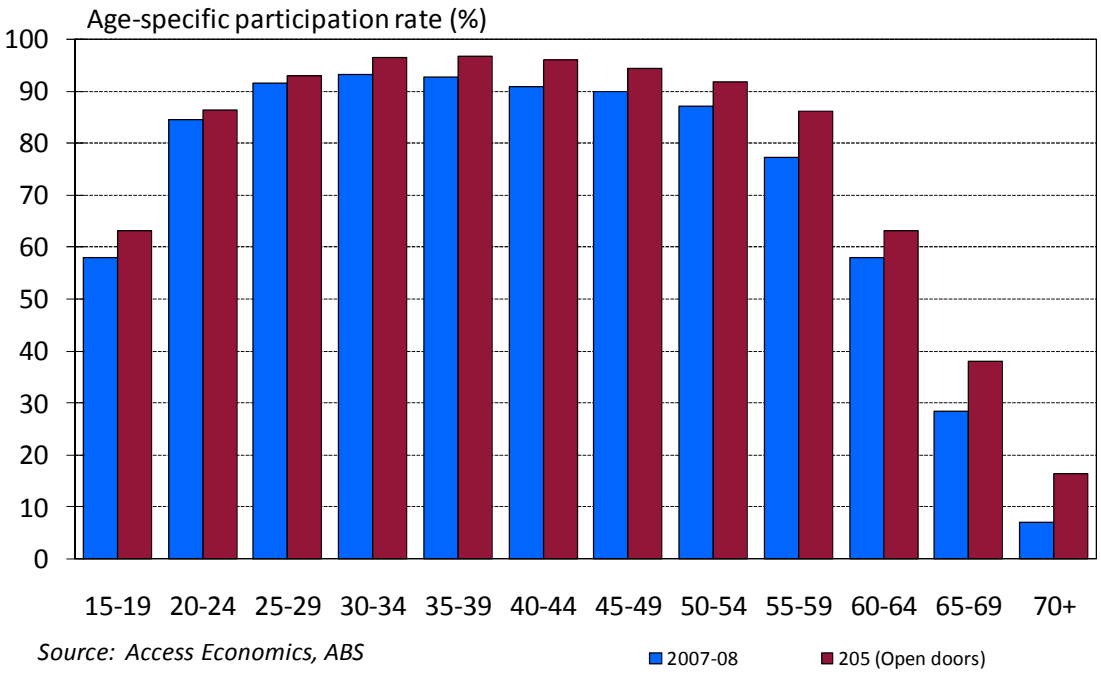
- **Ageing** within the economy is the most important factor that drives participation rates in the forecast period. As the Australian population ages, as is all but certain, the overall number of retried persons in the economy will increase. Other things equal, **the shift of people into older age brackets provides a tendency for population-wide labour force participation to fall. That is, unless there are significant enough lifts in age specific participation rates to offset this ageing effect (which is the case in open doors).**
- **Migration trends** have, and will continue to have, a very large impact of the demographic make-up of Australia. As migrants tend to be relatively younger (and, are particularly targeted to add to Australia's workforce) they are able to mitigate the main ageing trend. A strong rate of migration in **open doors** (net migration of at least 250,000 per year) is one factor which allows labour force participation to continue to rise over time (see Chart 2.6).
- **Unemployment rates** also have an impact. As participation rates are effectively the unemployment rate plus the employment rate the higher unemployment assumption in **flags** lifts the participation rate closer to the **low-trust globalisation** results.

The labour force participation rates for **low-trust globalisation** and **flags** shown in Chart 2.6 are effectively the derivative based on expected population growth and expected employment growth.

For **open doors** the labour force participation rate has been set by assumption (with the overall GDP growth rate for this scenario effectively endogenous). That setting reflects the projected age specific participation rates shown in Chart 2.7and Chart 2.8. It is based on a continuation of existing trends for labour force participation in the 15-24 and 60+ age cohorts and the current 80th percentile OECD labour force participation rates for the remaining age

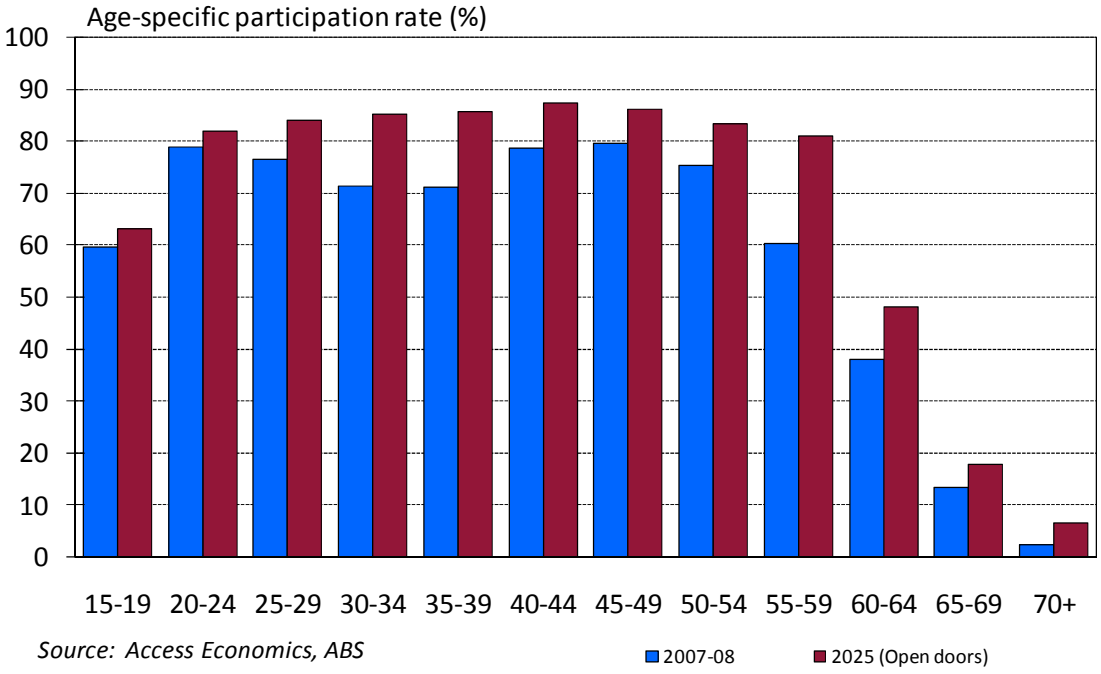
groups (25-59 years of age). Further detail on the OECD labour force participation rates is shown in Appendix B.

Chart 2.7: Age-specific participation rates – males



Source: Access Economics, ABS

Chart 2.8: Age-specific participation rates – females

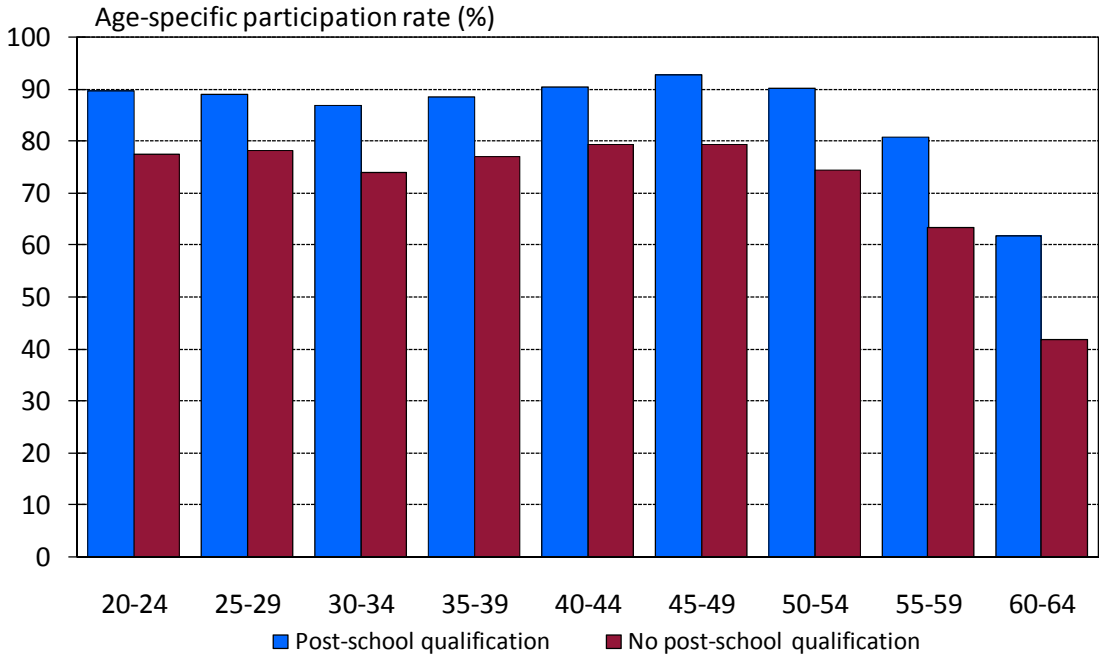


Source: Access Economics, ABS

The labour force participation rate selected for open doors is an aspirational target, but also a realistic one based on the experiences of other countries (as well as on the level and age composition of the projected migrant intake, which is in line with actual migrant intakes over recent years).

Access Economics also investigated an alternate method of setting a labour force participation target under **open doors**. That was based on the observation that Australians with qualifications at Certificate III level or higher have significantly higher labour force participation than Australians of the same age without such qualifications as shown in Chart 2.9.

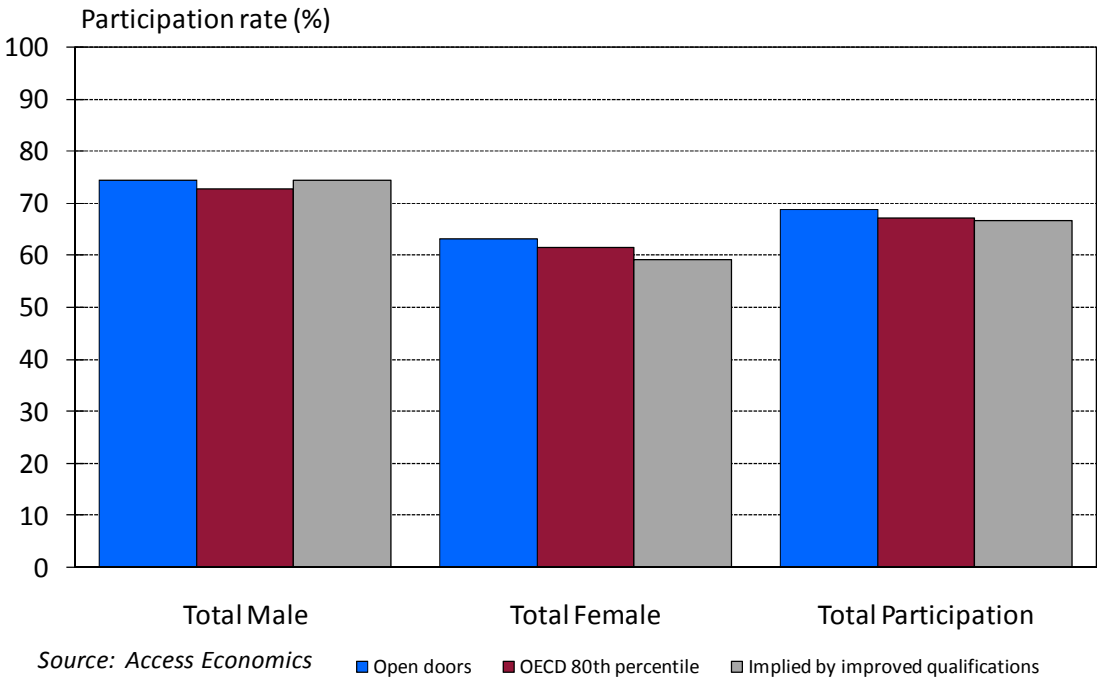
Chart 2.9: Labour force participation rates based on holding of post-school qualifications



Source: 2007 ABS Survey of Education and Work

A current COAG target is to halve the number of people aged 20-64 without qualifications at the Certificate III and above level by 2020. If this target were achieved and the age specific participation rates for each group (with and without qualifications) did not change between 2008 and 2020, the resulting overall labour force participation rate would be very similar to that shown here for **open doors** as well as close to the rate that would be achieved if Australia reached the current 80th percentile of OECD age-specific fertility rates (see Chart 2.9). Hence the labour force participation rate for this scenario is one which is both achievable (based on overseas experience) and consistent with higher levels of skill development contained within COAG targets.

Chart 2.10: Comparison of aggregate labour force participation scenarios (2025)



Source: Access Economics

A result of achieving the target rates of labour force participation shown in **open doors** would be to mitigate the aged dependency effect over time – with participation rates in 2025 actually edging up to reach 68.8%, against declining rates in the other scenarios (which have fallen to 64.2% in **low-trust globalisation** and 63.1% in **flags** by 2025).

If the higher rates of labour force participation in **open doors** were achieved off the back of increased skills, there would be a notable cost involved with those additional qualifications. However the significant decline in the total labour force participation rate which would otherwise result over time suggests the additional training may largely pay for itself by postponing the workforce side of the fiscal effects of ageing.

2.8 National parameter summary

Table 2.2 presents a summary of key economic parameters used within the scenarios.

Table 2.2: Summary assumptions by scenario

Variable	Open doors	Low-trust globalisation	Flags
Global growth rate[1]	3.80%	3.10%	2.60%
Assumptions			
Australian growth rate[1]	3.93%	3.00%	2.20%
Annual net migration to Australia[1]	250,000 or 1.00%	200,000 or 0.80%	100,000 or 0.40%
Labour productivity growth[1]	1.75%	1.50%	1.30%
Exports[1]	6.29%	4.35%	2.94%
Capital/Labour ratio[1]	1.50%	1.00%	0.50%
Implied results			
Population growth[1]	1.70%	1.47%	1.02%
Workforce growth[1]	2.12%	1.49%	0.96%
Employment growth[1]	2.15%	1.48%	0.89%
Unemployment rate[2]	4.5%	5.1%	6.0%
Participation rate[2]	68.8%	64.2%	63.1%
Exports to GDP[2]	30.5%	26.0%	23.3%
Business investment to GDP[2]	14.0%	12.2%	10.5%

1 – Average growth rate 2010-2025 (% per annum). 2 – Level as at 2025.

Source: Skills Australia, Three Global Scenarios; Access Economics

2.9 State parameter summary

Projected skills demand is also undertaken at the State/Territory level. Projections for economic parameters at this level reflect the demographic profile of each State and expected trends in migration, including interstate migration. Those trends will affect growth in the working age population and, in turn, the workforce. Projected trend State workforce growth rates by scenario are shown in Table 2.3.

Table 2.3: State workforce growth rates by scenario

State/Territory	Open doors	Low-trust globalisation	Flags
National	2.12%	1.49%	0.96%
New South Wales	1.88%	1.24%	0.68%
Victoria	2.03%	1.40%	0.87%
Queensland	2.74%	2.13%	1.63%
South Australia	1.50%	0.90%	0.43%
Western Australia	2.68%	1.99%	1.34%
Tasmania	0.87%	0.40%	0.19%
Northern Territory	2.02%	1.47%	1.11%
ACT	1.62%	1.10%	0.80%

Average growth rate 2010-2025 (% per annum)

Source: Access Economics

Projected output growth by State follows both broad trends in expected workforce growth and historic ratios of output per employee. The latter in part reflects the industry structure which exists in each State.

An exception to this general trend has been included for South Australia where the scenarios include a lift in output per worker. This is on the basis that the State will experience a change in its industry structure – driven by an expectation of additional defence and resources activity (given the State's emerging capabilities in defence industries and its high rate of mineral exploration expenditure in recent years). In **open doors** this gives an additional 0.6% output growth per worker per year (compared to the national average), in **low-trust globalisation** it is an extra 0.5% and in **flags** it is an extra 0.4% per year.

Projections for trend output growth rates by State are shown in Table 2.4.

Table 2.4: State output growth rates by scenario

State/Territory	Open doors	Low-trust globalisation	Flags
National	3.93%	3.00%	2.20%
New South Wales	3.61%	2.67%	1.85%
Victoria	3.76%	2.83%	2.04%
Queensland	4.49%	3.58%	2.83%
South Australia	3.85%	2.84%	1.99%
Western Australia	4.42%	3.44%	2.55%
Tasmania	2.58%	1.82%	1.35%
Northern Territory	3.75%	2.91%	2.29%
ACT	3.35%	2.55%	2.01%

Average growth rate 2010-2025 (% per annum)

Source: Access Economics

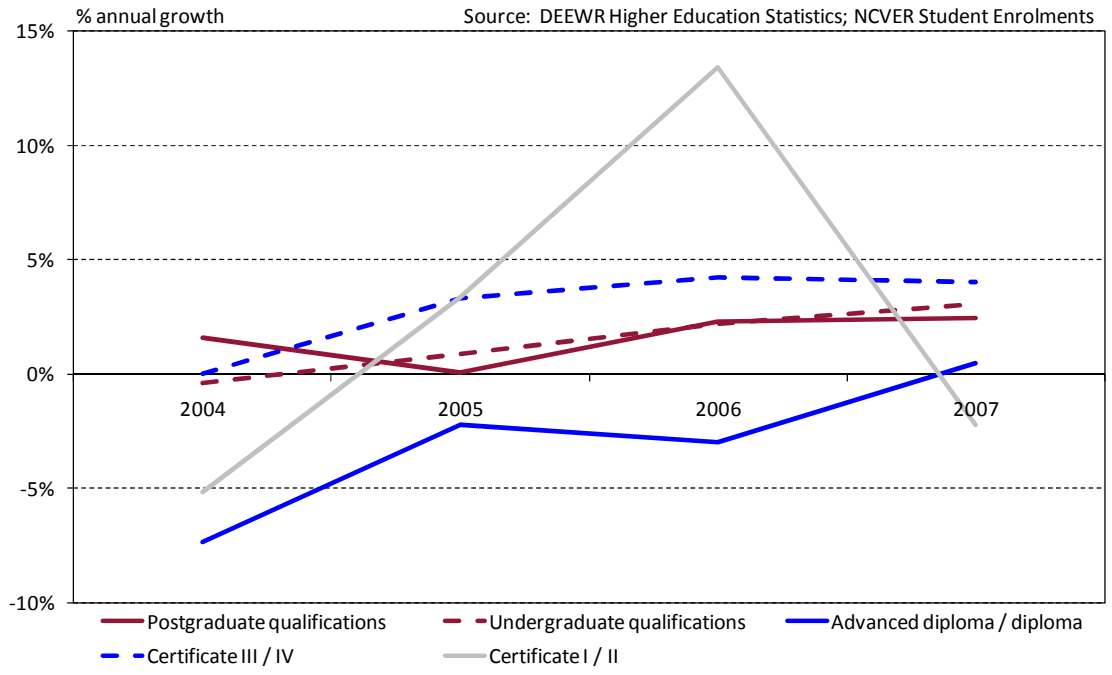
3 Student qualification profile

3.1 Historic trends in student participation

The analysis of student enrolments are in terms of domestic students, consistent with the DEEWR Higher Education and NCVER VET statistical collections. Growth in student participation in post-school qualifications has been strong in recent years, although growth rates have been below those seen through much of the 1990s.

Chart 3.1 shows growth in student enrolments over recent years for each of the five different qualification types. There were 732,172 students enrolled in courses leading to a higher education qualification (postgraduate or undergraduate qualification) and over 1.2 million students enrolled in courses leading to a VET qualification (diploma/advanced diploma or certificate level course) in 2007, bringing the total number of students pursuing non-school qualifications to a little over 1.9 million.[2] Overall, this represents an annual growth of 2.0% from 2006. Translated across education sector, this represents almost 2.9% growth for the higher education sector and about 1.5% for the VET sector.

Chart 3.1: Annual growth in student enrolments by type of qualification, 2003 to 2007



Average growth in enrolments between 2003 and 2007 has been strongest for Certificate III/IV qualifications (averaging 2.9% per annum), and Certificate I/II qualifications (averaging 2.1% per annum with year on year growth rates in student enrolments quite volatile over this period). Moderate growth in enrolments from 2003 to 2007 has been seen for undergraduate qualifications (averaging 1.4% per annum) and postgraduate qualifications (averaging 1.6% per

[2] This analysis makes use of detailed enrolment data which was only available up to 2007 at the time of publication.

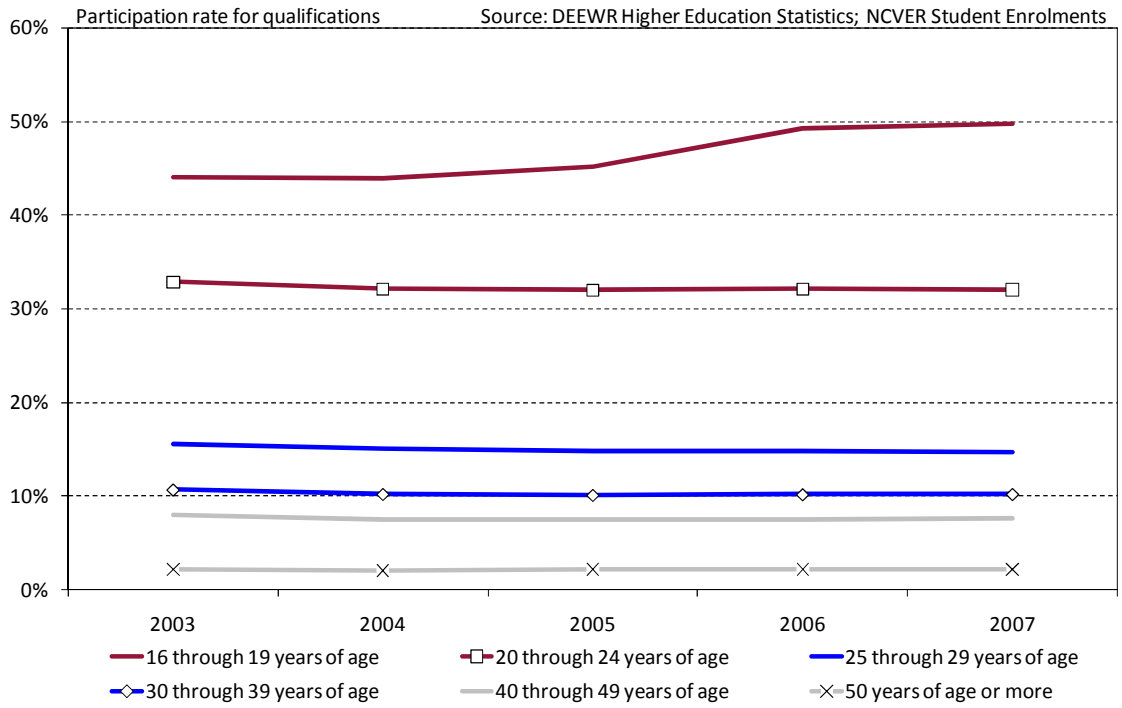
annum), while there has been a strong decline in enrolments at the advanced diploma/diploma level (averaging -3.0% per annum).

As a share of Australia's post-school education system from 2003 to 2007, VET enrolments (covering diploma/advanced diploma or certificate level courses) accounted for, on average, 62%, while higher education enrolments (covering postgraduate or undergraduate qualifications) accounted for the remaining 38%.

How has student participation by age changed over recent years? Examined as a share of the number of people in each age cohort it has increased for the immediate post-school cohorts and kept relatively stable for older age cohorts.

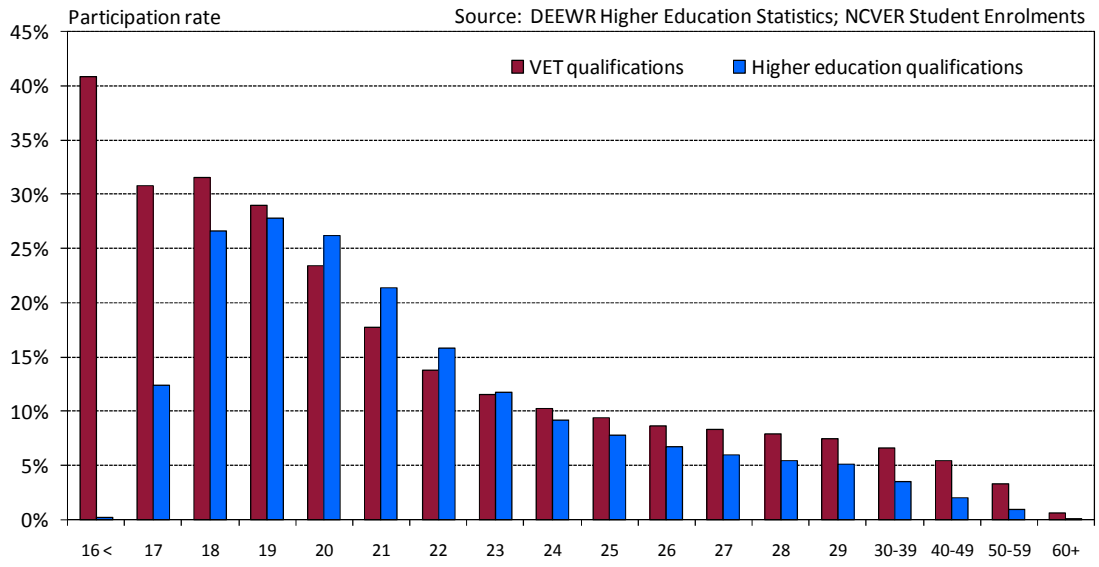
Chart 3.2 shows the participation rate by age cohort (student numbers as a share of the number of people in each age cohort) for total post-school qualifications from 2003 to 2007. Across age cohorts, Chart 3.2 shows that 16 to 19 and 20 to 24 year olds have the highest share of participants in post-school education. For 16 to 19 year olds, their participation rate has moved upwards from 44.0% in 2003 to 49.8% in 2007, led by a notable shift up in certificate I/II enrolments (which may reflect an expansion of VET in schools).

Chart 3.2: Student participation rates for total post-school qualifications by age, 2003 to 2007



The average age profiles of course differ between higher education and VET qualifications. Chart 3.3 shows that VET is undertaken by a significant proportion of 16 year olds with a general decline in participation as ages increase. For higher education the peak comes at 19 years of age with a steady decline thereafter. Between ages 20 and 23 there is greater participation in higher education than VET, but this reverses after age 24. That suggests training later in one's career is more likely to be VET than higher education.

Chart 3.3: Student participation rates by age, higher education and VET, 2007



Appendix C provides further detail on recent student participation in post-school qualifications by age.

Of interest too in this analysis is not only the number of participants in post-school education, but also how many qualifications are completed each year. It is student completions which we compare later in the report with the implied labour market demand for additional qualifications.

Table 3.1 shows the ratio of student completions to enrolments per annum. The ratios reflect the average length of courses, with higher education qualifications typically taking several years to achieve. The ratios also reflect those who enrol in qualifications but do not complete them.

The overall ratio of completions to enrolments has been relatively steady between 2004 and 2007. The ratio has risen on average for postgraduate qualifications, which may reflect a relative switch towards shorter Masters or Graduate Diploma qualifications at the expense of doctorate research. The ratio has also risen strongly for Diploma/Advanced Diploma qualifications. The ratio of student completions to enrolments has dropped since 2005 for Certificate I/II qualifications.

Table 3.1: Ratio of student completions to enrolments, 2003 to 2007

	2003	2004	2005	2006	2007
Postgraduate	28.6%	29.9%	30.7%	30.7%	30.7%
Undergraduate	23.0%	23.4%	23.2%	23.0%	22.3%
Diploma / Advanced Diploma	22.5%	22.8%	25.3%	26.9%	27.6%
Certificate III / IV	26.5%	26.3%	28.0%	25.6%	25.3%
Certificate I / II	25.3%	24.6%	24.9%	22.4%	22.2%
Total	25.1%	25.2%	26.0%	24.8%	24.5%

Source: DEEWR Higher Education Statistics; NCVER Student Enrolments

Average completion ratios may also change in the future including through policy settings. Reducing the length of courses or having greater recognition of previous study could raise the ratio of completions to participants, effectively attaining more student completions for a given amount of education resources.

The overall low ratio of student completions to enrolments will also reflect some people undertaking 'refresher' training to maintain or improve their skills, but which does not necessarily lead to formal qualifications. Such refresher training can play an important role for many through their working careers so that their skills remain relevant in the labour market.

The focus of the projections in this report are those which lead to additional formal qualifications. However, the 'refresher' type training which does not do this still plays a valuable role and one which may become more significant over time depending on the rate of technological change. Within this modelling framework, scenario analysis which mimics more/less refresher training could be undertaken via changes to the ratio of student completions to enrolments.

3.2 Factors affecting student demand

The relatively steady profile of student participation by age shown in the previous section suggests that demographics are clearly important in analysing student demand. However, Access Economics (2008) noted a range of other factors which can also play a role. Other key factors are discussed below.

- **State of the labour market.** Periods of strong employment growth do not see additional people join the workforce solely from the ranks of the unemployed. Rather, strong job prospects tempt those "at the margin" to enter the labour market when they were previously non-participants (not employed and not actively looking for work). This is known as the encouraged/discouraged worker effect. The strong labour market (up until mid 2008) appears to have led to a decline in recent years in domestic student demand at some higher education institutions.
- **Fee structures.** A number of studies have examined the impact of the Higher Education Contribution scheme (HECS) on student participation in higher education, and have generally found that the introduction of HECS and subsequent changes in the level of charges have had minimal impact, both in terms of overall applications and on enrolments by students from lower socio-economic status backgrounds. Fee structures, however, have had a more significant impact on participation from mature aged students. These potential students are more likely to already be earning above the repayment threshold, such that HECS changes have a more immediate potential effect.
- **Social origin / social economic status.** Research in this area has found that a parent's occupation, parent's education and family wealth (used as proxies for socio-economic status) all had a positive effect on participation. That is, young people from higher socio-economic backgrounds were more likely to participate in post-school education than those from lower socio-economic backgrounds. Moreover, other research has found evidence that socio-economic status is also the dominant factor in explaining the variation in student perspectives on the value and attainability of higher education.
- **Language background.** Studies have found that, broadly, students from non-English speaking backgrounds (NESBs) are more likely to participate in higher education than students from English-speaking backgrounds. The high NESB participation rates reflect

the value attached to university education by many migrant groups and the expectations of many families that their children will attend university and enter professional careers.

3.3 Pathways to skill development

There are key age cohorts for students to attend both higher education and VET, as shown in Chart 3.3 above. But not all students follow the same path to post-school qualifications and, with both longer and more challenging working lives, periods of retraining or upskilling later in one's career are becoming more common.

Pathways to skills development have evolved over time to present more flexible and varied alternatives to school completers who wish to undertake further education. They have also evolved in response to societal needs which change over time as well as economies which grow to become more knowledge-based. The latter has been due to, in part, a larger proportion of the population progressing from secondary school to tertiary education.

Different pathways to skill development are also occurring as a direct result of an increasing number of partnerships between vocational education and training providers and universities, which have been set up to enhance the pathways from an industry qualification to a higher education qualification. These partnerships have encouraged the development of new pathways which typically take the form of students undertaking a diploma or advanced diploma in TAFE and then articulating into a university degree with advanced standing as a result of their prior TAFE study.

The transition from one form of post-school qualification to another is important for the purpose of the qualification projections presented in this report. Given a 'typical' transition profile, additional demand for higher level qualifications will also mean delivering some lower level qualifications. The degree of multiple post-school qualification holding is discussed in section 7.3, and allowance for multiple qualification holding (and a trend increase in such) is included within the projections in this report.

4 Demographic projections

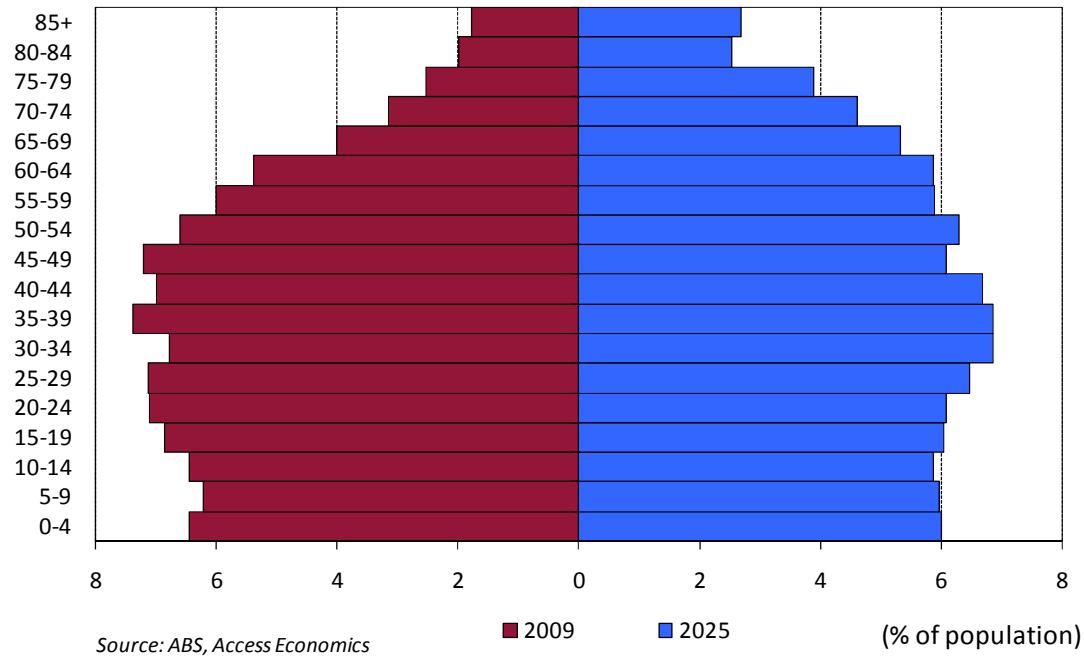
4.1 Outlook for Australia's population

While Australia's population continues to grow, that growth is slowing. Additionally, within the overall population, Australia is ageing, reflecting both lower fertility rates and increased life expectancy. The current 'ageing' phase that the Australian population (in total) is entering will probably take around four decades to stabilise, ending only once the huge post-World War II baby boomer cohort has died and the impacts of the steep fall in national fertility rates seen in the 1970s have worked their way through the population statistics.

Based on the ABS estimated resident population there are over 2.8 million people in total aged 65+ in Australia at present, which should increase to over 6.7 million by 2038. By contrast, there are currently just under 3.0 million Australians aged 15-24, which is tipped to rise to just 3.7 million across the same period. That is, comparatively speaking, the 15-24 group will go from 200,000 more than the 65+ group to 3 million fewer in 30 years.

The change in Australia's age structure is best encapsulated by the population pyramid (Chart 4.1 shows the change in the mid-range **low-trust globalisation** scenario), which sees a significant increase in the share of population in older age groups.

Chart 4.1: Population pyramid, 2009 and 2025



Source: ABS, Access Economics

The critical demographic challenge facing Australia is the retirement of the baby boomers (and the lack of replacements in the workforce for them unless we see notable rises in age specific labour force participation rates). We are now at the point where retirements are about to surge and there is a dearth of population about to reach working age (caused partly by the moderation in birth numbers of the 1990s).

Implications in terms of forecast growth in the working age population are shown in Chart 4.2, which shows all scenarios seeing slower growth over time (due to an ageing population), but with that growth remaining positive to 2025 in all scenarios.

Chart 4.2: Projected growth in working age population (15-64)

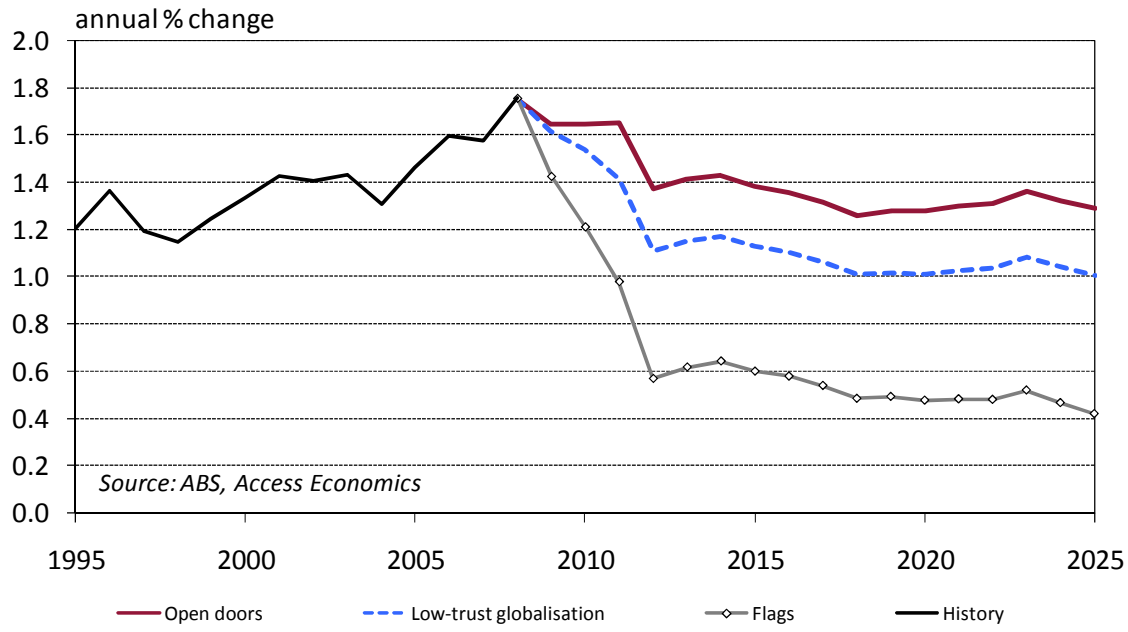
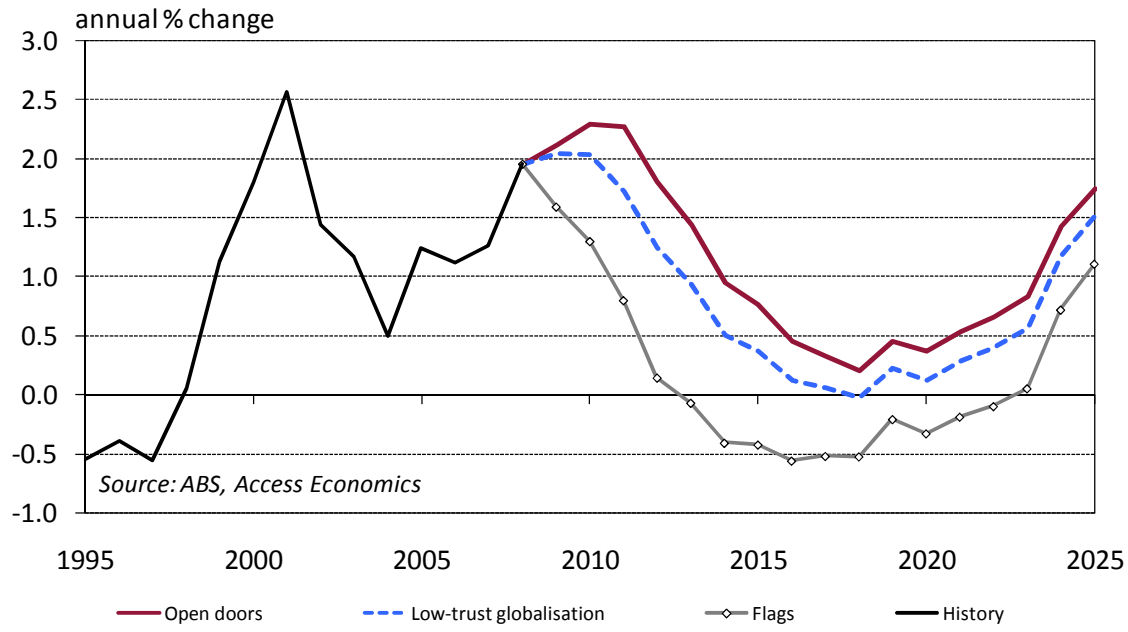


Chart 4.3: Projected growth in prime student cohort (18-22)



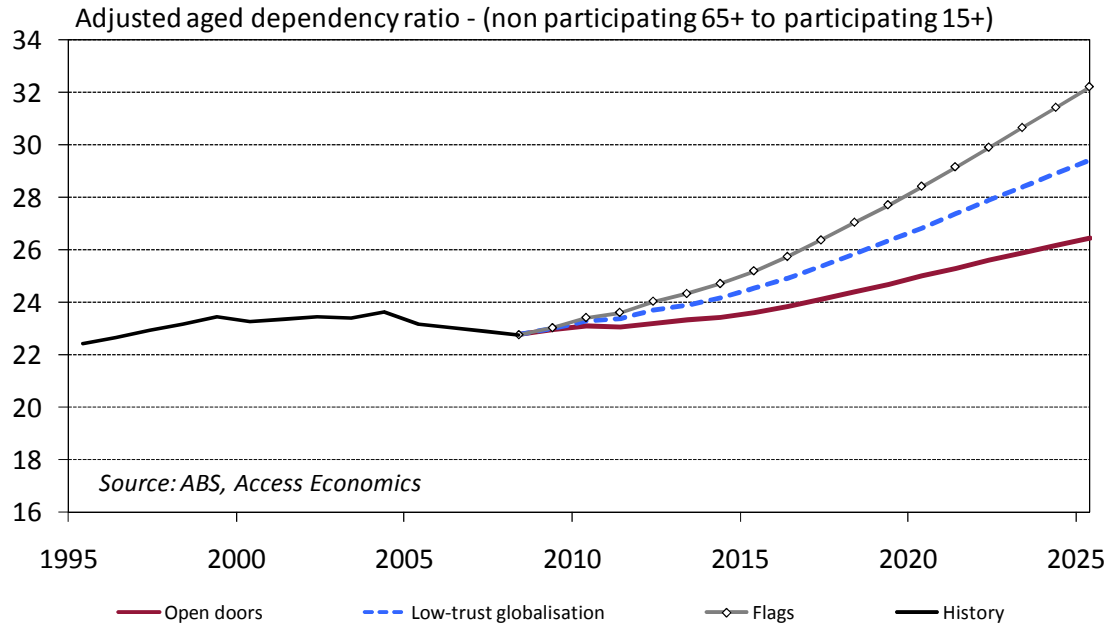
Even with the strong swing provided by higher migration, past trends in national birth rates imply a decline in the growth of the prime student cohort (18-22). In **flags** the size of this group actually declines while the scenarios with greater migration still see more modest growth over the next decade.

Note that Chart 4.3 possibly overstates the growth in potential student numbers from this cohort as the impact of migration will be more at the top end of this age cohort, and would also be skewed towards persons who already have qualifications. In all cases growth rates begin to rise again in the 2020s – representing the period where the recent surge in births translates to growth in tertiary-age student numbers.

An implication of these demographic trends is that the aged dependency ratio will rise over time. This measure is often shown as the ratio of those aged over 65 as a share of the working age population. To highlight the effect of the different rates of labour force participation in the three scenarios Chart 4.4 shows an adjusted aged dependency ratio – the number of people aged over 65 who are not participating in the workforce compared with all those aged 15+ who are participating in the workforce. Broadly it is the ratio of retirees to the labour force.

The ratio does increase over time in all scenarios but the increase is quite modest in **open doors** (reflecting high net migration and the significant shift up in age based labour force participation rates).

Chart 4.4: Projected aged dependency ratio

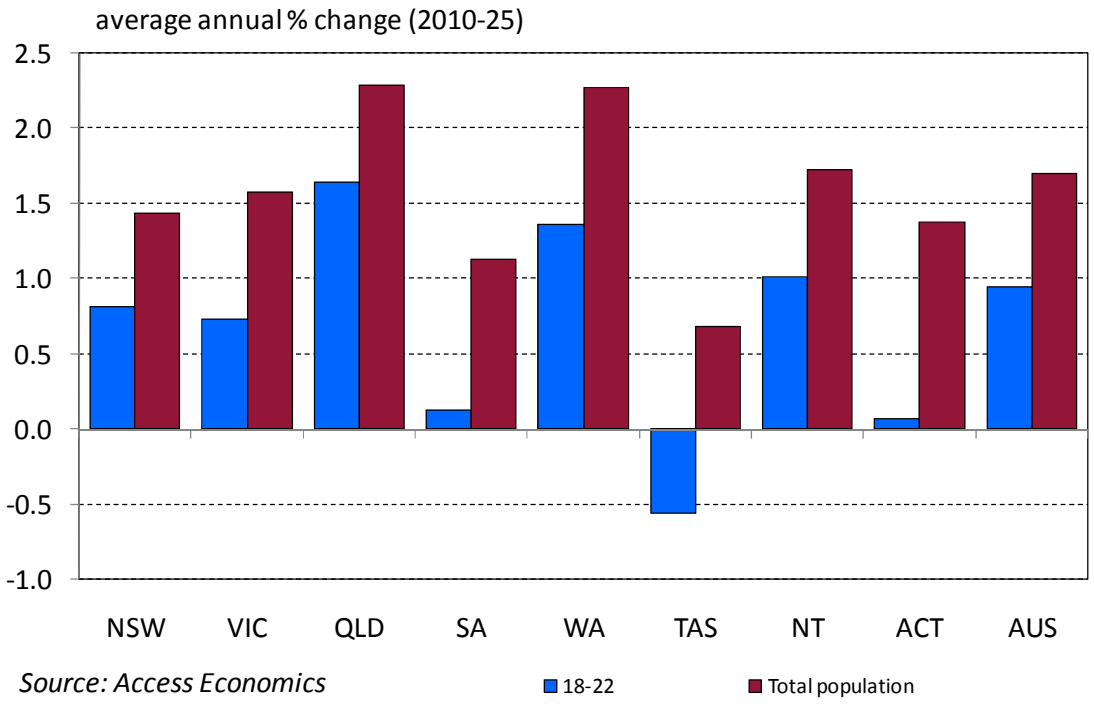


4.2 Outlook by State

Projections for growth in both the working age population and the 18-22 cohort by State in each of the scenarios are shown in the following three charts. Some States will have negative

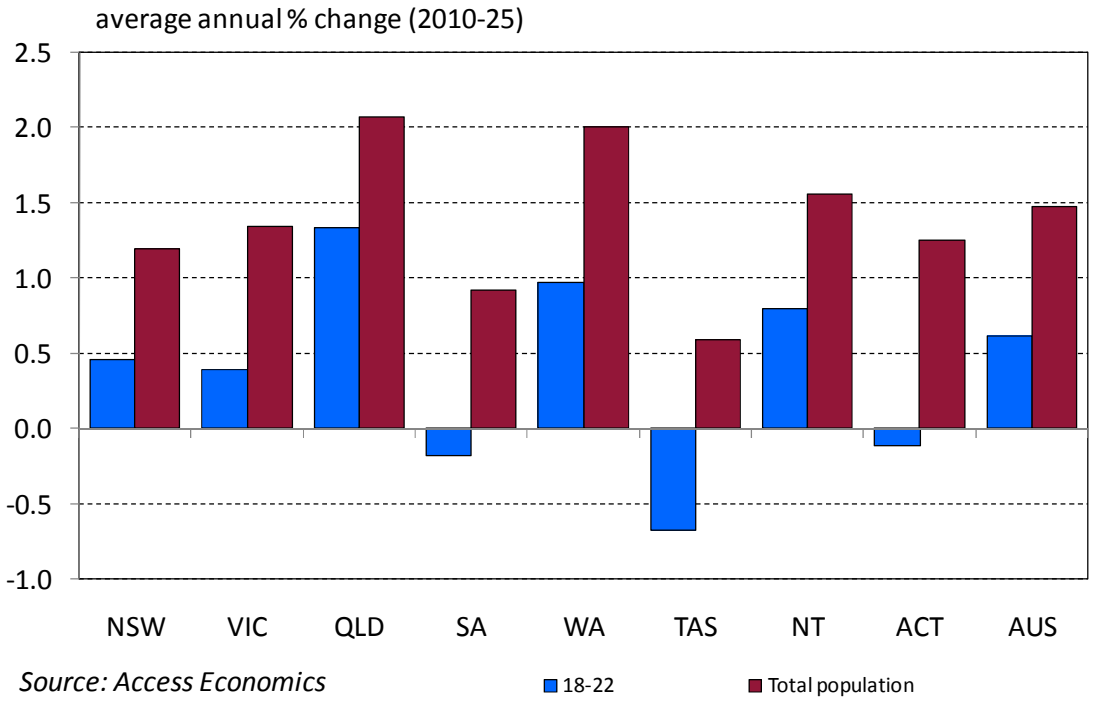
or weak growth in the student age cohort even in the open doors scenario. In flags, only Queensland, Western Australia and the Northern Territory see the 18-22 age cohort increasing in size over the 2010 to 2025 period.

Chart 4.5: State trends in working age and 18-22 year old population (2010-2025),Open doors



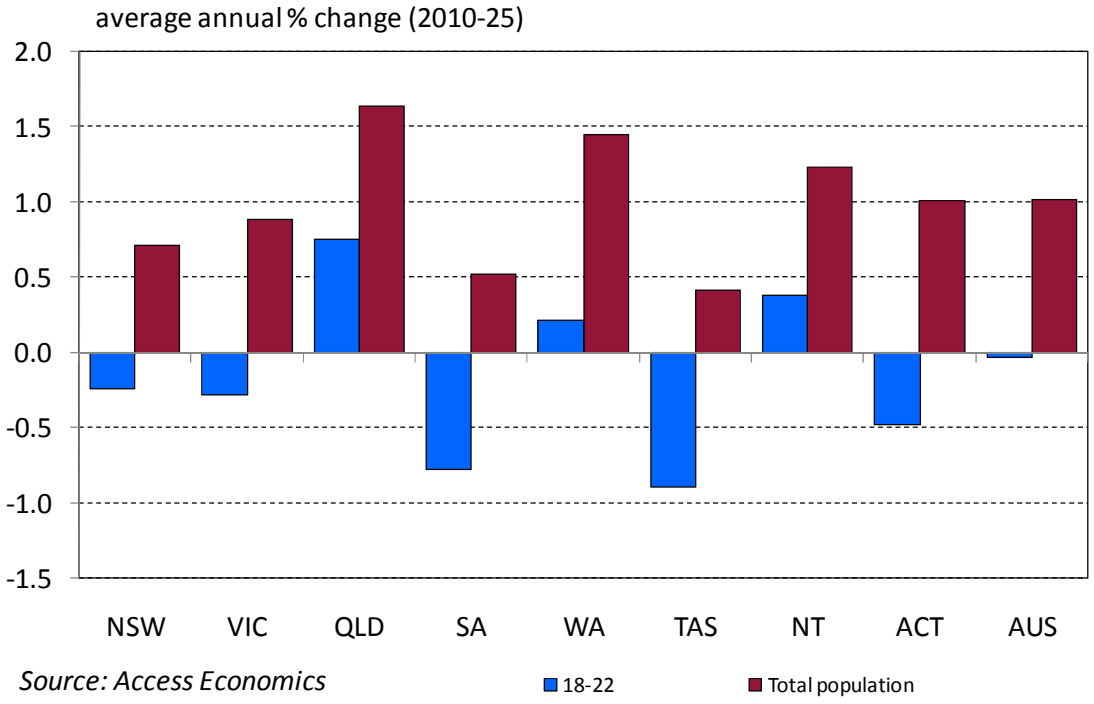
Source: Access Economics

Chart 4.6: State trends in working age and 18-22 year old population (2010-2025), Low-trust globalisation



Source: Access Economics

Chart 4.7: State trends in working age and 18-22 year old population (2010-2025), Flags



Source: Access Economics

5 Projected student demand for qualifications

5.1 The forecast equation

The equations for student demand attempt to estimate the supply of students wanting to undertake tertiary study. Student numbers are projected, though the changes over time are driven by student demand rather than any interaction with a limited supply of actual places. Separate, though similar, equations are derived for:

- Postgraduate participation;
- Undergraduate participation;
- Advanced diploma and diploma participation;
- Certificate III and IV (high) participation; and
- Certificate I and II (low) participation.

The equations are developed at the State level, with the sum of the States reflecting national demand. The key components of the forecast equation are as follows.

- A **demographic estimate** of the number of Australians in each age cohort (cohorts here are individual year of age from 16 to 29, then 30-39, 40-49, 50-59 and 60 and over).
- A set of **student participation rates** which reflect the shares of the population by age cohort who are likely to be studying at any point in time. New migrants are assumed to have the same student participation rates by age as other Australians. Note that these participation rates reflect an input to the modelling, rather than the final output (the other factors discussed below will influence the overall estimate of student demand such that the projected participation rate can vary from that used as an input).
- Several **non-demographic factors**.
  - **Projected Year 12 completion rates**, representing a broad 'trend in demand' ratio for applications that is broadly independent of economic cycles. It reflects underlying changes in the demand for education (Australia's move to becoming a higher skill economy).
  - **Unemployment rates by State**, as an economic cycle driver that may reflect short-term choices between work and study.
  - **Wages by State**, which captures trends in the longer term decision between work and study.
  - A **relative wage measure** for higher education intensive sectors of the economy, which captures trends in wage movements between sectors which are higher education intensive relative to those which are not.

Algebraically the equations can be represented as a linear regression function of the general form:

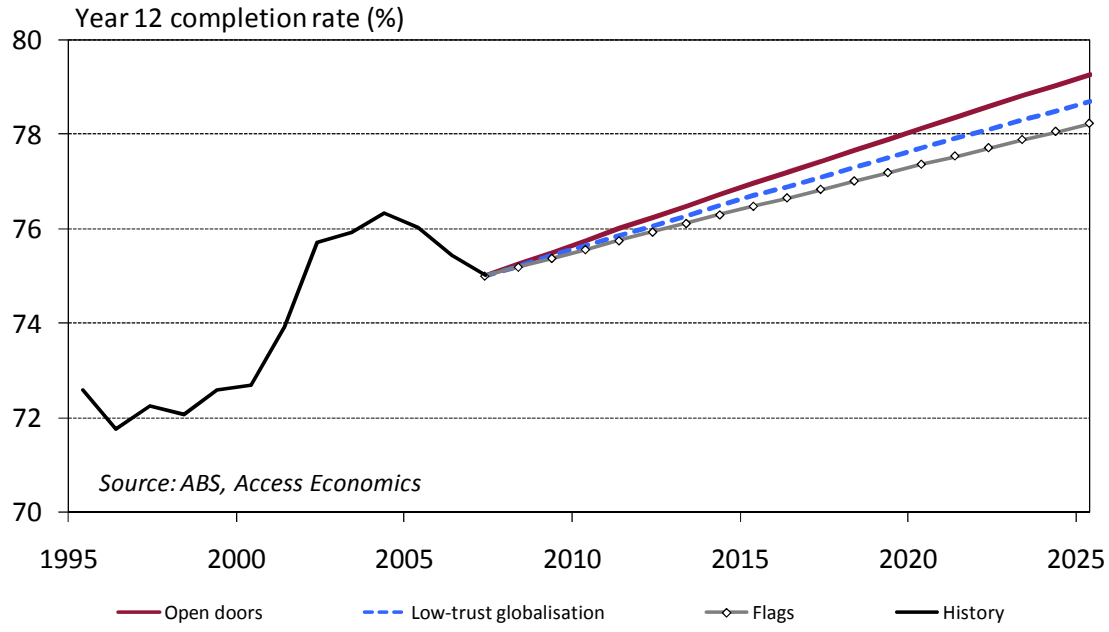
$$yj = x'\beta j + \varepsilon j, \qquad for\ j = Postgrad, Undergrad, A.Dip/Dip, Cert\ High, Cert\ Low,$$

where the dependent variable y is a series of participation rates by qualification; the vector x contains explanators that drive participation, including the unemployment rate and the real

wage index; β is a vector of parameter estimates, including an intercept; and ε is the idiosyncratic error term. The equations are estimated using ordinary least squares and the resulting parameters then fed into the projection model. They are adjusted where the implied variable is not sensible (which occurs where other factors intervene, or where the combination of factors operates in such a way that one component gives erroneous results, not impossible in a case where the sample size is fairly small and the variables subject to correlation).

Australia's Year 12 completion rate has risen since 1995 (rising strongly between 2000 and 2004 and then moderating from 2004 to 2007). Our forecast projections have a variation of the average trend growth in this measure since 1995 continuing. The three scenarios have differing rates of increase, with **low-trust globalisation** seeing a rate of increase in line with the average across the past decade, and the other scenarios having a faster or slower rate of increase depending on the assumed labour productivity profile in those scenarios. The projected rates are shown in Chart 5.1.

Chart 5.1: Year 12 completion rates by scenario



5.2 National projections for students

Combining the trends in population, age groups, year 12 completion, unemployment and wages across the three global scenarios gives the results shown in Table 5.1.

Table 5.1: Projected student enrolment growth by scenario

Average growth over period	2010-15	2015-20	2020-25	2010-25
Open doors				
Postgraduate	1.88%	2.50%	2.56%	2.31%
Undergraduate	2.19%	1.76%	2.30%	2.08%
Diploma/Advanced Dip.	2.08%	2.17%	2.56%	2.27%
Certificate III/IV	1.95%	2.06%	2.58%	2.20%
Certificate I/II	1.74%	2.01%	2.86%	2.20%
Total	1.99%	2.01%	2.55%	2.18%
Low-trust globalisation				
Postgraduate	1.55%	2.03%	2.04%	1.87%
Undergraduate	1.65%	1.33%	1.87%	1.62%
Diploma/Advanced Dip.	1.63%	1.72%	2.08%	1.81%
Certificate III/IV	1.51%	1.63%	2.12%	1.76%
Certificate I/II	1.34%	1.61%	2.44%	1.79%
Total	1.53%	1.59%	2.10%	1.74%
Flags				
Postgraduate	0.80%	1.24%	1.21%	1.08%
Undergraduate	0.68%	0.63%	1.21%	0.84%
Diploma/Advanced Dip.	0.81%	0.98%	1.33%	1.04%
Certificate III/IV	0.74%	0.93%	1.42%	1.03%
Certificate I/II	0.65%	0.97%	1.80%	1.14%
Total	0.72%	0.89%	1.41%	1.00%

Source: Access Economics

Differences between rates of growth across different education levels are driven by the course of population growth across the next 15 years. Undergraduate and diploma courses will see far slower growth in the middle years as the moderation in birth numbers of the late 1990s translates to a relatively weak growth rate in the key age groups for early tertiary qualifications at the end of the next decade.

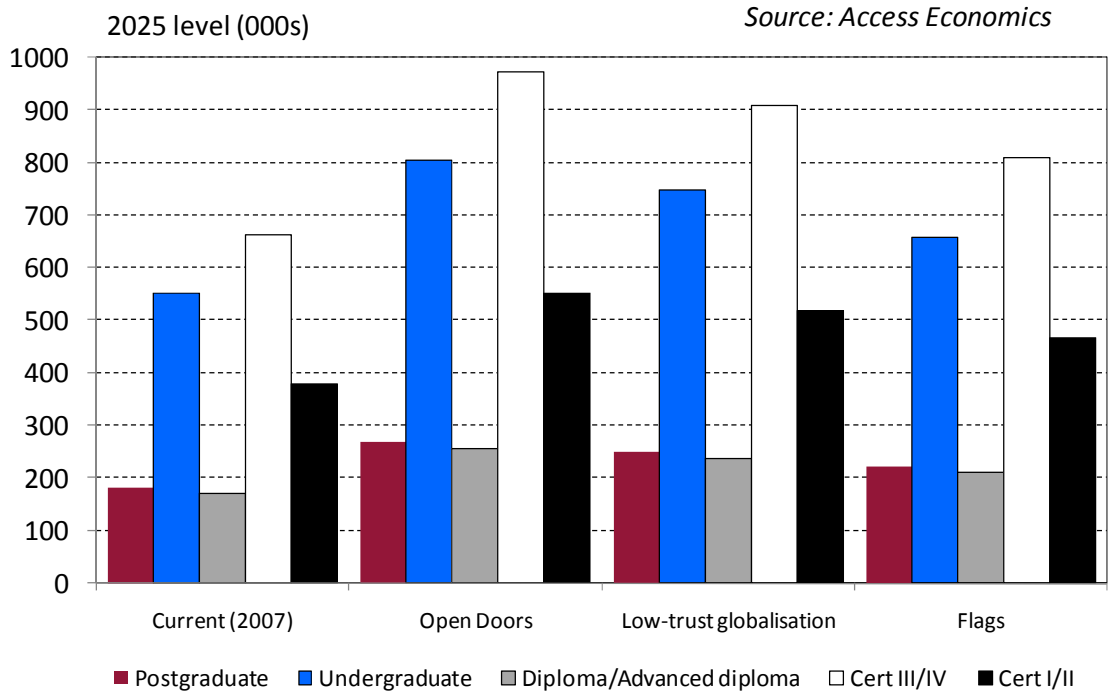
Student demand for postgraduate qualifications, on the other hand, may show stronger growth thanks to two factors:

- As their demographic is slightly older, the real impact of the 1990s moderation in birth numbers is at the end of the forecast period (the weakness late in the next decade is why growth in undergraduate levels is the weakest of the three higher education qualifications across the 15 year period); and
- In the higher migration scenarios the rapid intake of 20-34 years olds that would be expected will add to postgraduate participation levels. While **flags** sees growth in postgraduate numbers ease slowly, in **open doors** the growth rate initially accelerates, and then only falls marginally in the latter part of the projection.

The expected levels of participation in post-school education in 2025 are shown in Chart 5.2. **Open doors** sees a total post-school education sector of 2.85 million (in a total population of 28.5 million). This compares with 2.66 million students in **low-trust globalisation** in 2025 (in a

total population of 27.5 million), and 2.36 million students in **flags** (in a 25.6 million population).

Chart 5.2: Projected student enrolments in 2025 by qualification and scenario



The relative gap here (student numbers 17% lower in **flags** relative to **open doors**, but total population just 10% less) reflects the impact of migration (which boosts age groups more likely to be attending higher education) and the stronger tendency towards tertiary education – boosted by higher year 12 completion rates (assumed to be stronger in **open doors** and hence seeing a relatively larger proportion of the population entering the tertiary education system). The lower unemployment rate in **open doors**, which might tend to lower student demand for education as employment can be more easily obtained at lower skill levels, does not outweigh these otherwise positive influences on demand.

Table 5.2 shows the number of student enrolments projected for each scenario over time.

Table 5.2: Projected student enrolment level by scenario

Average, 5 years to:	2015	2020	2025
Open doors			
Postgraduate	201,737	225,119	255,978
Undergraduate	631,818	692,240	764,293
Diploma/Advanced Dip.	193,931	214,643	241,670
Certificate III/IV	744,809	819,196	921,115
Certificate I/II	420,296	459,571	521,496
Total	2,192,590	2,410,769	2,704,553
Low-trust globalisation			
Postgraduate	199,539	218,201	241,839
Undergraduate	618,964	662,666	716,219
Diploma/Advanced Dip.	190,732	206,534	227,100
Certificate III/IV	732,870	789,661	868,243
Certificate I/II	413,694	443,949	493,341
Total	2,155,799	2,321,011	2,546,743
Flags			
Postgraduate	192,698	202,811	215,997
Undergraduate	593,932	610,780	638,548
Diploma/Advanced Dip.	184,364	192,164	203,698
Certificate III/IV	709,987	738,030	783,646
Certificate I/II	401,689	417,486	449,367
Total	2,082,670	2,161,271	2,291,256

Source: Access Economics

Levels of projected student completions of post-school education are shown in Chart 5.3. Combined levels of qualification completions across the 15 years to 2025 vary from 8.91 million (590,000 per year) in **open doors**, down to 8.55 million (570,000 per year) in **low-trust globalisation** and 7.94 million (530,000 per year) in **flags**.

Chart 5.3: Projected student completions in 2025 by qualification and scenario

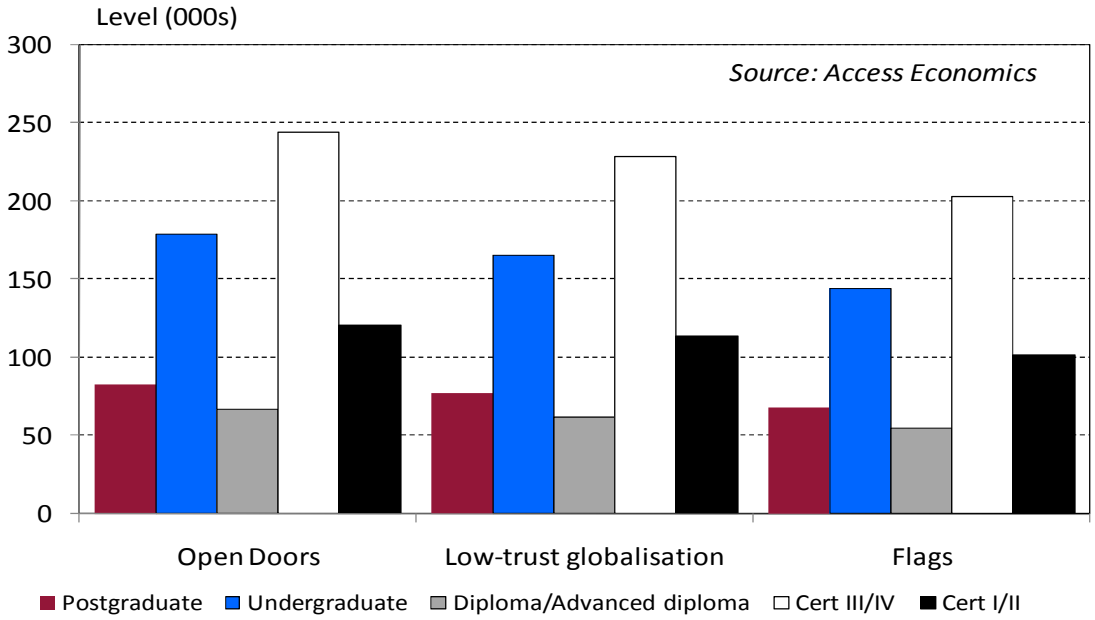


Table 5.3 shows the number of student completions projected for each scenario over time.

Table 5.3: Projected student completion level by scenario

Average, 5 years to:	2015	2020	2025
Open doors			
Postgraduate	62,099	69,332	78,726
Undergraduate	140,892	155,978	171,190
Diploma/Advanced Dip.	50,526	56,057	63,008
Certificate III/IV	187,547	206,788	232,107
Certificate I/II	92,106	101,000	114,377
Total	533,169	589,155	659,408
Low-trust globalisation			
Postgraduate	61,390	67,132	74,299
Undergraduate	138,033	148,983	159,926
Diploma/Advanced Dip.	49,686	53,896	59,151
Certificate III/IV	184,513	199,172	218,563
Certificate I/II	90,644	97,475	108,076
Total	524,266	566,659	620,016
Flags			
Postgraduate	59,203	62,269	66,222
Undergraduate	132,217	136,459	141,482
Diploma/Advanced Dip.	47,989	50,049	52,936
Certificate III/IV	178,607	185,773	196,805
Certificate I/II	87,931	91,452	98,177
Total	505,947	526,002	555,622

Source: Access Economics

5.3 Contribution from net migration

The previous section reports on the projected supply of skills from domestic students.

The training of domestic students is the key area of skills attainment but Australia is also a net importer of skills via migration. Many migrants coming to Australia bring qualifications with them[3] – migrants holding relevant qualifications has been an increasing trend as our migration program has both become larger and more skewed towards skilled migration over the past decade.

Emigration of Australian residents also needs to be considered as this will also include a number of people who are highly skilled.

Overall however, net migration to Australia (immigration less emigration) is currently a substantial positive, adding over 250,000 to Australia's population during 2008. Net migration is projected to remain a positive going forward under each of the scenarios (to differing degrees).

This section examines how many and what type of qualifications net migration might contribute? The item of interest is what qualifications migrants bring with them. Once those migrants become Australian residents they will accrue further qualifications based on their age and the age based student participation rates used in the student modelling (at exactly the same rates that other Australian residents gain initial or further qualifications over time based on their age).

In terms of qualifications which migrants might bring with them, there is a surprising lack of data in this area. The most recent Longitudinal Survey of Immigrants to Australia (LSIA) conducted in 2005 does report on qualifications held by migrants. This only relates to immigration but if you assume a similar profile for emigration, then this profile can be used as a proxy for the qualifications provided by net migration.

Chart 5.4 provides an estimate of post-school qualifications held by new migrants based on the LSIA information. It reports on principal applicants (rather than dependents or other members of the migrating party) and reports on the broad streams of migration (though the survey does not cover humanitarian migrants). Information on qualifications at the Certificate I/II level was not collected as part of the survey.

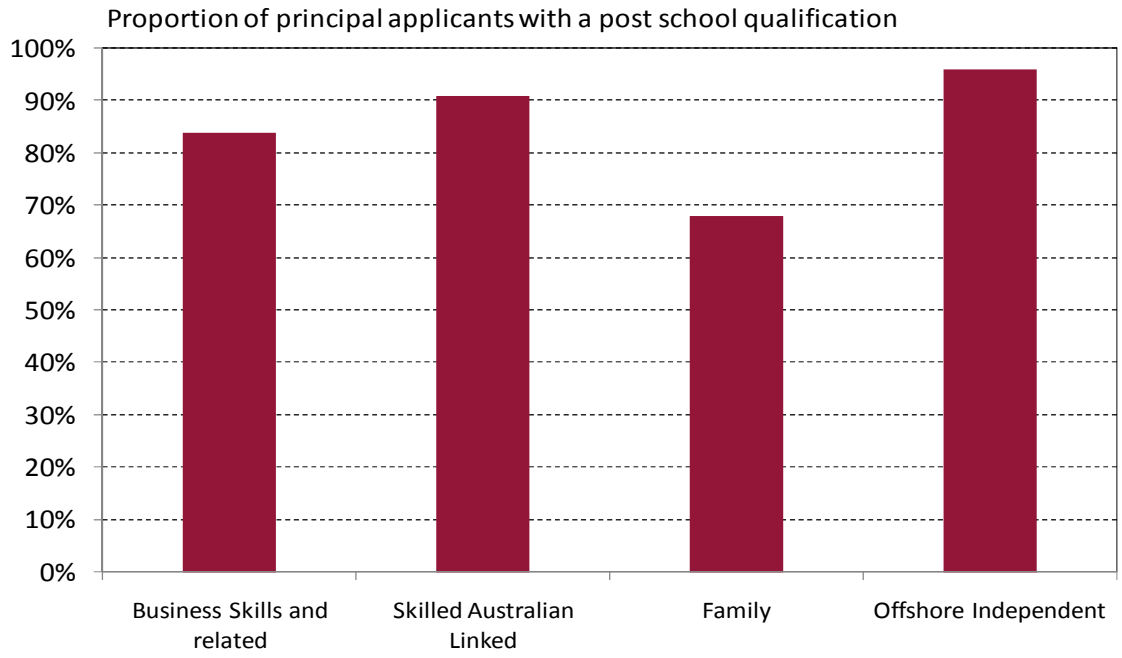
Overall some 76% of new migrants surveyed through the LSIA held a post-school qualification. Of those holding a post-school qualification, some 67% held an undergraduate qualification or higher.

Based on the above information, the typical structure of migration by visa stream and principal applicant/dependent and the projected volume of net migration under each scenario, Table 5.4 provides an estimate of the qualifications which may be contributed by net migration over time.

[3] This reflects qualifications held when migrants become Australian permanent residents. In some cases these are qualifications that were obtained in Australia on a full fee paying basis by foreign students who later go on to become Australian permanent residents. Note also that not all qualifications held by migrants may be recognised in Australia.

Further assumptions used in developing this estimate are that there are no qualifications held by members of the migrating party other than the principal applicant and no qualifications held by humanitarian migrants. These are conservative assumptions, though we are also implicitly assuming that all principal applicant qualifications would be recognised in Australia and this may not necessarily be the case.

Chart 5.4: Post-school qualifications held by new migrants, principal applicants



Source: Longitudinal Survey of Immigrants to Australia, Department of Immigration and Citizenship

Table 5.4: Projected qualifications contributed by net migration by scenario

Average, 5 years to:	2015	2020	2025
Open doors			
Postgraduate	21,910	22,109	23,754
Undergraduate	50,540	51,000	54,795
Diploma/Advanced Dip.	20,629	20,817	22,365
Certificate III/IV	17,872	18,035	19,376
Total	110,950	111,961	120,291
Low-trust globalisation			
Postgraduate	17,616	17,565	18,491
Undergraduate	40,634	40,517	42,653
Diploma/Advanced Dip.	16,585	16,538	17,410
Certificate III/IV	14,369	14,327	15,083
Total	89,204	88,947	93,636
Flags			
Postgraduate	9,202	8,764	8,799
Undergraduate	21,227	20,216	20,298
Diploma/Advanced Dip.	8,664	8,251	8,285
Certificate III/IV	7,506	7,149	7,178
Total	46,599	44,380	44,559

Source: Access Economics

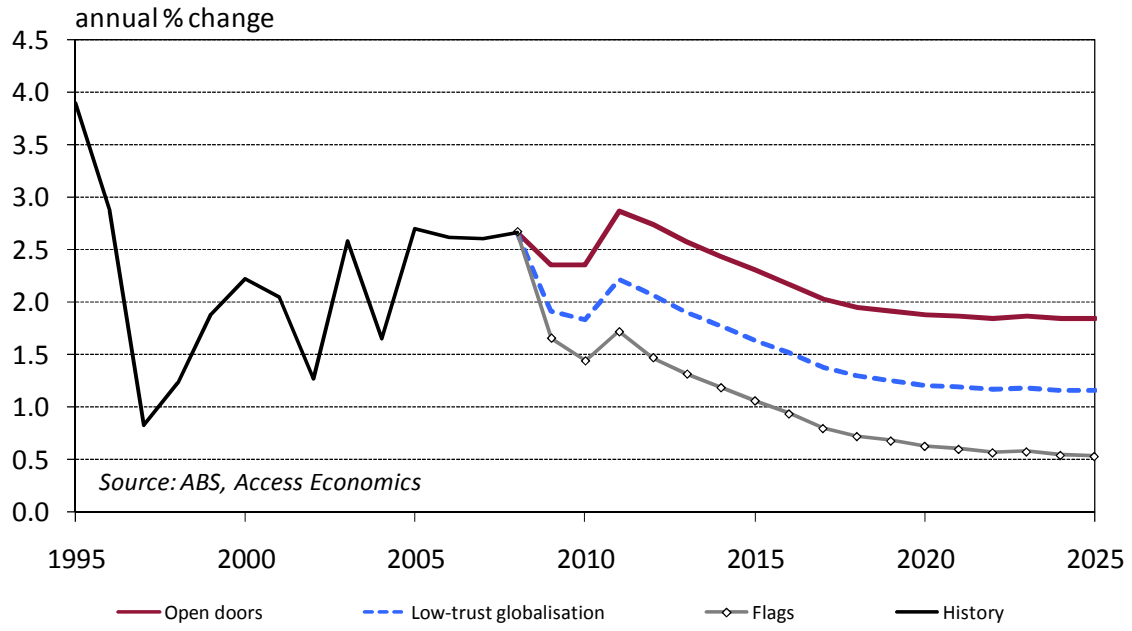
Table 5.4 suggests that net migration to Australia does play a significant role in supplementing qualifications, particularly for postgraduate and undergraduate qualifications. For the high net migration scenario in **open doors**, the qualifications contributed by net migration are equivalent to around 20% of annual student completions in 2010, moving down to 18% by 2025.

6 Labour market projections

6.1 Overview

Projected total employment growth in each of the scenarios is shown in Chart 6.1.

Chart 6.1: Total employment growth



The global financial crisis means that employment growth is expected to be very weak over 2009 and 2010 (not fully reflected in Chart 6.1 which is driven more by longer term trend factors than short term cyclical movements). The good news in the short term is that– unlike the US and Europe – Australia's job losses are smaller, and hence the risk of a vicious cycle is less. That doesn't mean we are out of the woods. Leading indicators of the job market are still covered in red ink. But things could be much worse.

Beyond the short term we do expect a recovery in employment growth from 2011, but the extent of the recovery will depend on which scenario we are in, as shown in Chart 6.1.

Over the 15 years to 2025, total employment growth averages 2.1% per annum in **open doors**, 1.5% per annum in **low-trust globalisation** and 0.9% per annum in **flags**.

In all scenarios this is lower than the rate of employment growth seen in the recent past, thanks to our demographic profile which will ensure a slowing in the rate of Australia's working age population over time (though the high net migration and rising labour force participation in **open doors** does mitigate this significantly). Hence the gradual decline in employment growth over the projection period.

The projections of industry demand for skills/qualifications are driven by detailed labour market projections of employment by industry and occupation, and then assessing the skill/qualification requirements of that labour market demand. Scenario assumptions on the overall level of employment growth, the rate of labour productivity growth and the composition of that growth influence projected industry demand for skills.

Access Economics has a well established framework for projecting employment demands by industry and occupation (and by State/Territory) over time. It uses:

- projections of components of final demand (which are informed by the scenario parameters discussed in chapter 2);
- then forecasts growth in employment by industry using known relationships between components of final demand and industry employment (based on input-output data);
- translates those to occupational employment forecasts using Census data showing the occupational employment share for each industry; and
- estimates a retirement rate for each occupation based on data showing participation rates by age.

There are two areas where Access Economics has applied manual adjustments to the industry profile within scenarios which is above and beyond that delivered by the framework noted above.

- **Open doors sees a change in industry structure because of a global agreement to mitigate climate change.**
  - Concept Economics (2008) undertook modelling to examine the effects on employment by industry of the proposed Carbon Pollution Reduction Scheme.[4]
  - Relative to where employment levels would otherwise have been, the modelling results include an 18% reduction in coal mining employment by 2025, a 14% reduction in employment in electricity and gas supply and a 7% reduction in employment in oil and gas extraction.
  - These have been applied to the industry aggregates used by Access Economics in the **open doors** scenario, with the rate of employment growth in other sectors normalised to achieve the specified rate of overall employment growth.
  - No similar change is made in **low-trust globalisation** or **flags** as these scenarios do not include global action to mitigate climate change.
- **Flags sees a change in industry structure driven by protectionism.**
  - In **flags** an increase in protectionism (and resultant much slower growth in global trade) means less use of global comparative advantage and a greater reliance on self sufficiency.
  - As a result, Australia's industry structure may revert back towards where it used to be – a relative switch towards more production for the domestic market and

[4] This study was chosen as it was the only publicly available source which represented the current Carbon Pollution Reduction Scheme being considered and represented the effects of climate change mitigation on employment by industry. It was beyond the scope of this project to undertake original climate change mitigation modelling. Better understanding the likely employment effects of climate change mitigation remains a very important area for further research. Modelling undertaken by the Commonwealth Treasury may provide an important foundation in this regard.

less trade, particularly trade in high value added services (such as education to foreign students and tourism).

- The modelling sees by 2025 the following industries accounting for the same share of total employment that they held in 1995 – manufacturing; electricity, gas and water; construction; public administration and safety; education and training; arts and recreation services.
- These have been applied to the industry aggregates used by Access Economics in the **flags** scenario, with the rate of employment growth in other sectors normalised to achieve the specified rate of overall employment growth.
- No similar change is made in **open doors** or **low-trust globalisation** as these scenarios do not include similar moves to protectionism.

To complete the picture a concordance between employment by industry and occupation, and qualification requirements is required. This is developed using the ABS *Survey of Education and Work* data, as discussed in the following chapter. Further details on the methodology for labour market demand projections are provided in Appendix A.

6.2 Employment growth by industry

In the short term the global financial crisis is hitting some sectors more than others. Finance, manufacturing and real estate agencies have all lost 4% or more jobs since the crisis hit, while mining and the retailers are down by more than 1.2%. Those are notable losses, and there are few sectors on the other side of the ledger. Of those however, job numbers are comfortably up in the public sector and in the health sector too, while a better year on the farm has added to the number of farmers in the nation.

Over the longer term, trend employment growth in **open doors** is strongest in areas such as business services (finance, real estate, professional services) and social services (health care, education and public administration). That follows a similar trend experienced over recent years where services have accounted for the bulk of new jobs created.

Manufacturing employment is projected to continue to decline, thanks both to productivity growth and continued further specialisation in manufacturing outside of Australia.

The construction sector has been a strong employment generator in recent years and, following a short term cyclical slump linked to a downturn in engineering construction activity, is expected to be solid going forward ,though a little below the economy wide average for jobs growth.

Continued productivity growth will keep jobs growth in check in agriculture and mining (with the latter also affected by climate change mitigation strategies). Indeed, while mining employment growth is below the economy wide average in each scenario, mining output growth is still expected to be strong thanks to Australia's rich resource deposits. There remains strong potential to expand mining activity, perhaps primarily through LNG and iron ore but also other areas. These new projects will typically employ large workforces during construction phases (which would be classified to the construction sector), but also typically are highly capital intensive in operation and so only require small operational workforces.[5]

[5] Mining sector employment has increased significantly in recent years, up to the start of the global financial crisis. However, over the 20 years to 2004 it exhibited no growth at all.

Table 6.1: Employment growth by industry, 1 digit ANZSIC – Open doors

Average annual growth, 5 years to:	2005	2010	2015	2020	2025	15 yr avg to 2025	Level in 2025
Agriculture, Forestry and Fishing	-4.0%	0.9%	1.4%	0.9%	1.0%	1.1%	455,001
Mining	8.8%	4.8%	0.4%	1.3%	1.4%	1.0%	240,587
Manufacturing	-0.9%	1.1%	0.3%	-0.4%	0.0%	0.0%	1,031,792
Electricity, Gas, Water and Waste Services	4.4%	4.3%	0.2%	-0.8%	-0.4%	-0.3%	143,624
Construction	4.2%	2.2%	0.9%	2.2%	2.2%	1.8%	1,325,334
Wholesale Trade	-0.6%	2.3%	1.9%	0.8%	0.8%	1.2%	486,066
Retail Trade	2.8%	1.8%	3.2%	1.9%	1.7%	2.2%	1,799,971
Accommodation and Food Services	2.1%	2.2%	3.2%	2.0%	1.7%	2.3%	1,017,527
Transport, Postal and Warehousing	1.9%	2.8%	3.9%	2.7%	2.6%	3.1%	1,003,005
Information Media and Telecommunications	1.4%	2.1%	3.5%	1.9%	1.8%	2.4%	331,543
Financial and Insurance Services	2.3%	2.6%	3.5%	1.8%	1.7%	2.3%	548,620
Rental, Hiring and Real Estate Services	2.5%	2.6%	3.6%	2.6%	2.3%	2.8%	344,525
Professional, Scientific and Technical Services	2.5%	2.8%	3.8%	2.8%	2.5%	3.1%	1,336,713
Administrative and Support Services	2.6%	2.6%	3.4%	2.4%	2.2%	2.7%	530,656
Public Administration and Safety	4.6%	2.7%	3.6%	2.5%	2.2%	2.8%	992,154
Education and Training	2.5%	2.1%	2.2%	2.4%	2.1%	2.2%	1,096,368
Health Care and Social Assistance	3.5%	3.0%	2.9%	3.2%	2.8%	2.9%	1,732,660
Arts and Recreation Services	4.1%	2.2%	3.2%	2.1%	1.8%	2.4%	286,207
Other Services	2.4%	2.0%	2.6%	1.6%	1.4%	1.9%	619,293
Total	**2.1%**	**2.3%**	**2.6%**	**2.0%**	**1.9%**	**2.1%**	**15,321,646**

Source: ABS Labour Force Survey; Access Economics

Table 6.2 reports growth in employment by industry in **low-trust globalisation**, which shows a similar structure to **open doors** but with a lower rate of growth on average. In this scenario, overall mining employment growth is only just positive over the 15 year period, while employment in agriculture, manufacturing, utilities and wholesale trade is expected to contract over the projection period.

Table 6.2: Employment growth by industry, 1 digit ANZSIC – Low-trust globalisation

Average annual growth, 5 years to:	2005	2010	2015	2020	2025	15 yr avg to 2025	Level in 2025
Agriculture, Forestry and Fishing	-4.0%	0.6%	0.2%	-0.3%	-0.4%	-0.2%	361,061
Mining	8.8%	4.6%	0.0%	0.8%	0.7%	0.5%	162,894
Manufacturing	-0.9%	0.8%	-0.6%	-1.4%	-1.1%	-1.0%	914,071
Electricity, Gas, Water and Waste Services	4.4%	4.3%	0.1%	-1.1%	-0.9%	-0.6%	116,676
Construction	4.2%	1.5%	0.1%	1.5%	1.5%	1.0%	1,135,936
Wholesale Trade	-0.6%	1.9%	1.0%	-0.1%	-0.2%	0.2%	422,728
Retail Trade	2.8%	1.8%	2.6%	1.4%	1.1%	1.7%	1,629,265
Accommodation and Food Services	2.1%	2.1%	2.5%	1.3%	1.0%	1.6%	936,329
Transport, Postal and Warehousing	1.9%	2.6%	3.2%	2.0%	1.9%	2.3%	820,892
Information Media and Telecommunications	1.4%	1.9%	2.8%	1.3%	1.1%	1.7%	351,880
Financial and Insurance Services	2.3%	2.5%	2.8%	1.2%	1.0%	1.6%	534,768
Rental, Hiring and Real Estate Services	2.5%	2.4%	3.0%	2.0%	1.7%	2.2%	304,464
Professional, Scientific and Technical Services	2.5%	2.6%	3.2%	2.2%	2.0%	2.5%	1,179,014
Administrative and Support Services	2.6%	2.3%	2.8%	1.8%	1.6%	2.1%	535,869
Public Administration and Safety	4.6%	2.6%	3.0%	1.9%	1.6%	2.2%	910,543
Education and Training	2.5%	2.0%	1.5%	1.7%	1.4%	1.5%	1,011,266
Health Care and Social Assistance	3.5%	2.9%	2.3%	2.6%	2.3%	2.4%	1,615,133
Arts and Recreation Services	4.1%	2.1%	2.7%	1.5%	1.2%	1.8%	255,178
Other Services	2.4%	1.9%	2.0%	1.0%	0.8%	1.2%	545,492
Total	**2.1%**	**2.1%**	**1.9%**	**1.3%**	**1.2%**	**1.5%**	**13,743,459**

Source: ABS Labour Force Survey; Access Economics

The **flags** scenario presents a somewhat different industry growth pattern with stronger growth for manufacturing and utilities as Australia's economy moves back towards one based more on domestic production. The services sectors (which have generated the bulk of jobs created over the past decade) show only modest employment growth in this scenario.

Table 6.3: Employment growth by industry, 1 digit ANZSIC – Flags

Average annual growth, 5 years to:	2005	2010	2015	2020	2025	15 yr avg to 2025	Level in 2025
Agriculture, Forestry and Fishing	-4.0%	0.2%	-1.3%	-1.9%	-2.1%	-1.8%	276,591
Mining	8.8%	4.2%	-1.3%	-0.4%	-0.5%	-0.7%	132,805
Manufacturing	-0.9%	1.7%	3.1%	2.0%	1.9%	2.3%	1,573,202
Electricity, Gas, Water and Waste Services	4.4%	5.5%	4.1%	2.7%	2.8%	3.2%	216,969
Construction	4.2%	1.0%	-0.5%	1.0%	0.9%	0.5%	1,018,567
Wholesale Trade	-0.6%	1.4%	-0.4%	-1.5%	-1.7%	-1.2%	331,865
Retail Trade	2.8%	1.6%	1.4%	0.3%	0.0%	0.6%	1,362,035
Accommodation and Food Services	2.1%	1.9%	1.3%	0.2%	-0.1%	0.5%	778,946
Transport, Postal and Warehousing	1.9%	2.3%	1.9%	0.8%	0.7%	1.1%	672,917
Information Media and Telecommunications	1.4%	1.8%	2.1%	0.6%	0.4%	1.1%	317,827
Financial and Insurance Services	2.3%	2.2%	1.6%	0.0%	-0.2%	0.5%	443,082
Rental, Hiring and Real Estate Services	2.5%	2.1%	1.8%	0.9%	0.6%	1.1%	252,972
Professional, Scientific and Technical Services	2.5%	2.2%	2.0%	1.1%	0.8%	1.3%	979,243
Administrative and Support Services	2.6%	2.0%	1.6%	0.8%	0.5%	1.0%	448,535
Public Administration and Safety	4.6%	2.3%	1.9%	0.8%	0.5%	1.0%	762,096
Education and Training	2.5%	2.0%	1.0%	1.2%	0.8%	1.0%	928,625
Health Care and Social Assistance	3.5%	2.7%	1.2%	1.5%	1.2%	1.3%	1,359,349
Arts and Recreation Services	4.1%	1.5%	0.4%	-0.6%	-0.9%	-0.4%	180,371
Other Services	2.4%	1.7%	1.0%	0.0%	-0.2%	0.3%	467,955
Total	**2.1%**	**1.9%**	**1.3%**	**0.7%**	**0.6%**	**0.9%**	**12,503,948**

Source: ABS Labour Force Survey; Access Economics

Further details on projected employment by industry under the three scenarios are found in Appendix D.

6.3 Employment growth by occupation

This section reports average employment growth by occupation over the projection period, based on the industry growth rates and the expected occupational profile within industries. This utilises labour force survey and Census information showing the historic profile of occupations within industries and how this profile has changed over time.

Table 6.4 shows the share of employment by industry for each broad occupational group as reported in the ABS Labour Force Survey. It shows that most occupations are spread across quite a number of industries (an exception is sales workers who are located 60% in the retail trade sector).

Table 6.4: Industry share of employment by occupation

	Managers	Professionals	Technicians and Trades Workers	Community and Personal Service Workers	Clerical and Administrative Workers	Sales Workers	Machinery Operators And Drivers	Labourers	Total
Agriculture, Forestry and Fishing	15.1%	0.3%	1.2%	0.1%	1.2%	0.2%	3.8%	6.8%	3.4%
Mining	1.2%	1.5%	2.3%	0.0%	0.8%	0.0%	7.2%	0.9%	1.5%
Manufacturing	10.5%	4.2%	18.3%	0.6%	7.1%	5.0%	19.6%	18.5%	9.9%
Electricity, Gas, Water and Waste Services	0.9%	1.2%	1.7%	0.1%	1.6%	0.3%	2.4%	1.0%	1.2%
Construction	6.1%	1.4%	31.4%	0.1%	6.5%	0.8%	9.9%	14.1%	9.1%
Wholesale Trade	6.0%	2.0%	1.9%	0.1%	4.8%	6.9%	8.7%	2.1%	3.7%
Retail Trade	15.0%	2.3%	5.1%	1.0%	5.6%	60.0%	5.4%	10.7%	11.4%
Accommodation and Food Services	9.2%	0.3%	5.7%	20.0%	1.7%	8.7%	1.3%	14.4%	6.6%
Transport, Postal and Warehousing	3.9%	1.7%	1.4%	1.6%	8.4%	1.9%	32.9%	3.5%	5.3%
Information Media and Telecommunications	2.2%	3.4%	2.5%	0.0%	2.5%	2.2%	0.8%	0.5%	2.1%
Financial and Insurance Services	4.6%	6.3%	0.2%	0.1%	11.1%	1.6%	0.0%	0.1%	3.8%
Rental, Hiring and Real Estate Services	1.9%	0.9%	0.6%	0.2%	2.5%	7.7%	1.2%	1.2%	1.9%
Professional, Scientific and Technical Services	5.2%	19.7%	5.3%	0.2%	9.9%	1.1%	0.4%	0.6%	7.3%
Administrative and Support Services	1.9%	2.0%	1.2%	3.2%	3.8%	1.1%	1.2%	11.5%	3.2%
Public Administration and Safety	5.1%	7.0%	2.0%	13.4%	11.8%	0.3%	2.1%	2.6%	5.8%
Education and Training	4.1%	23.6%	1.8%	10.3%	5.6%	0.2%	0.1%	1.9%	7.7%
Health Care and Social Assistance	3.2%	19.0%	2.8%	37.7%	10.1%	0.7%	1.3%	4.9%	10.3%
Arts and Recreation Services	1.6%	1.5%	1.5%	5.6%	1.4%	0.6%	0.5%	1.1%	1.7%
Other Services	2.3%	1.7%	13.0%	5.7%	3.5%	0.7%	1.0%	3.5%	4.2%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: ABS Labour Force Survey 2008

While there was considerable dispersion within scenarios of employment growth by industry, the projections for employment growth by occupation form a much tighter band. The broad occupational types required are similar across industry sectors. This is less true at the more detailed occupational level – Appendix D provides more detailed projections of occupational employment growth by scenario.

Technicians and trade workers are the broad occupation with the most modest employment growth in both **open doors** and **low-trust globalisation**, though in **flags** they are equal to the broader rate of employment growth.

Focusing on the results for **open doors** in Table 6.5, those broad occupational categories which are expected to show faster than average employment growth are professionals, community and personal service workers, clerical and administrative workers and sales workers. Note that projected employment growth rates for components within these groups do vary – for more detail refer to Table D.3 in Appendix D.

Note that the lower skilled occupations of machinery operators and drivers, and labourers are also projected to show solid employment growth in Table 6.5 (even if a little below the national average). In large part this reflects their exposure to the construction sector which is also expected to show solid employment growth thanks to ongoing requirements for new residential housing, and a continued high rate of business investment which supports engineering construction activity. Table 6.4 shows that machinery operators and drivers have a notable exposure to the transport sector which is expected to see above average employment growth, while a good share of employment of labourers is within the accommodation and administrative and support services sectors which are also expected to show above average employment growth.

Table 6.5: Employment growth by occupation, 1 digit ANZSCO – Open doors

Average annual growth, 5 years to:	2005	2010	2015	2020	2025	15 yr avg to 2025	Level in 2025
Managers	4.8%	2.5%	2.5%	1.8%	1.7%	2.0%	1,940,149
Professionals	3.0%	3.2%	2.8%	2.3%	2.1%	2.4%	3,247,141
Technicians and Trades Workers	1.7%	2.6%	1.8%	1.7%	1.6%	1.7%	2,187,801
Community and Personal Service Workers	1.8%	2.6%	2.9%	2.2%	2.0%	2.3%	1,414,038
Clerical and Administrative Workers	1.2%	1.6%	2.8%	2.1%	2.0%	2.3%	2,380,818
Sales Workers	2.4%	1.2%	3.3%	2.2%	1.9%	2.4%	1,573,758
Machinery Operators And Drivers	1.0%	2.5%	2.2%	1.6%	1.7%	1.9%	1,005,043
Labourers	0.4%	1.4%	2.3%	1.8%	1.7%	1.9%	1,572,898
Total	**2.1%**	**2.3%**	**2.6%**	**2.0%**	**1.9%**	**2.1%**	**15,321,646**

Source: ABS Labour Force Survey; Access Economics

Table 6.6: Employment growth by occupation, 1 digit ANZSCO – Low-trust globalisation

Average annual growth, 5 years to:	2005	2010	2015	2020	2025	15 yr avg to 2025	Level in 2025
Managers	4.8%	2.3%	1.7%	1.0%	1.0%	1.2%	1,710,777
Professionals	3.0%	3.0%	2.1%	1.6%	1.4%	1.7%	2,934,113
Technicians and Trades Workers	1.7%	2.2%	1.1%	1.0%	0.9%	1.0%	1,945,155
Community and Personal Service Workers	1.8%	2.5%	2.2%	1.5%	1.3%	1.7%	1,279,320
Clerical and Administrative Workers	1.2%	1.4%	2.2%	1.5%	1.3%	1.7%	2,149,117
Sales Workers	2.4%	1.1%	2.6%	1.6%	1.3%	1.8%	1,430,987
Machinery Operators And Drivers	1.0%	2.2%	1.5%	0.9%	1.0%	1.1%	892,268
Labourers	0.4%	1.1%	1.6%	1.1%	1.0%	1.2%	1,401,723
Total	**2.1%**	**2.1%**	**1.9%**	**1.3%**	**1.2%**	**1.5%**	**13,743,459**

Source: ABS Labour Force Survey; Access Economics

Table 6.7: Employment growth by occupation, 1 digit ANZSCO – Flags

Average annual growth, 5 years to:	2005	2010	2015	2020	2025	15 yr avg to 2025	Level in 2025
Managers	4.8%	2.1%	1.1%	0.5%	0.4%	0.7%	1,559,227
Professionals	3.0%	2.9%	1.4%	0.9%	0.7%	1.0%	2,607,727
Technicians and Trades Workers	1.7%	2.1%	1.0%	0.8%	0.7%	0.9%	1,891,171
Community and Personal Service Workers	1.8%	2.3%	1.4%	0.7%	0.5%	0.9%	1,123,353
Clerical and Administrative Workers	1.2%	1.3%	1.4%	0.7%	0.5%	0.8%	1,884,639
Sales Workers	2.4%	0.9%	1.6%	0.5%	0.3%	0.8%	1,218,527
Machinery Operators And Drivers	1.0%	2.1%	1.4%	0.7%	0.7%	0.9%	858,708
Labourers	0.4%	1.1%	1.5%	0.9%	0.8%	1.1%	1,360,594
Total	**2.1%**	**1.9%**	**1.3%**	**0.7%**	**0.6%**	**0.9%**	**12,503,948**

Source: ABS Labour Force Survey; Access Economics

6.4 Replacement demand

Along with employment growth, much labour market movement relates to turnover or replacement of existing workers.

People leave their occupations for a variety of reasons and these may or may not generate a training demand. Reasons include:

- retirement (where the replacement worker would require training);
- movement to a role with a different skill set (requiring training);
- movement to another occupation but using the same skills (not requiring training); or
- time out of the workforce (which may or may not require re-training or refresher training on return).

It is important to note that there is no single definition of replacement demand which is 'correct'. Rather, it depends on which definition of replacement best suits the purpose it is used for – in this case estimating training demand.

For the purposes of training demand, one is interested in that proportion of replacement which is likely to generate a skills requirement. Providing a replacement when people retire is one such area. The new entrant needs to match the skill set of the retiree (including the propensity for that retiree to have held post-school qualifications). Hence there is specific allowance for retirees within the training demand projections for this report.

For other elements of replacement the training demand implications are more difficult to assess. However, movement between occupations which leads to an additional post-school qualification is captured as an additional training demand within our broader modelling framework because we take into account the degree of multiple qualification holding. Hence the modelling allows for replacement of all qualifications a person obtained over their career when they leave the workforce – not just those which were relevant for their last occupation held.

There are a variety of measures of turnover or replacement including gross turnover which measures all movements in and out of an occupation and 'net replacement' which is calculated as a subset of turnover. These measures are examined by DEEWR in a variety of contexts.

Access Economics has estimated and projected the level of retirements in each occupation using the age profile of each occupation from 2006 Census data. It is measures as an exit starting from the 50-54 age cohort where on the balance of probabilities that person does not return. The estimate takes into account changes in the age profile of an occupation over time, as well as the 'typical age' of retirement in each occupation. The latter varies by occupation and is estimated based on an examination of when older people typically leave an occupation, relative to the national average labour force participation rates. Some further increase in the labour force participation of older cohorts is projected to continue (particularly within **open doors**), which will help to keep retirements lower than they would otherwise be.

Some occupations will typically retain their workforce to an older age than others. Doctors for example tend to continue working well beyond a typical retirement age, whereas police officers tend to leave their occupation much earlier.

The estimated retirement rates by broad occupational groups for each scenario are shown in the following three tables. The highest expected rate of retirement is for managers – people often move into management later in their careers and so at any point in time there are a higher proportion of this group retiring.

Table 6.8: Retirement rate by occupation, 1 digit ANZSCO – Open doors

Average annual rate, 5 years to:	2005	2010	2015	2020	2025	15 yr avg to 2025	Level in 2025
Managers	2.7%	2.8%	2.7%	2.6%	2.4%	2.6%	45,965
Professionals	1.8%	2.1%	2.0%	2.0%	1.9%	2.0%	62,324
Technicians and Trades Workers	1.6%	1.8%	1.8%	1.8%	1.7%	1.8%	37,785
Community and Personal Service Workers	1.6%	1.9%	1.8%	1.7%	1.7%	1.8%	23,405
Clerical and Administrative Workers	1.8%	2.0%	1.9%	1.8%	1.7%	1.8%	39,908
Sales Workers	1.4%	1.7%	1.6%	1.5%	1.3%	1.5%	20,509
Machinery Operators And Drivers	1.8%	2.1%	2.1%	2.0%	1.9%	2.0%	19,095
Labourers	1.8%	2.1%	2.0%	1.8%	1.7%	1.9%	26,710
Total	**1.8%**	**2.1%**	**2.0%**	**1.9%**	**1.8%**	**1.9%**	**275,701**

Source: Access Economics

Table 6.9: Retirement rate by occupation, 1 digit ANZSCO – Low-trust globalisation

Average annual rate, 5 years to:	2005	2010	2015	2020	2025	15 yr avg to 2025	Level in 2025
Managers	2.7%	2.8%	2.7%	2.7%	2.6%	2.7%	43,142
Professionals	1.8%	2.1%	2.1%	2.1%	2.1%	2.1%	61,056
Technicians and Trades Workers	1.6%	1.8%	1.8%	1.9%	1.9%	1.9%	37,050
Community and Personal Service Workers	1.6%	1.9%	1.9%	1.8%	1.8%	1.8%	22,980
Clerical and Administrative Workers	1.8%	2.0%	2.0%	1.9%	1.8%	1.9%	39,184
Sales Workers	1.4%	1.7%	1.6%	1.5%	1.5%	1.5%	20,239
Machinery Operators And Drivers	1.8%	2.1%	2.1%	2.1%	2.1%	2.1%	18,634
Labourers	1.8%	2.1%	2.0%	2.0%	1.9%	2.0%	26,132
Total	**1.8%**	**2.1%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**	**268,416**

Source: Access Economics

Table 6.10: Retirement rate by occupation, 1 digit ANZSCO – Flags

Average annual rate, 5 years to:	2005	2010	2015	2020	2025	15 yr avg to 2025	Level in 2025
Managers	2.7%	2.8%	2.7%	2.7%	2.7%	2.7%	41,027
Professionals	1.8%	2.1%	2.1%	2.2%	2.3%	2.2%	59,627
Technicians and Trades Workers	1.6%	1.8%	1.8%	1.9%	1.9%	1.9%	36,523
Community and Personal Service Workers	1.6%	1.9%	1.9%	2.0%	2.0%	2.0%	22,463
Clerical and Administrative Workers	1.8%	2.0%	2.0%	2.0%	2.0%	2.0%	38,331
Sales Workers	1.4%	1.7%	1.7%	1.7%	1.6%	1.7%	19,835
Machinery Operators And Drivers	1.8%	2.1%	2.1%	2.1%	2.2%	2.1%	18,449
Labourers	1.8%	2.1%	2.0%	2.0%	1.9%	2.0%	25,672
Total	**1.8%**	**2.1%**	**2.1%**	**2.1%**	**2.1%**	**2.1%**	**261,928**

Source: Access Economics

The projected retirement rates are broadly similar across the three scenarios. They are a little lower in **open doors** as the higher labour force participation rate is in part driven by a delayed retirement for some workers.

Further details on projected retirement rates by occupation (and what that translates to in terms of numbers of people) under the three scenarios are found in Appendix D.

Taken together, employment growth and retirements represent the number of job openings relevant to future qualification demand. The following tables show these numbers of job openings over time by occupation for each of the scenarios. As noted at the start of this section, there will be additional job turnover beyond this, with the following tables representing job openings likely to generate an additional skills requirement.

Table 6.11: Job openings by occupation, 1 digit ANZSCO – Open doors

Average 5 years to:	2015	2020	2025
Managers	79,092	74,663	77,485
Professionals	117,692	117,929	123,245
Technicians and Trades Workers	63,550	66,313	70,668
Community and Personal Service Workers	50,246	47,424	49,182
Clerical and Administrative Workers	85,930	80,960	83,406
Sales Workers	57,165	48,912	48,834
Machinery Operators And Drivers	34,568	32,185	34,983
Labourers	53,469	50,186	52,453
Total	**541,712**	**518,571**	**540,257**

Source: Access Economics

Table 6.12: Job openings by occupation, 1 digit ANZSCO – Low-trust globalisation

Average 5 years to:	2015	2020	2025
Managers	66,136	59,225	58,858
Professionals	100,813	98,090	99,394
Technicians and Trades Workers	51,050	51,735	53,500
Community and Personal Service Workers	42,995	38,880	39,023
Clerical and Administrative Workers	73,657	66,235	65,905
Sales Workers	49,356	39,767	38,079
Machinery Operators And Drivers	28,596	25,325	26,706
Labourers	44,452	39,563	39,841
Total	**457,055**	**418,820**	**421,306**

Source: Access Economics

Table 6.13: Job openings by occupation, 1 digit ANZSCO – Flags

Average 5 years to:	2015	2020	2025
Managers	56,760	48,481	46,635
Professionals	82,417	77,182	75,255
Technicians and Trades Workers	48,651	48,868	49,277
Community and Personal Service Workers	34,095	28,909	27,811
Clerical and Administrative Workers	58,634	49,349	46,959
Sales Workers	36,881	26,190	23,304
Machinery Operators And Drivers	27,092	23,343	23,834
Labourers	42,811	36,916	35,849
Total	**387,342**	**339,238**	**328,925**

Source: Access Economics

7 Qualification profile

7.1 Share of employed with qualifications

To assess the future qualification implications of labour market demand, we utilise **a profile of the typical qualification mix that is associated with specific industries and occupations**. The propensities shown in this section represent recent information on average propensities to hold qualifications – in most cases these are not necessarily a strict requirement in order to undertake a particular job.

The following tables show the profile of highest qualifications of those employed by industry and occupation, as drawn from the 2007 ABS *Survey of Education and Work*. The survey also records the field of education for qualifications. The data at this level (employment by qualification, field of education, industry and occupation) is only available for the higher level (1 digit) industry and occupational classifications.

Key results from Table 7.1 (postgraduate qualifications) include the following.

- **Professionals** show by far the highest share of postgraduate qualification. At least 10% of professionals in all industries except accommodation and food services have postgraduate qualifications.
- **Managers** show the next highest level of postgraduate qualification, though the profile is far more diverse by industry.
- Across **other occupations** the propensity for postgraduate qualifications is low, but does increase for employment in the health, education or public administration sectors.

Table 7.1: Postgraduate qualification, share of employment by industry and occupation, 2007

	Managers	Professionals	Technicians and Trades Workers	Community and Personal Service Workers	Clerical and Administrative Workers	Sales Workers	Machinery Operators And Drivers	Labourers	Total
Agriculture, Forestry and Fishing	1.7%	19.4%	0.0%	0.0%	3.9%	0.0%	0.0%	1.0%	1.7%
Mining	22.0%	16.2%	1.0%	0.0%	2.4%	0.0%	0.0%	0.0%	5.5%
Manufacturing	9.3%	10.2%	0.6%	0.0%	1.6%	0.8%	0.4%	1.2%	2.7%
Electricity, Gas, Water and Waste Services	14.8%	19.0%	2.0%	0.0%	4.6%	0.0%	0.0%	0.0%	6.1%
Construction	2.7%	15.0%	0.9%	0.0%	1.9%	0.0%	0.0%	0.2%	1.5%
Wholesale Trade	8.2%	16.6%	2.6%	0.0%	0.0%	2.4%	0.0%	0.0%	3.9%
Retail Trade	2.9%	10.3%	0.9%	0.0%	3.2%	1.6%	0.9%	1.1%	2.2%
Accommodation and Food Services	4.3%	0.0%	2.0%	1.4%	1.1%	1.6%	5.0%	0.7%	1.9%
Transport, Postal and Warehousing	10.2%	12.5%	4.0%	0.0%	0.8%	4.0%	1.9%	0.8%	3.0%
Information Media and Telecommunications	15.3%	15.1%	2.1%	0.0%	6.7%	2.1%	0.0%	0.0%	9.2%
Financial and Insurance Services	12.1%	14.2%	2.4%	9.2%	4.9%	2.9%	0.0%	0.0%	9.2%
Rental, Hiring and Real Estate Services	11.9%	10.2%	0.0%	0.0%	1.3%	2.4%	0.0%	3.7%	4.2%
Professional, Scientific and Technical Services	19.4%	19.6%	3.6%	0.0%	2.7%	9.4%	0.0%	0.0%	13.8%
Administrative and Support Services	12.0%	12.9%	3.0%	2.5%	2.4%	0.0%	0.0%	0.7%	4.0%
Public Administration and Safety	24.7%	19.5%	6.8%	5.9%	6.1%	0.0%	0.0%	0.0%	11.0%
Education and Training	41.6%	32.3%	2.3%	3.5%	3.1%	11.9%	0.0%	0.9%	23.7%
Health Care and Social Assistance	19.2%	21.6%	5.9%	2.8%	3.9%	0.0%	0.0%	0.0%	10.7%
Arts and Recreation Services	4.8%	11.0%	0.0%	4.8%	3.7%	0.0%	0.0%	0.0%	4.8%
Other Services	3.7%	24.6%	0.4%	3.6%	4.1%	0.0%	0.0%	1.0%	3.6%
Total	**9.9%**	**21.1%**	**1.5%**	**3.1%**	**3.2%**	**1.8%**	**0.8%**	**0.7%**	**6.8%**

Source: ABS Survey of Education and Work 2007

Key results from Table 7.2 (undergraduate qualifications) include the following.

- **Professionals** again lead the way significantly, with nearly half of those in this occupational group possessing a bachelor degree (and then add in over 20% who have

achieved postgraduate qualifications). This strong profile holds up across most industries.

- As one would expect, **managers** are next in the pecking order with a solid holding of undergraduate qualifications in most industries.
- There is also a solid proportion of **community and personal service workers**, **clerical and administrative workers** and **sales workers** who possess an undergraduate degree.

For some of the latter group, the undergraduate degree may not be a requirement. That suggests these occupations have some people working below their skill potential, suggesting there may be scope to improve productivity in the workforce just based on the existing qualification mix. In some cases, there may be issues of recognition of qualifications (if the qualification was received overseas), or the qualification may be dated and those people may need some additional education to meet current practice and work in a higher level occupation.

Table 7.2: Undergraduate qualification, share of employment by industry and occupation, 2007

	Managers	Professionals	Technicians and Trades Workers	Community and Personal Service Workers	Clerical and Administrative Workers	Sales Workers	Machinery Operators And Drivers	Labourers	Total
Agriculture, Forestry and Fishing	10.0%	15.4%	6.2%	0.0%	5.9%	27.0%	2.8%	2.7%	7.2%
Mining	20.3%	53.4%	3.1%	0.0%	16.5%	53.9%	1.4%	5.1%	13.6%
Manufacturing	22.3%	46.2%	4.1%	12.8%	11.3%	5.5%	2.6%	2.4%	10.2%
Electricity, Gas, Water and Waste Services	18.6%	51.9%	1.2%	0.0%	14.6%	19.7%	3.5%	4.0%	15.0%
Construction	15.1%	51.4%	2.9%	0.0%	7.8%	9.1%	0.2%	3.4%	6.0%
Wholesale Trade	22.3%	34.2%	7.3%	0.0%	11.4%	10.3%	2.1%	2.1%	13.0%
Retail Trade	12.8%	46.0%	2.6%	5.5%	8.3%	6.7%	3.5%	2.4%	8.5%
Accommodation and Food Services	14.5%	34.7%	3.8%	5.0%	12.8%	2.8%	0.0%	5.1%	6.7%
Transport, Postal and Warehousing	15.7%	36.7%	7.2%	16.5%	9.1%	6.7%	4.8%	7.1%	9.5%
Information Media and Telecommunications	32.2%	38.3%	9.5%	19.1%	13.8%	19.2%	0.0%	4.3%	23.6%
Financial and Insurance Services	34.5%	41.1%	42.8%	0.0%	18.4%	17.4%	0.0%	0.0%	28.9%
Rental, Hiring and Real Estate Services	14.7%	41.9%	10.7%	0.0%	6.2%	11.9%	0.0%	0.0%	13.1%
Professional, Scientific and Technical Services	39.0%	53.9%	18.8%	48.6%	12.3%	29.7%	13.2%	0.0%	38.6%
Administrative and Support Services	27.5%	24.0%	6.1%	11.5%	10.0%	6.5%	3.6%	7.2%	12.1%
Public Administration and Safety	29.0%	44.2%	12.8%	15.4%	16.8%	8.9%	1.7%	5.0%	23.3%
Education and Training	32.7%	48.2%	14.7%	11.1%	14.0%	27.3%	0.0%	0.0%	36.0%
Health Care and Social Assistance	27.9%	51.3%	18.1%	9.2%	10.6%	0.0%	4.0%	3.3%	26.1%
Arts and Recreation Services	29.8%	38.8%	6.0%	8.4%	15.8%	16.5%	21.3%	13.7%	19.1%
Other Services	21.0%	42.7%	3.0%	9.5%	8.8%	16.0%	5.4%	6.7%	9.9%
Total	**20.8%**	**47.2%**	**5.4%**	**9.6%**	**12.3%**	**7.9%**	**3.0%**	**3.9%**	**17.2%**

Source: ABS Survey of Education and Work 2007

Table 7.3 (those with an advanced diploma or diploma as their highest level qualification) shows a more even spread across occupational groups, with **community and personal service workers** more likely to be in this category, particularly in the finance, real estate, public administration or health care sectors.

Table 7.3: Advanced diploma / diploma qualification, share of employment by industry and occupation, 2007

	Managers	Professionals	Technicians and Trades Workers	Community and Personal Service Workers	Clerical and Administrative Workers	Sales Workers	Machinery Operators And Drivers	Labourers	Total
Agriculture, Forestry and Fishing	7.5%	27.2%	8.3%	0.0%	13.7%	0.0%	6.1%	3.1%	6.9%
Mining	9.5%	12.6%	3.7%	0.0%	7.8%	0.0%	1.1%	0.0%	4.9%
Manufacturing	10.2%	10.9%	6.7%	18.0%	9.1%	8.6%	3.4%	3.6%	6.8%
Electricity, Gas, Water and Waste Services	14.2%	8.8%	9.9%	0.0%	9.9%	15.2%	0.0%	3.6%	8.0%
Construction	8.7%	11.2%	3.5%	0.0%	13.3%	4.3%	3.3%	2.4%	5.0%
Wholesale Trade	11.2%	14.9%	4.8%	0.0%	8.7%	12.3%	2.9%	3.5%	8.7%
Retail Trade	9.1%	9.7%	6.9%	9.5%	6.7%	5.8%	5.5%	4.6%	6.5%
Accommodation and Food Services	13.3%	12.7%	8.8%	6.5%	7.6%	3.1%	7.1%	4.0%	7.0%
Transport, Postal and Warehousing	10.6%	17.2%	7.9%	10.7%	8.8%	9.3%	3.5%	7.4%	7.3%
Information Media and Telecommunications	13.3%	13.9%	18.7%	0.0%	11.1%	7.5%	0.0%	0.0%	12.8%
Financial and Insurance Services	14.0%	15.3%	6.6%	25.5%	8.5%	14.1%	0.0%	38.4%	12.0%
Rental, Hiring and Real Estate Services	4.7%	16.7%	17.1%	22.1%	11.7%	10.3%	0.0%	0.0%	10.0%
Professional, Scientific and Technical Services	13.4%	10.7%	17.8%	9.2%	10.6%	10.0%	0.0%	11.2%	11.7%
Administrative and Support Services	9.2%	9.5%	8.0%	17.3%	12.6%	2.8%	0.0%	4.7%	8.5%
Public Administration and Safety	12.1%	12.6%	14.6%	21.0%	10.9%	3.2%	5.6%	1.0%	13.3%
Education and Training	13.7%	10.5%	18.9%	15.5%	16.7%	10.4%	0.0%	3.3%	12.1%
Health Care and Social Assistance	19.0%	15.8%	12.0%	21.6%	8.5%	0.0%	11.8%	4.3%	15.7%
Arts and Recreation Services	10.9%	15.3%	10.3%	8.4%	8.9%	3.4%	0.0%	2.9%	9.8%
Other Services	6.8%	16.0%	3.9%	19.2%	10.5%	2.9%	5.7%	10.2%	8.0%
Total	**10.8%**	**12.7%**	**7.1%**	**16.2%**	**10.1%**	**6.7%**	**3.5%**	**3.9%**	**9.4%**

Source: ABS Survey of Education and Work 2007

Table 7.4 (those with a certificate III / IV qualification as their highest level qualification) are very highly represented in the **technician and trade workers** occupation. There are also a reasonable proportion of **managers** in this category as well.

Table 7.4: Certificate III/IV qualification, share of employment by industry and occupation, 2007

	Managers	Professionals	Technicians and Trades Workers	Community and Personal Service Workers	Clerical and Administrative Workers	Sales Workers	Machinery Operators And Drivers	Labourers	Total
Agriculture, Forestry and Fishing	17.4%	6.4%	25.2%	0.0%	22.6%	0.0%	12.5%	13.5%	16.4%
Mining	15.5%	8.3%	62.8%	0.0%	11.9%	46.1%	25.5%	11.6%	28.3%
Manufacturing	26.0%	16.2%	49.4%	18.7%	12.2%	19.3%	16.6%	16.8%	26.9%
Electricity, Gas, Water and Waste Services	20.4%	8.9%	52.7%	100.0%	18.3%	0.0%	28.1%	15.3%	26.8%
Construction	44.9%	8.5%	53.7%	0.0%	15.1%	34.5%	22.4%	23.3%	39.6%
Wholesale Trade	9.5%	4.4%	52.6%	0.0%	19.8%	15.7%	17.8%	10.7%	16.6%
Retail Trade	18.9%	5.0%	49.0%	13.2%	12.4%	9.6%	11.9%	7.9%	13.8%
Accommodation and Food Services	13.5%	6.8%	33.2%	10.8%	11.8%	4.3%	13.8%	6.9%	12.6%
Transport, Postal and Warehousing	17.4%	11.7%	56.3%	10.1%	16.2%	6.4%	19.3%	6.8%	18.2%
Information Media and Telecommunications	6.1%	5.8%	29.9%	0.0%	10.7%	12.9%	40.8%	11.3%	12.3%
Financial and Insurance Services	5.6%	3.8%	25.8%	27.1%	8.4%	16.1%	100.0%	61.6%	7.0%
Rental, Hiring and Real Estate Services	20.8%	8.1%	43.9%	0.0%	17.9%	20.0%	49.7%	21.7%	20.3%
Professional, Scientific and Technical Services	9.5%	3.1%	29.1%	0.0%	11.4%	3.8%	8.4%	32.3%	8.7%
Administrative and Support Services	11.9%	12.3%	39.3%	17.9%	11.4%	17.7%	21.1%	15.9%	16.2%
Public Administration and Safety	6.7%	2.5%	32.7%	16.9%	15.4%	16.4%	12.2%	22.3%	13.2%
Education and Training	1.9%	2.5%	27.3%	21.8%	16.6%	10.7%	43.8%	15.2%	8.0%
Health Care and Social Assistance	12.8%	4.6%	16.9%	30.3%	12.9%	20.5%	26.5%	8.9%	15.2%
Arts and Recreation Services	9.2%	3.5%	34.7%	14.3%	11.7%	13.3%	29.3%	2.8%	12.8%
Other Services	26.3%	3.2%	57.6%	20.5%	13.0%	30.5%	20.4%	10.6%	36.8%
Total	**16.6%**	**4.6%**	**47.4%**	**20.7%**	**13.6%**	**11.4%**	**19.3%**	**13.9%**	**18.2%**

Source: ABS Survey of Education and Work 2007

Finally, Table 7.5 (those with a certificate I / II qualification as their highest level qualification) are a relatively small proportion in occupations across the board, with the strongest representation amongst **clerical and administrative workers**. This table (and the subsequent projections for this report) include within the certificate I/II category those classified within the Survey of Education and Work as 'certificate nfd' – it is known these people hold a post-school certificate but its level is not further defined. This is for ease of exposition, and it is likely to be true in the majority of cases as mixed field programs is the most common field of education for this group, which is far more common at the certificate I/II level.

Table 7.5: Certificate I/II qualification, share of employment by industry and occupation, 2007

	Managers	Professionals	Technicians and Trades Workers	Community and Personal Service Workers	Clerical and Administrative Workers	Sales Workers	Machinery Operators And Drivers	Labourers	Total
Agriculture, Forestry and Fishing	9.1%	4.3%	18.7%	0.0%	6.6%	0.0%	8.1%	8.8%	9.3%
Mining	7.7%	0.0%	1.7%	0.0%	8.4%	0.0%	12.0%	11.2%	6.8%
Manufacturing	4.9%	2.7%	5.2%	11.8%	14.0%	6.6%	6.5%	7.8%	6.7%
Electricity, Gas, Water and Waste Services	0.0%	3.0%	1.7%	0.0%	9.6%	0.0%	0.0%	3.9%	3.2%
Construction	6.6%	1.7%	5.2%	0.0%	13.3%	10.8%	5.8%	5.6%	6.2%
Wholesale Trade	4.4%	2.7%	8.7%	42.5%	11.5%	9.1%	8.6%	7.1%	7.8%
Retail Trade	7.5%	6.2%	6.2%	15.4%	13.1%	6.9%	4.7%	5.6%	7.2%
Accommodation and Food Services	6.2%	0.0%	10.2%	9.8%	11.7%	6.7%	13.5%	5.9%	8.1%
Transport, Postal and Warehousing	4.6%	1.4%	6.6%	12.8%	10.4%	10.5%	6.6%	5.8%	7.5%
Information Media and Telecommunications	6.3%	3.4%	8.2%	0.0%	8.7%	5.6%	11.7%	4.6%	6.2%
Financial and Insurance Services	2.2%	2.9%	0.0%	0.0%	8.9%	5.7%	0.0%	0.0%	5.6%
Rental, Hiring and Real Estate Services	11.0%	4.1%	0.0%	32.6%	12.4%	12.0%	1.5%	7.0%	10.1%
Professional, Scientific and Technical Services	4.5%	1.2%	5.7%	33.0%	15.4%	3.2%	0.0%	0.0%	5.1%
Administrative and Support Services	3.3%	4.4%	3.8%	15.6%	11.8%	2.2%	16.3%	6.5%	7.8%
Public Administration and Safety	2.9%	2.8%	6.9%	6.2%	9.7%	2.1%	12.8%	15.7%	6.5%
Education and Training	3.9%	0.8%	4.9%	14.2%	10.6%	3.0%	12.5%	9.5%	4.2%
Health Care and Social Assistance	7.0%	0.9%	12.1%	7.7%	14.7%	0.0%	7.8%	8.3%	6.4%
Arts and Recreation Services	8.2%	5.2%	11.5%	6.2%	7.7%	15.3%	15.3%	6.6%	7.6%
Other Services	9.3%	2.9%	8.8%	9.4%	8.5%	4.5%	0.0%	5.3%	7.9%
Total	**6.1%**	**1.8%**	**6.5%**	**9.2%**	**11.6%**	**7.4%**	**7.1%**	**6.9%**	**6.7%**

Source: ABS Survey of Education and Work 2007

7.2 Skills deepening over time

How have the qualification shares shown in the above tables changed over time, and how are they likely to change in the future? As the Australian economy heads down the path of being a higher skill / higher productivity economy over time, the level of qualifications within particular occupations tends to rise over time.

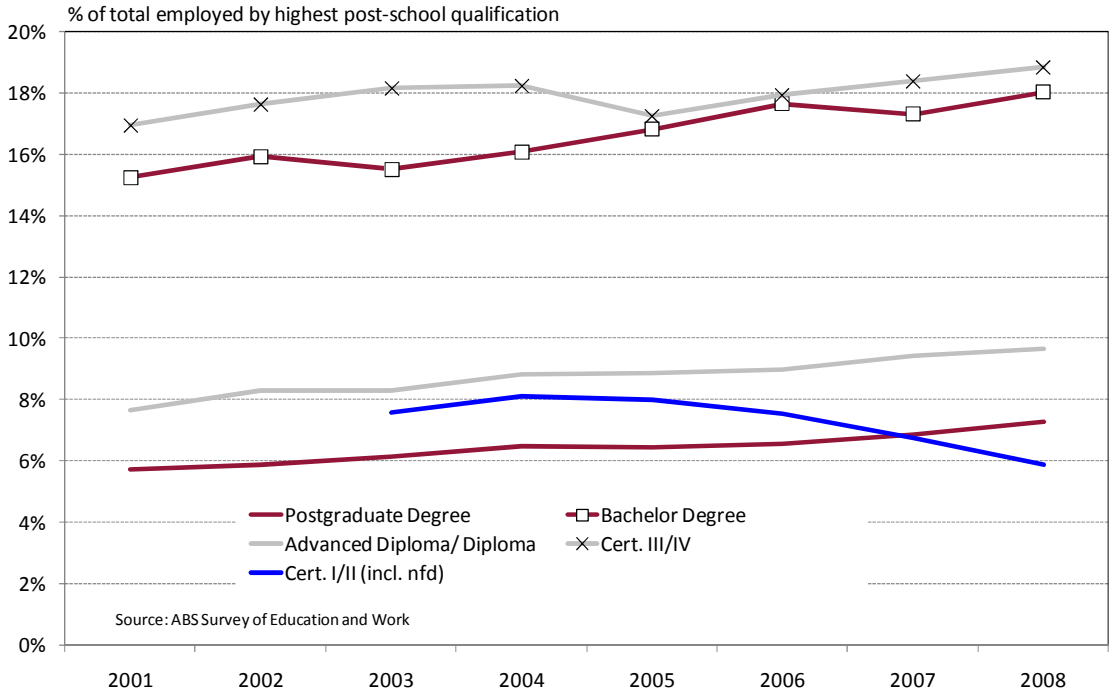
"Skills deepening" is an important issue in assessing the economy's likely future requirements for qualifications. There are two concepts captured by skills deepening. On the one hand, it can mean an increase over time in the proportion of people within a given occupation or industry with a post-school qualification. On the other hand, it can also mean within a given occupation or industry seeing an increase in the proportion of people with higher-level qualifications (or an increase in number of qualifications per person on average). Both of these trends have occurred over recent years.

An increase in the share of those employed who hold post-school qualifications has been evident over recent years. **The share of those employed with post-school qualifications was 55.7% in 2003. By 2008 it was 59.7% - an increase of four percentage points over five years**.

The trends by type of highest level qualification are shown in the chart below with data back to 2001 for most qualifications.[6] There has been an increase over time in all qualification levels with the exception of certificate I/II. Note that even for the latter group it does not mean that the share of the workforce who hold these qualifications has not increased. It more likely reflects that many of those previously holding a certificate I/II as their highest level qualification have subsequently obtained another (higher level) qualification.

[6] The certificate I/II data is not well reported in the survey for 2001 and 2002.

Chart 7.1: Share of employment by highest post-school qualification



While there has been an increase in qualifications held, and a relative shift towards higher level post-school qualifications, it is important to note that higher qualifications may not always be a requirement or even used in the relevant position. That is, many people with a qualification do not use that qualification directly in their work (there are a number of sales workers and labourers who hold higher education qualifications). Others without formal qualifications have the skills to do their job (not all professionals hold an undergraduate degree, as one might have expected).

Skills deepening is generally seen as occurring due to the changing nature of labour demand. That is, roles are becoming more demanding and increasing job complexities has prompted employers to expect higher levels of interactive and cognitive abilities that can only be achieved through higher levels of qualification. During the current economic downturn, skills deepening may be seen as an investment in the future economic recovery, warding off otherwise likely problems of skill shortages in the future. Further discussions on this topic are provided in Karmel (2008) and Lowry et al. (2008).

Going forward, Access Economics' assumptions are that the share of those employed holding post-school qualifications will be influenced by two key drivers.

- **The observed trend change in the qualifications profile between 2001 and 2008.**
  - This is estimated at the level of the national qualification share of employment by occupation and industry.[7]

[7] In fact, the detailed industry-occupation skills deepening trends are estimated over the time period 2003 to 2007 (the years for which such detailed data was available). These growth rates are then scaled up marginally to reflect the observed average skills deepening by qualification over the period 2001 to 2008, a broader time period to assess trends.

- The default assumption is that the average trend growth seen in skills deepening by industry and occupation continues at the same rate as the recent past.
- Where estimates over this period are seen as implausible to continue over a longer time frame the estimated growth has been modified.

■ **The assumed overall rate of productivity growth for the scenario.**

- The trends as described above are used in the **low-trust globalisation** scenario, which has an average productivity growth rate of 1.5% per annum.
- The trend changes are scaled up in **open doors**, consistent with its stronger productivity growth rate (1.75% per annum)
- The trend changes are scaled down in **flags**, consistent with its weaker productivity growth rate (1.3% per annum)

The following three tables show the qualifications profile used in 2025 under each of these scenarios.

Table 7.6: All post school qualifications, share of employment by occupation – Open doors

Occupation	Postgraduate		Undergraduate		Dip/Adv Diploma		Certificate III/IV		Certificate I/II	
	2007	2025	2007	2025	2007	2025	2007	2025	2007	2025
Managers	9.9%	14.0%	20.8%	27.2%	10.8%	14.2%	16.6%	23.0%	6.1%	4.1%
Professionals	21.1%	27.4%	47.2%	53.6%	12.7%	11.1%	4.6%	5.2%	1.8%	1.1%
Technicians and Trades Workers	1.5%	4.6%	5.4%	9.5%	7.1%	14.3%	47.4%	42.7%	6.5%	8.4%
Community and Personal Service Workers	3.1%	4.4%	9.6%	9.1%	16.2%	27.3%	20.7%	32.9%	9.2%	6.2%
Clerical and Administrative Workers	3.2%	7.1%	12.3%	21.1%	10.1%	11.3%	13.6%	19.3%	11.6%	10.6%
Sales Workers	1.8%	4.6%	7.9%	15.5%	6.7%	12.1%	11.4%	25.5%	7.4%	5.4%
Machinery Operators And Drivers	0.8%	4.2%	3.0%	6.1%	3.5%	6.5%	19.3%	18.8%	7.1%	9.9%
Labourers	0.7%	2.9%	3.9%	7.6%	3.9%	8.1%	13.9%	21.7%	6.9%	5.3%
Total	**6.8%**	**10.8%**	**17.2%**	**23.0%**	**9.4%**	**12.9%**	**18.2%**	**22.2%**	**6.7%**	**5.9%**

Source: ABS Survey of Education and Work 2007; Access Economics

Table 7.7: All post school qualifications, share of employment by occupation – Low-trust globalisation

Occupation	Postgraduate		Undergraduate		Dip/Adv Diploma		Certificate III/IV		Certificate I/II	
	2007	2025	2007	2025	2007	2025	2007	2025	2007	2025
Managers	9.9%	13.9%	20.8%	26.6%	10.8%	13.8%	16.6%	22.3%	6.1%	4.0%
Professionals	21.1%	27.4%	47.2%	53.9%	12.7%	10.7%	4.6%	5.1%	1.8%	1.1%
Technicians and Trades Workers	1.5%	4.5%	5.4%	9.2%	7.1%	14.0%	47.4%	40.9%	6.5%	8.0%
Community and Personal Service Workers	3.1%	4.3%	9.6%	8.8%	16.2%	27.3%	20.7%	32.7%	9.2%	6.1%
Clerical and Administrative Workers	3.2%	6.8%	12.3%	20.2%	10.1%	10.8%	13.6%	18.8%	11.6%	10.3%
Sales Workers	1.8%	4.4%	7.9%	14.8%	6.7%	11.5%	11.4%	24.5%	7.4%	5.3%
Machinery Operators And Drivers	0.8%	3.9%	3.0%	5.7%	3.5%	6.1%	19.3%	18.3%	7.1%	9.3%
Labourers	0.7%	2.7%	3.9%	7.2%	3.9%	7.7%	13.9%	20.6%	6.9%	5.2%
Total	**6.8%**	**10.6%**	**17.2%**	**22.7%**	**9.4%**	**12.6%**	**18.2%**	**21.5%**	**6.7%**	**5.7%**

Source: ABS Survey of Education and Work 2007; Access Economics

Table 7.8: All post school qualifications, share of employment by occupation – Flags

Occupation	Postgraduate		Undergraduate		Dip/Adv Diploma		Certificate III/IV		Certificate I/II	
	2007	2025	2007	2025	2007	2025	2007	2025	2007	2025
Managers	9.9%	13.6%	20.8%	26.0%	10.8%	13.5%	16.6%	22.5%	6.1%	3.8%
Professionals	21.1%	26.9%	47.2%	54.0%	12.7%	10.3%	4.6%	5.7%	1.8%	1.1%
Technicians and Trades Workers	1.5%	4.1%	5.4%	8.5%	7.1%	14.2%	47.4%	38.5%	6.5%	7.4%
Community and Personal Service Workers	3.1%	4.1%	9.6%	8.6%	16.2%	27.4%	20.7%	32.5%	9.2%	6.1%
Clerical and Administrative Workers	3.2%	6.4%	12.3%	19.5%	10.1%	10.6%	13.6%	18.2%	11.6%	10.2%
Sales Workers	1.8%	4.0%	7.9%	13.9%	6.7%	11.0%	11.4%	24.1%	7.4%	5.2%
Machinery Operators And Drivers	0.8%	3.3%	3.0%	5.0%	3.5%	5.6%	19.3%	17.6%	7.1%	8.8%
Labourers	0.7%	2.7%	3.9%	6.1%	3.9%	7.0%	13.9%	21.6%	6.9%	5.3%
Total	**6.8%**	**10.2%**	**17.2%**	**21.9%**	**9.4%**	**12.3%**	**18.2%**	**21.4%**	**6.7%**	**5.6%**

Source: ABS Survey of Education and Work 2007; Access Economics

As all scenarios are projected under a variant of the historic trend which saw a notable increase in skills deepening, there is also a significant increase in skills projected for each scenario. **Open doors** of course sees the highest rate of skills deepening, linked to the faster productivity growth in that scenario. Aggregate results are:

- Under **open doors** in 2025 74.9% of those employed hold a post-school qualification (and 25.1% hold no post-school qualification).
- Under **low-trust globalisation** in 2025 73.2% of those employed hold a post-school qualification (and 26.8% hold no post-school qualification).
- Under **flags** in 2025 71.2% of those employed hold a post-school qualification (and 28.8% hold no post-school qualification).

Note that employment growth is much lower under **flags** than the other scenarios. That means the total number of people with post-school qualifications will be notably lower – a lower share (as shown in Table 7.8) multiplied by a lower base level of employment.

Note also that the overall share of people employed who hold a post-school qualification is increasing at a rapid rate in **open doors** (0.9 percentage points per annum), marginally higher than the rate observed over the 2003 to 2008 period (0.8 percentage points per annum). This is the net effect of two factors:

- It is pushed lower due to the fact that for this modelling the historic trends in skills deepening are estimated and applied at the industry-occupation level. Many of the industry-occupation groups seeing strong growth in post-school qualifications held are reaching saturation point over the forecast horizon. That is, many are getting to or near the point where everyone already has a post-school qualification so there can be no further reduction in the share of the workforce who don't hold a post-school qualification. For example less than 3% of professionals in most industry groups do not hold a post-school qualification in **open doors** in 2025.
- It is pushed higher by the faster rate of productivity growth in this scenario and the assumption this is commensurate with a more rapid rate of skills deepening across all occupations (subject to saturation point limits in some industry-occupation groups as noted above).

7.3 Multiple qualifications

Assessing and projecting the share of the employed workforce who hold post-school qualifications is one issue, while assessing and projecting the total number of post-school qualifications held by those employed is another. The latter allows for the fact that many people do hold more than one post-school qualification.

The share of qualification holders by their highest qualification who also hold other post-school qualifications is shown in Table 7.9. These estimates have been derived by Access Economics based on the ABS Survey of Education and Work.

Table 7.9: Share of qualification holders with additional post-school qualifications

	Highest qualification				
	Postgrad	Undergrad	Dip. / Adv Dip.	Cert III / IV	Cert I / II
Has qualification:					
Postgraduate	134.0%				
Undergraduate	73.3%	115.0%			
Diploma / Adv Diploma	6.6%	15.5%	112.1%		
Certificate III / IV	2.2%	4.4%	17.3%	113.3%	
Certificate I / II	0.7%	4.1%	12.0%	16.4%	128.5%

Source: Access Economics, based on the 2007 ABS Survey of Education and Work, with some component detail from the 2001 ABS Survey of Education and Work

Table 7.9 suggests that of those holding a postgraduate qualification as their highest level qualification, 34.0% also hold an additional postgraduate qualification, 73.3% also hold an undergraduate qualification, 6.6% also hold a diploma / advanced diploma, 2.2% also hold a Certificate III / IV qualification and 0.7% also hold a Certificate I / II qualification.

These average relationships are used in estimating how many additional post-school qualifications may be associated with an additional demand for a particular highest level qualification. The tendency to hold more than one post-school qualification also increases over time in the projections at a rate consistent with trends over recent years. In 2003, 31.1% of those aged 15-64 who held a post-school qualification actually held more than one post-school qualification. By 2007 that share had grown to 32.2%.

The projected increase in the degree of multiple qualification holding is also allowed to vary by scenario, in line with the assumed rate of labour productivity growth in each scenario. That is, projections for growth in multiple qualification holding in **low-trust globalisation** effectively follow past trends, the rate is faster in **open doors** consistent with faster productivity growth, and slower in **flags** consistent with slower productivity growth.

8 Projected labour market demand for qualifications

8.1 Employment by highest level qualification

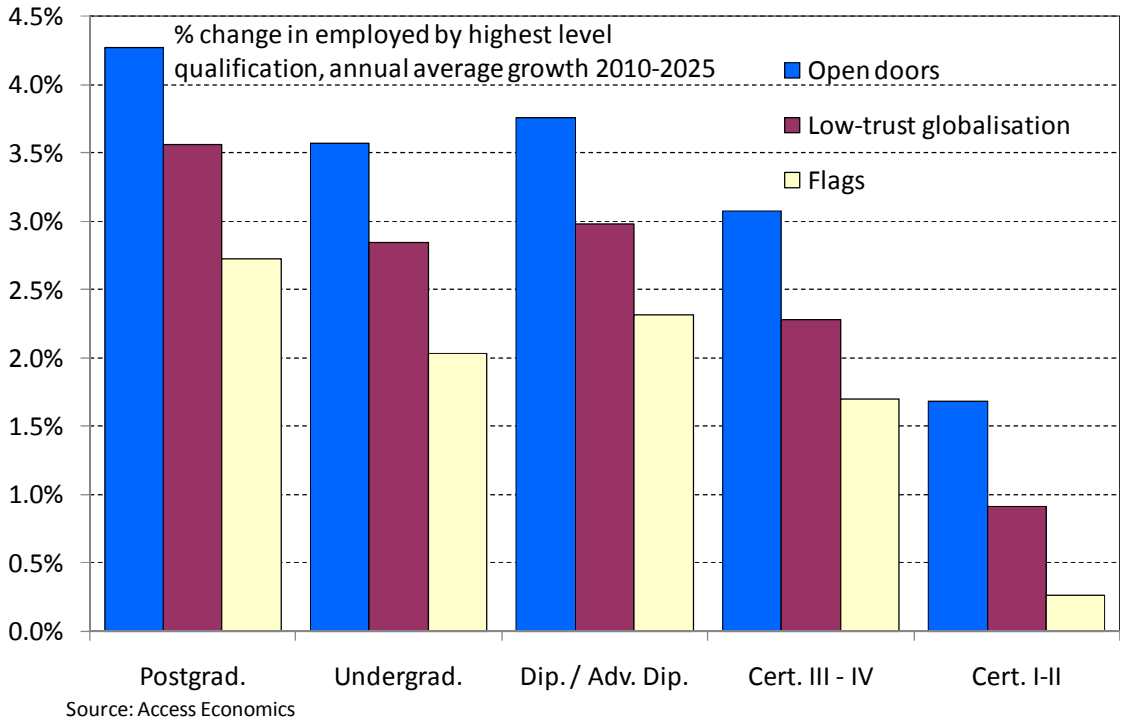
This section presents the implied labour market demand for qualifications, which is driven by the labour force growth aggregates discussed in chapter 6 and the projected qualification profiles discussed in chapter 7.

Average growth in employment by highest level qualification over the period 2010 to 2025 is presented in Chart 8.1. The chart shows a reasonably ordinal ranking in employment growth by highest level qualification both between the scenarios, and from highest level post-school qualifications to lowest level post-school qualifications.

In each of the scenarios, average growth in employment for those with postgraduate, undergraduate, diploma/advanced diploma or certificate III/IV qualifications as their highest level qualification exceeds the overall average employment growth for the scenario. Average growth in employment for those with certificate I/II level qualifications as their highest level qualification is lower than the overall average employment growth for each scenario.

The stronger than average growth for higher level qualifications reflects skills deepening over time, along with generally higher qualification requirements for those occupations with higher than average growth prospects. The industry spread (higher chance of being employed in relatively faster growing industries) also helps.

Chart 8.1: Projected employment growth by highest level qualification, average 2010 - 2025



Source: Access Economics

Details on projected employment growth by those with and without qualifications are shown below. In all scenarios the number of people employed without post school qualifications is shrinking, which follows logically from the skills deepening assumptions discussed in the previous chapter.

Table 8.1: Projected employment growth by those with/without qualifications - Open doors

Employment	2010	2025	Avg growth 15
With post school qualifications	7,029,680	11,570,042	3.4%
Without post school qualifications	4,129,906	3,751,604	-0.6%
Total	**11,159,586**	**15,321,646**	**2.1%**

Source: Access Economics

Table 8.2: Projected employment growth by those with/without qualifications – Low-trust globalisation

Employment	2010	2025	Avg growth 15
With post school qualifications	6,872,467	10,131,050	2.6%
Without post school qualifications	4,173,331	3,612,409	-1.0%
Total	**11,045,798**	**13,743,459**	**1.5%**

Source: Access Economics

Table 8.3: Projected employment growth by those with/without qualifications – Flags

Employment	2010	2025	Avg growth 15
With post school qualifications	6,752,063	8,972,776	1.9%
Without post school qualifications	4,216,285	3,531,172	-1.2%
Total	**10,968,348**	**12,503,948**	**0.9%**

Source: Access Economics

Details on projected employment growth by highest level qualification and field of education are shown in the following tables. The differences in growth rates by field of education in the tables below reflect a combination of:

- the composition of employment growth by both industry and occupation (with different implications by field of education for different industry and occupation trends); and
- different trends in skill deepening by industry and occupation.

Table 8.4: Projected employment growth by highest level qualification by field of education - Open doors

Average annual growth, 15 years to 2025	Post graduate	Under graduate	Diploma/ Adv Diploma	Certificate III / IV	Certificate I / II	All post school quals
Natural and physical sciences	3.9%	3.6%	3.7%	2.8%	0.0%	3.7%
Information technology	5.1%	3.8%	3.8%	3.6%	2.4%	4.0%
Engineering and related technologies	5.0%	3.3%	3.9%	2.2%	1.9%	2.7%
Architecture and building	4.4%	3.9%	4.5%	1.7%	2.9%	2.3%
Agriculture, environment and related studies	4.7%	3.9%	3.7%	3.9%	2.1%	3.8%
Health	3.8%	3.2%	3.7%	3.9%	2.8%	3.5%
Education	3.7%	2.9%	2.3%	4.7%	2.6%	3.2%
Management and commerce	4.6%	3.8%	3.7%	4.6%	1.8%	4.1%
Society and culture	4.2%	3.8%	4.0%	4.5%	1.1%	4.0%
Creative arts	4.3%	3.8%	3.7%	3.7%	3.0%	3.8%
Food, hospitality and personal services	2.8%	4.8%	4.7%	3.5%	2.1%	3.7%
Mixed field programmes	3.7%	4.0%	3.5%	2.1%	1.6%	1.9%
Total	**4.3%**	**3.6%**	**3.8%**	**3.1%**	**1.7%**	**3.4%**

Source: Access Economics

Table 8.5: Projected employment growth by highest level qualification by field of education – Low-trust globalisation

Average annual growth, 15 years to 2025	Post graduate	Under graduate	Diploma/ Adv Diploma	Certificate III / IV	Certificate I / II	All post school quals
Natural and physical sciences	3.2%	2.9%	2.9%	2.1%	0.0%	3.0%
Information technology	4.4%	3.1%	2.9%	2.8%	1.6%	3.3%
Engineering and related technologies	4.2%	2.5%	3.1%	1.3%	1.0%	1.9%
Architecture and building	3.8%	3.2%	3.8%	0.7%	1.9%	1.4%
Agriculture, environment and related studies	4.0%	3.0%	2.8%	2.9%	1.2%	2.9%
Health	3.2%	2.6%	3.1%	3.3%	2.0%	2.9%
Education	2.9%	2.2%	1.6%	4.0%	1.9%	2.4%
Management and commerce	3.8%	3.1%	2.8%	3.9%	1.0%	3.3%
Society and culture	3.5%	3.1%	3.3%	3.8%	0.6%	3.3%
Creative arts	3.5%	3.1%	2.9%	2.9%	2.3%	3.0%
Food, hospitality and personal services	1.9%	4.0%	3.9%	2.8%	1.4%	3.0%
Mixed field programmes	3.1%	3.2%	2.8%	1.4%	0.9%	1.1%
Total	**3.6%**	**2.8%**	**3.0%**	**2.3%**	**0.9%**	**2.6%**

Source: Access Economics

Table 8.6: Projected employment growth by highest level qualification by field of education - Flags

Average annual growth, 15 years to 2025	Post graduate	Under graduate	Diploma/ Adv Diploma	Certificate III / IV	Certificate I / II	All post school quals
Natural and physical sciences	2.5%	2.2%	2.6%	1.8%	0.0%	2.3%
Information technology	3.4%	2.1%	2.3%	1.9%	1.1%	2.4%
Engineering and related technologies	3.7%	2.3%	3.4%	1.2%	1.0%	1.8%
Architecture and building	2.7%	2.2%	3.0%	0.1%	1.8%	0.8%
Agriculture, environment and related studies	3.5%	2.1%	1.7%	1.9%	0.2%	2.0%
Health	2.3%	1.5%	2.3%	2.5%	1.5%	2.0%
Education	2.1%	1.5%	1.0%	3.6%	0.5%	1.7%
Management and commerce	3.0%	2.3%	2.0%	3.0%	0.3%	2.5%
Society and culture	2.6%	2.1%	2.5%	3.0%	0.5%	2.4%
Creative arts	2.6%	2.2%	2.2%	2.3%	1.1%	2.2%
Food, hospitality and personal services	0.3%	2.7%	2.8%	1.9%	0.7%	2.0%
Mixed field programmes	2.1%	2.3%	2.0%	0.7%	0.2%	0.4%
Total	**2.7%**	**2.0%**	**2.3%**	**1.7%**	**0.3%**	**1.9%**

Source: Access Economics

The following tables show the stock of those employed who hold qualifications at various points in time, along with average annual growth in such over the preceding five years. By 2025 the scenarios show:

- 11.6 million employed people holding post-school qualifications in **open doors**;
- 10.1 million employed people holding post-school qualifications in **low-trust globalisation**; and
- 9.0 million employed people holding post-school qualifications in **flags**.

Table 8.7: Persons employed by highest level qualification – Open doors

Qualification Level	2015	2020	2025
Postgraduate	1,170,958	1,423,716	1,675,751
- growth average annual 5 years to	5.5%	4.0%	3.3%
Undergraduate	2,618,514	3,091,533	3,561,879
- growth average annual 5 years to	4.5%	3.4%	2.9%
Diploma / Adv Diploma	1,463,325	1,735,563	2,001,195
- growth average annual 5 years to	4.9%	3.5%	2.9%
Certificate III / IV	2,614,854	3,023,970	3,425,490
- growth average annual 5 years to	3.8%	2.9%	2.5%
Certificate I / II	767,886	831,749	905,727
- growth average annual 5 years to	1.7%	1.6%	1.7%
Total with post school qualifications	8,635,537	10,106,531	11,570,042
- growth average annual 5 years to	4.2%	3.2%	2.7%
Total without post school qualifications	4,027,382	3,866,853	3,751,604
- growth average annual 5 years to	-0.5%	-0.8%	-0.6%
Total employment	**12,662,919**	**13,973,384**	**15,321,646**
- growth average annual 5 years to	**2.6%**	**2.0%**	**1.9%**

Source: Access Economics

Table 8.8: Persons employed by highest level qualification – Low-trust globalisation

Qualification Level	2015	2020	2025
Postgraduate	1,104,876	1,301,136	1,481,892
- growth average annual 5 years to	4.7%	3.3%	2.6%
Undergraduate	2,476,891	2,827,478	3,148,689
- growth average annual 5 years to	3.7%	2.7%	2.2%
Diploma / Adv Diploma	1,367,705	1,563,781	1,744,739
- growth average annual 5 years to	4.0%	2.7%	2.2%
Certificate III / IV	2,441,206	2,718,390	2,969,768
- growth average annual 5 years to	2.9%	2.2%	1.8%
Certificate I / II	716,534	747,171	785,963
- growth average annual 5 years to	0.9%	0.8%	1.0%
Total with post school qualifications	8,107,212	9,157,956	10,131,050
- growth average annual 5 years to	3.4%	2.5%	2.0%
Total without post school qualifications	4,026,866	3,803,387	3,612,409
- growth average annual 5 years to	-0.7%	-1.1%	-1.0%
Total employment	**12,134,078**	**12,961,343**	**13,743,459**
- growth average annual 5 years to	**1.9%**	**1.3%**	**1.2%**

Source: Access Economics

Table 8.9: Persons employed by highest level qualification – Flags

Qualification Level	2015	2020	2025
Postgraduate	1,038,007	1,174,589	1,285,242
- growth average annual 5 years to	3.9%	2.5%	1.8%
Undergraduate	2,339,161	2,570,301	2,753,433
- growth average annual 5 years to	2.8%	1.9%	1.4%
Diploma / Adv Diploma	1,286,374	1,423,733	1,551,664
- growth average annual 5 years to	3.2%	2.0%	1.7%
Certificate III / IV	2,337,670	2,533,555	2,684,872
- growth average annual 5 years to	2.3%	1.6%	1.2%
Certificate I / II	674,958	682,211	697,564
- growth average annual 5 years to	0.1%	0.2%	0.4%
Total with post school qualifications	7,676,170	8,384,389	8,972,776
- growth average annual 5 years to	2.6%	1.8%	1.4%
Total without post school qualifications	4,038,860	3,773,913	3,531,172
- growth average annual 5 years to	-0.9%	-1.3%	-1.3%
Total employment	**11,715,029**	**12,158,302**	**12,503,948**
- growth average annual 5 years to	**1.3%**	**0.7%**	**0.6%**

Source: Access Economics

8.2 Employment by total qualifications

The results in the above section present projections for employment by highest level qualifications. However, many people hold more than one post-school qualification (as discussed earlier in section 7.3). The following tables project the total level of qualifications held by those employed when projections of the extent of multiple qualification holding are taken into account. In summary:

- In **open doors** by 2025 there are projected to be 18.0 million post-school qualifications held by those employed, an annual average increase of 3.8% from 2010.
- In **low-trust globalisation** by 2025 there are projected to be 15.6 million post-school qualifications held by those employed, an annual average increase of 3.0% from 2010.
- In **flags** by 2025 there are projected to be 13.7 million post-school qualifications held by those employed, an annual average increase of 2.2% from 2010.

Table 8.10: Total qualifications held by those employed – Open doors

Qualification Level	2015	2020	2025
Postgraduate	1,581,259	1,931,770	2,284,558
- growth average annual 5 years to	**5.6%**	**4.1%**	**3.4%**
Undergraduate	3,932,574	4,720,377	5,519,584
- growth average annual 5 years to	**4.9%**	**3.7%**	**3.2%**
Diploma / Adv Diploma	2,178,048	2,623,539	3,073,429
- growth average annual 5 years to	**5.2%**	**3.8%**	**3.2%**
Certificate III / IV	3,429,553	4,033,206	4,642,184
- growth average annual 5 years to	**4.2%**	**3.3%**	**2.9%**
Certificate I / II	1,817,232	2,109,473	2,431,568
- growth average annual 5 years to	**3.5%**	**3.0%**	**2.9%**
Total	**12,938,665**	**15,418,365**	**17,951,323**

Source: Access Economics

Table 8.11: Total qualifications held by those employed – Low-trust globalisation

Qualification Level	2015	2020	2025
Postgraduate	1,490,393	1,762,329	2,015,351
- growth average annual 5 years to	**4.8%**	**3.4%**	**2.7%**
Undergraduate	3,709,445	4,300,739	4,855,253
- growth average annual 5 years to	**4.1%**	**3.0%**	**2.5%**
Diploma / Adv Diploma	2,034,076	2,358,952	2,668,046
- growth average annual 5 years to	**4.3%**	**3.0%**	**2.5%**
Certificate III / IV	3,193,953	3,611,058	4,002,685
- growth average annual 5 years to	**3.2%**	**2.5%**	**2.1%**
Certificate I / II	1,683,984	1,873,766	2,076,418
- growth average annual 5 years to	**2.5%**	**2.2%**	**2.1%**
Total	**12,111,852**	**13,906,844**	**15,617,753**

Source: Access Economics

Table 8.12: Total qualifications held by those employed – Flags

Qualification Level	2015	2020	2025
Postgraduate	1,398,967	1,588,674	1,744,498
- growth average annual 5 years to	**3.9%**	**2.6%**	**1.9%**
Undergraduate	3,492,791	3,891,901	4,220,475
- growth average annual 5 years to	**3.2%**	**2.2%**	**1.6%**
Diploma / Adv Diploma	1,909,101	2,136,396	2,347,202
- growth average annual 5 years to	**3.4%**	**2.3%**	**1.9%**
Certificate III / IV	3,044,614	3,341,506	3,587,563
- growth average annual 5 years to	**2.6%**	**1.9%**	**1.4%**
Certificate I / II	1,582,646	1,701,290	1,824,361
- growth average annual 5 years to	**1.7%**	**1.5%**	**1.4%**
Total	**11,428,118**	**12,659,767**	**13,724,098**

Source: Access Economics

8.3 Additional qualifications required over time

The previous section reported total qualifications held at points in time under each of the scenarios. The additional qualifications required over time is the growth in that stock. On top of that requirement however is the need to account for replacement demand as people leave the workforce permanently (for retirement) and are replaced by new entrants to the workforce. Replacement demand estimates by occupation were discussed in section 6.4.

The following tables show projections of the additional qualifications required over time for those employed implied from labour market demand (including skills deepening and multiple qualification holding), as well as replacement for retirement. The additional qualification requirement is shown split into three components – that due to growth in employment, that due to replacement for retirement and that due to additional skills deepening (relative to the rate of skills deepening existing in 2010)

Note that the projections don't imply the additional qualifications need to be provided locally. Some element of skill requirements will be delivered via net migration as new migrants bring qualifications with them to Australia.

On average between 2010 and 2025:

- in **open doors** an average 793,000 additional qualifications are required per annum;
- in **low-trust globalisation** an average 641,000 additional qualifications are required per annum; and
- in **flags** an average 516,000 additional qualifications are required per annum.

Within **open doors**, on average between 2010 and 2015 41.0% of the additional qualification demand is due to employment growth, 30.4% is due to replacement demand and 28.6% is due to skills deepening. Over time as employment growth moderates then retirement and skills deepening account for larger shares of overall qualifications demand. On average over the five years to 2025 employment growth accounts for 37.5% of qualification demand, replacement demand has moved up to 33.0% and skills deepening has moved up to 29.5%.

Low-trust globalisation has a lower rate of employment growth so the employment growth contribution to qualifications demand is also lower. On average over the five years to 2025 employment growth accounts for 29.4% of qualification demand, replacement demand accounts for 40.4%% and skills deepening accounts for 30.2%.

Flags has a lower rate of employment growth still. On average over the five years to 2025 employment growth accounts for 19.1% of qualification demand, replacement demand accounts for 50.0% and skills deepening accounts for 30.8%.

Table 8.13: Number of additional qualifications required by those employed – Open doors

Average, 5 years to	2015	2020	2025
Postgraduate			
- due to employment growth	36,677	34,544	35,106
- due to retirement	28,459	30,870	33,341
- due to skills deepening	41,485	41,536	44,531
Total	106,620	106,949	112,978
Undergraduate			
- due to employment growth	98,091	90,835	93,567
- due to retirement	72,549	78,813	85,187
- due to skills deepening	73,597	77,465	82,711
Total	244,237	247,113	261,466
Diploma / Advanced Diploma			
- due to employment growth	54,693	50,584	52,887
- due to retirement	38,586	41,891	45,228
- due to skills deepening	45,062	44,655	46,310
Total	138,341	137,130	144,425
Certificate III - IV			
- due to employment growth	74,247	70,701	75,339
- due to retirement	60,512	64,699	69,072
- due to skills deepening	55,589	57,771	58,005
Total	190,348	193,171	202,416
Certificate I-II			
- due to employment growth	52,469	49,805	53,544
- due to retirement	34,093	37,207	40,412
- due to skills deepening	4,637	9,429	12,554
Total	91,199	96,441	106,511
All qualifications			
- due to employment growth	**316,177**	**296,469**	**310,443**
- due to retirement	**234,199**	**253,479**	**273,241**
- due to skills deepening	**220,370**	**230,855**	**244,111**
Total	**770,745**	**780,804**	**827,795**

Source: Access Economics

Table 8.14: Number of additional qualifications required by those employed – Low-trust globalisation

Average, 5 years to	2015	2020	2025
Postgraduate			
- due to employment growth	27,175	23,449	22,018
- due to retirement	27,748	29,918	31,991
- due to skills deepening	37,781	36,561	37,093
Total	92,703	89,929	91,102
Undergraduate			
- due to employment growth	73,150	61,578	58,803
- due to retirement	70,874	76,496	81,820
- due to skills deepening	65,308	66,517	67,093
Total	209,332	204,590	207,717
Diploma / Advanced Diploma			
- due to employment growth	40,513	33,828	32,898
- due to retirement	37,499	40,412	43,148
- due to skills deepening	38,113	36,472	36,957
Total	116,125	110,713	113,003
Certificate III - IV			
- due to employment growth	51,293	43,715	43,304
- due to retirement	58,700	62,313	65,798
- due to skills deepening	45,526	46,243	44,774
Total	155,519	152,271	153,876
Certificate I-II			
- due to employment growth	38,168	32,568	32,662
- due to retirement	32,910	35,556	38,094
- due to skills deepening	922	5,691	8,875
Total	71,999	73,814	79,631
All qualifications			
- due to employment growth	**230,299**	**195,139**	**189,684**
- due to retirement	**227,730**	**244,696**	**260,851**
- due to skills deepening	**187,650**	**191,483**	**194,793**
Total	**645,679**	**631,317**	**645,328**

Source: Access Economics

Table 8.15: Number of additional qualifications required by those employed – Flags

Average, 5 years to	2015	2020	2025
Postgraduate			
- due to employment growth	17,220	12,355	9,541
- due to retirement	27,011	28,856	30,474
- due to skills deepening	33,930	30,708	29,230
Total	78,161	71,919	69,246
Undergraduate			
- due to employment growth	47,816	33,078	26,461
- due to retirement	69,213	74,074	78,283
- due to skills deepening	57,384	55,586	52,580
Total	174,413	162,738	157,323
Diploma / Advanced Diploma			
- due to employment growth	27,291	18,808	15,705
- due to retirement	36,514	39,019	41,170
- due to skills deepening	32,708	31,342	33,729
Total	96,513	89,169	90,604
Certificate III - IV			
- due to employment growth	38,852	29,288	26,041
- due to retirement	57,609	61,070	64,164
- due to skills deepening	36,954	35,605	31,274
Total	133,415	125,962	121,479
Certificate I-II			
- due to employment growth	27,025	19,799	17,798
- due to retirement	31,957	34,198	36,181
- due to skills deepening	-1,766	3,907	7,420
Total	57,215	57,904	61,399
All qualifications			
- due to employment growth	**158,203**	**113,326**	**95,545**
- due to retirement	**222,304**	**237,216**	**250,272**
- due to skills deepening	**159,209**	**157,149**	**154,234**
Total	**539,716**	**507,691**	**500,051**

Source: Access Economics

9 Balance of student demand and labour market demand

9.1 Assessing relative demand

This chapter compares the projected demands from both the student model and the labour market demand model. The tables below compare the projections for each scenario.

The student projections are the annual flow of student completions over time, reflecting the completions data shown in chapter 5. They include multiple qualifications which some students may undertake. The labour market demand projections are the annual additional qualifications required over time, reflecting the data shown in section 8.3.

The strong employment growth and skills deepening profiles in **open doors** produce a very high level of implied qualifications 'demand' from the labour market. While population growth is also stronger in **open doors** than the other scenarios, the projected supply of students remains well short of implied labour market demand over the forecast horizon.

Note that the supply of students in this case reflects student completions from domestic institutions. The overall stock of qualifications in Australia will also be supplemented by net migration, which in **open doors** is assumed to be at least 250,000 persons per annum.

Table 9.1: Projected student demand and implied labour market demand for qualifications – Open doors

Average, 5 years to	2015	2020	2025
Supply of students			
Postgraduate	62,099	69,332	78,726
Undergraduate	140,892	155,978	171,190
Diploma / Advanced Diploma	50,526	56,057	63,008
Certificate III - IV	187,547	206,788	232,107
Certificate I-II	92,106	101,000	114,377
Total	**533,169**	**589,155**	**659,408**
Labour market demand			
Postgraduate	106,620	106,949	112,978
Undergraduate	244,237	247,113	261,466
Diploma / Advanced Diploma	138,341	137,130	144,425
Certificate III - IV	190,348	193,171	202,416
Certificate I-II	91,199	96,441	106,511
Total	**770,745**	**780,804**	**827,795**
Difference (supply less demand)			
Postgraduate	-44,522	-37,617	-34,253
Undergraduate	-103,345	-91,134	-90,275
Diploma / Advanced Diploma	-87,815	-81,073	-81,417
Certificate III - IV	-2,801	13,618	29,691
Certificate I-II	907	4,559	7,866
Total	**-237,576**	**-191,649**	**-168,388**

Source: Access Economics

The level of 'excess demand' in the **open doors** scenario also differs by level of qualification. The excess demand is significant for postgraduate, undergraduate and diploma/advanced diploma level, but for most of the projection period supply exceeds demand at the certificate level. That in part reflects the projections for future skills demand being largely at the higher end of the skills spectrum (given expected industry/occupational growth and skills deepening). It also reflects the fact some certificate level skills provision is targeted at the unemployed (whereas the labour market demand projections only examine the skill profile of those employed).

Low-trust globalisation also sees 'excess demand' for skills over time at the higher education end of the spectrum. However, labour force participation tails off over time in this scenario (relative to open doors) which helps to produce slower growth in labour market demand. Over the five years to 2025 overall projected supply and demand moves closer towards balance.

Table 9.2: Projected student demand and implied labour market demand for qualifications – Low-trust globalisation

Average, 5 years to	2015	2020	2025
Supply of students			
Postgraduate	61,390	67,132	74,299
Undergraduate	138,033	148,983	159,926
Diploma / Advanced Diploma	49,686	53,896	59,151
Certificate III - IV	184,513	199,172	218,563
Certificate I-II	90,644	97,475	108,076
Total	**524,266**	**566,659**	**620,016**
Labour market demand			
Postgraduate	92,703	89,929	91,102
Undergraduate	209,332	204,590	207,717
Diploma / Advanced Diploma	116,125	110,713	113,003
Certificate III - IV	155,519	152,271	153,876
Certificate I-II	71,999	73,814	79,631
Total	**645,679**	**631,317**	**645,328**
Difference (supply less demand)			
Postgraduate	-31,314	-22,796	-16,803
Undergraduate	-71,299	-55,607	-47,791
Diploma / Advanced Diploma	-66,439	-56,816	-53,851
Certificate III - IV	28,994	46,901	64,687
Certificate I-II	18,645	23,661	28,445
Total	**-121,412**	**-64,658**	**-25,313**

Source: Access Economics

The **flags** scenario sees much slower growth again in labour market demand, but with relatively less change on the supply side relative to the other scenarios (with the supply projections being largely demographically driven). The bottom line result is a modest level of 'excess demand' over the five years to 2015 moving to a significant level of 'excess supply' of qualifications over the following ten years.

Table 9.3: Projected student demand and implied labour market demand for qualifications – Flags

Average, 5 years to	2015	2020	2025
Supply of students			
Postgraduate	59,203	62,269	66,222
Undergraduate	132,217	136,459	141,482
Diploma / Advanced Diploma	47,989	50,049	52,936
Certificate III - IV	178,607	185,773	196,805
Certificate I-II	87,931	91,452	98,177
Total	**505,947**	**526,002**	**555,622**
Labour market demand			
Postgraduate	78,161	71,919	69,246
Undergraduate	174,413	162,738	157,323
Diploma / Advanced Diploma	96,513	89,169	90,604
Certificate III - IV	133,415	125,962	121,479
Certificate I-II	57,215	57,904	61,399
Total	**539,716**	**507,691**	**500,051**
Difference (supply less demand)			
Postgraduate	-18,958	-9,650	-3,024
Undergraduate	-42,196	-26,279	-15,842
Diploma / Advanced Diploma	-48,523	-39,120	-37,668
Certificate III - IV	45,192	59,811	75,326
Certificate I-II	30,716	33,549	36,778
Total	**-33,769**	**18,311**	**55,571**

Source: Access Economics

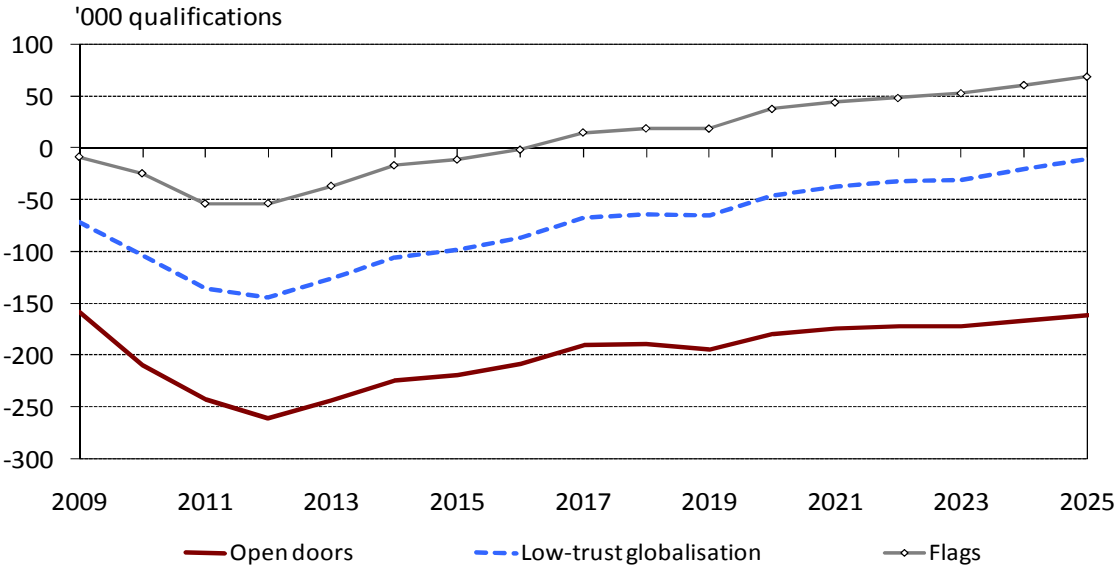
It should be kept in mind that all scenarios includes considerable further skill deepening (with a variation around the continuation of recent trends based on assumed productivity growth in each scenario), full allowance for multiple qualification holding and a further trend in the extent of multiple qualification holding. Those factors add to labour market demand beyond allowance for employment growth and replacement demand.

Chart 9.1 shows student demand less labour market demand projections over time for each of the scenarios with a notable gap between the scenarios. The projections show that labour market demand does wane over time as demographics have an effect on the working age population and therefore the ability to grow employment over time.

The bottom line is that **open doors** produces a demand for skills which is not likely to be met based on existing demographic trends in the supply of students, particularly at the higher education end of the spectrum. A significant skills contribution is required from net migration and, beyond that, a structural lift in student participation rates.

For **flags** the labour market demand for skills is likely to be far less over time than the demographically-driven projection for the number of students. The outcome for **low-trust globalisation** falls in the middle.

Chart 9.1: Projected student demand less projected labour market demand for total qualifications



Source: Access Economics

Much of the skills gap shown above may be made up for via migration. Table 5.4 earlier provided an estimate of the qualifications which may be contributed by net migration under each of the scenarios (noting that the base migration data used for these calculations is not perfect but the best available at present).

Applying that estimate against the skills gap identified above that net migration will help to notably close the skills gap within the **open doors** scenario, and help to push the supply of skills above demand over time for the other two scenarios.

Chart 9.2: Projected student demand plus qualifications acquired from net migration less projected labour market demand for total qualifications

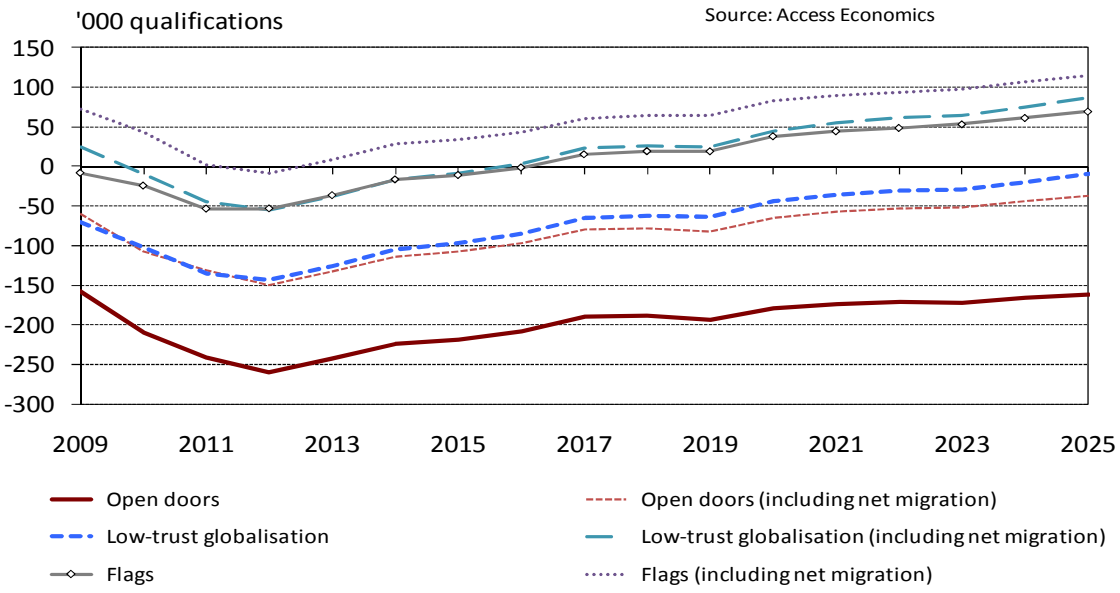


Table 9.4 shows the supply-demand difference when an estimate of qualifications acquired from net migration is included, with only a notable shortfall remaining within the **open doors** scenario.

Table 9.4: Projected supply including net migration less demand for qualifications

Average, 5 years to	2015	2020	2025
Open doors			
Postgraduate	-22,612	-15,508	-10,498
Undergraduate	-52,806	-40,134	-35,481
Diploma / Advanced Diploma	-67,186	-60,257	-59,051
Certificate III - IV	15,071	31,652	49,068
Certificate I-II	907	4,559	7,866
Total	**-126,626**	**-79,688**	**-48,097**
Low-trust globalisation			
Postgraduate	-13,698	-5,232	1,688
Undergraduate	-30,665	-15,091	-5,138
Diploma / Advanced Diploma	-49,853	-40,278	-36,442
Certificate III - IV	43,363	61,228	79,770
Certificate I-II	18,645	23,661	28,445
Total	**-32,209**	**24,288**	**68,323**
Flags			
Postgraduate	-9,756	-886	5,776
Undergraduate	-20,969	-6,063	4,456
Diploma / Advanced Diploma	-39,859	-30,868	-29,383
Certificate III - IV	52,699	66,960	82,504
Certificate I-II	30,716	33,549	36,778
Total	**12,831**	**62,691**	**100,131**

Source: Access Economics

9.2 COAG targets

The projected demand for qualifications can be compared with some of the stated **COAG and Australian government targets** for skill development.

9.2.1 Target: by 2020 the proportion of persons aged 20-64 without qualifications at the Certificate III and above level would be halved.

The target refers to a stock of qualifications at a future point in time so it is best analysed via the labour market demand modelling which reports on stocks of qualifications held. It is assessed in terms of highest qualification held (multiple qualifications of Certificate III level and above do not contribute towards the target).

This change would require the share of those aged 20-64 without a Certificate III qualification to halve from 50% in 2007 to 25% in 2020.

The implied labour market demand modelling for this report doesn't have an age dimension and focuses on all persons employed rather than all persons aged 20-64. Based on this modelling the **open doors** scenario comes closest to achieving this target. Using employed persons as the base some 48.4% of those employed were without a Certificate III qualification or higher in 2007. In **open doors** this is projected to fall to 33.6% in 2020 and 30.4% in 2025 – a very substantial reduction, though not quite achieving the halving of the proportion without such qualifications.

In short the target is not achieved under these projections, even for the **open doors** scenario. The shortfall to the target in **open doors** in 2020 amounts to approximately 1,298,000 additional people who would require a Certificate III or above qualification (and are not otherwise projected as having one in 2020). That is, 8.6% (33.6% projected share without - 25% target) x 15,089,000 people aged 20-64 in 2020 = 1,298,000.

To achieve the target on the demand side would require either:

- still further skills deepening beyond that allowed for in these projections and/or;
- a different industry/occupational profile of employment skewed further towards those industries and occupations which have a higher propensity to require Certificate III and above qualifications.

Section 9.1 above suggests a supply shortfall for higher education and diploma/advanced diploma qualifications relative to labour market demand, so a further condition to meet the target would be a significant contribution to qualifications resulting from net migration and/or additional resources to encourage higher student participation.

9.2.2 Target: by 2020 the number of diploma and advanced diploma completions would be doubled.

The target refers to the number of student completions so it is best analysed via the student demand projections.

This target implies an additional 45,000 diploma and advanced diploma completions per annum (based on 2007 completion levels). The demographically based student demand projections show that the target would not be met under each of the scenarios.

However, under the implied labour market demand projections the demand exists under each of the scenarios for the target to be achieved. The latter accounts for significant skill deepening over time, as well as taking into account the extent to which those with higher qualifications tend to also hold diplomas or advanced diplomas with that trend projected to continue in the future.

9.2.3 Target: by 2025 the proportion of those aged 25-34 with a degree will increase to 40%.

The target refers to a stock of qualifications at a future point in time so it is best analysed via the labour market demand modelling which reports on stocks of qualifications held.

In 2007 around 30.6% of this target group held a degree or higher qualification.

The implied labour market demand modelling reports the stock of qualifications obtained on the basis of the number of people employed rather than on an age basis. On that basis however there is significant growth in the proportion of those employed with a degree or higher:

- In **open doors** the share of persons employed with a degree or higher increases from 24.0% in 2007 to 33.8% in 2025.
- In **low-trust globalisation** the share of persons employed with a degree or higher increases from 24.0% in 2007 to 33.4% in 2025.
- In **flags** the share of persons employed with a degree or higher increases from 24.0% in 2007 to 32.0% in 2025.

Applying these percentage point increases to the target group suggests the target would be achieved under **open doors** and **low-trust globalisation** but not under **flags**.

Section 9.1 above suggests a supply shortfall for degrees relative to labour market demand, so a further condition to meet the target would be a significant contribution to the stock of degrees resulting from net migration and/or additional resources to encourage higher student participation.

9.3 Implications of demand mismatch

What does a mis-match between supply and demand mean?

In the tables and chart above some of the supply-demand imbalances may reflect factors not specifically accounted for in the modelling, such as the addition to qualifications coming from net migration.

But beyond that the different economic scenarios create different pressures on demand for skills (driven by labour market projections) and supply of skills (driven by demographic projections). A mis-match between supply and demand can then create incentives for other actions to occur. These other actions could include one or more of the following.

- **A change in relative wages** for those occupations which are demanded by employers, but are receiving insufficient enrolments from students. Clearly, the higher the wage, the better the payoff for students investing their time, effort and fees into education for that occupation, and so the more likely it is that students will seek to apply to study for those occupations which are likely to be in shortage. That said, changes in relative wages are difficult to bring about and are frequently resisted.
- **Different demographics and pathways** – one issue identified is that there won't be enough people coming through in the traditional higher education feeder group (age 18-22). Boosting supply may mean older students and alternate pathways to higher education and vocational training. Attracting those who have already spent time in the workforce to undertake further qualifications may be a more common practice going forward.
- **An even more prominent role for migration** – filling skill shortages on the one hand via an increased number of skilled migrants, and adding to the supply of students on the other hand because of an age profile which is younger than the Australian average.
- **Enticing back more people from out of the labour force – the scenarios see a lift in age specific labour force participation rates to varying degrees, with the potential for this to occur more or less depending on how attractive the labour force happens to be at particular points in time.**
- **Increased interstate migration** – lecturers can move, students can move, graduates can move, and more experienced workers can move. Or, more broadly, it would be folly to assume that not merely can supply match demand, but that it can do so at the regional level as well. Moreover, this includes not merely the interstate moves listed here, but also the potential for Australians to work abroad for a time of rewards are relatively better there.
- **Changes on the demand side** – any skill shortages may lead employers to seek and adopt **alternate solutions, such as seeking better technology** and making their businesses more capital intensive rather than labour intensive.
- **Changes in the concordance between occupations and qualifications**. The qualification map reported in this analysis continues to change over time in a different manner to that shown in these projections.
- **Changes in the depth of skills required** – the scenarios see skills deepening occurring to varying degrees, with the potential for this to occur more or less depending on incentives to skill development and different limitations on the supply of student places available.

Some of the above incentives could be tested within the modelling framework through sensitivity analysis around the existing scenarios.

Glossary of Acronyms

ABS	Australian Bureau of Statistics
ASCED	Australian Standard Classification of Education
ANZSCO	Australian and New Zealand Standard Classification of Occupations
ANZSIC	Australian and New Zealand Standard Industrial Classification
ASCO	Australian Standard Classification of Occupations
COAG	Council of Australian Governments
CURF	Confidentialised Unit Record File
DEEWR	Department of Education, Employment and Workplace Relations
DIAC	Department of Immigration and Citizenship
GDP	Gross Domestic Product
HECS	Higher Education Contribution Scheme
LSAY	Longitudinal Survey of Australian Youth
LSIA	Longitudinal Survey of Immigrants to Australia
MFP	Multi-factor productivity
NCVER	National Centre for Vocational Education Research
NESB	Non English-Speaking Background
SEW	Survey of Education and Work
TAFE	Technical and Further Education
TFR	Total fertility rate
VET	Vocational Education Training

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Appendix A: Methodology for labour market demand projections

Access Economics has a well established framework for projecting employment demands by industry and occupation over time, based on the Access Economics Macro (AEM) model of the Australian economy.

Macroeconomic variables

The AEM model is a relatively small, dynamic model of the Australian economy. It has a theoretically consistent long-term open-economy growth path, together with short-term dynamics derived from Australian economic experience over the past 30 years. The model ensures internally consistent forecasts for key economic variables – GDP and its components, employment, exchange rates, inflation, and interest rates.

These forecasts form the basis for Access Economics' regular forecasts and commentary on the economy – detailed in our quarterly Business Outlook publication.

The key macroeconomic variables used for this analysis from the AEM model include components of final demand (such as categories of private consumption and investment) and total employment.

For each of the scenarios discussed in the report, the macroeconomic model has been calibrated to meet the targets of GDP growth (domestic and international), employment, labour force participation, migration and other key selected parameters.

Industry employment

Growth in employment by industry is forecast using known relationships between components of final demand and industry employment (based on input output data). The coefficients measure the induced employment that arises from an increase in a component of domestic final demand. That is, the coefficient measures how much employment in a given industry will rise as a result of an increase in the corresponding component of final demand. For example, if the investment forecasts suggest that housing investment is gaining strength, then the construction industry will gain strength. Or, say, if rural exports are lifting, then the farm sector is similarly seen lifting.

A counterfactual estimation is conducted on historical data to determine actual employment growth not picked up by this methodology, for example due to changes in worker productivity and structural changes in the economy. Corresponding adjustments are made to the forecasts.

This analysis is undertaken for 55 industries (using the ANZSIC two-digit classification).

Note that the projections obtained from this methodology are then scaled to meet specific targets for broad industries under some scenarios (for example, the **flags** scenario targets manufacturing).

Occupational employment

Forecasts for industry employment are translated into occupational employment forecasts using 2006 Census data which shows the occupational employment share for each of the industry groups examined.

These relationships are allowed to move over time, allowing trends in employment structures – notably the gradually increase in skill levels in the workforce – to be modelled.

This analysis is undertaken for 81 industries (using the ASCO three-digit classification). These are later translated to the updated 1 digit ANZSCO classification. The model relies on the longer history of the ASCO series and two Census periods to draw out the longer term relationships.

Relationship to qualification profile

To assess the future qualification implications of labour market demand, we utilise **a profile of the typical qualification mix that is associated with employment in specific industries and occupations**. This represents recent information on average propensities to hold qualifications – in most cases these are not necessarily a strict requirement in order to undertake a particular job. The historic profile is drawn from the 2007 ABS *Survey of Education and Work*.

The qualifications profile (the share of those employed who hold a post-school qualification) increases over time reflecting skills deepening in the economy. The projected changes in the qualifications profile are by assumption for each scenario, though they have been derived based on recent historic trends in the degree of skills deepening occurring.

Multiple qualification profile

Assessing and projecting the share of the employed workforce who hold post-school qualifications is one issue, while assessing and projecting the total number of post-school qualifications held by those employed is another. The latter allows for the fact that many people do hold more than one post-school qualification.

The share of qualification holders by their highest qualification who also hold other post-school qualifications is derived to estimate the total number of qualifications held. The tendency to hold more than one post-school qualification is allowed to increase over time, in line with trends over recent years.

Replacement demand

There are a variety of measures of turnover or replacement demand including gross turnover which measures all movements in and out of an occupation and net replacement which is calculated as a subset of turnover.

It is important to note that there is no single definition of replacement demand which is 'correct'. Rather, it depends on which definition of replacement best suits the purpose it is used for – in this case estimating training demand.

For the purposes of training demand, one is interested in that proportion of replacement which is likely to generate a skills requirement. Providing a replacement when people retire is

one such area. The new entrant needs to match the skill set of the retiree (including the propensity for that retiree to have held post-school qualifications). Hence there is specific allowance for retirees within the training demand projections for this report.

For other elements of replacement the training demand implications are more difficult to assess. However, movement between occupations which leads to an additional post-school qualification is captured as an additional training demand within our broader modelling framework because we take into account the degree of multiple qualification holding.

Calculation of retirement rates

A retirement as Access Economics defines it, does not necessarily have to leave the labour force entirely. A retirement can be from an occupation to another occupation provided they never return. From a training perspective this often just as important as leaving the workforce entirely. This is particularly evident for certain occupations that favour younger workers such as police officers, hair dressers, computer scientists, etc…

In an effort to make retirements distinct from other turnover, we say a retirement is those percentage of workers that leave an occupation at older ages (beginning from 45 – measured as an exit from the 50-54 cohort) and on the balance of probabilities do not return, using the existing age profile as a guide.

To make the certain retirements are consistent across the entire economy, the number of retirements is measured for each five year age cohort against the national average age profile. The overall age specific labour force participation rates are then used to adjust the retirements in each year of the forecasts to reflect the changes over time.

Access Economics therefore generates a retirement estimate for each occupation that reflects the workers that are likely to never return to their original profession and therefore generate the need for additional long term training demand.

Let matrix X denote the 2006 Census snapshot of employment by three-digit ASCO by age. Similarly, matrix X' denotes the same snapshot in 2001. The subscript α denotes the number of people employed in an occupation and subscript β denotes the number in an age group.

As a basis for retirement, the national change in labour force participation rates has been used. These national rates have been denoted by $P\beta$.

Retirements by age by occupation are then estimated as follows:

$$\mathrm{Ret}_{\alpha\beta} = \frac{(X_{\alpha(\beta-1)} - X_{\alpha(\beta-1)}\frac{P_{\beta}}{P_{\beta-1}})}{5} * \frac{X_{\beta} / X'_{\beta-1}}{X_{\alpha\beta} / X'_{\alpha(\beta-1)}}$$

This provides a net measure of the number of retirements for each occupation and each age group they retire from. This allows the national labour force participation rates to be adjusted

for the observed retirement age profile in each occupation. This methodology is then used to project the number of retirements for each occupation over the forecasts.

Summary of influences on labour market demand projections for qualifications

Under each of the scenarios, projected labour market demand for qualifications is influenced by:

- the expected growth rate for total employment;
- the industry profile of that employment;
- the occupational profile of that employment;
- the existing highest level qualifications profile of employment in particular occupations and industries;
- projected changes in these highest level qualification profiles;
- the existing degree of multiple qualification holding for each qualification level and projected changes in this profile over time; and
- replacement demand based on expected permanent retirement from the workforce.

Further research

The goal of the modelling was to provide a long run projection of demand for skills from two perspectives – a student demand perspective and an implied labour market demand perspective. These have been projected for the economy as a whole under three different scenarios.

A more detailed analysis of skills demand which focuses on particular occupations or aspects of skills development is possible in many cases. However, data limitations may preclude a more detailed analysis which is also conducted on an economy-wide basis. Limitations of the modelling and potential areas for further research may include the following.

- **Occupational structure**. The labour market demand for qualifications is conducted at the one-digit ANZSCO level (even though employment projections are conducted at the three digit ANZSCO level). This aggregation reflects the availability of data on the concordance between industry/occupation of employment and qualification profile in the ABS Survey of Education and Work. Other data sources may show this concordance at a more detailed level (but not, we understand, for the economy as a whole).
- **Replacement demand**. Using retirement estimates and allowing for upskilling over time through multiple qualification holdings will provide an appropriate economy-wide replacement demand estimate. However, in examining specific occupations in isolation, other estimates of replacement demand may be more appropriate.
- **Age dimension of qualification structure**. This project utilises information on qualifications by level and field of education for those employed classified by industry and occupation. A further information dimension is the age of those employed people. Incorporating an age dimension would make the modelling task considerably more complex. Examining the qualification profile of those employed by age cohort (but not by the industry and occupation dimensions) suggests a reasonably constant qualification

share by age cohort for all qualifications. The exception is undergraduate qualifications where there the tendency to hold these is higher in younger age cohorts.

- **Multiple qualification holding**. The modelling utilises information on the extent of multiple qualification holding and the level of additional qualifications held. However, the field of education of further post-school qualification is not known from this data. The modelling could be improved by a data source which captured information on all qualifications held by an individual, rather than just the highest level qualification as provided in the Survey of Education and Work.
- **Refresher training**. There is little information on the level of regular or 'refresher' training undertaken by those whom already hold a qualification. This is skills development which does not lead to an additional recognised qualification. It is captured on the supply projections within the average ratio of completions to enrolments (where refresher training adds to the latter but not the former) but is not linked to the occupational profile of those in the workforce. Scenario analysis which mimics more/less refresher training could be undertaken via changes to the ratio of student completions to enrolments.
- **Skills deepening**. The modelling provides a channel for skills deepening by industry and occupation. This occurs based on rules of thumb related to historic trends rather than based on some measure of underlying requirements within an occupation. Qualifications growth is of course limited so that no more than 100% of the target group can hold post-school qualifications, but achieving or nearing this upper limit does not in the modelling have further implications for multiple qualification holding. Growth in the degree of multiple qualification holding also follows rules of thumb rather than reflecting underlying need
- **Unemployed and not in the labour force**. The labour market demand projections are based on the skill needs of people in employment. Further analysis might examine the level and qualifications of those unemployed or not in the labour force.
- **Employment effects of climate change mitigation**. Better understanding the likely employment effects of climate change mitigation remains a very important area for further research. Modelling undertaken by the Commonwealth Treasury may provide an important foundation in this regard. Such analysis ideally needs to be placed in the context of the Carbon Pollution Reduction Scheme being considered along with additional policy reforms such as renewable energy targets.
- **Qualifications acquired from net migration**. The qualifications held by new migrants (and also by those exiting the country) are not well tabled in existing collections. Given the significance of net migration it forms an important component of skills acquisition and so would warrant further research. Forthcoming surveys may include further detail and more contemporary information on qualifications held by new migrants.
- **Supply limitations**. The student demand projections are based largely on demographic trends, with these projections implicitly assuming that resources will track growth in student demand for places. There may well be limitations on the supply of student places. Further analysis might focus more on unmet demand. There is some information available on this, but not at a detailed enough level as required for this analysis.

Appendix B: OECD labour force participation rates

In the **open doors** scenario the labour force participation rate for those aged 25-59 years of age in 2025 is based on the current 80th percentile OECD labour force participation rate for the relevant age group. The following tables show the 80th percentile labour force participation rate for the OECD in 2008 by age and gender group, as well as the country that has that rate (and Australia's comparative result).

Table B.1: Male age specific participation rates comparison (% - 2008)

Age group	OECD 80th percentile	From	Australia	OECD average
15-19	55.02	New Zealand	58.51	34.10
20-24	80.78	Canada	84.76	73.34
25-29	92.92	Switzerland	91.60	90.25
30-34	96.43	France	93.14	94.37
35-39	96.69	Japan	92.36	94.60
40-44	95.93	France	91.00	93.92
45-49	94.45	Germany	90.11	91.66
50-54	91.69	Czech Republic	87.06	87.59
55-59	86.71	Mexico	76.31	77.64
60-64	67.38	Sweden	58.00	54.30
65-69	35.57	United States	28.61	29.09
70+	11.57	Ireland	7.27	11.82
Total male	**86.55**	**Denmark**	**85.54**	**83.69**

Table B.2: Female age specific participation rates comparison (% - 2008)

Age group	OECD 80th percentile	From	Australia	OECD average
15-19	53.44	United Kingdom	59.82	27.93
20-24	76.15	Canada	78.66	60.58
25-29	84.03	Belgium	76.00	70.38
30-34	85.16	Iceland	72.23	68.60
35-39	85.62	Finland	71.72	70.32
40-44	87.41	Norway	78.08	73.07
45-49	86.06	Denmark	79.81	73.18
50-54	83.23	Denmark	74.58	68.71
55-59	75.50	Norway	60.82	55.92
60-64	46.29	Switzerland	37.84	34.17
65-69	22.22	Portugal	14.17	16.58
70+	4.41	New Zealand	2.10	5.15
Total female	**75.78**	**Canada**	**71.11**	**63.48**

Appendix C: Historic student participation

Information on current levels of student participation in higher education and VET by age, along with recent trends, can inform the projections of future student demand for skills development.

This Appendix provides information on recent student participation rates by age and is an extension of the information provided in section 3.1.

The growth in student participation in postgraduate qualifications in recent years has been very much driven by those aged 20-24, with a modest increase from the 25-29 age cohort also.

Table C.1: Student participation rate for postgraduate qualifications

	2003	2004	2005	2006	2007
16 through 19 years of age	0.01%	0.01%	0.01%	0.01%	0.01%
20 through 24 years of age	1.81%	1.85%	1.82%	1.87%	1.94%
25 through 29 years of age	2.74%	2.82%	2.77%	2.75%	2.78%
30 through 39 years of age	1.87%	1.87%	1.84%	1.85%	1.86%
40 through 49 years of age	1.25%	1.24%	1.22%	1.22%	1.20%
50 through 59 years of age	0.55%	0.56%	0.57%	0.59%	0.61%
60 years of age or more	0.06%	0.06%	0.07%	0.07%	0.08%

Source: DEEWR Higher Education Statistics; ABS 3101.0

For undergraduate qualifications it has also been very much the younger age cohorts who have been participating more, with declining participation from those aged over 25 (perhaps linked to the recent strength of the labour market).

Table C.2: Student participation rate for undergraduate qualifications

	2003	2004	2005	2006	2007
16 through 19 years of age	16.25%	15.83%	15.93%	16.31%	16.71%
20 through 24 years of age	14.75%	14.73%	14.65%	14.65%	14.82%
25 through 29 years of age	3.66%	3.61%	3.53%	3.48%	3.47%
30 through 39 years of age	1.80%	1.75%	1.72%	1.69%	1.68%
40 through 49 years of age	0.91%	0.88%	0.86%	0.84%	0.84%
50 through 59 years of age	0.30%	0.30%	0.29%	0.30%	0.31%
60 years of age or more	0.04%	0.04%	0.04%	0.04%	0.04%

Source: DEEWR Higher Education Statistics; ABS 3101.0

For diploma and advanced diploma qualifications there has been a decline in participation between 2003 and 2007 across most age cohorts.

Table C.3: Student participation rate for advanced diploma / diploma qualifications

	2003	2004	2005	2006	2007
16 through 19 years of age	3.64%	3.45%	3.37%	3.10%	2.93%
20 through 24 years of age	3.73%	3.40%	3.23%	3.06%	3.02%
25 through 29 years of age	1.93%	1.70%	1.59%	1.52%	1.50%
30 through 39 years of age	1.30%	1.16%	1.11%	1.07%	1.08%
40 through 49 years of age	0.89%	0.83%	0.81%	0.80%	0.82%
50 through 59 years of age	0.40%	0.38%	0.40%	0.40%	0.42%
60 years of age or more	0.05%	0.05%	0.05%	0.05%	0.06%

Source: NCVER student enrolments; ABS 3101.0

It has been a very different story over recent years for certificate III / IV qualifications with a notable increase in participation from those aged 16-19. This is no doubt linked to the strength of apprenticeship commencements given greater incentives and the demand for trade skills.

Table C.4: Student participation rate for certificate III / IV qualifications

	2003	2004	2005	2006	2007
16 through 19 years of age	12.72%	13.31%	13.98%	14.65%	15.17%
20 through 24 years of age	9.14%	9.09%	9.45%	9.73%	9.73%
25 through 29 years of age	4.88%	4.74%	4.74%	4.86%	4.90%
30 through 39 years of age	3.78%	3.67%	3.62%	3.70%	3.78%
40 through 49 years of age	3.20%	3.03%	3.03%	3.03%	3.13%
50 through 59 years of age	1.81%	1.73%	1.76%	1.78%	1.86%
60 years of age or more	0.23%	0.23%	0.25%	0.26%	0.29%

Source: NCVER student enrolments; ABS 3101.0

There has also been strong growth in participation of 16-19 year olds in certificate I / II qualifications, but this has been offset by declining participation from all other age cohorts.

Table C.5: Student participation rate for certificate I / II qualifications

	2003	2004	2005	2006	2007
16 through 19 years of age	11.36%	11.29%	11.83%	15.25%	14.94%
20 through 24 years of age	3.41%	3.02%	2.83%	2.81%	2.50%
25 through 29 years of age	2.30%	2.09%	2.07%	2.11%	1.97%
30 through 39 years of age	1.90%	1.72%	1.77%	1.81%	1.75%
40 through 49 years of age	1.68%	1.52%	1.56%	1.58%	1.55%
50 through 59 years of age	1.11%	1.05%	1.08%	1.08%	1.03%
60 years of age or more	0.30%	0.28%	0.32%	0.31%	0.29%

Source: NCVER student enrolments; ABS 3101.0

The participation rate for 16 to 39 year olds by field of education across all qualification is shown in Table C.6. Recent years have seen a notable decline in participation in information technology and agriculture and related studies. Strongest growth has been seen in health; food hospitality and personal cervices; engineering and architecture. Overall, management and commerce remains the most popular field of study.

Table C.6:Student participation rate by field of education (16 to 39 year olds)

	2003	2004	2005	2006	2007
Natural and Physical Sciences	0.82%	0.83%	0.83%	0.80%	0.80%
Information Technology	1.22%	1.05%	0.90%	0.86%	0.66%
Engineering and Related Technologies	3.12%	3.04%	3.15%	3.39%	3.38%
Architecture and Building	1.03%	1.11%	1.16%	1.28%	1.34%
Agriculture, Environmental and Related Studies	0.91%	0.87%	0.83%	0.82%	0.76%
Health	1.36%	1.39%	1.47%	1.58%	1.71%
Education	1.19%	1.18%	1.21%	1.21%	1.26%
Management and Commerce	5.12%	5.02%	4.97%	5.04%	5.15%
Society and Culture	3.53%	3.40%	3.42%	3.54%	3.43%
Creative Arts	1.09%	1.06%	1.06%	1.09%	1.10%
Food, Hospitality and Personal Services	1.29%	1.29%	1.34%	1.62%	1.63%
Mixed Field Programmes	0.84%	0.88%	0.90%	0.82%	0.96%

Source: DEEWR Higher Education Statistics; NCVER student enrolments; ABS 3101.0

Appendix D: Projected employment growth – detailed tables

The following tables support the analysis presented in chapter 6, providing more detail on projected employment levels and growth and replacement rates over the period 2010 to 2025.

Table D.1: Employment growth by industry (2 digit ANZSIC) and by scenario

Average annual growth, 15 years to 2025	Open doors	Low-trust	Flags
Agriculture	1.0%	-0.3%	-2.0%
Services to Agriculture; Hunting and Trapping	2.2%	1.1%	-0.4%
Forestry and Logging	1.4%	0.6%	-0.7%
Commercial Fishing	1.2%	-0.2%	-2.0%
Coal Mining	-1.4%	-1.3%	-2.6%
Oil and Gas Extraction	1.2%	0.0%	-1.7%
Metal Ore Mining	0.4%	-0.4%	-1.7%
Other Mining	-0.4%	-1.7%	-3.4%
Services to Mining	3.2%	2.7%	1.7%
Food, Beverage and Tobacco Manufacturing	-0.1%	-0.9%	2.8%
Manufacturing	-3.2%	-5.3%	-4.0%
Wood and Paper Product Manufacturing	-0.6%	-1.6%	1.6%
Printing, Publishing and Recorded Media	-0.8%	-1.8%	1.5%
Manufacturing	-3.5%	-4.9%	-1.9%
Non-Metallic Mineral Product Manufacturing	2.5%	1.6%	5.1%
Metal Product Manufacturing	0.7%	-0.3%	3.0%
Machinery and Equipment Manufacturing	0.9%	0.0%	3.7%
Other Manufacturing	-1.7%	-2.7%	0.8%
Electricity and Gas Supply	-1.4%	-1.3%	4.2%
Water Supply, Sewerage and Drainage Services	-0.2%	-0.7%	2.8%
General Construction	1.0%	0.1%	1.3%
Construction Trade Services	2.0%	1.3%	0.0%
Basic Material Wholesaling	0.0%	-1.1%	-2.6%
Machinery and Motor Vehicle Wholesaling	1.5%	0.6%	-0.8%
Personal and Household Good Wholesaling	1.4%	0.4%	-1.1%
Food Retailing	2.8%	2.3%	1.2%
Personal and Household Good Retailing	2.1%	1.5%	0.4%
Motor Vehicle Retailing and Services	1.3%	0.6%	-0.6%
Accommodation, Cafes and Restaurants	2.3%	1.6%	0.4%
Road Transport	2.5%	1.7%	0.4%
Rail Transport	0.2%	-1.0%	-2.6%
Water Transport	4.0%	3.1%	1.9%
Air and Space Transport	3.0%	2.2%	0.9%
Other Transport	3.9%	1.6%	-1.0%
Services to Transport	2.3%	1.5%	0.3%
Storage	7.2%	6.7%	5.7%
Communication Services	3.1%	2.4%	1.2%
Finance	1.2%	0.5%	-0.8%
Insurance	1.7%	1.0%	-0.2%
Services to Finance and Insurance	4.4%	3.9%	2.8%
Property Services	2.4%	1.9%	0.9%
Scientific research, technical and computer services	3.5%	2.9%	1.8%
management services	2.5%	1.9%	0.6%
Other business services	3.4%	2.9%	1.7%
Government Administration	3.0%	2.4%	1.1%
Defence	1.2%	0.5%	2.7%
Education	2.2%	1.5%	1.0%
Health Services	2.2%	1.6%	0.5%
Community Services	4.6%	4.2%	3.1%
Motion Picture, Radio and Television Services	1.1%	0.3%	0.9%
Libraries, Museums and the Arts	3.1%	2.6%	-1.2%
Sport and Recreation	2.3%	1.7%	-0.5%
Personal Services	1.6%	1.0%	-0.1%
Other Services	1.7%	1.0%	-0.1%
Private Households Employing Staff	-0.7%	-2.7%	-5.2%
Total	**2.1%**	**1.5%**	**0.9%**

Source: Access Economics

Table D.2: Employment level by industry (2 digit ANZSIC) and by scenario - 2025

Number of people - 2025	Open doors	Low-trust	Flags
Agriculture	379,596	307,524	234,291
Services to Agriculture; Hunting and Trapping	36,451	30,141	23,647
Forestry and Logging	18,455	16,071	13,016
Commercial Fishing	12,612	10,130	7,697
Coal Mining	28,816	29,789	23,811
Oil and Gas Extraction	4,472	3,712	2,770
Metal Ore Mining	58,551	51,473	41,308
Other Mining	10,769	8,510	6,355
Services to Mining	75,648	69,400	58,556
Food, Beverage and Tobacco Manufacturing	224,491	196,472	362,291
Textile, Clothing, Footwear and Leather Manufacturing	27,246	19,407	25,085
Wood and Paper Product Manufacturing	60,788	50,679	86,668
Printing, Publishing and Recorded Media	94,665	80,576	139,741
Petroleum, Coal, Chemical and Associated Product Manufacturing	59,027	47,328	78,894
Non-Metallic Mineral Product Manufacturing	66,475	55,448	94,669
Metal Product Manufacturing	218,267	183,172	313,282
Machinery and Equipment Manufacturing	299,419	255,211	460,849
Other Manufacturing	65,853	54,520	96,441
Electricity and Gas Supply	52,276	53,225	130,579
Water Supply, Sewerage and Drainage Services	38,984	36,009	63,472
General Construction	363,941	310,575	366,505
Construction Trade Services	869,751	759,737	596,121
Basic Material Wholesaling	113,837	93,999	72,255
Machinery and Motor Vehicle Wholesaling	240,565	205,597	162,607
Personal and Household Good Wholesaling	223,041	188,188	147,252
Food Retailing	1,071,388	995,244	838,074
Personal and Household Good Retailing	934,248	859,342	718,075
Motor Vehicle Retailing and Services	328,795	297,732	245,689
Accommodation, Cafes and Restaurants	785,781	706,883	586,709
Road Transport	353,477	313,640	253,733
Rail Transport	51,647	42,825	33,038
Water Transport	35,930	31,331	25,694
Air and Space Transport	89,678	79,217	64,484
Other Transport	2,626	1,800	1,171
Services to Transport	134,192	118,333	96,900
Storage	168,325	156,849	133,756
Communication Services	327,540	292,885	241,917
Finance	270,278	239,381	196,116
Insurance	109,743	98,457	81,494
Services to Finance and Insurance	220,121	201,249	169,052
Property Services	286,115	264,103	223,241
Scientific research, technical and computer services	681,644	614,776	510,677
Legal, accounting, marketing and business management services	572,610	512,717	420,711
Other business services	574,792	526,437	438,395
Government Administration	778,440	711,772	579,675
Defence	31,280	28,139	40,206
Education	1,071,877	961,700	891,658
Health Services	1,193,362	1,091,695	912,833
Community Services	622,532	582,948	496,599
Motion Picture, Radio and Television Services	59,019	52,016	57,549
Libraries, Museums and the Arts	140,757	130,165	70,943
Sport and Recreation	232,308	214,458	150,039
Personal Services	283,778	260,277	218,171
Other Services	262,981	238,438	197,998
Private Households Employing Staff	2,387	1,760	1,190
Total	**15,321,646**	**13,743,459**	**12,503,948**

Source: Access Economics

Table D.3: Employment growth by occupation (3 digit ASCO) and by scenario

Average annual growth, 15 years to 2025	Open doors	Low-trust	Flags
General managers and administrators	2.5%	1.7%	1.2%
Miscellaneous generalist managers	1.2%	0.3%	1.1%
Resource managers	2.5%	1.8%	1.1%
Engineering, distribution and process managers	1.8%	1.0%	1.5%
Sales and marketing managers	1.7%	1.0%	0.7%
Miscellaneous specialist managers	2.8%	2.1%	1.3%
Farmers and farm managers	1.1%	-0.2%	-1.8%
Natural and physical science professionals	2.4%	1.7%	0.9%
Building and engineering professionals	2.1%	1.5%	1.5%
Accountants, auditors and corporate treasurers	2.2%	1.5%	0.8%
Sales, marketing and advertising professionals	2.1%	1.4%	0.8%
Computing professionals	2.6%	2.0%	1.3%
Miscellaneous business and information professionals	2.5%	1.9%	1.1%
Medical practitioners	2.3%	1.7%	0.5%
Nursing professionals	2.7%	2.1%	0.8%
Miscellaneous health professionals	2.1%	1.5%	0.5%
School teachers	2.3%	1.6%	1.1%
University and vocational teachers	3.1%	2.2%	1.5%
Miscellaneous education professionals	2.7%	1.9%	1.1%
Social welfare professionals	2.6%	2.1%	1.1%
Miscellaneous social professionals	2.5%	1.9%	0.8%
Artists and related professionals	1.8%	1.2%	0.6%
Miscellaneous professionals	2.5%	1.8%	1.1%
Medical and science technical officers	2.0%	1.4%	0.8%
Building and engineering associate professionals	1.9%	1.3%	1.4%
Finance associate professionals	2.6%	2.0%	1.0%
Miscellaneous business and administration associate professionals	2.3%	1.7%	1.0%
Shop managers	2.2%	1.6%	0.5%
Hospitality and accommodation managers	2.4%	1.7%	0.6%
Miscellaneous managing supervisors (sales and service)	2.3%	1.7%	0.7%
Enrolled nurses	2.6%	2.0%	0.9%
Welfare associate professionals	3.4%	3.0%	1.9%
Miscellaneous health and welfare associate professionals	2.3%	1.7%	0.8%
Police officers	1.8%	1.1%	-0.1%
Miscellaneous associate professionals	2.1%	1.5%	0.5%
Mechanical engineering tradespersons	1.2%	0.4%	1.6%
Fabrication engineering tradespersons	1.0%	0.1%	2.4%
Automotive tradespersons	1.3%	0.7%	0.1%
Electrical and electronics tradespersons	1.8%	1.1%	1.1%
Structural construction tradespersons	1.6%	0.9%	0.6%
Final finishes construction tradespersons	1.9%	1.2%	0.4%
Plumbers	2.1%	1.4%	0.4%
Food tradespersons	2.3%	1.7%	1.2%
Skilled agricultural workers	1.7%	0.6%	-0.9%
Horticultural tradespersons	2.2%	1.5%	0.1%
Printing tradespersons	-0.3%	-1.4%	1.5%
Wood tradespersons	-0.4%	-1.3%	1.0%
Hairdressers	1.9%	1.3%	0.0%
Textile, clothing and related tradespersons	-0.3%	-1.2%	-0.6%
Miscellaneous tradespersons and related workers	1.3%	0.7%	1.0%
Secretaries and personal assistants	2.5%	1.7%	0.9%
Advanced numerical clerks	1.8%	1.1%	0.4%
Miscellaneous advanced clerical and service workers	2.6%	1.9%	0.7%
General clerks	3.0%	2.2%	1.3%
Keyboard operators	1.6%	1.1%	0.7%
Receptionists	2.0%	1.5%	0.6%
Intermediate numerical clerks	1.7%	1.1%	0.4%
Material recording and despatching clerks	1.7%	1.0%	0.9%
Miscellaneous intermediate clerical workers	2.4%	1.8%	1.0%
Intermediate sales and related workers	1.8%	0.9%	0.5%
Carers and aides	3.3%	2.7%	1.8%
Hospitality workers	2.5%	1.8%	0.5%
Miscellaneous intermediate service workers	2.1%	1.5%	0.2%
Mobile plant operators	2.0%	1.3%	1.1%
Intermediate stationary plant operators	1.2%	0.4%	1.8%
Intermediate TCF machine operators	-0.8%	-2.2%	-0.7%
Miscellaneous intermediate machine operators	0.6%	-0.6%	1.9%
Road and rail transport drivers	2.1%	1.4%	0.5%
Intermediate mining and construction workers	1.0%	0.4%	0.0%
Miscellaneous intermediate production and transport workers	2.3%	1.6%	1.2%
Elementary clerks	2.7%	2.0%	1.0%
Sales assistants	2.6%	2.0%	0.8%
Miscellaneous elementary sales workers	2.1%	1.6%	0.6%
Elementary service workers	2.6%	1.9%	0.9%
Cleaners	2.6%	2.0%	1.1%
Process workers	0.7%	-0.3%	2.5%
Product packagers	1.1%	0.4%	1.3%
Mining, construction and related labourers	1.7%	1.0%	0.8%
Agricultural and horticultural labourers	1.5%	0.4%	-0.8%
Elementary food preparation and related workers	2.5%	2.0%	1.0%
Miscellaneous labourers and related workers	2.0%	1.3%	0.9%
Total	**2.1%**	**1.5%**	**0.9%**

Source: Access Economics

Table D.4: Employment level by occupation (3 digit ASCO) and by scenario - 2025

Number of people - 2025	Open doors	Low-trust	Flags
General managers and administrators	142,117	124,539	113,457
Miscellaneous generalist managers	136,051	116,282	129,904
Resource managers	153,729	136,165	122,756
Engineering, distribution and process managers	192,777	169,356	182,348
Sales and marketing managers	164,469	146,389	139,801
Miscellaneous specialist managers	175,819	157,299	139,068
Farmers and farm managers	265,141	215,061	166,922
Natural and physical science professionals	114,497	103,027	90,082
Building and engineering professionals	269,147	244,658	242,075
Accountants, auditors and corporate treasurers	265,984	240,087	213,528
Sales, marketing and advertising professionals	132,316	116,798	105,936
Computing professionals	282,688	255,776	226,997
Miscellaneous business and information professionals	276,716	249,729	220,810
Medical practitioners	95,689	87,264	72,605
Nursing professionals	336,389	305,992	251,989
Miscellaneous health professionals	166,077	153,278	131,153
School teachers	425,282	380,375	350,145
University and vocational teachers	106,396	92,737	83,603
Miscellaneous education professionals	66,829	59,471	52,441
Social welfare professionals	181,186	167,948	144,745
Miscellaneous social professionals	135,236	122,392	102,888
Artists and related professionals	209,358	189,651	172,458
Miscellaneous professionals	81,585	73,440	65,532
Medical and science technical officers	68,082	61,738	56,557
Building and engineering associate professionals	164,261	147,061	149,902
Finance associate professionals	172,763	157,287	134,250
Miscellaneous business and administration associate professionals	580,376	525,774	469,858
Shop managers	312,631	285,948	241,567
Hospitality and accommodation managers	224,165	202,196	168,377
Miscellaneous managing supervisors (sales and service)	181,569	164,646	141,673
Enrolled nurses	34,231	31,416	26,443
Welfare associate professionals	45,717	42,504	36,225
Miscellaneous health and welfare associate professionals	38,685	35,028	30,819
Police officers	66,991	60,556	49,994
Miscellaneous associate professionals	111,748	102,756	86,349
Mechanical engineering tradespersons	163,667	144,115	173,912
Fabrication engineering tradespersons	108,937	93,959	134,569
Automotive tradespersons	194,980	176,420	161,369
Electrical and electronics tradespersons	296,315	263,097	258,835
Structural construction tradespersons	284,763	248,130	231,540
Final finishes construction tradespersons	102,864	89,904	78,425
Plumbers	99,585	85,850	71,418
Food tradespersons	158,990	144,277	134,286
Skilled agricultural workers	18,191	15,423	12,092
Horticultural tradespersons	105,638	94,014	75,427
Printing tradespersons	20,892	17,458	28,427
Wood tradespersons	35,336	30,292	43,978
Hairdressers	76,789	69,545	56,655
Textile, clothing and related tradespersons	17,547	15,180	17,062
Miscellaneous tradespersons and related workers	118,874	107,279	112,364
Secretaries and personal assistants	202,984	179,669	157,815
Advanced numerical clerks	189,892	171,229	152,724
Miscellaneous advanced clerical and service workers	85,822	76,647	63,439
General clerks	280,066	244,580	212,573
Keyboard operators	116,340	107,749	100,041
Receptionists	235,767	215,155	188,601
Intermediate numerical clerks	335,629	302,080	272,274
Material recording and despatching clerks	166,472	149,999	147,460
Miscellaneous intermediate clerical workers	279,381	254,102	223,056
Intermediate sales and related workers	219,355	191,401	179,702
Carers and aides	551,110	509,583	441,388
Hospitality workers	265,629	237,851	193,657
Miscellaneous intermediate service workers	241,591	220,545	178,747
Mobile plant operators	179,557	158,601	152,119
Intermediate stationary plant operators	85,892	75,815	94,082
Intermediate TCF machine operators	20,557	16,370	21,285
Miscellaneous intermediate machine operators	52,025	41,782	63,417
Road and rail transport drivers	450,571	402,152	348,652
Intermediate mining and construction workers	86,132	77,127	72,055
Miscellaneous intermediate production and transport workers	349,147	314,599	294,234
Elementary clerks	140,329	126,736	108,015
Sales assistants	845,071	768,581	639,999
Miscellaneous elementary sales workers	310,658	286,784	246,751
Elementary service workers	207,583	187,761	158,396
Cleaners	326,776	296,868	257,717
Process workers	159,719	135,211	212,586
Product packagers	87,617	78,615	91,461
Mining, construction and related labourers	168,420	147,639	140,767
Agricultural and horticultural labourers	124,236	104,030	84,638
Elementary food preparation and related workers	242,774	223,564	190,787
Miscellaneous labourers and related workers	134,478	121,067	111,897
Total	**15,321,646**	**13,743,459**	**12,503,948**

Source: Access Economics

Table D.5: Retirement rate by occupation (3 digit ASCO) and by scenario

Average annual rate, 15 years to 2025	Open doors	Low-trust	Flags
General managers and administrators	2.8%	2.9%	3.0%
Miscellaneous generalist managers	2.6%	2.8%	2.6%
Resource managers	2.1%	2.2%	2.3%
Engineering, distribution and process managers	2.5%	2.7%	2.5%
Sales and marketing managers	2.2%	2.3%	2.3%
Miscellaneous specialist managers	2.5%	2.7%	2.8%
Farmers and farm managers	4.3%	4.3%	4.3%
Natural and physical science professionals	1.7%	1.7%	1.9%
Building and engineering professionals	1.9%	2.0%	2.0%
Accountants, auditors and corporate treasurers	1.7%	1.8%	1.9%
Sales, marketing and advertising professionals	1.5%	1.6%	1.7%
Computing professionals	1.5%	1.6%	1.7%
Miscellaneous business and information professionals	1.9%	2.0%	2.1%
Medical practitioners	2.3%	2.4%	2.7%
Nursing professionals	2.4%	2.5%	2.7%
Miscellaneous health professionals	1.8%	1.9%	2.1%
School teachers	2.4%	2.5%	2.6%
University and vocational teachers	2.4%	2.6%	2.7%
Miscellaneous education professionals	2.2%	2.3%	2.5%
Social welfare professionals	2.4%	2.5%	2.6%
Miscellaneous social professionals	1.7%	1.8%	2.0%
Artists and related professionals	1.7%	1.8%	1.8%
Miscellaneous professionals	1.8%	1.8%	1.9%
Medical and science technical officers	1.9%	2.0%	2.1%
Building and engineering associate professionals	2.3%	2.4%	2.4%
Finance associate professionals	1.9%	1.9%	2.1%
Miscellaneous business and administration associate professionals	2.1%	2.2%	2.4%
Shop managers	2.1%	2.2%	2.4%
Hospitality and accommodation managers	2.0%	2.1%	2.3%
Miscellaneous managing supervisors (sales and service)	2.2%	2.3%	2.5%
Enrolled nurses	2.2%	2.4%	2.6%
Welfare associate professionals	1.7%	1.7%	1.8%
Miscellaneous health and welfare associate professionals	2.0%	2.1%	2.3%
Police officers	2.1%	2.3%	2.5%
Miscellaneous associate professionals	1.7%	1.8%	1.9%
Mechanical engineering tradespersons	1.8%	1.9%	1.7%
Fabrication engineering tradespersons	1.7%	1.9%	1.5%
Automotive tradespersons	1.4%	1.5%	1.6%
Electrical and electronics tradespersons	1.7%	1.8%	1.8%
Structural construction tradespersons	1.7%	1.8%	1.8%
Final finishes construction tradespersons	2.0%	2.2%	2.3%
Plumbers	1.5%	1.6%	1.8%
Food tradespersons	1.4%	1.5%	1.6%
Skilled agricultural workers	2.4%	2.6%	2.9%
Horticultural tradespersons	1.5%	1.6%	1.8%
Printing tradespersons	2.8%	3.1%	2.3%
Wood tradespersons	1.6%	1.8%	1.4%
Hairdressers	1.2%	1.3%	1.5%
Textile, clothing and related tradespersons	3.2%	3.5%	3.1%
Miscellaneous tradespersons and related workers	2.0%	2.1%	2.0%
Secretaries and personal assistants	2.2%	2.3%	2.5%
Advanced numerical clerks	2.2%	2.4%	2.5%
Miscellaneous advanced clerical and service workers	1.5%	1.6%	1.8%
General clerks	2.0%	2.2%	2.3%
Keyboard operators	1.6%	1.7%	1.7%
Receptionists	1.8%	1.9%	2.0%
Intermediate numerical clerks	1.9%	2.0%	2.1%
Material recording and despatching clerks	1.8%	1.9%	2.0%
Miscellaneous intermediate clerical workers	1.6%	1.7%	1.8%
Intermediate sales and related workers	1.8%	2.0%	2.0%
Carers and aides	2.0%	2.1%	2.2%
Hospitality workers	0.7%	0.8%	0.9%
Miscellaneous intermediate service workers	1.4%	1.5%	1.6%
Mobile plant operators	2.1%	2.2%	2.2%
Intermediate stationary plant operators	2.0%	2.2%	1.9%
Intermediate textile, clothing and related machine operators	3.7%	4.1%	3.4%
Miscellaneous intermediate machine operators	2.1%	2.3%	1.8%
Road and rail transport drivers	2.3%	2.4%	2.6%
Intermediate mining and construction workers	2.0%	2.1%	2.1%
Miscellaneous intermediate production and transport workers	1.5%	1.6%	1.6%
Elementary clerks	2.0%	2.1%	2.3%
Sales assistants	1.1%	1.2%	1.3%
Miscellaneous elementary sales workers	1.1%	1.1%	1.2%
Elementary service workers	2.0%	2.1%	2.2%
Cleaners	2.5%	2.6%	2.7%
Process workers	2.1%	2.3%	1.7%
Product packagers	2.2%	2.3%	2.1%
Mining, construction and related labourers	1.7%	1.8%	1.9%
Agricultural and horticultural labourers	1.7%	1.8%	2.0%
Elementary food preparation and related workers	1.1%	1.2%	1.3%
Miscellaneous labourers and related workers	1.9%	2.0%	2.0%

Source: Access Economics

Table D.6: Retirement by occupation (3 digit ASCO) and by scenario - 2025

Number of people - 2025	Open doors	Low-trust	Flags
General managers and administrators	3,772	3,597	3,483
Miscellaneous generalist managers	3,637	3,438	3,493
Resource managers	3,507	3,359	3,249
Engineering, distribution and process managers	5,224	4,993	5,082
Sales and marketing managers	3,791	3,690	3,657
Miscellaneous specialist managers	4,102	3,933	3,766
Farmers and farm managers	8,361	6,782	5,264
Natural and physical science professionals	2,061	2,028	1,997
Building and engineering professionals	5,282	5,163	5,140
Accountants, auditors and corporate treasurers	4,823	4,745	4,671
Sales, marketing and advertising professionals	2,324	2,268	2,232
Computing professionals	4,674	4,598	4,517
Miscellaneous business and information professionals	5,206	5,096	4,986
Medical practitioners	2,118	2,088	2,020
Nursing professionals	7,063	6,906	6,566
Miscellaneous health professionals	3,025	3,000	2,938
School teachers	8,677	8,495	8,343
University and vocational teachers	2,332	2,215	2,133
Miscellaneous education professionals	1,095	1,090	1,082
Social welfare professionals	3,736	3,671	3,535
Miscellaneous social professionals	2,493	2,452	2,389
Artists and related professionals	3,703	3,660	3,618
Miscellaneous professionals	1,514	1,474	1,436
Medical and science technical officers	1,243	1,225	1,212
Building and engineering associate professionals	3,358	3,287	3,276
Finance associate professionals	3,117	3,065	2,982
Miscellaneous business and administration associate professionals	11,940	11,643	11,341
Shop managers	6,135	6,021	5,805
Hospitality and accommodation managers	3,843	3,798	3,717
Miscellaneous managing supervisors (sales and service)	3,748	3,665	3,550
Enrolled nurses	609	608	603
Welfare associate professionals	721	711	687
Miscellaneous health and welfare associate professionals	795	779	757
Police officers	1,487	1,459	1,401
Miscellaneous associate professionals	1,865	1,837	1,788
Mechanical engineering tradespersons	2,904	2,852	2,846
Fabrication engineering tradespersons	2,036	1,978	1,984
Automotive tradespersons	2,706	2,689	2,682
Electrical and electronics tradespersons	5,209	5,120	5,110
Structural construction tradespersons	4,899	4,767	4,647
Final finishes construction tradespersons	2,018	1,942	1,870
Plumbers	1,570	1,523	1,480
Food tradespersons	2,180	2,154	2,141
Skilled agricultural workers	319	313	307
Horticultural tradespersons	1,545	1,525	1,497
Printing tradespersons	540	527	521
Wood tradespersons	641	626	615
Hairdressers	959	958	948
Textile, clothing and related tradespersons	476	468	459
Miscellaneous tradespersons and related workers	2,256	2,232	2,240
Secretaries and personal assistants	2,875	2,842	2,811
Advanced numerical clerks	4,282	4,181	4,078
Miscellaneous advanced clerical and service workers	1,262	1,249	1,229
General clerks	5,243	5,034	4,846
Keyboard operators	1,730	1,718	1,710
Receptionists	3,755	3,706	3,638
Intermediate numerical clerks	6,057	5,980	5,925
Material recording and despatching clerks	3,148	3,096	3,078
Miscellaneous intermediate clerical workers	4,598	4,526	4,456
Intermediate sales and related workers	3,750	3,689	3,662
Carers and aides	10,006	9,788	9,368
Hospitality workers	1,786	1,774	1,750
Miscellaneous intermediate service workers	3,633	3,599	3,522
Mobile plant operators	3,679	3,561	3,498
Intermediate stationary plant operators	1,935	1,873	1,918
Intermediate textile, clothing and related machine operators	797	769	753
Miscellaneous intermediate machine operators	1,262	1,190	1,258
Road and rail transport drivers	8,724	8,565	8,394
Intermediate mining and construction workers	2,000	1,920	1,874
Miscellaneous intermediate production and transport workers	4,935	4,888	4,848
Elementary clerks	2,020	2,012	2,004
Sales assistants	8,433	8,387	8,278
Miscellaneous elementary sales workers	3,054	3,042	3,017
Elementary service workers	3,737	3,628	3,460
Cleaners	6,470	6,331	6,137
Process workers	3,512	3,434	3,413
Product packagers	1,690	1,669	1,667
Mining, construction and related labourers	3,064	2,966	2,904
Agricultural and horticultural labourers	1,686	1,658	1,640
Elementary food preparation and related workers	2,476	2,454	2,408
Miscellaneous labourers and related workers	2,458	2,376	2,323
Total	**275,701**	**268,416**	**261,928**

Source: Access Economics