

BANKWEST CURTIN ECONOMICS CENTRE

FUTURE OF WORK IN AUSTRALIA

Preparing for tomorrow's world

Focus on the States Series, No. 6/18
April 2018

About the Centre

The Bankwest Curtin Economics Centre is an independent economic and social research organisation located within the Curtin Business School at Curtin University. The Centre was established in 2012 through the generous support of Bankwest, a division of the Commonwealth Bank of Australia. The Centre's core mission is to deliver high quality, accessible research that enhances our understanding of key economic and social issues that contribute to the wellbeing of West Australian families, businesses and communities.

The Bankwest Curtin Economics Centre is the first research organisation of its kind in WA, and draws great strength and credibility from its partnership with Bankwest, Curtin University and the Western Australian government. The Centre brings a unique philosophy to research on the major economic issues facing the State.

By bringing together experts from the research, policy and business communities at all stages of the process – from framing and conceptualising research questions, through the conduct of research, to the communication and implementation of research findings – we ensure that our research is relevant, fit for purpose, and makes a genuine difference to the lives of Australians, both in WA and nationally.

The Centre is able to capitalise on Curtin University's reputation for excellence in economic modelling, forecasting, public policy research, trade and industrial economics and spatial sciences. Centre researchers have specific expertise in economic forecasting, quantitative modelling, micro-data analysis and economic and social policy evaluation. The Centre also derives great value from its close association with experts from the corporate, business, public and not-for-profit sectors.

Contents

List of figures	ii
List of tables	v
Foreword	vi
Executive summary	vii
Key findings	viii
Introduction	xii
Changes in employment	1
Introduction	2
More of us are working	3
Is part-time work the new black?	5
Where will all the jobs be?	8
What should I be when I grow up?	12
Alternative forms of employment	15
Will we all become freelancers? The Gig Economy	19
Future implications	22
Quality of jobs	25
Introduction	26
Is work becoming more precarious?	27
Workplace satisfaction & wellbeing	40
Will our wages increase?	50
Future implications	57
Technology and jobs	59
Introduction	60
Technological change	62
Will robots take our jobs?	64
Has the content of work changed?	68
Future implications	78
Preparing for the future	79
Introduction	80
Preparing for the future: The role of education	81
Gender and educational choice	86
The future of lower-educated workers	87
Future implications	95
Summary and conclusions	97
Glossary and technical notes	101
References	105

List of figures

Figure 1	Labour force participation, selected OECD countries, 2001 to 2016	3
Figure 2	Labour force participation, men and women, Australia, 1978 to 2018	4
Figure 3	Share of full and part-time employment, 1978 to 2018	5
Figure 4	Change in average weekly hours worked, Australia, 1978 to 2018	6
Figure 5	Change in full and part-time weekly hours worked, men and women, 1978 to 2018	6
Figure 6	Main reason for working part-time rather than full-time, 2015	7
Figure 7	Main reason for working part-time rather than full-time, men, 2002 to 2015	7
Figure 8	Main reason for working part-time rather than full-time, women, 2002 to 2015	7
Figure 9	Job losses and gains by sector, men and women, 2006 to 2016	9
Figure 10	Employment by industry, 1988 and 2018	10
Figure 11	Employment growth by industry, 1988 to 2018	10
Figure 12	Changes in the share of major occupation groups, 1988 to 2018	12
Figure 13	Employment growth, major occupation groups, 1988 to 2018	13
Figure 14	Top ten growth occupations (volume), 2006 to 2016	14
Figure 15	Bottom ten growth occupations (volume), 2006 to 2016	14
Figure 16	Regularly work from home, men and women, 2001 to 2016	16
Figure 17	Average hours of those that regularly work from home, men and women, 2001 to 2016	16
Figure 18	Regularly work from home, major occupation group, 2001 to 2016	17
Figure 19	Multiple job holders, 2002 to 2016	18
Figure 20	Share of workers who identify as independent contractors, 2014 to 2016	19
Figure 21	Share of workers with multiple jobs, by age and gender, 2014 to 2016	20
Figure 22	Distribution of online supply of freelancing services in Australia, by task, 2016 to 2018	21
Figure 23	Dimensions of precarious employment, by gender, 2003 to 2016	30
Figure 24	Precariousness across genders, 2003 to 2016	32
Figure 25	Precarious employment among male workers, by occupation, 2003 to 2016	33
Figure 26	Precarious employment among female workers, by occupation, 2003 to 2016	33
Figure 27	Precarious employment, by industry, 2001-02 to 2015-16	35
Figure 28	Drivers of change in precariousness, by domain and occupation, 2010-11 to 2015-16	37
Figure 29	Drivers of change in precariousness, by domain and industry, 2010-11 to 2015-16	39
Figure 30	Australians' satisfaction with work overall, 2001 and 2016	41

Figure 31	Workers reporting being very satisfied with different job aspects, 2001 and 2016	41
Figure 32	Average satisfaction with different job aspects by occupation, 2001 to 2016	43
Figure 33	Satisfaction with job aspects and weekly hours of work	44
Figure 34	Satisfaction and employer status, 2001 to 2016	45
Figure 35	Satisfaction and contract type, 2001 to 2016	46
Figure 36	Satisfaction and working from home, 2001 to 2016	46
Figure 37	Satisfaction with job prospects by gender, 2001 to 2016	47
Figure 38	Satisfaction with job prospects by occupation, 2001 to 2016	48
Figure 39	Satisfaction with job prospects by industry	49
Figure 40	Real growth in gross hourly wage, by gender and employment status, 2003 to 2016	50
Figure 41	Real gross hourly wage trends by gender and type of employment contract, 2003 to 2016	51
Figure 42	Trends in real gross hourly wage, by age and gender, 2003 to 2016	53
Figure 43	Real gross hourly wage trends by industry sector, Australia, 2003 to 2016	55
Figure 44	Share of individuals who believe that science and technology will create more opportunities for the next generation, selected OECD countries	61
Figure 45	Capital Deepening Index, selected OECD countries, 1985 to 2015	62
Figure 46	ICT Capital Deepening Index, selected OECD countries, 1985 to 2015	63
Figure 47	Non ICT Capital Deepening Index, selected OECD countries, 1985 to 2015	63
Figure 48	Number of robots per thousand employed persons, selected OECD countries, 1996 to 2015	65
Figure 49	Share of robots by application type, Australia, 2011 and 2016	65
Figure 50	Share of robots by skill level of jobs, Australia, 2011 and 2016	66
Figure 51	Share of employers where intelligent software systems is of major importance, by industry, Australia, 2015-16	67
Figure 52	The extent of importance of intelligent software systems by employer size, Australia, 2015-16	67
Figure 53	Changes in employment share by skill level, Australia, between 2006 and 2016	68
Figure 54	Changes in employment share by skill level and gender, Australia, between 2006 and 2016	69
Figure 55	Changes in employment share by skill level and state, Australia, between 2006 and 2016	69
Figure 56	Share of individuals who strongly agree/agree that their job is complex; and their job is repetitive, 2005 to 2016, Australia	70
Figure 57	Share of individuals who strongly agree/agree that their job is complex; and their job is repetitive, by gender 2005 and 2016, Australia	71

List of figures (continued)

Figure 58	Percentage of all individuals who strongly agree/agree that their job is complex; and their job is repetitive, by ABS skill level 2005 and 2016, Australia	71
Figure 59	Percentage of all individuals who strongly agree/agree that their job is complex; and their job is repetitive, by educational attainment 2005 and 2016, Australia	72
Figure 60	Percentage of all individuals who strongly agree/agree that their job is complex; and their job is repetitive, by occupation, 2005 to 2016, Australia	72
Figure 61	Percentage of all individuals who strongly agree/agree that their job is complex; and their job is repetitive, by occupation, males, 2005 to 2016, Australia	73
Figure 62	Percentage of all individuals who strongly agree/agree that their job is complex; and their job is repetitive, by occupation, females, 2005 to 2016, Australia	73
Figure 63	Percentage of all individuals who strongly agree/agree that their job is complex; and their job is repetitive, by detailed occupation, 2005 to 2016, Australia	74
Figure 64	Percentage of all individuals who strongly agree/agree that their job is complex; and their job is repetitive, by industry, 2005 to 2016, Australia	76
Figure 65	Routineness in jobs in OECD countries, 2010 to 2014	77
Figure 66	Enrolments in tertiary degree programs, by gender and field, Australia, 2001 to 2016	82
Figure 67	Jobs that often require learning new skills by occupation, Australia, 2005 and 2016	83
Figure 68	Average number of training courses attended by gender, Australia, 2007 to 2016	84
Figure 69	Average number of training courses attended by occupation, Australia, 2007 to 2016	84
Figure 70	Training courses by aim of the training, 2016	85
Figure 71	Training courses to prepare for future job or promotion by occupation, 2016	85
Figure 72	Share of higher education enrolments in Australia, by field, 2001 to 2016	86
Figure 73	Share of female higher education enrolments in Australia, by field, 2001 to 2016	86
Figure 74	Employment rates of lower-educated workers by gender, 2002 to 2016	87
Figure 75	Share of employment by occupation, lower-educated males, 2001 to 2016	88
Figure 76	Share of employment by occupation, lower-educated females, 2001 to 2016	88
Figure 77	Number of low-skilled workers by occupation and age cohort, males, 2002 to 2016	90
Figure 78	Number of low-skilled workers by occupation and age cohort, females, 2002 to 2016	91
Figure 79	Gender role attitudes on work, OECD countries, 2005-09 and 2010-14	93
Figure 80	Share of individuals who agree that men should have more right to a job than women by educational attainment, Australia, 2005 and 2010	94

List of tables

Table 1	Dimensions of precarious employment	28
Table 2	Job precariousness index by occupation and industry, 2015-16	36
Table 3	Real gross hourly wages by occupation and employment status, 2010 and 2016	52
Table 4	Distribution of real gross wages by industry, 2016 (uprated to June 2017)	56

Foreword



Is the future of work really all about robots?

Are we placing too much emphasis on technology and not enough on the quality of jobs that we should strive to create in our future workplaces? Will we be happy and healthy in our jobs? Is work becoming more precarious? What type of jobs will give workers the security and stability that they need?

Examining Australia's future labour market can prompt more questions than answers, but it is an issue of central importance to our society. Having a job that provides an adequate wage and security is a right that should be available to everyone. It can mean the difference between poverty and just getting by, being able to lead an independent life, and to just feel useful and belong somewhere.

This sixth report in BCEC's *Focus on the States* series seeks to provide insights into these questions and many more. We examine the way in which the organisation of work is changing – from workforces to workplaces, changes in the quality of jobs over time, how technology is impacting the labour market and what can do to prepare for the future.

Importantly, it highlights the nature of and growing rate of precarious employment across Australian workplaces through a unique index that captures job insecurity, lack of control over work and poor working conditions.

While most commentary on this topic focuses on technology and the role of automation, we believe it is essential to focus on the quality of future jobs and the people in them.

I hope this report goes some way to shed light on one of the most talked about, but perhaps least understood, economic and social issues facing Australia.

A handwritten signature in black ink, appearing to read 'Alan Duncan', written in a cursive style.

Professor Alan Duncan

Director, Bankwest Curtin Economics Centre
Curtin Business School, Curtin University

Executive summary

This sixth report in BCEC's *Focus on the States* series looks at the changing nature of employment, the quality of work, and considers the role of technology in the jobs of the future. The report also sheds light on patterns of employment and hours worked across industry sectors, and brings empirical evidence to bear on the extent to which our work patterns are likely to evolve into the future.

The report highlights the critical imperative to ensure that workers – particularly low-skilled men – can access retraining and education opportunities that smooth their transition to new, higher skilled jobs, or into other forms of employment.

The share of robots to employees in Australia has tripled in the last 20 years, but still lags substantially behind the US and Europe. This suggests that Australian businesses have the capacity for a significant expansion of automation to take on tasks currently delivered by people. Estimates suggesting that up to 4 in 10 jobs are likely to be 'eliminated' or replaced by automation are overstated. The report also considers the important role for education and training in preparing for tomorrow's world of work, and in capitalising on the benefits of increased automation and artificial intelligence (AI).

In moving towards the labour market of the future, there will inevitably be a transformation in the nature of work, and the workplace. We can expect 'traditional' jobs and workplace orthodoxies to give way to new ways of working, and modes of employment. People are likely to change jobs more regularly in the future, to work fewer hours, or to hold more than a single job at any point in their working career.

But the workplace of the future, and the opportunities it affords to businesses and society, comes with responsibilities and risks. One of the greatest challenges in preparing for the future of work is to ensure that no one is left behind. The report finds that job insecurity has risen in recent years, more so among men. Men are also working fewer hours, and real growth in hourly pay has stalled since 2014, particularly among labourers, and machinery operators and drivers.

Freelancers and independent contractors generally don't benefit from the employment protections afforded to permanent or fixed-term employees. As a freelancer, if you're sick, you don't earn. And freelancers or own-account workers bear the full responsibility - and cost - of saving for retirement.

Our report develops a unique index of precarious employment for Australia, combining indicators of job insecurity, employment conditions, irregularity of employment and lack of control of work-life balance. We find that precarious employment has increased for both genders since 2009, but more rapidly for men than women.

The services sector continues to grow as a major player in Australia's future of work, something that is reflected in an exceptional growth in higher education enrolments in fields of health, medical sciences and education.

Key findings

Employment changes

More of us are working

Between 2000 and 2016, the labour force participation rate across all OECD countries increased from 69.9% to 71.7%.

Increases in female participation have been primarily responsible for overall increases in participation rates.

For Australia, female participation rates have increased from 40% to 60%, while male participation rates have fallen from 80% to 70% over the last three decades.

Is part-time work the new black?

Over the last 40 years, full-time employment has become a less common way of working for both men and women.

Between 1978 and 2018, the proportion of men working full-time decreased from 95% to 81%. In this same period, the share of women working full-time fell from around two-thirds to half.

Increases in part-time work have been driven by both demand and supply-side factors.

Since the late 1970s, part-time work has increased from representing around 15% of all employees, doubling to 31% in 2018.

Part-time work for men has increased almost fourfold in the past four decades – from 5% to 18%.

Men working part-time are more likely to cite a preference for this type of work than they did ten years ago.

For women, caring responsibilities as the main reason for part-time work has been declining over time from around 35% in 2002 to 30% in 2015.

Decreasing hours of work

Among men, average weekly hours decreased by around 2.5 hours – from 41.3 hours in 1978 to 38.8 hours in 2018. Women have seen similar decreases over the same period, falling from 31.4 to 30.0 hours on average between 1978 and 2018.

Australia non longer makes things – it services people

Like many advanced economies, Australia has been moving towards a service economy and away from manufacturing for some time.

In the ten years to 2016, Australia lost around 270,000 manufacturing jobs and gained almost 400,000 jobs in the health sector.

The share of workers employed in the manufacturing sector has halved in the last thirty years from 15.4% to 7.2%.

Employment growth in the Health Care and Social Assistance sector averaged 4.5% annually between 2008 and 2018 – almost three times the pace of employment growth across all sectors.

What should I be when I grow up?

Professional workers now tower above other major occupation groupings, increasing their share from 15.6% in 1988 to 23.9% in 2018.

Between 2008 and 2018, professional workers increased by 3% annually, whereas total employment grew by 1.6% on average.

Low skilled workers – machinery operators and drivers and labourers – have decreased their share in the labour market over time.

The rapid growth in community and personal service workers is likely to go some way towards narrowing the division between high and low-medium skilled workers.

Women have dominated the top ten growth occupations between 2006 and 2016.

Carers and aides and health professionals have added the most to their workforce in the last ten years – 320,000 workers.

A gender divide is evident in the bottom ten growth occupations, with a greater proportion of men affected by job losses in the last ten years.

New models of work

The prevalence of workers with more than one job has remained stable over the last ten years at around 8%.

Freelancing and the Gig Economy

More people are moving from the formal employment sector to independent employment or contract work during the middle of their working lives.

This reflects the new opportunities on offer in the shared or Gig Economy.

Our estimates show that 11.6% of the Australian workforce are independent contractors, equivalent to around 1,270,000 workers.

Women and younger workers are more likely to hold multiple jobs. Around 17% of women aged 18 to 24 and a tenth of women aged between 25 and 34 have two or more jobs.

Software development, incorporating programming, web design and data science, is the largest category of online freelancing services originating in Australia, with listings rising from 26% to 37% of all services between 2016 and 2018.

Working from home

Around 1 in 5 employed persons work on a regular basis from home, with relatively no change over time.

Those that regularly work from home spend on average 9.5 hours each week working at home.

In 2016, 41.2% of managers and 38.2% of professionals regularly worked at home. Increases in the professional and managerial workforce will likely see rates of working from home rise over the coming years.

Quality of jobs

Job precariousness

Precarious employment is an important concern for government, industry and community sectors in the workplace of the future.

The concept is multidimensional and seeks to encapsulate not only the inadequacy of working hours and employment benefits, but other dimensions such as insecurity of the job itself or a lack of employment rights and entitlements.

Using data from the Household Income and Labour Dynamics in Australia

survey, we construct a unique index of precarious employment in Australia.

Since 2009, precarious employment increased for both genders, but more rapidly for men than women.

Professionals and managers have the lowest level of precariousness for both genders, and labourers and machinery operators and drivers the highest.

Female sales workers and female community and personal services workers have significantly higher levels of precariousness than their male counterparts do.

The Accommodation and Food Services sector records the highest index value of precarious employment, which has also been increasing over time.

Employment stability in the Mining sector has declined at a faster rate than any other industry since the GFC.

Managers in the Accommodation and Food Services sector enjoy less stable employment than managers operating in other sectors.

Labourers working in Public Administration and Safety, Accommodation and Food Services and Agriculture have the highest levels of precarious employment across all occupations and industries.

Poorer employment conditions, including lack of access to sick and family leave, drive the greater level of precariousness among labourers.

Workplace satisfaction

A higher share of workers are satisfied with their jobs now compared to 15 years ago, however the share of very satisfied workers has decreased.

However, there has been a decrease in the extent of workers reporting being 'very satisfied' with one's job.

Only 27.3% of workers in 2016 said they were very satisfied compared to 35.2% in 2001.

Despite flatter wage growth, the share of workers reporting being very satisfied with pay has only fallen by around 3 percentage points – from 22.6% to 19.5%.

Key findings (continued)

Overall job satisfaction is the highest among managers and the lowest among machinery operators and drivers.

Managers may well become the most satisfied group of workers across all domains if the increase in satisfaction with work hours continues to rise over the coming years.

The nature and job security of clerical and administrative jobs may not be particularly rewarding, but they offer the flexibility and hours that makes workers happy.

Workers in low-skilled occupations report low levels of satisfaction with their job security compared to those in high-skilled occupations.

Employees of their own business are significantly happier than other workers.

Casual workers are much less satisfied with their jobs than those with permanent and fixed term contracts.

Workers who regularly work from home are on average more satisfied with their work than those who don't.

Future job prospects

Women are more optimistic about their job prospects than men.

Machinery operators and drivers are the least satisfied with their future employment prospects.

Hospitality has the highest share of workers who are dissatisfied with their job prospects.

Real Estate has the largest share of workers reporting the highest degree of satisfaction with job prospects, 36%.

At the other extreme, the share of Mining workers who are highly satisfied with their job prospects is just 16.5%.

Will our wages increase?

One of the greatest uncertainties in preparing for the future of work is the degree to which pay and remuneration will be affected for different jobs, careers and skill sets.

Hourly wage growth for full-time men has stalled since 2014.

Gross hourly wages have fallen in real terms since 2013 for part-time male

workers, falling 11% in three years to \$30.45 by 2016.

Among men, real gross hourly wages increased the most between 2010 and 2016 for those on fixed-term contracts (9.3%), followed by permanent (6.8%) and casual (2.2%).

Real growth in casual pay has been even slower for women – a mere 1.7% since 2010.

The issue of casualisation will become a concern in the future if workers are recruited on casual terms to positions that would previously have attracted a permanent or fixed-term contract.

Between 2010 and 2016, real hourly pay among male technicians and trades grew by 7.6%, yet declined among female trade workers by 7.5%.

There has been no progression in average pay rates since the GFC, either for young men or women. In fact, average real hourly pay for women has fallen by 2.6% since 2010.

The overall gap in pay between the youngest cohort and older workers has widened by nearly 30% since the start of the decade.

The mining sector has consistently delivered the highest average hourly wage across all industries, averaging gross pay of \$53.85 per hour worked, up by nearly a tenth since the start of the decade.

Real gross hourly wages for agriculture workers have fallen by 4.7% to \$24.25 since the start of the decade.

Technology and jobs

Technological advances and the rapid pace of innovation in the new world of automation will inevitably affect the task content and demand for skills in many occupational roles.

Around 60% of Australians believe that science and technology will create more opportunities for the next generation.

Humans will work alongside AI and automation in the workplace of the future, taking advantage of new ways of producing, working and creating.

Capital deepening has increased by 82% over the last 20 years in Australia.

Will robots take our jobs?

As of 2015, the number of robots per thousand employees in Australia was just over 0.6 in 2015, in comparison to just over 1.6 in the US and Europe.

The number of robots per thousand employees in Australia has tripled in the last 20 years but still stands at a very low base.

As of 2016, the highest share of robots (over 40% of the total number of robots) were employed in assembling and disassembling tasks

Over half of robots in Australia are employed in the lowest skilled jobs.

Intelligent software systems are of major importance in over 15% of mining businesses and over 33% of businesses with 200 or more employees.

Has the content of work changed?

Low-skilled employment share in Australia has decreased in the last 10 years.

A significantly higher share of Australians report having a job with repetitive content rather than complex content.

The share of females reporting complex job content has increased by nearly 30% in the last 11 years.

Over 43% of high-skilled individuals in 2016 had a complex and difficult job.

Over 52% of individuals with year 11 and below education held jobs with repetitive content in 2016.

Female managers are less likely to hold a complex job and more likely to hold a repetitive job, compared to their male counterparts.

There is evidence of a decrease in routine tasks in jobs in the Agriculture, Mining and Manufacturing sectors.

Routine task content is higher in Australia compared to New Zealand and United States.

Preparing for the future

The analysis presented in this chapter shows a mixed picture in terms of how well Australia is preparing for the future.

The role of education sector

Domestic enrolments in health degrees have been rapidly rising in the last 15 years.

Management and commerce attract the largest number of male students in Australia.

There are increasingly large numbers of overseas male students enrolling in engineering and IT degrees.

Over 56% of professionals often require learning new skills for their job.

Attendance of training courses has increased among females but decreased among males in the last 10 years.

Gender and educational choice

We have seen a three-fold increase in domestic female enrolments in health degrees since 2001.

IT's share of total tertiary enrolments has nearly halved between 2001 to 2016.

The share of female enrolments in IT has decreased by nearly 10 percentage points since 2001.

Future of low-skilled workers

Employment rates of low-skilled females has been higher compared to males during most of the last 15 years.

The majority of lower-educated males are employed in jobs that are at high risk of technological disruption.

The role of culture

If the jobs that currently have strong representation of women are harder to automate than men's, and female-dominated occupations are growing more rapidly than male-dominated roles, society will need to make adjustments to traditional attitudes around gender roles at work.

Gender biased attitudes are particularly prevalent among those with lower education levels.

Around 10% of men and 7.5% of women in Australia in 2012 believed that men should have more right to a job than women.

Introduction

The Australian labour market is undergoing rapid change, fuelled by a combination of disruptive markets and technologies, the ageing population and workforce globalisation. New jobs and markets are being created and new ways of doing business emerging every day.

As consumers, we now have access to other people's assets and skills like never before through online platforms such as Uber, AirBNB, Airtasker, Upwork and Fiverr. And as producers, we have the ability to sell our assets and skills through these channels and secure work or additional income that we may have otherwise never been able to.

As new technologies take over some of the tasks previously performed by labour and industries move offshore, the service sector continues to forge ahead as the major player in Australia's future of work. Our ageing and ailing population is also fuelling this shift, with massive increases in the type of jobs that are needed to support these social changes.

Having a job that provides an adequate wage and security is a right that should be available to everyone. It can mean the difference between poverty and just getting by, being able to lead an independent life, and to just feel useful and belong somewhere.

Is the future of work really all about robots? Are we placing too much emphasis on technology and not enough on the *quality of jobs* that we should strive to create in our future workplaces? Will we be happy and healthy in our jobs? Is work becoming more precarious? What type of jobs will give workers the security and stability that they need?

Is now the time for workers to return to education and begin re-skilling? What kinds of careers can our children expect and where should they focus their education? And will robots really take our jobs?

This sixth report in BCEC's *Focus on the States* series seeks to provide insights into a number of these questions – and many more. We examine the way in which the organisation of work is changing – from workforces to workplaces, changes in the quality of jobs over time, how technology is impacting the labour market and what can do to prepare for the future.

Changes

in employment

Introduction

The progress made over the last two centuries has seen our working lives turned upside down. We've experienced three major revolutions in this relatively short time frame - agricultural, industrial and now digital. As we move deeper into the twenty-first century, we continue to see some remarkable changes as the fourth industrial revolution takes hold and the prospect of robots and artificial intelligence being embedded in our workplaces becomes very real.

Markets have become more global than ever before. Labour can be traded without having to relocate physically. The Gig Economy is creating new opportunities for how we buy and sell our labour and capital, with platforms such as Uber, AirBnB, Airtasker and Fiverr facilitating these transactions.

This chapter explores changes in the characteristics of employment - how we work, where we work, when we work and what type of jobs are likely to be in demand in the future.

First, we examine changes in paid labour force participation and the extent to which standard full-time employment has changed. Next, we look at Australia's trajectory towards a service economy and away from manufacturing, and examine the industries and occupations that are growing or declining.

We then explore the new models of employment focusing on the gig and share economy and freelance work. Is there acceleration in alternative forms of employment such as freelancing, working from home and moonlighting? Will we all be working part-time in the future doing some freelance work on the side? Or will it be business as usual?

Finally, we discuss the implications of changes in the way we work and what this might mean for the future.

More of us are working

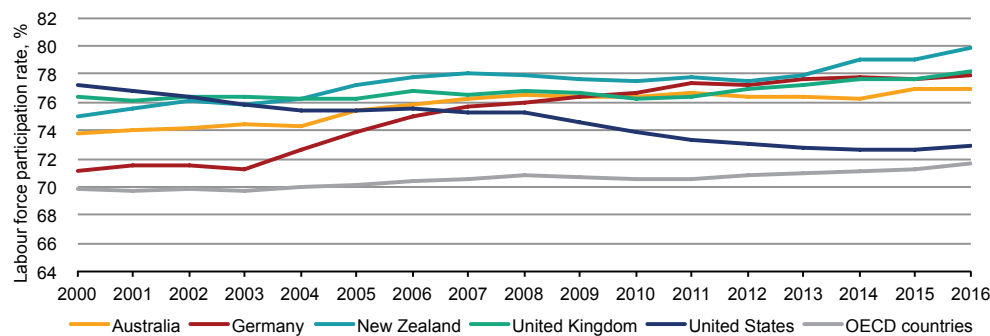
Participation in the paid labour force – either being in employment or looking for work – is a key indicator of the overall health of any economy. It measures how much labour is being supplied relative to the population that we think should be engaged in the labour force – typically those aged 15 to 64 years.

One of the biggest transformations we have seen in advanced economies in recent times is the increased participation of women in the paid labour force. This trend is primarily responsible for the overall increase in labour force participation across most OECD countries (Figure 1). Between 2000 and 2016, the labour force participation rate across all OECD countries increased from 69.9 to 71.7 per cent.

Compared to other OECD countries, Australia is tracking higher than the OECD average labour force participation rate, yet remains below our close neighbour – New Zealand – and the United Kingdom and Germany. Since the turn of the century, participation rates for the United States have been trending downward, with the pace picking up in the post-GFC period.

Increases in female participation have been primarily responsible for overall increases in participation rates.

Figure 1 Labour force participation, selected OECD countries, 2001 to 2016



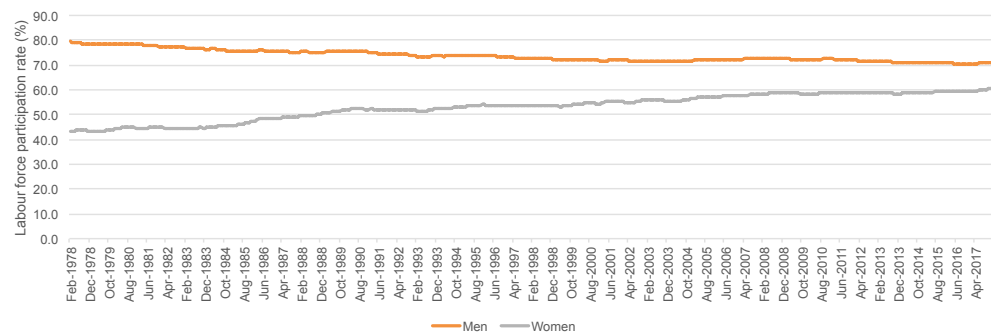
Note: Labour force participation rate is the labour force (employed + unemployed) divided by the working-age population, in this case those aged 15 to 64 years.

Source: Bankwest Curtin Economics Centre | OECD.Stat.

Increasing overall participation rates in Australia have been driven by the rise in female labour force participation, while male labour force participation has been falling (Figure 2). Over the last three decades, female participation rates have increased dramatically - from around 40 to 60 per cent - while male participation rates have fallen from 80 to 70 per cent. Gains in educational attainment together with increased support for women to engage in the paid labour force through childcare, and growth in female-dominated occupations, are all likely to be contributing to the upwards trajectory of female labour force participation over time. For men, on the other hand, a greater propensity to engage in post-school qualifications, slower growth in traditional male-dominated occupations and increased retirement support through the aged pension and superannuation are likely to be contributing to the overall decline in male participation.

These patterns are likely to continue, and a convergence between male and female labour force participation will be likely in the next ten years or so. However, the way in which men and women engage in the paid labour force is very different and is unlikely to change substantially over the coming years unless we see a dramatic societal shift. Women continue to dominate caring responsibilities and hence the part-time workforce, using this employment arrangement as a means to balance work and family. And while men may have increased their role as carers to a small extent, Australian society primarily remains a male breadwinner model (Cassells *et al.* 2013).

Figure 2 Labour force participation, men and women, Australia, 1978 to 2018



Source: Bankwest Curtin Economics Centre | ABS Cat No.6202.0, Labour Force, Australia.

Is part-time work the new black?

Part-time work has become a more common form of employment in Australia, driven by both demand - and supply-side factors. On the supply-side, more workers are preferencing part-time work to combine other activities and responsibilities that they may have such as studying and raising a family. Workers are also using part-time work as a retirement transition pathway.

On the demand-side, the changing composition of our labour market is driving an increase in part-time work, as modern economies move towards the service sector and employers use part-time workers to gain greater flexibility and productivity in their organisation.

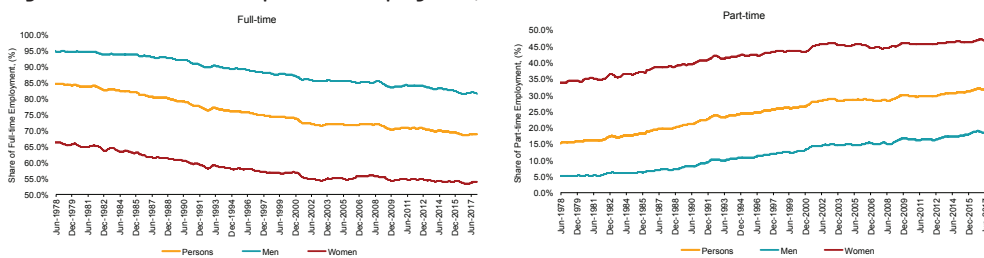
Since the late 1970s, part-time work has increased from representing around 15 per cent of all employees, doubling to 31 per cent in 2018 (Figure 3). For women, the proportion of all workers employed in a part-time capacity has increased from 34 per cent to 47 per cent across this same period, with growth slowing over the last two decades.

Over the last 40 years, full-time employment has become a less common way of working for both men and women. Between 1978 and 2018, the proportion of men working full-time decreased from 95 per cent to 81 per cent. In this same period, the share of women working full-time fell from around two-thirds to 54 per cent.

And while part-time work for men is still less common than women, the growth rate has been considerable over the past four decades, increasing almost fourfold from 5 per cent to 18 per cent.

Since the late 1970s, part-time work has increased from representing around 15% of all employees, doubling to 31% in 2018.

Figure 3 Share of full and part-time employment, 1978 to 2018



Source: Bankwest Curtin Economics Centre | ABS Cat No.6202.0, Labour Force, Australia.

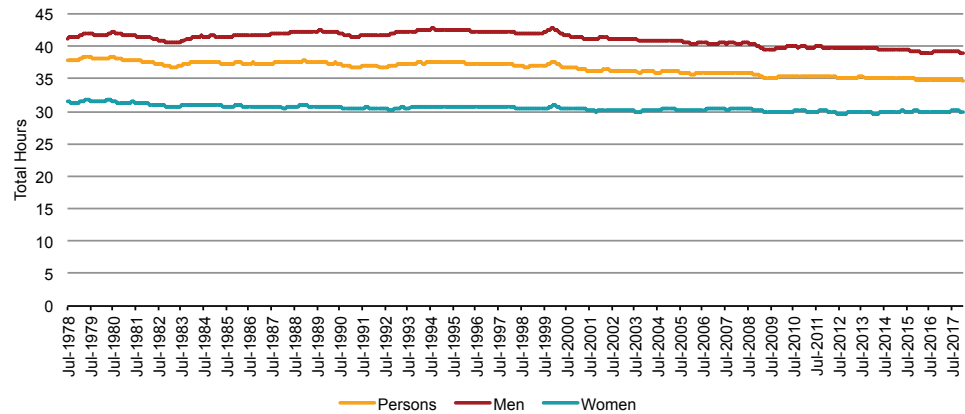
Part-time work for men has increased almost fourfold in the past four decades – from 5% to 18%.

Decreasing hours of work overall – but part-time hours on the rise

Taking a long-term view, average weekly hours worked have been gradually declining over the past three decades (Figure 4). Among men, average weekly hours decreased by around 2.5 hours each week – from 41.3 hours in 1978 to 38.8 hours in 2018. Women have seen similar decreases over the same period, falling from 31.4 to 30.0 hours on average between 1978 and 2018. This trend is driven by both an increase in part-time work and declining average full-time hours as a general pattern. Will average hours of work continue to fall? It is expected that this downward trend will continue as part-time work continues to constitute a greater share of all workers.

Average hours worked each week will continue to fall as part-time work plays a greater role in the labour market and full-time hours recede.

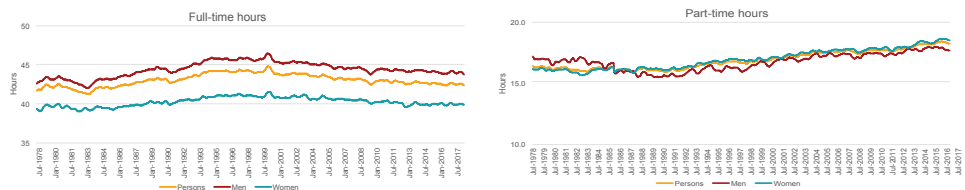
Figure 4 Change in average weekly hours worked, Australia, 1978 to 2018



Source: Bankwest Curtin Economics Centre | ABS Cat No.6202.0, Labour Force, Australia.

Average full-time hours have been falling since the early 2000s, after reaching a high of 46.4 hours for men and 41.5 hours for women in 1999 (Figure 5). Average weekly hours for full-time men have since fallen to 43.7 hours, and for women, to 39.9 hours. On the other hand, part-time hours have been increasing over time. Weekly part-time workers averaged 16 hours in 1978, increasing by 2.5 hours to 18.5 hours in 2018. This pattern is evident for both women and men, with a combination of factors including an overall movement towards a service economy, the increased propensity to combine work and study and the Australian tax/transfer system all playing a role.

Figure 5 Change in full and part-time weekly hours worked, men and women, 1978 to 2018

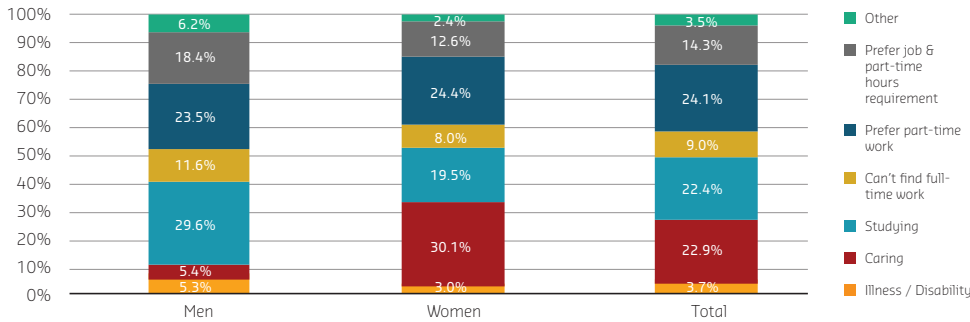


Source: Bankwest Curtin Economics Centre | ABS Cat No.6202.0, Labour Force, Australia.

What's the main reason people work part-time?

Reasons for working part-time abound and can vary substantially by gender and age group. The most common reason among men is that they are combining work with study (29.6%), followed by a preference for part-time work (23.5%) and a preference for the job which requires part-time hours (18.4%). Among women, caring for others is the most common reason stated for working part-time (30.1%) followed by a preference for part-time work (24.4%) and studying (19.5%).

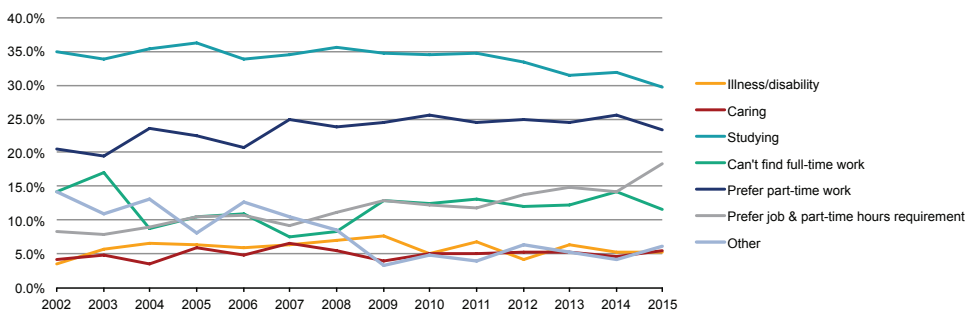
Figure 6 Main reason for working part-time rather than full-time, 2015



Source: Bankwest Curtin Economics Centre | Authors' calculations from HILDA Wave 15.

Over the last decade or so, this pattern has been changing somewhat, with men working part-time more likely to cite a preference for part-time work than they did ten years ago as the main reason for part-time work, and less likely to report studying as the main reason.

Figure 7 Main reason for working part-time rather than full-time, men, 2002 to 2015

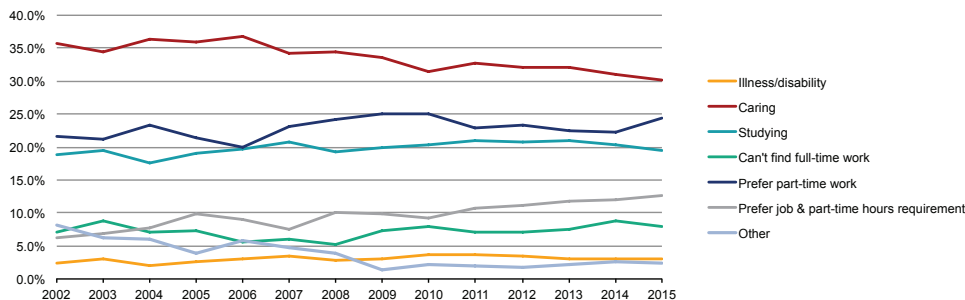


Source: Bankwest Curtin Economics Centre | Authors' calculations from HILDA Waves 2 to 15.

Men working part-time are more likely to cite a preference for this type of work than they did 10 years ago.

For women, caring responsibilities as the main reason for part-time work has been declining over time from around 35 per cent in 2002 to 30 per cent in 2015. Like men, a preference for part-time work has increased as the main reason given why women are working part-time rather than full-time.

Figure 8 Main reason for working part-time rather than full-time, women, 2002 to 2015



Source: Bankwest Curtin Economics Centre | ABS Cat No.6202.0, Labour Force, Australia.

Where will all the jobs be?

Predicting what type of jobs will be around in the next five to ten years is a slightly easier task than envisioning what the workforce may look like in the next twenty or thirty years' time. Jobs exist today such as social media managers, doggy day carers and cloud computing specialists that years ago we would have never thought of, and the jobs of that exist in the future will be much the same.

What we do know is where the points of change are happening – what occupations and industries are growing, how fast this is happening and we can make fairly educated guesses around whether or not these patterns are here to stay or whether they are likely to be temporary. In this section we look at how occupations and industries have changed in Australia over the last ten to thirty years and what lies ahead in the coming years.

Australia no longer makes things – it services people

Like many advanced economies, Australia has been moving towards a service economy and away from manufacturing for some time. In the 1960s manufacturing contributed around 25 per cent to Australia's gross domestic product and employed over 1 million workers – it now contributes around 6 per cent and employs around 895,000 workers – despite the total workforce being more than two times larger.

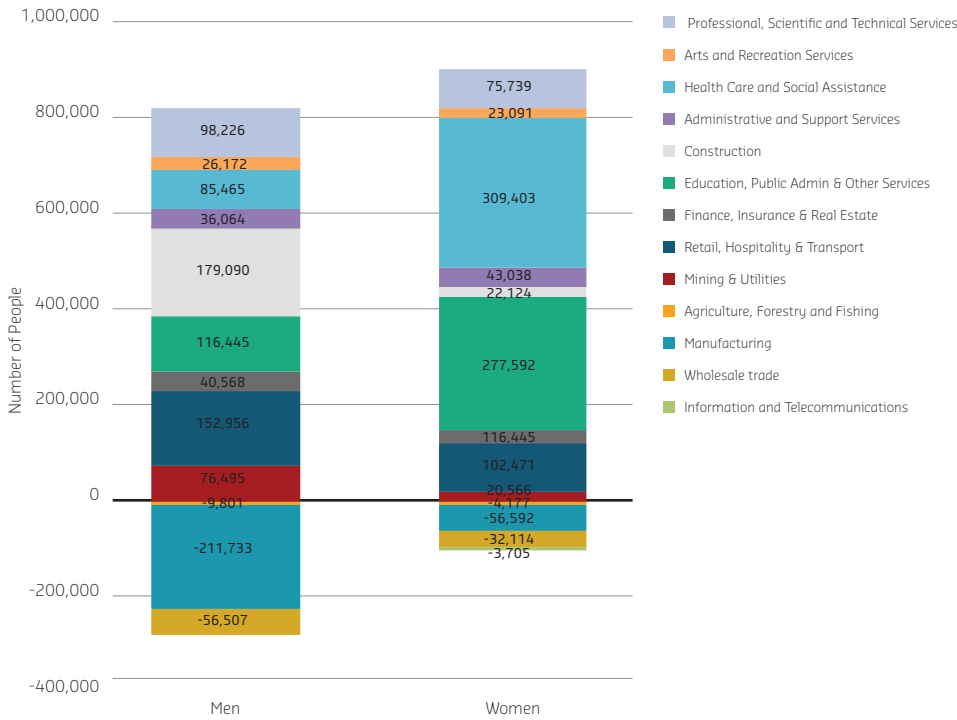
Trade liberalisation has been one of the key drivers of the decline in manufacturing in Australia over the last few decades, together with the competitiveness of Asian manufacturing giants, including China, Japan and South Korea. A number of core manufacturing industries were established in the post-World War II era, supported and protected by government through grants and tariffs, but these supports have steadily been pulled away since the 1980s.

The move away from manufacturing as one of the cornerstones of the Australian economy has been politically divisive over the years, but for the most part is now an accepted norm for the nation. We no longer make things – we service people.

Despite the labour force growing by some 1.3 million workers between the 2006 and 2016 Census periods, Australia saw an absolute loss of workers in the Manufacturing sector of around 270,000 workers – the majority of whom were men. The number of workers in the Wholesale Trade sector also declined over this period, reducing by around 90,000 workers in the ten years to 2016, two-thirds of whom were men. On the other side of the equation, around 400,000 jobs were gained in the Health Care and Social Assistance sector – with almost 80 per cent of these going to women.

In the 10 years to 2016, Australia lost around 270,000 manufacturing jobs and gained almost 400,000 jobs in the health sector.

Figure 9 Job losses and gains by sector, men and women, 2006 to 2016



Note: Census counts differ from those ascertained from the ABS Labour Force Survey at similar timeframes. The ABS labour force survey estimates of job losses for the Manufacturing sector are considerably lower than those extracted from Census data. These differences could be due to differences between employee and employer industry classification and survey sampling error. Census data has been selected as it is population level data and does not suffer from sampling errors that are inherent in the ABS labour force survey. Changes to the Census question about industry of employment over time may have resulted in an over- or under-count of employment in particular industries. This change has been the removal of tick boxes for industry of employment in the 2016 Census.

Source: Bankwest Curtin Economics Centre | Authors' calculations from Census Tablebuilder.

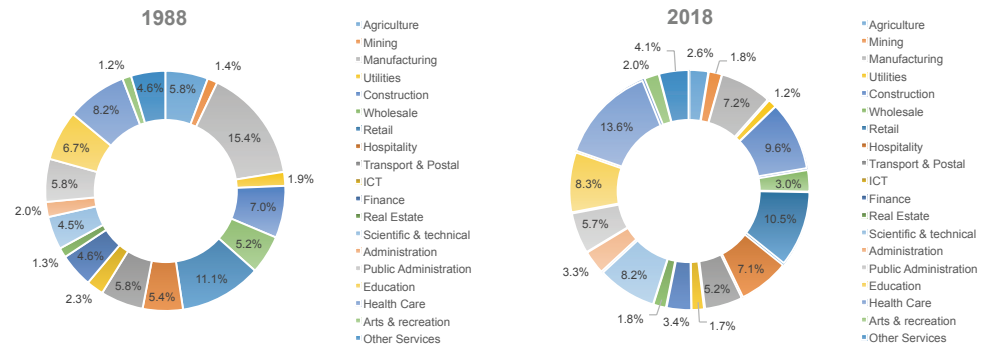
Education, Public Administration and Other Services have also seen considerable growth in the ten years to 2016, with similar gains to the Health Care and Social Assistance sector. These industries gained around 394,000 workers – 70 per cent of whom were women. The male-dominated Construction sector gained around 200,000 workers between 2006 and 2016, over 90 per cent of these were men. Similar patterns are observed for the Mining and Utilities sectors, which added 97,000 workers – the majority of whom were men.

Professional, Scientific and Technical Services, Arts and Recreation Services and Administrative Support Service sectors saw similar job gains among both men and women. The Finance, Insurance and Real Estate sectors gained an additional 64,000 workers – the majority men.

The movement towards services and away from manufacturing has been a characteristic of the Australia labour market for some time now. Thirty years ago the manufacturing sector constituted 15.4 per cent of all employment. This has now halved to 7.2 per cent of all workers (Figure 10). Recent trends have seen the pace of this transformation increase more rapidly as the manufacturing sector shrinks even further. Between 1988 and 1998 the manufacturing sector shrunk on average by 0.3 per cent each year (Figure 11). During the last ten years, the annual decline averaged 1.6 per cent. The closure of Australia's car manufacturing industry has been one of the key drivers behind this increased rate of decline, with the final Holden plant closing its doors in Elizabeth, South Australia on 20th October 2017.

The share of workers employed in the Manufacturing sector has halved in the last 30 years from 15.4% to 7.2%.

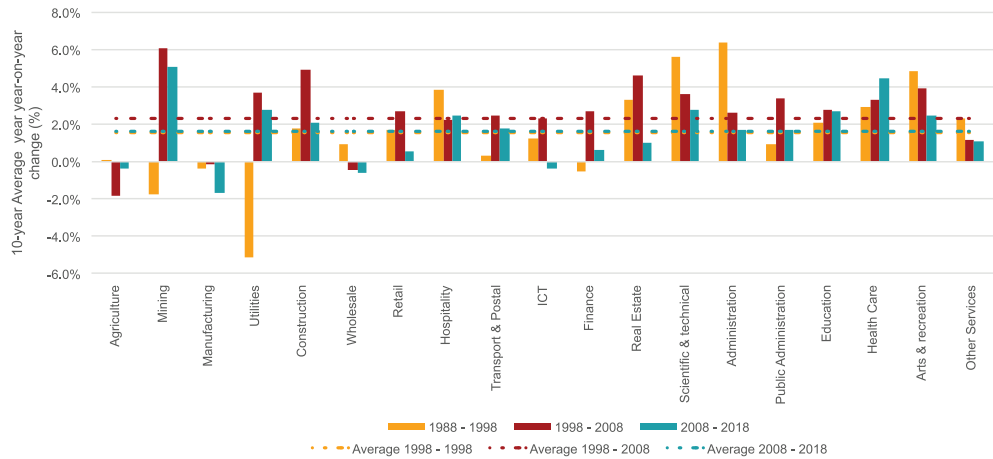
Figure 10 Employment by industry, 1988 and 2018



Source: Bankwest Curtin Economics Centre | ABS Cat No.6291.0.55.003, Labour Force, Australia.

The service sectors – mainly Health Care and Social Assistance – have been filling the gap, increasing the share of workers from 8.2 to 13.6 per cent in the last three decades. And the pace of growth has increased decade after decade. Between 1988 and 1998 annual employment growth in the Health sector averaged 2.9 per cent. This increased to 3.3 per cent between 1998 and 2008, and 4.5 per cent in the ten years between 2008 and 2018 – almost three times the pace of employment growth across all sectors.

Figure 11 Employment growth by industry, 1988 to 2018



Source: Bankwest Curtin Economics Centre | ABS Cat No.6291.0.55.003, Labour Force, Australia.

Employment growth in the Health Care and Social Assistance sector averaged 4.5% annually between 2008 and 2018 – almost 3 times the pace of employment growth across all sectors.

The Education sector has also increased its share of total employment substantially in the last three decades – from 4.5 to 8.2 per cent of all workers (Figure 10). Growth rates have also been considerable – averaging well above the all sector average, especially in the most recent period. Between 2008 and 2018, employment in the Education sector recorded an average annual growth rate of 2.7 per cent, whereas all sectors grew by around 1.6 per cent on average.

The male-dominated Mining and Construction sectors have both experienced average annual employment growth beyond that of the all sector average over the past two decades, with growth easing to a more natural state in the last decade compared to the rapid annual employment growth seen during the mining boom period. Over the course of 1998 to 2008, employment in the Mining sector saw average annual growth rates beyond 6 per cent, around four times the pace of the labour market overall. The Construction sector also grew rapidly during this period, averaging 4.9 per cent annually. Both industries have also increased their employment share over time slightly.

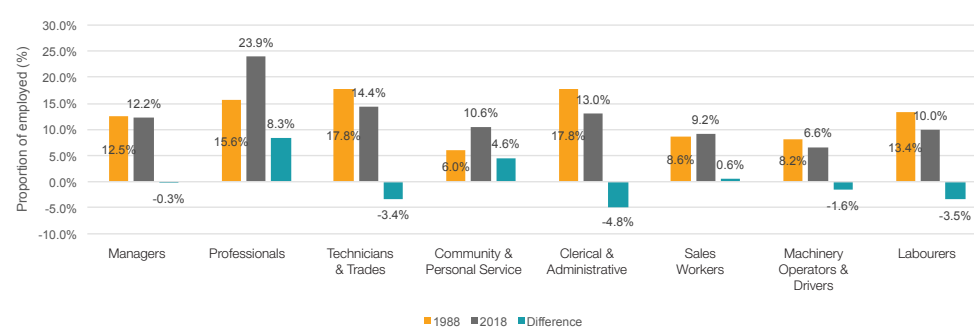
In more recent times, employment growth in the Construction sector has eased, but is still growing at a faster pace than employment overall – 2.1 per cent compared to 1.6 per cent annually. Mining has also eased pace, averaging 5.1 per cent annual growth between 2008 and 2018, compared to 6.1 per cent across 1998 to 2008. The Mining sector overall is a relatively small contributor to total employment, constituting only 1.8 per cent of all workers, but reliance on the sector to the overall economy cannot be discounted, especially in Western Australia.

What should I be when I grow up?

Between 2008 and 2018, professional workers increased by 3% annually, whereas total employment grew by 1.6% on average.

The changing composition of the workforce is reflected in changes in the share of major occupation groupings over time (Figure 12). Professional workers now tower above other major occupation groupings, increasing their share from 15.6 per cent in 1988 to 23.9 per cent in 2018. Average annual growth rates for this occupation group have been well above the average for the workforce overall during the last thirty years (Figure 13). Between 2008 and 2018, professional workers increased by 3 per cent on average each year, whereas total employment grew by only 1.6 per cent on average.

Figure 12 Changes in the share of major occupation groups, 1988 to 2018



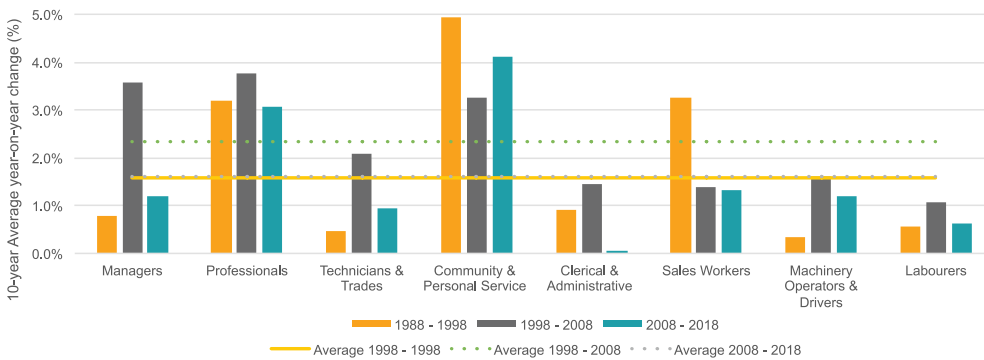
Source: Bankwest Curtin Economics Centre | ABS Cat No.6291.0.55.003, Labour Force, Australia.

The rapid growth in community and personal service workers is likely to go some way towards narrowing the division between high and low-medium skilled workers.

One of the primary concerns of what the future of work will look like is the hollowing out of medium-skilled workers. In some predominantly medium-skilled occupations, such as technicians and trades workers, and clerical and administrative workers, the employment shares have indeed decreased in the last three decades. However the share of community and personal service workers (a combination of low-medium skilled workers) has increased from 6 per cent in 1988 to 10.6 per cent in 2018. And the rate of growth of community and personal service workers is well above the all-occupation average (1.6%), growing by 4.0 per cent on average each year between 2008 and 2018 (Figure 13). This suggests that growth in this occupation category is likely to go some way towards narrowing the division between high and low-medium skilled workers within the Australian labour market.

Machinery operators and drivers have the smallest occupational grouping, with their share decreasing from 8.2 per cent in 1988 to 6.6 per cent in 2018 (Figure 12). Labourers, another group of low-skilled workers, have also experienced a decreased in employment share from 13.4 per cent in 1988 to 10 per cent in 2018. The rate of employment growth for both occupations has been well below that of the all occupation average in the last decade (Figure 13).

Figure 13 Employment growth, major occupation groups, 1988 to 2018

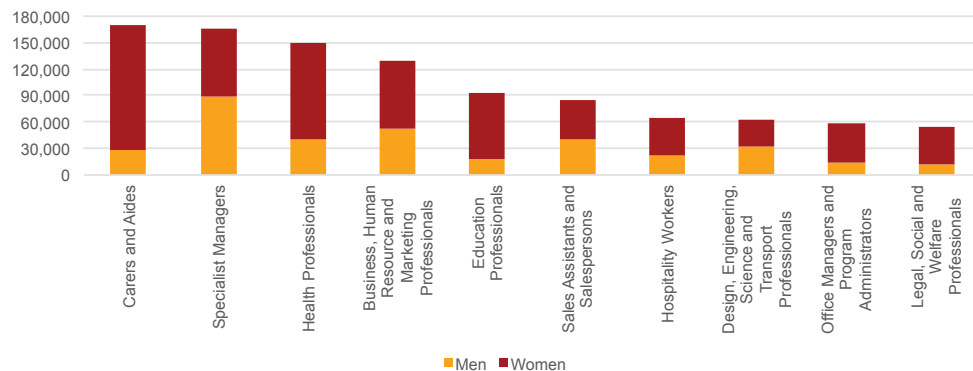


Source: Bankwest Curtin Economics Centre | ABS Cat No.6291.0.55.003, Labour Force, Australia.

Commensurate with the large growth in the Health Care and Social Assistance Sector – there are now 170,645 more Carers and Aides employed than there were ten years ago – 150,000 of these workers were women (Figure 14). Australia’s ageing and ailing population is no doubt playing a key role in this trend, with aged care and disability workers falling within this occupation category. Child care workers are also included within this occupation category. Health Professionals have also increased substantially - by around 150,000 workers in the ten years to 2016. The majority of these additional workers have also been women.

Women have dominated the top 10 growth occupations between 2006 and 2016.

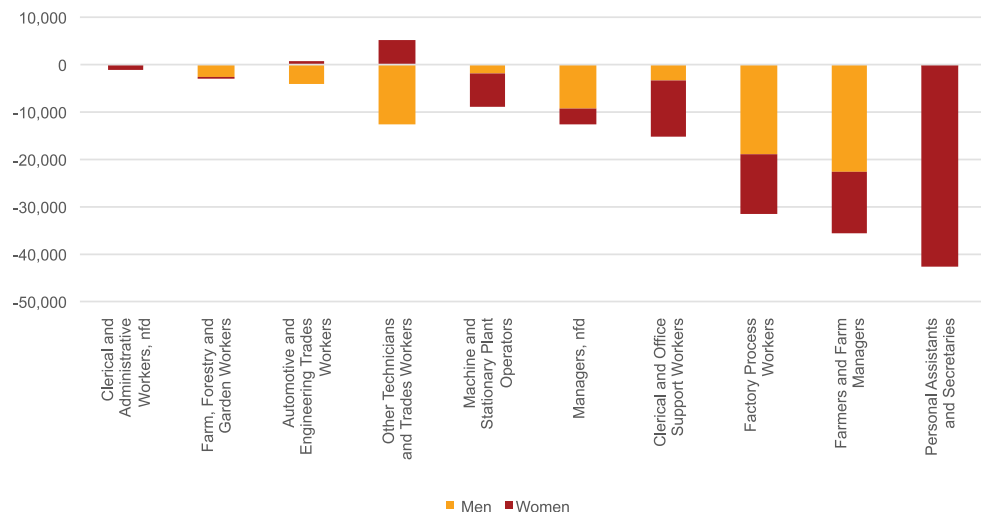
Figure 14 Top ten growth occupations (volume), 2006 to 2016



Note: Occupations are classified using the Australian and New Zealand Classification of Occupations (ANZSCO) 2-digit level.
Source: Bankwest Curtin Economics Centre | Authors' calculations from Census Tablebuilder.

Meanwhile, a number of occupations have shrunk over the last decade. There were 42,752 fewer personal assistants and secretaries in 2016 than in 2006 (Figure 15). Other occupations that have seen a substantial fall in workers are farmers and farm managers (-35,000) and factory process workers (-31,000). The latter is consistent with the rapid contraction of the manufacturing sector. With the exception of personal assistants and secretaries, a gender divide is evident in the bottom ten growth occupations, with a greater proportion of men affected by job losses in the last ten years.

Figure 15 Bottom ten growth occupations (volume), 2006 to 2016



Note: Occupations are classified using the Australian and New Zealand Classification of Occupations (ANZSCO) 2-digit level.
Source: Bankwest Curtin Economics Centre | Authors' calculations from Census Tablebuilder.

Alternative forms of employment

Tele-commuting, working from home and other places

For centuries our workplaces have been organised around a central space - one that has typically been close to home. Advances in transport have allowed labour mobility to push beyond that of our immediate neighbourhoods - across suburbs, cities and even states.

In recent times, the type of work we now do, together with technological advancements in communications, and the push for greater workplace flexibility has changed the need to work in a central location or even in the same country or state in which we reside. Will we see a return to the past where we are at home more often than not, or at least, closer to it?

Telecommuting, or working remotely is one such trend that has become more common across the globe.

For employers, this means access to a wider pool of employees than what previously may have been available to them, reduced overhead costs, and productivity gains through reduced commuting times and engaging workers at times that they are operating at their best. Similarly, for employees there can be numerous benefits, including access to a broader range of employers, greater work-life balance gained through reduced commuting times and greater autonomy over work hours. The environment also benefits with fewer cars on the road and reduced demand for public transport.

However, lack of boundaries around when and where we work could also encroach upon our lives in ways that may not be beneficial. Our working days can easily extend into our nights and weekends, taking up time we would normally spend resting and catching up with family and friends.

Without current time-use data we lack information about the extent to which our jobs infiltrate our home lives and impact on our wellbeing. In Australia, this data has been absent for more than a decade and at a time when the structure of labour markets have been changing dramatically.

The collegiality of workspaces and the human interaction that they provide should also not be discounted in any deliberate shift towards working remotely or from home.

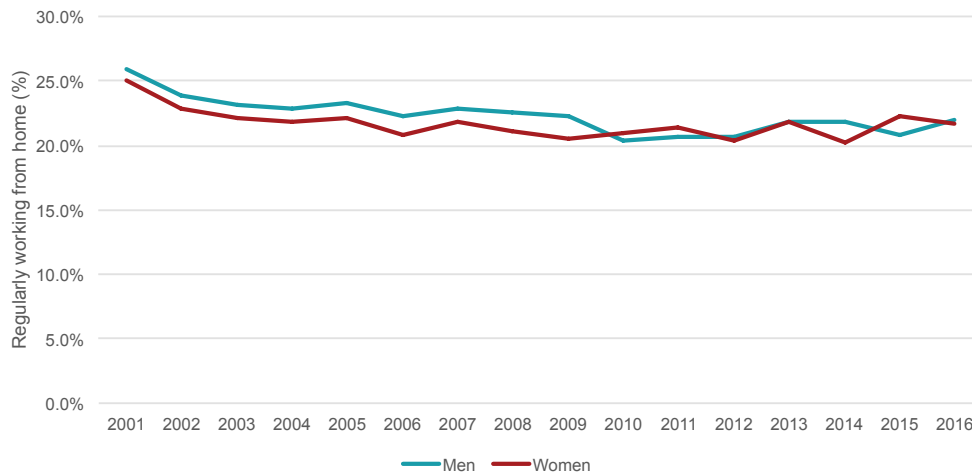
So are we more or less likely to abandon our work stations and set-up at home or in a co-working space in the future?

In recent years there has been very little change in the proportion of workers regularly doing some work from home (Figure 16). In fact, regular work from home has decreased slightly between 2001 and 2016, from 25.5 per cent of workers to 21.8 per cent. Prior to the global financial crisis, men had a slightly higher propensity to work regularly from home than women, however there is little difference between the two sexes in recent times.

Without current time-use data we lack information about the extent to which our jobs infiltrate our home lives and impact on our wellbeing.

Around 1 in 5 employed persons work on a regular basis from home.

Figure 16 Regularly work from home, men and women, 2001 to 2016



Source: Bankwest Curtin Economics Centre | Authors' calculations from HILDA Waves 2 to 16.

For those that do regularly work from home, they spend on average 9.5 hours each week working at home. This has decreased since 2001 by around an hour. Men typically observed higher average hours worked from home each week prior to 2009. At this point, average hours working at home among women increased from around 8 to 10 hours between 2008 and 2009, likely reflecting the greater pressure on employees at this time. Since 2010, average hours worked at home have tracked closely for men and women, but a slight divergence can be seen in the latest data point, with average hours worked at home among women tracking upwards and for men, slightly downwards.

Those that regularly work from home spend on average 9.5 hours each week working at home.

Figure 17 Average hours of those that regularly work from home, men and women, 2001 to 2016

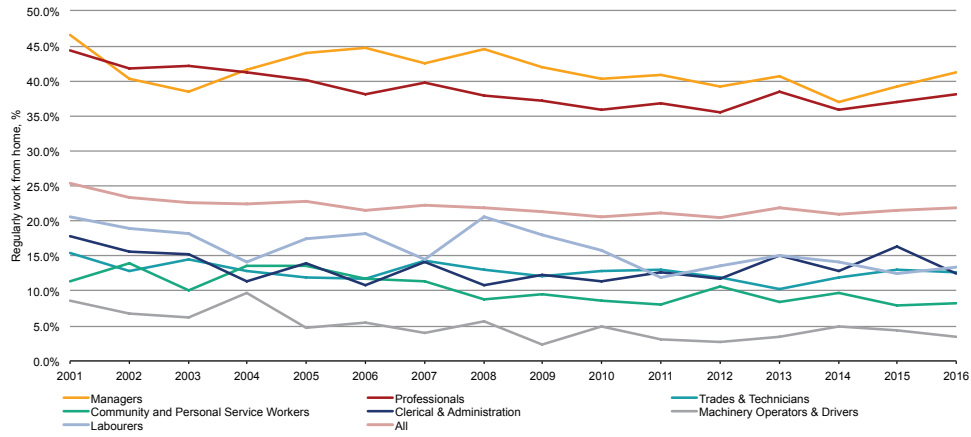


Source: Bankwest Curtin Economics Centre | Authors' calculations from HILDA Waves 2 to 16.

Regular work has decreased between 2001 and 2016 for all occupations (Figure 18). Nevertheless, it remains highly prevalent among managers and professionals – well above the average rates of working from home across occupations. In 2016, 41.2 per cent of managers and 38.2 per cent of professionals regularly worked at home. Increases in the professional and managerial workforce will likely see rates of working from home rise over the coming years. Largely owing to the nature of the occupation, machinery operators and drivers have been the least likely to work from home throughout the entire period from 2001 to 2016.

Increases in the professional and managerial workforce will likely see rates of working from home rise over the coming years.

Figure 18 Regularly work from home, major occupation group, 2001 to 2016



Source: Bankwest Curtin Economics Centre | Authors' calculations from HILDA Waves 2 to 16.

The prevalence of workers with more than 1 job has remained stable over the last 10 years at around 8%.

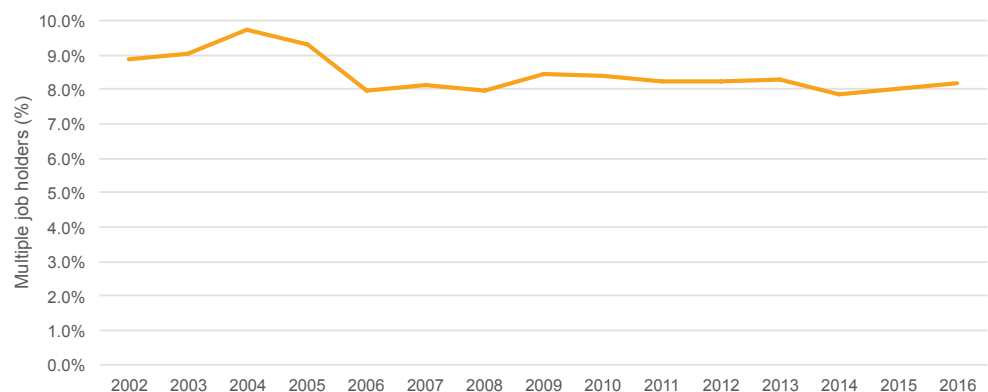
Moonlighting – are we more likely to be working multiple jobs?

The growth of the share economy and freelance platforms, together with an increase in the prevalence of part-time work would suggest that there may also be a greater likelihood for people to now work more than one job. Has the incidence of moonlighting – having two or more jobs – increased in recent years? As Figure 19 shows, in the last 10 years around 8 per cent of employed individuals have held multiple jobs, with very little change over time. Not only has this share not been growing, it has decreased slightly compared to the preceding few years.

In spite of a relatively low prevalence, moonlighting can have important implications for many workers' lives. Moonlighters may have multiple motives. Holding multiple jobs may simply be a response to not being able to secure sufficient working hours with a primary employer. If so, this may be a stressful experience and an inadequate labour market outcome. However, there may be other motives. Having multiple jobs may be a way for workers to engage in multiple activities of interest. For example, in addition to a 'day' job, a worker with a talent for singing may pursue this by performing at night or on the weekend. Moonlighting can also be a way to have a flexible working schedule, particularly for women, where balancing work and family is a central concern. While evaluating these motives are important, it is not feasible within the scope of current analysis.

The likelihood of an increase in the number of workers holding multiple jobs in the coming years is difficult to judge and may be even more challenging to capture as labour market channels become more global. With the increase in freelance work in recent times and the overall movement towards a knowledge economy, it's likely that these workers in particular will have more of an opportunity in the future to be able to undertake this type of work to complement or to some degree substitute for full-time hours.

Figure 19 Multiple job holders, 2002 to 2016



Source: Bankwest Curtin Economics Centre | Authors' calculations from HILDA Waves 2 to 16.

Will we all become freelancers? The Gig Economy

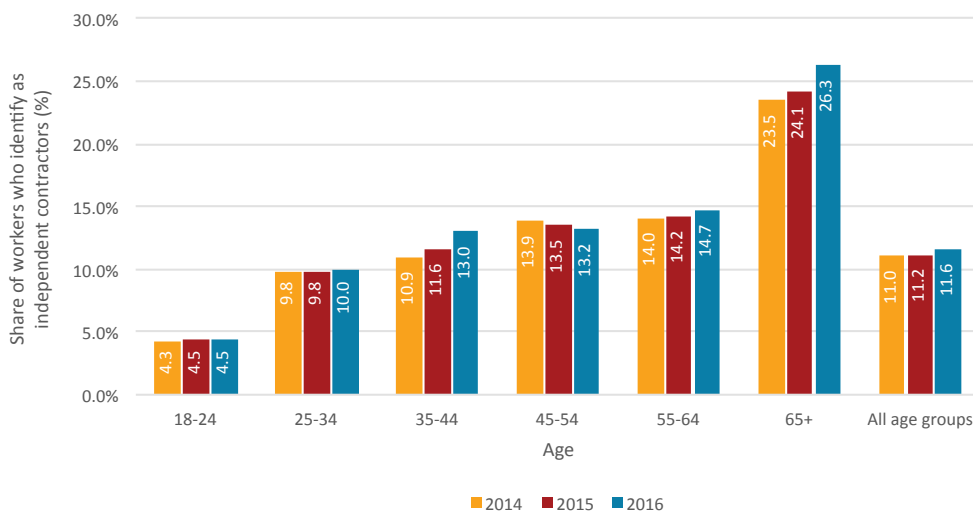
Much of the public commentary on the future of work references the rise of the Gig Economy as a signal of the changing way we work. So is freelancing the way of the future? Who are the freelancers, and what services do they offer in Australia?

A report commissioned in 2015 by Upwork estimates that around 30 per cent of the Australian workforce are doing freelance work in Australia, equating to nearly 3.7 million workers. Upwork's definition of freelancing includes independent contractors as well as 'moonlighters', workers with multiple sources of income, temporary workers and freelancing business owners¹.

According to Upwork, the independent contractor segment in their survey accounts for around 35 per cent of the Australian freelancing workforce, some 1.3 million workers. Our own estimates using information drawn from the HILDA survey suggest that around 11.6 per cent of the Australian workforce are independent contractors, equivalent to around 1,270,000 workers.

11.6% of the Australian workforce are independent contractors, equivalent to around 1,270,000 workers.

Figure 20 Share of workers who identify as independent contractors, 2014 to 2016



Source: Bankwest Curtin Economics Centre | Authors' calculations the HILDA survey, waves 14 to 16.

Figure 20 breaks this workforce segment by age, and finds a rising share of people in the 35 to 44 age range who report themselves to be independent contractors, up from 10.9 per cent of workers in 2014 to 13.0 per cent in the latest 2016 survey. There are a number of potential explanations for this finding, but one could be that more people are moving from the formal employment sector to independent employment or contract work during the middle of their working lives, perhaps motivated by the new opportunities on offer in the shared or Gig Economy.

¹ Our view is that the size of the freelancing workforce is somewhat smaller than Upwork suggests, because of issues in their definition of freelancing. One cannot say that *all* independent contractors or *all* workers with multiple incomes are necessarily freelancers. For example, around a third of workers in construction self-identify as independent contractors according to our research, but that is largely because of the nature of the construction business, with many builders are engaged by companies on project-based contract work without having a formal status as an employee. This does not then define each construction worker as a freelancer. That said, the approach Upwork takes is instructive in capturing the changing trends in employment status in Australia.

Women and younger workers are more likely to hold multiple jobs.

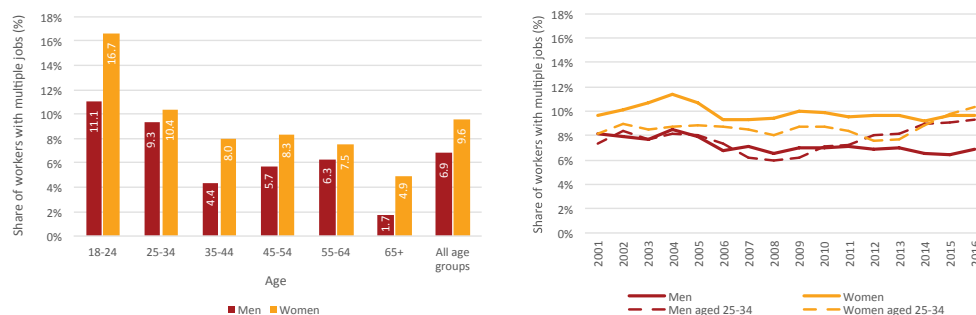
Moonlighters are typically harder to capture in official statistics, almost by definition. One working definition of moonlighting relates to workers who combine a traditional job with additional freelancing work - for example, working as an Uber driver, online data entry, web design or software development services - as a supplement to income. However, it is highly likely that official surveys suffer from incomplete reporting of instances of multiple sources of income.

In the absence of other information, and building on our earlier analysis, Figure 21 looks at the distribution of those that report multiple jobs broken down by age and gender. While many such people may be working entirely in the formal sector, some may combine a traditional job with freelance work. Women and younger workers are more likely to hold multiple jobs. For example, around 17 per cent of women aged 18 to 24 and a tenth of women aged between 25 and 34 have two or more jobs. This compares with 11 per cent and 8.6 per cent of men, respectively, at comparable ages.

The prevalence of multiple jobs has risen more steeply since 2010 among younger cohorts of workers.

Figure 21 also shows that the prevalence of multiple jobs has risen more steeply since 2010 among younger cohorts of workers - as shown by the hashed lines. This may well be a foretaste of the future for younger workers, as traditional forms of employment continue to be disrupted.

Figure 21 Share of workers with multiple jobs, by age and gender, 2014 to 2016

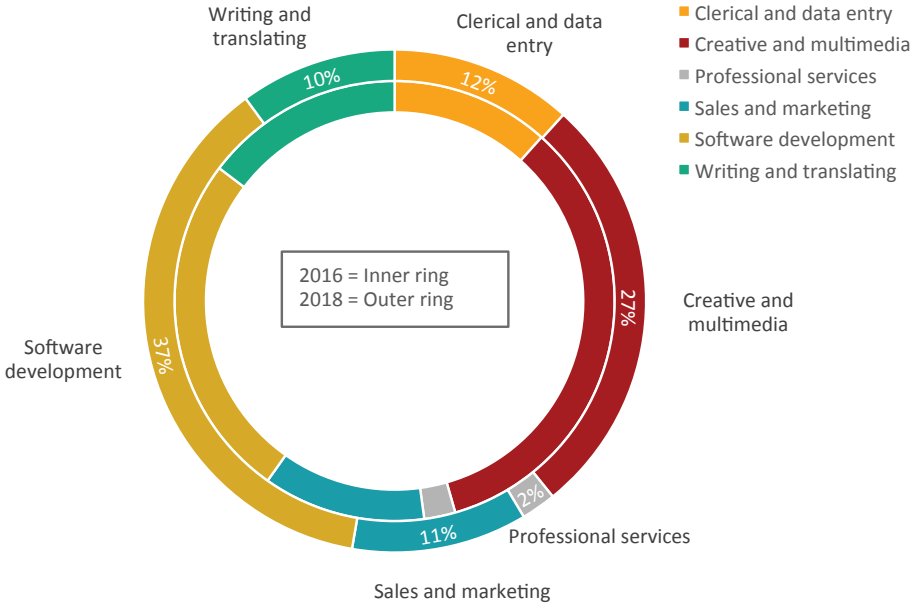


Source: Bankwest Curtin Economics Centre | Authors' calculations the HILDA survey, waves 1 to 16.

There is very little authoritative data on the size of the Gig Economy in Australia, nor the growth in the number of Australian workers who are advertising online goods and services to the global marketplace. However, the Oxford Internet Institute collect samples of data drawn from a range of major freelancing platforms - Freelancer, Guru, Mturk, Peopleperhour and Upwork - to assemble an Online Labour Index. While this data is not able to capture authentic measures of the scale of online freelancing services, however the data can be used to monitor the distribution of online services by major task.

Figure 22 reveals that software development, incorporating tasks such as programming, web design and data science, to be the largest category of online freelancing services originating in Australia, with listings rising from 26 per cent to 37 per cent of all services between 2016 and 2018. Creative and multimedia services represent 27 per cent of listings in 2018, reflecting the large demand for video, social media, art design and animation.

Figure 22 Distribution of online supply of freelancing services in Australia, by task, 2016 to 2018



Software development is the largest category of online freelancing services originating in Australia, with listings rising to 37% of all services by 2018.

Source: Bankwest Curtin Economics Centre | Authors' calculations using data from the Online Labour Index, Oxford Internet Institute.

Future implications

We are (still) a society built around work

Work is important. It provides us with most of our income, occupies a significant part of our time, provides friendships, can be a source of satisfaction or stress, can be intellectually or physically challenging – or dull and boring. Our work also forms a large part of our identity. If work changes, then we change, and society changes too.

This chapter focused on big picture trends in measures such as labour participation rates, the balance between full- and part-time work, the industrial and occupational distribution of work, and new models of employment. Some trends are long-standing, and we can be reasonably confident they will continue into the future. But other features are less certain.

Our first finding is that at an aggregate level, more of us are employed than ever before. The labour force participation rate in Australia is around 77 per cent, six percentage points above the OECD average, and has been rising for decades – primarily driven by increases in female labour force participation.

However, while participation may be increasing, the number of hours we spend at work each week has been falling overall. Full-time workers are working less – since 1999, men have reduced their weekly full-time hours by 2.7 hours per week, while women have dropped their hours by 1.6 hours per week.

Men and women converge

Labour force participation trends are not the same for men and women. The entry of women into the labour market has been a key ongoing feature of society for over 30 years, with female labour force participation rising from 40 to 60 per cent. Male participation has fallen over the same period from 80 to 70 per cent. If these trends continue – and there is no reason to suspect they won't – then there may well be a convergence between female and male labour force participation rates in the relatively near future, for the first time in our history.

However, the overall pattern of participation by men and women is not the same. Almost half (47%) of women work part-time, compared to less than one in five (18%) of men. But things are changing even on this front, and the likelihood that they will completely converge is slim, at least in the short to medium term.

Part-time work: the new normal?

Part-time work has doubled from 15 per cent of all employees in 1978 to 31 per cent in 2018. This is mainly a result of women entering the workforce, but the trend is upwards for both men and women. Indeed, it is growing faster for men (from 5% to 18% since 1978).

Traditionally, the main reason women worked part-time was because of caring duties, and while this is still the case, its extent is declining (35% in 2002, 30% in 2015). For men, studying was the main reason for working part-time, but that too has dropped by around five percentage points. For both sexes, a preference for part-time work has been increasing as the main reason given for why they are working part-time rather

than full-time. Not being able to find full-time work is not a significant factor. Instead, it appears that people are finding the flexibility afforded by part-time work, and the opportunity it provides for leisure and other pursuits, may be more important.

Female dominated sectors are growing faster

A key reason for the contrasting trends in men's and women's employment is to be found in Australia's shift to a service economy. In essence, industry sectors in which women dominate are growing fastest, while the situation for men is more mixed.

Health Care and Social Assistance is the biggest growth sector, reflecting our ageing population and the growing demand for childcare, aged care and disability services. Education, Public Administration and Other Services have also grown rapidly. Combined, these sectors added almost 800,000 jobs between 2006 and 2016 – and just under 75 per cent of these went to women.

By contrast, male dominated industries had contrasting fortunes. Manufacturing continued its long-term slide and lost 270,000 jobs (almost 80% of whom were men), but this was balanced out by growth in Construction, Mining and Utilities, which added around 300,000 jobs (over 90% men). But this only means male-dominated industries stood still overall, while female-dominated industries grew substantially.

Further, Construction and Mining are also subject to greater uncertainty, relying on the state of the economy and the level of government infrastructure spending, whereas the care sector is likely to continue to grow irrespective of the economy, as demand for these services grows.

The impact of automation is also likely to be greater in Mining, making men potentially more vulnerable in the labour market. This makes the issue of the potential for Australia to grow its own advanced manufacturing and ICT-based industries even more important.

Rise of the professionals

Occupational changes largely reflect industry changes. There is evidence of a fall in traditional manual occupations such as technicians and trades, labourers and machinery operators and drivers. Employment of personal assistants and secretaries has also dropped dramatically. The big winners over the past twenty years have been professionals, who now comprise the largest occupational grouping, at almost 24 per cent. They have overtaken trades and technicians, who dropped from 17.8 per cent to 14.4 per cent over the same period.

Job polarisation?

One of the primary concerns of what the future of work will look like, is the hollowing out of medium-skilled workers. While there has been a decrease in predominately medium-skilled occupations over time, such as technicians and trade workers, the rapid growth in community and personal service workers (a combination of low-medium skilled workers) is likely to go some way towards narrowing the division between high and low-medium skilled workers. However, the gendered nature of changes in medium-skilled workers needs to be considered, with far more women occupying community and personal service worker jobs than men.

The Gig Economy and more flexible working patterns

The gig or freelance economy has received a large amount of attention, but there is an absence of compelling evidence on the size of the freelance sector. Recent estimates from Upwork suggesting that 30 per cent of Australian workers are freelancing are likely to overstate the scale of the market. The prevalence of independent contractors - some 1.2 million workers nationally on latest estimates - has grown among younger cohorts, but is an imperfect proxy for freelancing, and likely reflects more the greater demand for outsourcing and contract work by Australian businesses.

Similarly, working from home and multiple job holdings - two measures that may offer some signals of a growing freelancing sector - have not increased substantially. Women are more likely to hold multiple jobs, as are younger workers, but less than 1 in 10 workers overall are in this position. Yet anecdotes of these forms of work abound, and it is unclear whether it is a case of statistics failing to catch up with reality or whether Australia is yet to really experience an increase in new forms of employment. There is also a lack of good research on the extent to which the boundaries between 'work' and 'home' are being blurred through the rapid adoption of smart phones and social media. This reinforces the need for time-use and other surveys to be undertaken and for more use of data analytics in order to find out what is really happening.

Quality

of jobs

Introduction

Given that work is so central to society, making it a positive factor in people's lives is important. We should aim for a higher goal than simply regarding 'any job is better than no job at all'. Ideally, the labour market should provide stable, secure and rewarding employment while allowing for work-life balance, a sense of control over one's work schedule and a decent safety net in terms of employment protections in case of unforeseen problems such as illness and injury.

Much of the discussion about the future of work centres on fears that jobs are becoming more precarious, with inferior working conditions, and that work may be less satisfying. In addition, there is a growing concern about wages, with the past few years showing signs of stagnation in remuneration despite relatively low unemployment rates.

What are the consequences of recent changes in the way work is organised? And what are the associated changes in economic and non-economic job rewards across different working arrangements? This chapter assesses the extent to which work has become more precarious by nature, the degree to which we are happy and satisfied in our jobs and how well we can expect to be paid in the future.

Is work becoming more precarious?

Patterns of employment in Australia have changed demonstrably over time, especially in the shift from full-time to part-time work, in the balance between women and men in labour force participation and hours of work, and in the type of occupations that we are more or less likely to work in.

The extent to which these labour market trends are motivated by workers' own preferences, or factors outside worker's control. Whatever drives such changes, stable and secure employment remains the goal for Australian workers. However, for many, their employment situation falls short of this ideal. Insecure job characteristics, and inferior or challenging working conditions compromise peoples' satisfaction with their employment situation and their overall living standard.

One of the greatest concerns in projecting forward to the labour market of the future, is that it is capable of meeting workers' aspirations for stable, secure and rewarding employment at their preferred hours and accompanied by good pay.

Precarious employment is an important concern for government, industry and community sectors in the workplace of the future. The concept is a multidimensional one that seeks to encapsulate not only the inadequacy of working hours and employment benefits, but other dimensions such as insecurity of the job itself or a lack of employment rights and entitlements.

The research presented in the next section represents the construction of a composite index of precariousness as a single barometer of the changing nature of the quality of work.

Dimensions of precarious employment

There is no consensus on the exact definition of job precariousness, but the majority of studies seeking to capture the concept share common aspects and attributes of employment quality. Some attributes are linked and are affected by labour market institutions and legal settings within country jurisdictions. From a review of the literature, insecure or precarious employment² can prospectively be summarised according to three broad domains: a) employment that has a short time horizon and limited duration; b) a lack of control over working conditions, and; c) a lack of employment protections.

Each domain of precariousness can be manifested in a number of individual attribute indicators, each of which prospectively contribute to workers' feelings of uncertainty or dissatisfaction with their employment situation.

In building a picture of workers' sense of precariousness in employment, we take advantage of the Household Income and Labour Dynamics in Australia (HILDA) survey. The HILDA survey is a longitudinal panel study that captures job attributes, labour force circumstances and socioeconomic characteristics of a large and representative panel of Australian workers. We follow the three broad domains of precariousness that stand out in existing literature and select indicators that are likely to capture these dimensions of precariousness (Table 1).

Table 1 Dimensions of precarious employment

Job insecurity	Lack of control	Working conditions
Self-reported probability of losing job in the next 12 months	Irregularity of work schedule	Lack of availability of family/compassionate leave
Self-reported dissatisfaction with job security	Difficulty in balancing work and non-work commitments	Lack of availability of sick leave
Casual or short-term contract	Preference for more/fewer hours	No extra leave entitlements
No union membership		

Notes: Each component indicator of job insecurity, lack of control and working conditions listed in the table is observed in the Household Income and Labour Dynamics in Australia (HILDA) survey.

Source: Bankwest Curtin Economics Centre | Household Income and Labour Dynamics in Australia (HILDA) survey.

² See Burgess & Campbell, 1998; Tweedie, 2013; Standing, 2016; or Vosko, MacDonald, & Campbell, 2009 for further discussion of the precariousness concept.

Indicators of precarious employment

Trends in the underlying indicators included in the precarious employment index can help identify areas of employment that have been improving or worsening over time and hence influencing the overall level of precariousness or stability in the labour market and across industries and occupations. These trends are reported for both men and women between 2003 and 2016 (Figure 20).

Measures of job security - self-reported probability of losing a job, and dissatisfaction with job security, have been increasing since the economic downturn. Dissatisfaction with job security has tracked relatively closely for both men and women over time (panel B), however, a consistent gap between male and female workers in their self-reported probability of losing a job is evident (panel A). Currently, men report an average probability of losing their job of 13 per cent and women around 11 per cent, with the gap between men and women widening on latest data. The proportion of workers that are dissatisfaction with their job security has been rising in recent years, but remains at below that of 2003 levels, for both men and women.

Another indicator of job security - the proportion of workers employed on a casual basis has also been increasing since the global financial crisis (panel G). Among male workers, casual work is now at levels similar to 2003, with around 14 per cent of workers employed on a casual basis. And while women have much higher rates of casual work, this has been on a downward trajectory over time, from 24 per cent in 2003 to around 18 per cent in 2016. This downward trajectory has served to narrow the gap between men and women from around 10 percentage points to 4 percentage points.

Indicators that are included in the level of control a worker has over their employment - irregularity of work schedule, difficulty in balancing work and non-work commitments and a preference for more or fewer hours have seen mixed patterns between 2003 and 2016. The proportion of workers that are dissatisfied with work-life balance has decreased for both men and women over time, and has now converged, with men as likely to be dissatisfied with their work-life balance as women are (panel C).

Likely linked to lower dissatisfaction levels with work-life balance, the proportion of workers that are working longer hours than desired has been improving between 2003 and 2016, with men and women tracking closely together across this period (panel F). In 2003, more than 35 per cent of men were working longer hours than desired - this has now decreased to around 25 per cent in 2016. For women, the proportion working longer hours has fallen more gradually, from around 27 per cent to 25 per cent across the same period. At the same time, those working fewer hours than desired has also been increasing for both men and women since 2008-09 (panel E). Workers that have irregular work schedules have been increasing in the post-GFC period, with women slightly more likely to be working on a irregular work schedule than men.

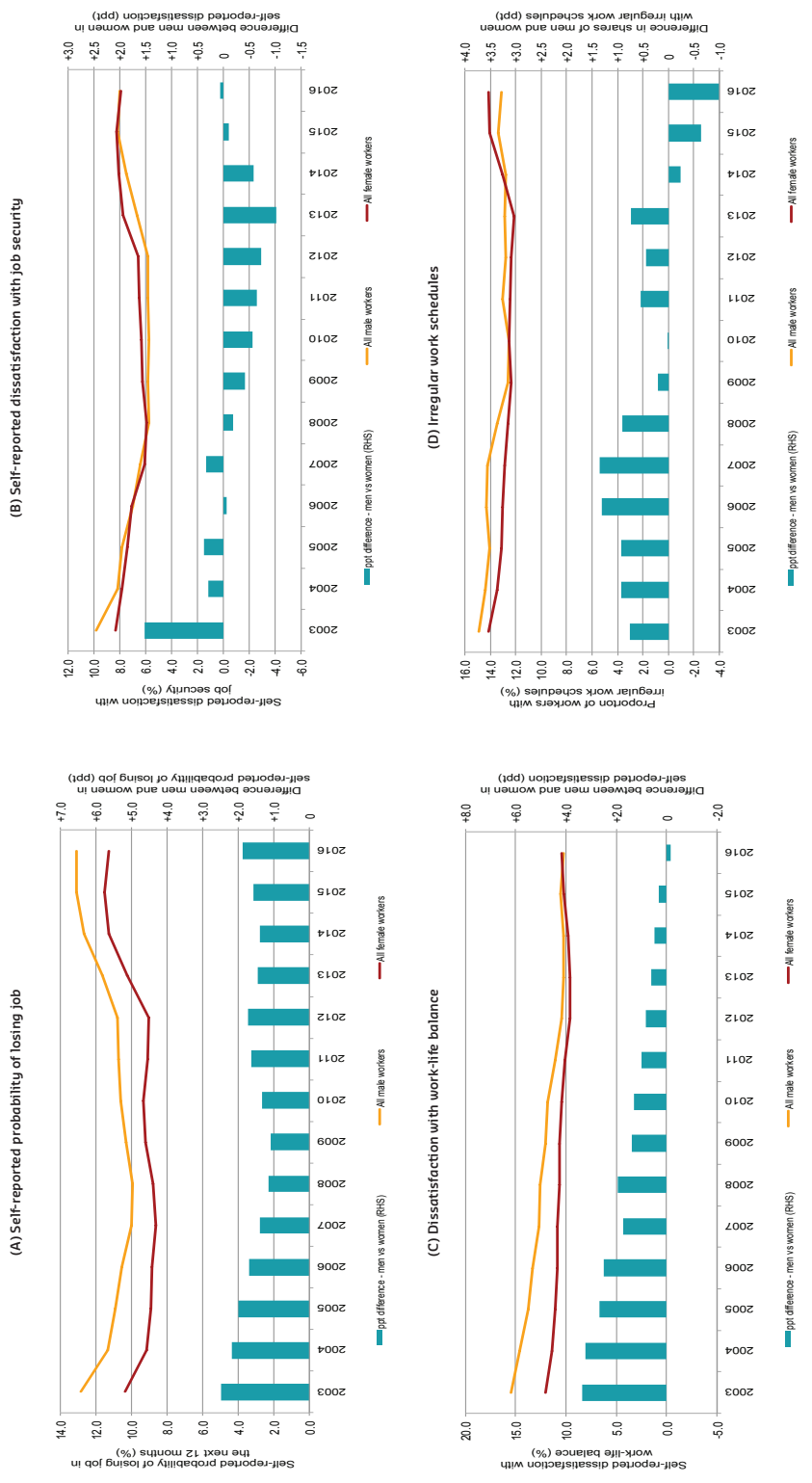
The proportion of workers with no access to sick or holiday leave has followed a similar pattern to those working on a casual contract, with slightly higher proportions registered for both men and women (panel H).

Men are more likely to report a higher probability of losing their job than women.

The gap between male and female casual workers has been closing over time.

In 2003, more than 35% of men were working longer hours than desired - this has now decreased to around 25% in 2016.

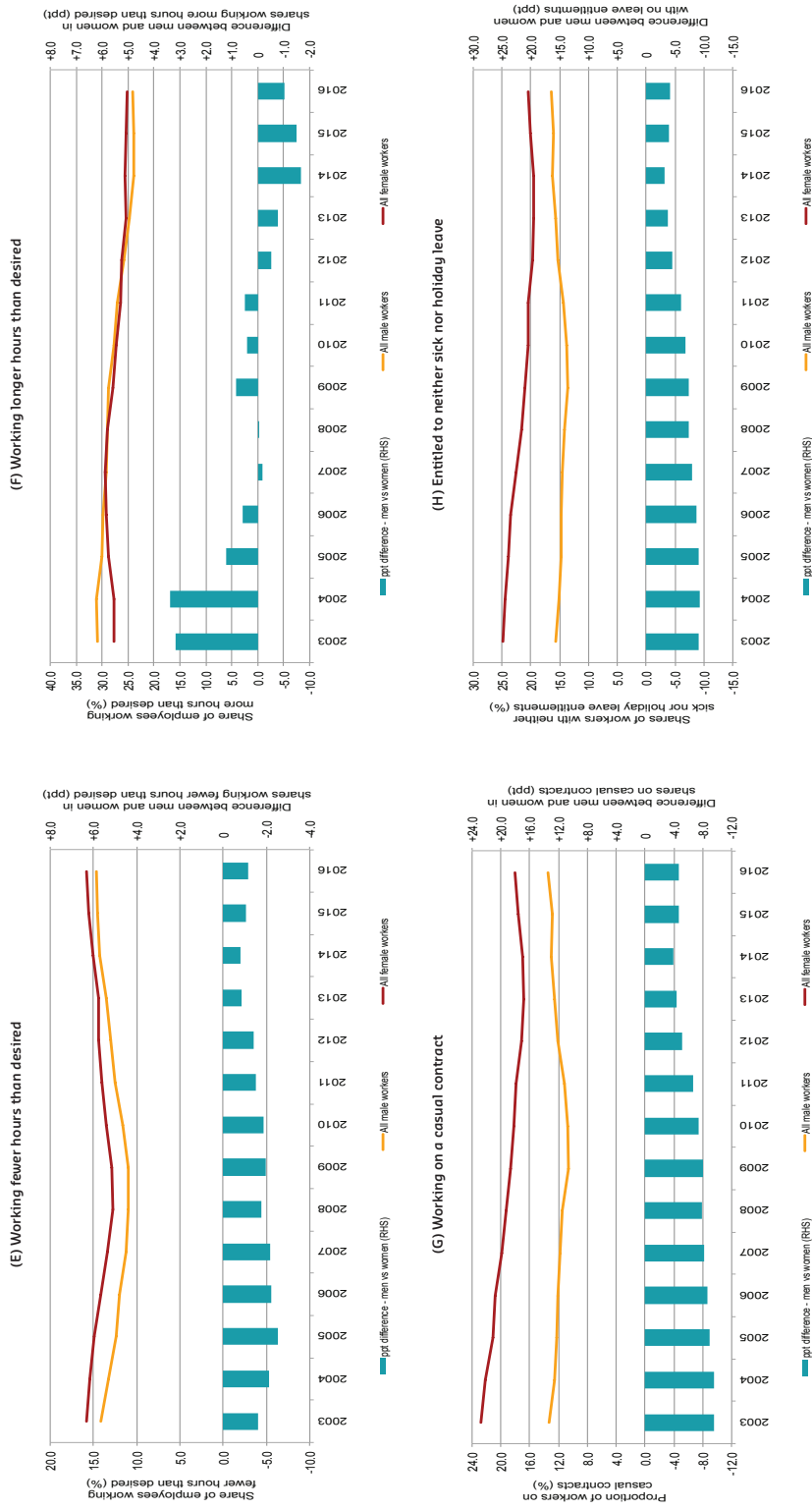
Figure 23 Dimensions of precarious employment, by gender, 2003 to 2016



Notes: Each series is calculated using samples of workers drawn from Waves 1 to 16 of the Household Income and Labour Dynamics in Australia (HILDA) survey. Series (a) shows the self-reported probabilities that workers have of losing their jobs within 12 months; series (b) shows the shares of workers who score at least 6 in the level of dissatisfaction with their security of employment on a scale of 0 (totally dissatisfied) to 10 (totally satisfied); series (c) reports the shares of workers who score at least 6 (on a scale of 0 to 10) in the level of dissatisfaction with their work-life balance; series (d) reports on the proportion of workers with irregular or unpredictable working schedules; series (e) and (f) report the shares of employees working fewer or longer hours than desired; series (g) shows the shares of workers on casual contracts; and series (h) reports the share of workers who enjoy neither sick nor holiday leave entitlements.

Source: Bankwest Curtin Economics Centre | Authors' calculations from the Household Income and Labour Dynamics in Australia (HILDA) survey.

Figure 23 Dimensions of precarious employment, by gender, 2003 to 2016



Notes: Each series is calculated using samples of workers drawn from Waves 1 to 16 of the Household Income and Labour Dynamics in Australia (HILDA) survey. Series (g) shows the self-reported probabilities that workers have of losing their jobs within 12 months; series (b) shows the shares of workers who score at least 6 in the level of dissatisfaction with their security of employment on a scale of 0 (totally satisfied) to 10 (totally dissatisfied); series (c) reports the shares of workers who score at least 6 (on a scale of 0 to 10) in the level of dissatisfaction with their work-life balance; series (d) reports on the proportion of workers with irregular or unpredictable working schedules; series (e) and (f) report the shares of employees working fewer or longer hours than desired; series (g) shows the shares of workers on casual contracts; and series (h) reports the share of workers who enjoy neither sick nor holiday leave entitlements.

Source: Bankwest Curtin Economics Centre | Authors' calculations from the Household Income and Labour Dynamics in Australia (HILDA) survey.

Precarious employment: An index

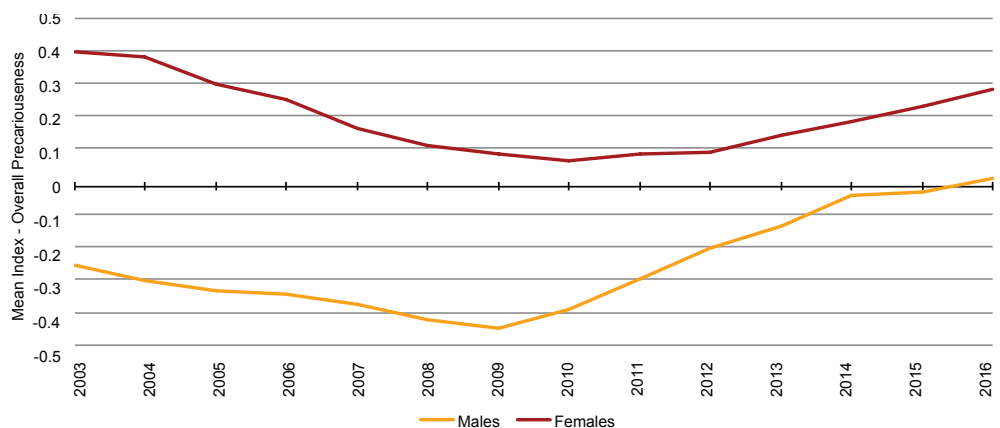
We implement a two-staged approach to construct an overall index of precarious employment in Australia. First, for each key dimension of precariousness outlined above, individual indicators are aggregated together using Principle Components Analysis (PCA). PCA is a statistical technique that aggregates a set of variables that are highly correlated. The technical detail of PCA is explained in the Glossary and technical notes.

Constructing a measure for each group, we then combine the domains into an overall index using simple summation. That is, we assume that the three domains – job insecurity, lack of control and working conditions contribute the same level of importance towards identifying the level of precariousness a worker is experiencing.

Figure 24 illustrates the constructed index of precariousness for men and women, with higher values indicating greater precarity and lower values, lower precarity. Overall, compared to men, women have consistently higher levels of precarious employment. From 2003 to 2008-09, during the mining boom, precarious employment for both genders had a decreasing trend. Since 2009, precarious employment has increased for both genders, but more rapidly for men than women. As of 2016, females' employment precariousness is almost equivalent to 2005 values, whereas for males, precarious employment has increased drastically.

Since 2009 precarious employment increased for both genders, but more rapidly for men than women.

Figure 24 Precariousness across genders, 2003 to 2016



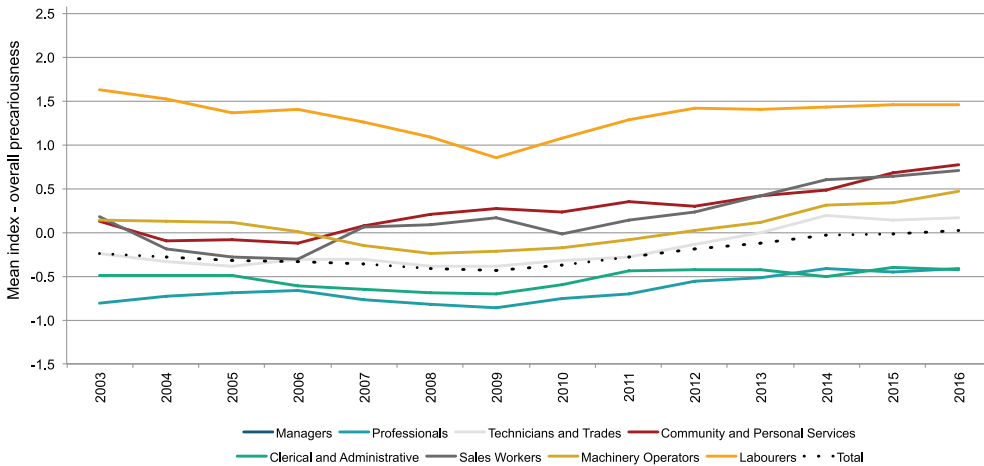
Source: Bankwest Curtin Economics Centre | Author calculation based on HILDA.

Precariousness across different occupations

Employment conditions can vary substantially across occupations, therefore in this section we look at different patterns of precariousness across major occupational groupings for both men and women. Labourers have the highest precariousness among male occupations, however their status has been more or less constant over the last fifteen years, with the exception of a noticeable decrease just prior to the onset of the global financial crisis in 2008-09 (Figure 25). The least precarious male occupation is the managerial workforce, however this has been rising in the post-GFC period. This trend is apparent across all major occupation groupings, with the exception of labourers. For some occupations, such as sales workers, community and personal service workers and machinery operators and drivers, precariousness has increased at a much faster rate than for other occupations.

Professionals and managers have the lowest level of precariousness for both genders.

Figure 25 Precarious employment among male workers, by occupation, 2003 to 2016



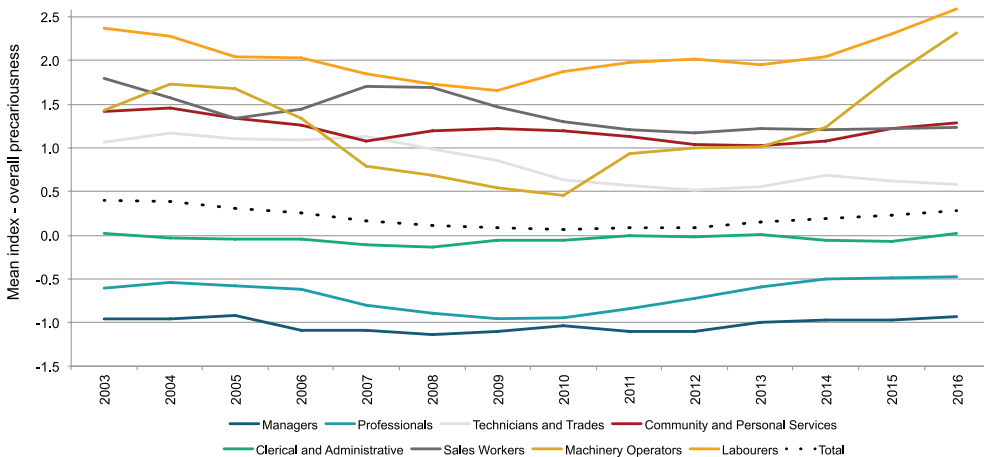
Source: Bankwest Curtin Economics Centre | Author calculation based on HILDA

Among women, female labourers also face the greatest degree of precarious employment, followed by machinery operators and drivers (Figure 26). Both occupations have seen a drastic increase in their level of precariousness over the post-GFC period. In contrast, precariousness among female managers has remained relatively stable over the last decade.

Precariousness for female and male managers differed until 2010, but has now converged and is very similar across genders. A similar trend of precariousness is seen for males and females in professional occupations.

Female sales workers, and community and personal services workers have significantly higher levels of precariousness than their male counterparts. However, the trend is different for men and women: precariousness among female sales workers has had a moderate decreasing trend in the last few years, yet precariousness for men in the same occupation has been rising rapidly since 2011. Female clerical and administrative workers have higher precariousness than their male counterparts, with the gap between both genders remaining almost the same since 2003.

Figure 26 Precarious employment among female workers, by occupation, 2003 to 2016



Source: Bankwest Curtin Economics Centre | Author calculation based on HILDA

Precarious employment: How do industries compare?

There are several factors affecting the likelihood of a worker being more or less precarious by nature, including the nature of the industry that they are working in. Certain sectors have greater exposure to economic downturns or upturns such as Manufacturing and Construction, while others may have greater propensity to be precarious by nature, such as the Hospitality industry.

The Accommodation and Food Services sector records the highest index value of precarious employment, which has also been increasing over time.

The Accommodation and Food Services sector records the highest index value of precarious employment, which has also been increasing over time. Agriculture, Forestry and Fishing records the second highest level of precariousness, however, this trend has been more or less constant over time with the exception of 2008-09.

Arts and Recreation Services, Administrative and Support Services, and Retail Trade also have relatively high levels of precarious employment, with varying patterns over time. For Arts and Recreation Services and Administrative and Support Services, precarious employment has fluctuated over time. However, for the Retail Trade sector, precarious employment decreased to its lowest level in 2009-10, before increasing again steadily through to 2015-16.

The Construction sector has had relatively low but typically always positive levels of precarious employment over the last fifteen years relative to the all industry average (zero). The level of precarious employment in the Construction sector decreased to just a fraction below the all industry average in 2009-10 and 2011-12, with the economic stimulus package targeted at the sector likely to have staved off a deterioration. Since this time, precarious employment in the Construction sector has been rising rapidly, with a slight improvement between 2013-14 and 2015-16.

Other Services and the Rental, Hiring and Real Estate sectors have mostly experienced higher levels of precarious employment compared to the industry average, in the last fifteen years.

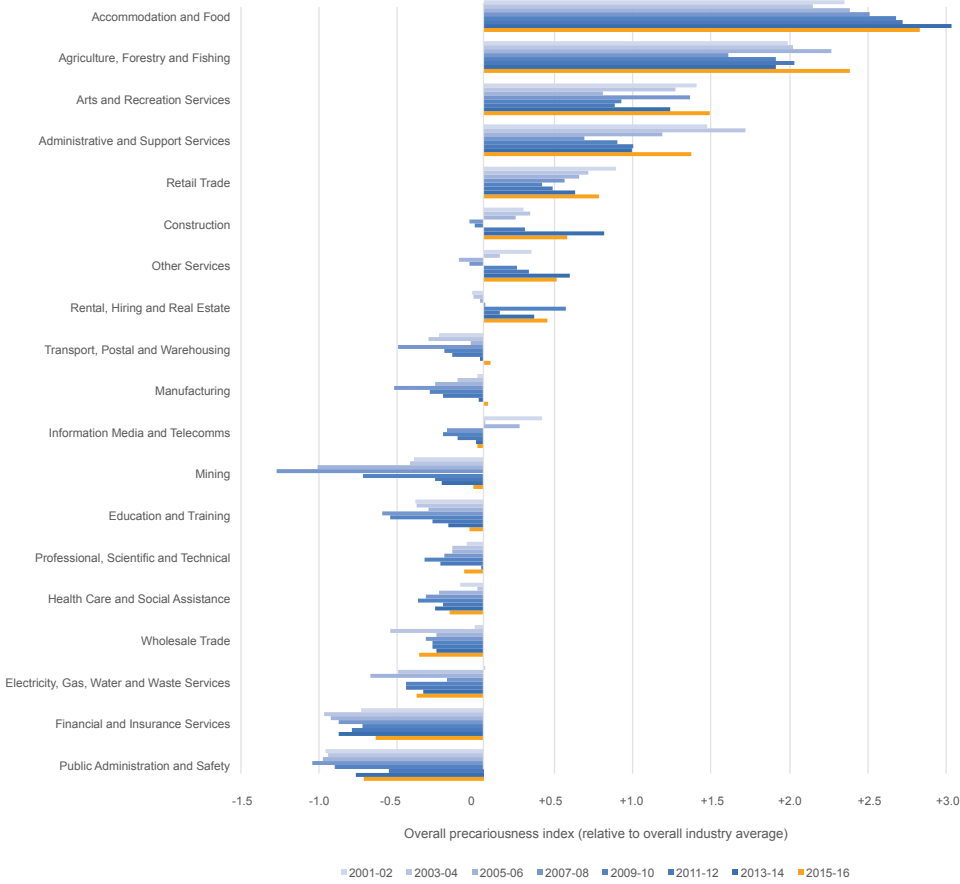
Surprisingly, the Manufacturing sector has lower levels of precarity relative to the all industry average. This pattern has been declining in the last few years and precarious employment reaching just above the all industry average on latest data – 2015-16.

Prior to the GFC the Mining sector had the most stable employment across all industries - a feature of the high demand for Mining labour as the resource boom gained momentum. In 2007-08, the level of precarious employment in the Mining sector was virtually non-existent and the furthest any industry has been from the all sector average. Since this time, employment stability in the Mining sector has declined at a faster rate than any other industry, returning close to the all industry average.

Employment stability in the Mining sector has declined at a faster rate than any other industry since the GFC.

The Finance and Insurance, Public Administration and Safety and Electricity, Gas and Water sectors all record greater employment stability levels compared to the overall industry average. These sectors have seen some deterioration in employment stability in the last two periods, but remain relatively strong employers.

Figure 27 Precarious employment, by industry, 2001-02 to 2015-16



Note: The precarious employment index is centred on the overall industry average as represented by zero.
Source: Bankwest Curtin Economics Centre | Author calculation based on HILDA.

Managers in the Accommodation and Food Services sector enjoy less stable employment than managers operating in other sectors.

Labourers working in Public Administration and Safety, Accommodation and Food Services and Agriculture have the highest levels of precarious employment across all occupations and industries.

Table 2 Job precariousness index by occupation and industry, 2015-16

	Managers	Professionals	Technicians and Trades	Community and Personal Care	Clerical and Administrative	Sales Workers	Machinery Operators	Labourers	All occupations
Accommodation and Food Services	0.15		1.25	3.73	1.13	3.67		4.22	2.70
Agriculture, Forestry and Fishing	-0.27		3.42				2.36	3.58	2.28
Arts and Recreation Services	-1.43	0.75	1.31	3.13	1.37			1.53	1.45
Administrative and Support Services	-0.08	-0.70	2.43	1.91	0.67	1.30		2.41	1.32
Retail Trade	-1.21	0.40	1.07		0.01	1.27	2.00	0.84	0.72
Construction	-1.21	-0.09	0.31		0.65		0.98	2.08	0.53
Other Services	-0.68	-0.95	-0.34	3.74	0.16			1.49	0.46
Rental, Hiring and Real Estate Services	-0.91	-0.59			0.78	0.31			0.40
Transport, Postal and Warehousing	-1.09	-0.22	0.77	-0.45	-0.25	-0.83	0.32	1.80	0.05
Manufacturing	-1.33	-0.60	0.03		-0.01	1.21	0.38	1.00	0.03
Information Media and Telecommunication	-0.92	0.36	0.34		-0.25				-0.04
Mining	-0.46	-0.33	-0.02		0.24		-0.04		-0.05
Education and Training	-0.96	-0.33	0.45	1.60	0.25			-0.25	-0.07
Professional, Scientific and Technical	-1.07	-0.22	0.40		0.74				-0.11
Health Care and Social Assistance	-1.25	-0.84	-0.54	0.60	-0.29			0.73	-0.20
Wholesale Trade	-1.21	-0.68	-0.12		-0.58	-0.70	0.65	2.44	-0.36
Electricity, Gas, Water and Waste Services	-0.85	-0.55	-0.93		0.09		0.03		-0.41
Financial and Insurance Services	-0.85	-0.61			-0.66	-1.32			-0.66
Public Administration and Safety	-1.14	-0.80	-0.88	-1.02	-0.41			4.03	-0.73
All industries	-0.99	-0.47	0.20	1.10	-0.05	1.06	0.56	1.90	0.16

Note: Cells with less than 15 observation are omitted to avoid very large standard error.
Source: Bankwest Curtin Economics Centre | Authors' calculation based on HILDA.

Discussion of the differing trends of precariousness across industries and occupations raises the question: are there particular hotspots of precarious or stable work for occupations within a particular industry? In Table 2, we intersect occupation and industries, comparing the level of precarious employment or relative stability that exists. Overall, across different industries managers have lower levels of precariousness, though industry does matter.

Managers in the Accommodation and Food Services sector enjoy less stable employment than managers operating in other sectors. Whereas, managers in the Health Care or Arts & Recreation Services are among the least precarious workers. Professional workers have greater employment stability across most industries than other occupations. However, professionals working in the Retail Trade, Information Media and Telecommunications and Arts and Recreation Services sector have less stability than their peers.

The level of employment stability enjoyed by technicians and trade workers is highly dependent on the type of sector that they are working within. Technicians and trade workers in the Agriculture and Administrative and Support sector have much higher levels of precarious employment than those working in other industries.

In sharp contrast to managers, labourers have high levels of precarious employment across all industries, with the exception of Education and Training. In particular, labourers in Public Administration and Safety as well as Accommodation and Food Services have the highest levels of precarious employment across all occupations and industries.

The Financial and Insurance sector is the only industry where all occupations are relatively stable. Conversely, all occupations (with the exception of managers) in the Art and Recreation Services and Agriculture and Forestry sectors have high levels of precarious employment.

What is driving change in precarious work?

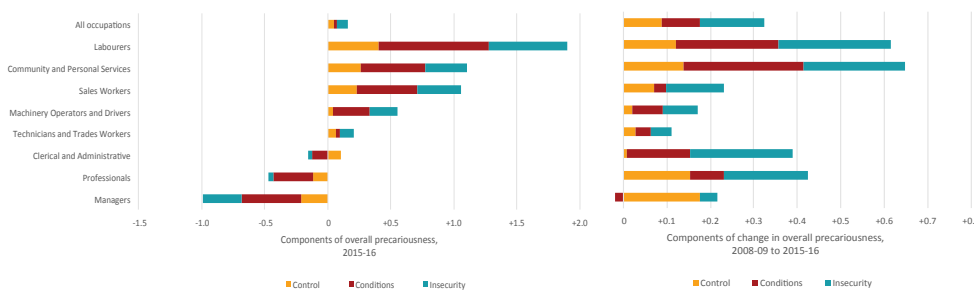
As discussed earlier, precariousness is identified as a multi-dimensional concept that envelopes different aspects of employment conditions. We have seen that the level of precarious employment differs across occupations, but which dimensions of precariousness are more or less influential in driving these differences?

The contribution of each of the three dimensions of precariousness to the increase in the overall index between 2010-11 and 2015-16 are plotted across occupations in Figure 28. Positive values reflect increases in a specific dimension resulting in greater levels of precariousness, and negative values, contribute towards lower levels of precariousness. All three dimensions of precariousness have had a negative impact on the overall index for managers, with employment conditions such as the availability of leave entitlements playing a substantial role in greater employment stability among managers relative to other occupations.

On the opposite side of the spectrum, labourers are observed to have positive values across all dimensions of precariousness, with employment conditions contributing the most to increases in precariousness, followed by employment insecurity.

Across different occupations, employment conditions have the most impact on precariousness of employment. An interesting pattern is observed in Figure 28 for clerical and administrative occupations: while control over their work positively contributes to overall levels of precariousness, job insecurity and employment conditions are serving to reduce overall precariousness.

Figure 28 Drivers of change in precariousness: by domain and occupation, 2010-11 to 2015-16



Source: Bankwest Curtin Economics Centre | Author calculation based on HILDA.

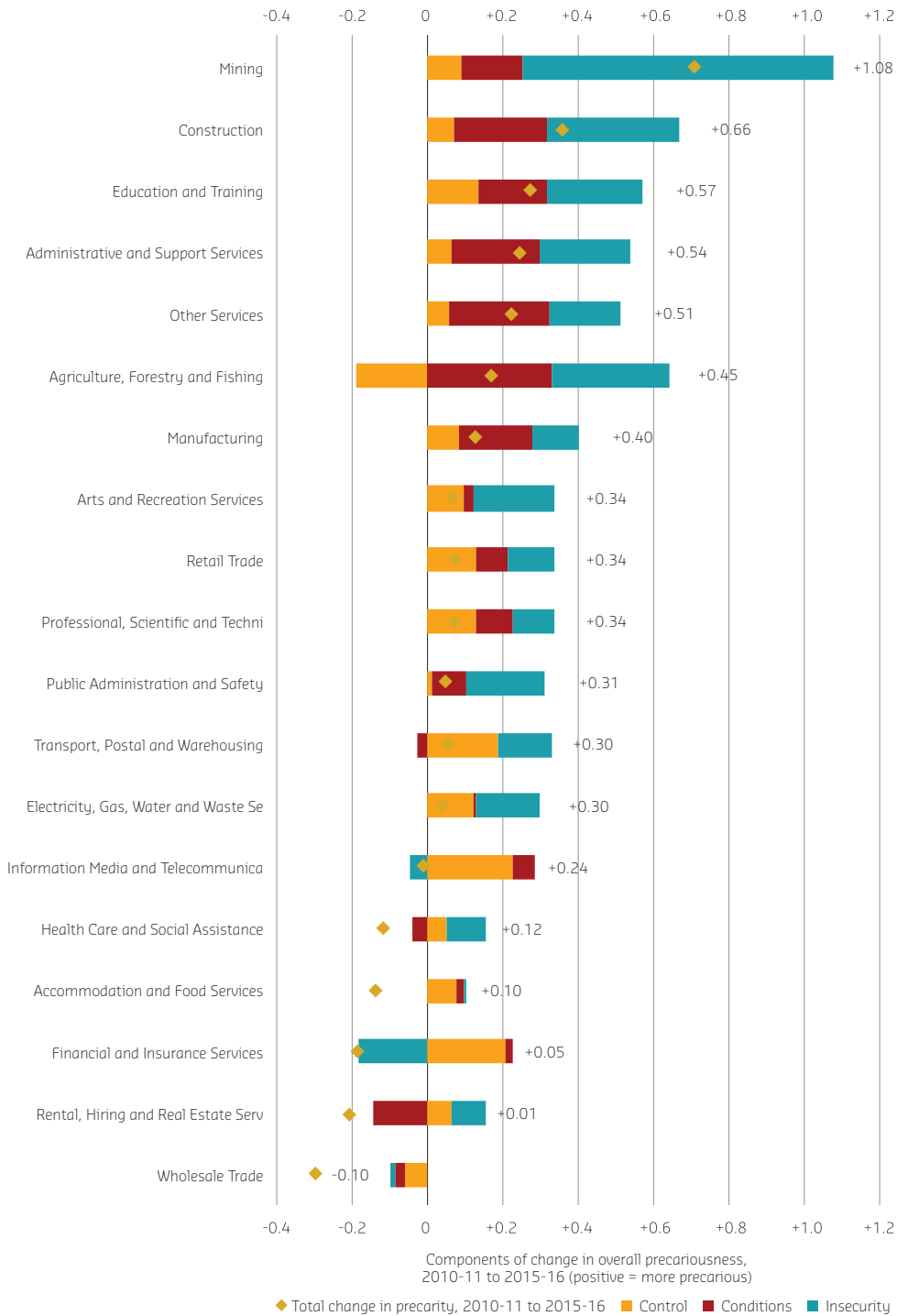
Poorer employment conditions, including lack of access to sick and family leave, drive the greater level of precariousness among labourers.

In Figure 29, we look at the contribution of the three dimensions of precariousness to the increase in the overall index between 2010-11 and 2015-16 across industries. In most industries, at least some dimensions of precariousness have had a positive contribution towards the overall index. However, the extent of this contribution varied.

Mining leads the list with all three dimensions of precariousness having negatively impacted the overall index in this industry. The dimension that had the most impact on precariousness in mining is employment security, likely caused by the downturn in the industry.

In other industries, we see both negative and positive contributions of various dimensions of precariousness towards the overall index. In Agriculture, Forestry and Fishing, for example, alongside the positive impact of employment conditions and insecurity on overall precariousness, we see the control over working schedules and hours contributing towards lower levels of precariousness. Similarly, in Financial and Insurance Services, control and conditions contributed towards higher levels of precariousness, while employment insecurity served to lower it.

Figure 29 Drivers of change in precariousness: by domain and industry, 2010-11 to 2015-16



Source: Bankwest Curtin Economics Centre | Author calculation based on HILDA.

Workplace satisfaction & wellbeing

Much of the rhetoric around the future of work has concentrated on the questions – ‘will we have a job?’ and ‘what type of job will we be doing?’. Less attention is paid to what is likely the more important question – ‘will we be happy and healthy in our jobs?’.

A happy workplace where people feel valued can increase productivity and reduce the amount of human resources dedicated to resolve workplace grievances. Greater satisfaction and happiness at work has also been shown to have a number of positive relationships with business performance. Organisations with happy workers tend to have lower levels of absenteeism and staff turnover (Kristensen & Westergaard-Nielsen, 2004). Happier workers and workplaces also deliver higher levels of productivity and are often more innovative (Oswald *et al.*, 2015; Iaffaldano & Muchinsky, 1985).

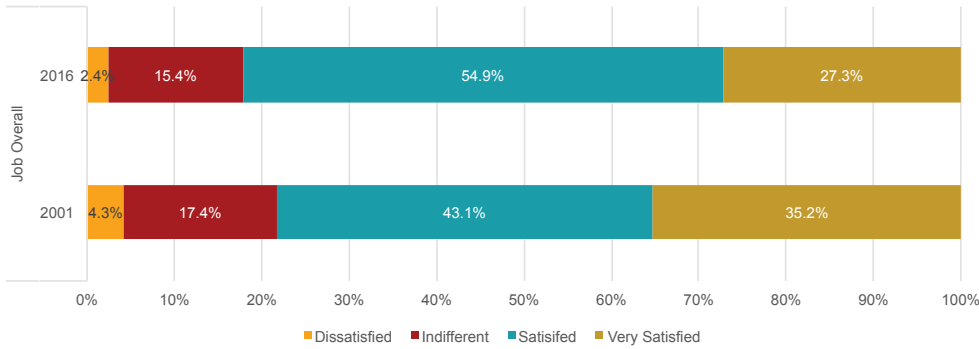
Given the amount of time spent at work, the standard of living and sense of identity and belonging that a job can afford us, happiness at work is also closely linked to overall life satisfaction, and more so for men than women (Dockery, 2003). Those that find it difficult in the labour market are more likely to have lower levels of life satisfaction than those that are gainfully employed. In our workplaces we are also often able to access basic needs that are intrinsic to our overall wellbeing and level of satisfaction or happiness. These needs include a sense of competency, a sense of autonomy and a sense of relatedness (Deci & Ryan, 2008). If all three are being met we are likely to feel far better about ourselves overall, and have increased motivation and engagement in our daily tasks – including work.

The importance of creating future workplaces that are ‘happy and healthy’ are clear. Using data from 16 waves of HILDA, we examine various aspects of job satisfaction, how these have changed over time and how this varies by the types of jobs we do and are likely to be more engaged in, in the future. We explore what type of job characteristics are likely to make us happier in the workplace and which occupations have the highest hopes for their future job prospects.

In the last 15 years we have seen a decrease in the share of workers who are dissatisfied with their job and an overall increase in job satisfaction, but fewer of us are very satisfied with our jobs (Figure 30). In 2016, only 2.4 per cent of individuals reported being dissatisfied with their job overall – a decrease of nearly 2 percentage points since 2001. Together with a decrease in the share of indifferent workers, this has resulted in a higher share of satisfied and very satisfied workers (78.3% in 2001 to 82.2% in 2016). However, there has been a decrease in workers reporting they are very satisfied with their job, with only 27.3 per cent of workers in 2016 indicating they were very satisfied with their job – a decrease from 35.2 per cent in 2001.

A higher share of workers are satisfied with their jobs now compared to 15 years ago, however the share of very satisfied workers has decreased.

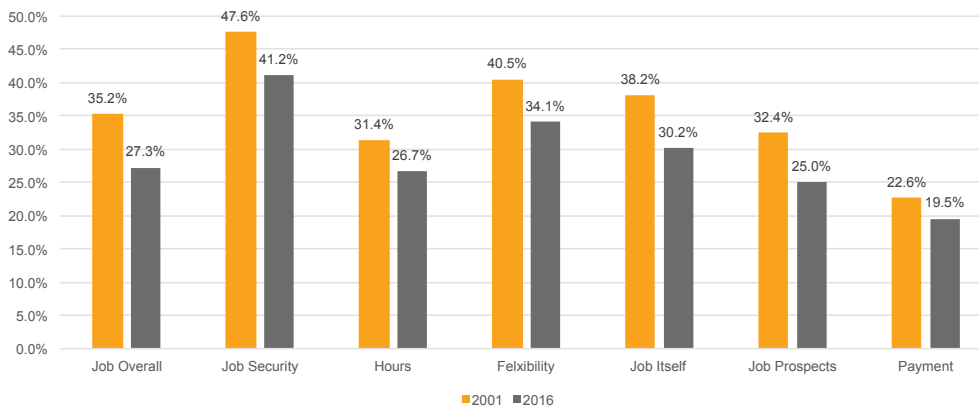
Figure 30 Australian's satisfaction with work overall, 2001 and 2016



Source: Bankwest Curtin Economics Centre | Authors' calculations from HILDA Waves 1 to 16.

The proportion of workers reporting being 'very satisfied' has declined across all job aspects (Figure 31). The biggest decrease has been for the job overall – down by 8 percentage points between 2001 and 2016. This is followed by job security – down 6.4 percentage points. Despite flatter wage growth in recent times, the proportion of workers reporting being very satisfied with pay has only fallen by around 3 percentage points – from 22.6 to 19.5 per cent over the last fifteen years. However, those reporting being very satisfied with their pay are starting from a much lower base than other job aspects.

Figure 31 Workers reporting being very satisfied with different job aspects, 2001 and 2016



Source: Bankwest Curtin Economics Centre | Authors' calculations from HILDA Waves 1 to 16.

Despite flatter wage growth, the share of workers reporting being very satisfied with pay has only fallen by around 3 percentage points – from 22.6 to 19.5%.

Overall job satisfaction is the highest among managers and the lowest among machinery operators and drivers.

What type of job will make me happy?

At times we may not have much choice over what we do, and many of us will fall into jobs and career paths. And at different times in our lives, we may be seeking different things in a job. We may want higher pay, or greater work-life balance, and we may also want to work with people that inspire and encourage us. Knowing what job types are associated with higher job satisfaction in various domains can help with these choices.

Looking at the major occupational groupings, our analysis shows that in 2016, overall job satisfaction was highest among managers and lowest among machinery operators and drivers (Figure 32). However, workers across occupations were more satisfied with some aspects of their job than others.

Not only do managers rank the highest in overall job satisfaction, they are at least as satisfied as workers from other occupations across most domains. A notable exception is satisfaction with hours worked, where manager satisfaction lags behind those in several other occupations, which is unsurprising given the long work hours that go hand in hand with managerial positions. However, managers' satisfaction with hours worked has been on the rise in recent years. While job security has declined in recent years, managers report being highly satisfied with their job security. Satisfaction with the job itself and the prospect that it offers appear to be among other significant drivers of managerial job satisfaction.

A professional is a more fulfilling career for those who prioritise working hours. Professionals report higher levels of satisfaction with hours compared to managers and indicate they are also rather happy about pay, being the second happiest group of workers in this domain after managers. Like managers, professionals report relatively high levels of satisfaction with the job itself and their job security, although satisfaction with job security has dropped over the years and is currently below the average reported in other occupations, including community and personal service workers and clerical and administrative workers, as well as managers.

Another group of workers consistently reporting high levels of overall job satisfaction from 2002 to 2016 are community and personal service workers. Like managers and professionals, community and personal service workers report being satisfied with the job itself, however unlike the other two groups, their satisfaction with job security is relatively low, as is their satisfaction with pay and job flexibility.

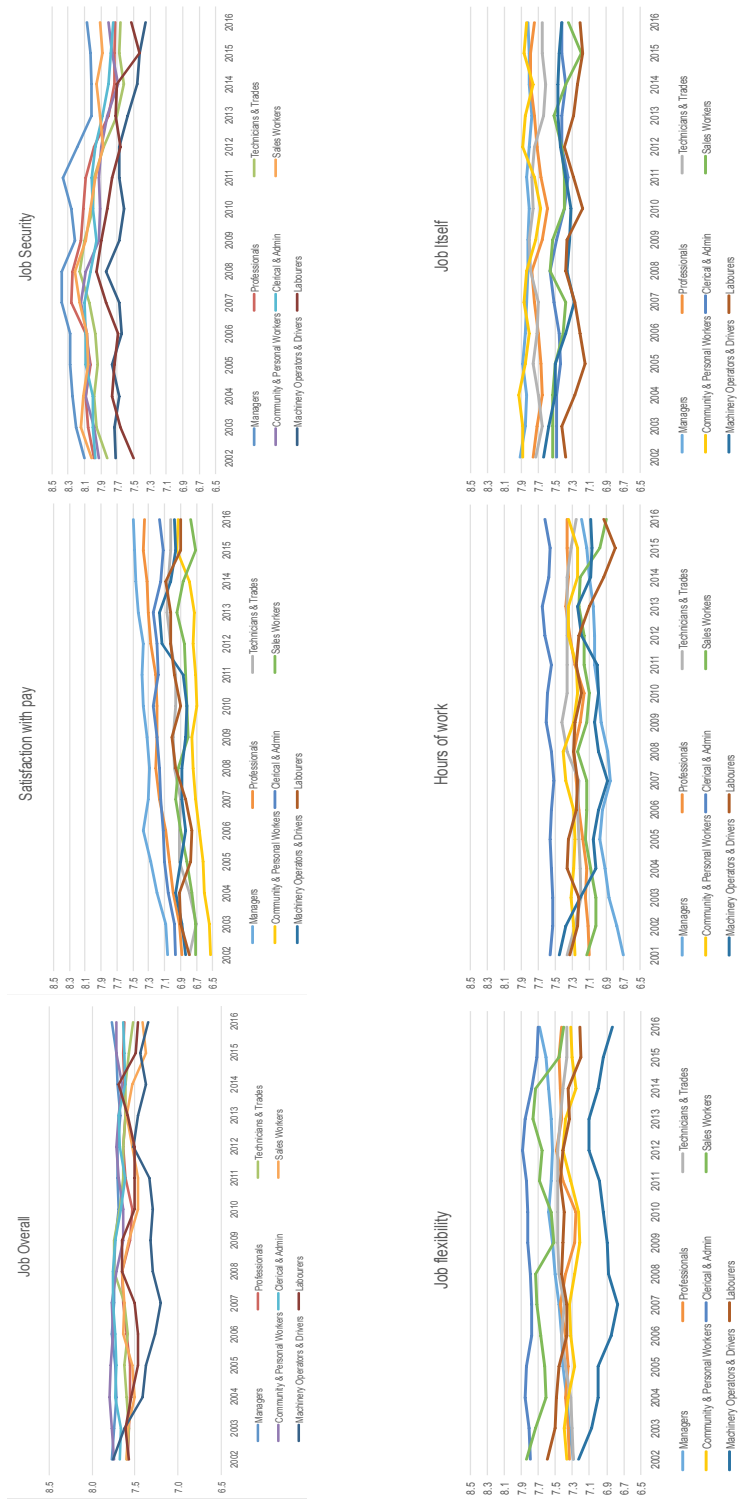
In contrast, satisfaction with pay and job flexibility is relatively high for another predominantly medium-skilled occupation - clerical and administrative workers. This group of workers is also particularly happy with hours worked, being the most satisfied of workers across all occupations for this domain. In contrast to community and personal service workers, clerical and administrative workers are not as satisfied with the job itself, and satisfaction with job security is also relatively low.

Overall levels of job satisfaction are relatively low among predominately lower-skilled workers, such as sales workers, machinery operators and drivers, and labourers. These three occupations report the lowest levels of satisfaction with job prospects, along with relatively low satisfaction with hours worked. Machinery operators and drivers reported the lowest levels of overall job satisfaction in 2016, following a steady decline over the past years.

The nature and job security of clerical and administrative jobs may not be particularly rewarding, but they offer the flexibility and hours that makes workers happy.

Workers in low-skilled occupations report low levels of satisfaction with their job security.

Figure 32 Average satisfaction with different job aspects by occupation, 2001 to 2016



Source: Bankwest Curtin Economics Centre | Authors' calculations from HILDA Waves 1 to 16.

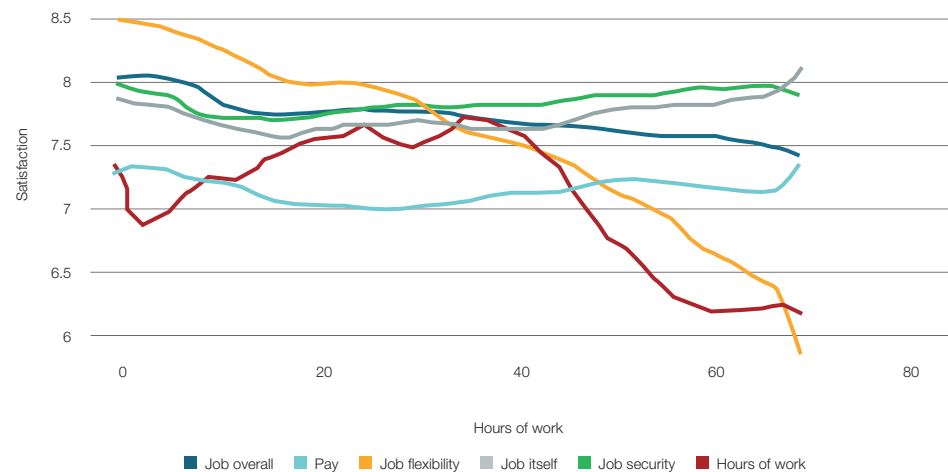
Overall job satisfaction is the highest for workers who work just a few hours a week.

Work fewer hours

Job satisfaction overall is the highest for workers who work just a few hours each week. As working hours increase, the level of overall job satisfaction decreases from an average of 8 down to 7.5 (Figure 33). On the other hand, satisfaction with hours of work increases as hours increase – but only to a point, plummeting after around 38 hours per week. Working long hours is often at the cost of having the flexibility to do other things in life and we can see a systematic decrease in satisfaction with job flexibility as weekly hours of work increase.

Working long hours may pay off in some respects, but only to an extent. Satisfaction with pay doesn't improve significantly if you work longer hours each week. We see gradual increases in the levels of satisfaction with the job itself and job security for those who work more than 20 hours a week, but there is likely to be a trade-off between satisfaction between these job aspects and job flexibility. It is likely that there is a two-way relationship between satisfaction with the job itself and hours worked: those who like their job may choose to spend more time doing it. Long working hours are also likely to be associated with more permanent full-time working arrangements, thus the positive link with satisfaction with job security.

Figure 33 Satisfaction with job aspects and weekly hours of work



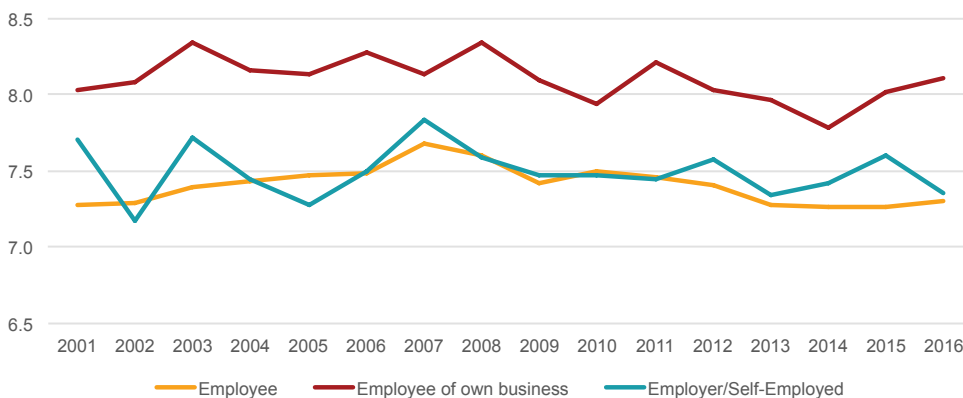
Source: Bankwest Curtin Economics Centre | Authors' calculations from HILDA Waves 1 to 16.

Work for yourself, at home and on a more permanent basis if you can...

Employees of their own business are significantly happier than those that are self-employed, employers or employees (Figure 34). This may be a reflection of the fact that these workers have greater control over what they do and how and when they do it. Following periods of a decrease after the GFC, satisfaction of this group of workers has started to increase again in the last few years.

Job satisfaction levels of employees and of employers/self-employed were at similar levels in 2016. Job satisfaction of employees has followed a rather smooth line over time, increasing throughout the periods leading the GFC and declining since. As a result, there is no difference in job satisfaction of this group between now and 15 years ago. Employers/self employed, on the other hand, had higher levels of job satisfaction 15 years ago than they do now.

Figure 34 Satisfaction and employer status, 2001 to 2016



Source: Bankwest Curtin Economics Centre | Authors' calculations from HILDA Waves 1 to 16.

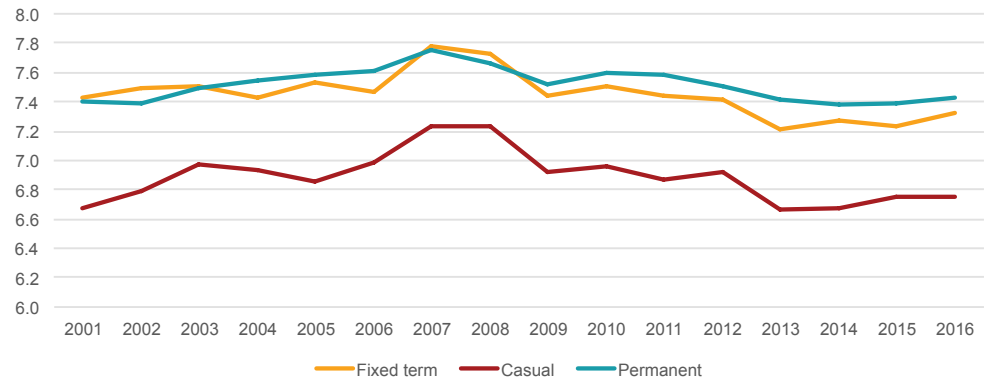
Job satisfaction varies depending on the type of one's contract (Figure 35). Casual workers are significantly less satisfied than those on permanent and fixed term contracts. This is likely related to lower levels of job security and the type of work that casual workers are engaged in – factors that may be less relevant for workers in other contractual arrangements. The level of job satisfaction among workers with fixed term and permanent jobs follow a similar pattern, with higher levels observed among permanent workers in the most recent years.

Employees of own business are significantly happier than other workers.

Casual workers are much less satisfied with their jobs than those with permanent and fixed term contracts.

Workers who regularly work from home are on average more satisfied with their work than those who don't.

Figure 35 Satisfaction and contract type, 2001 to 2016

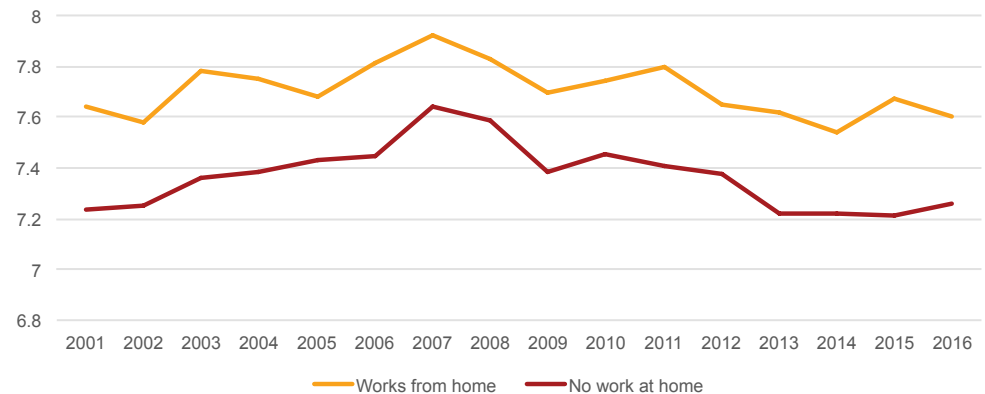


Source: Bankwest Curtin Economics Centre | Authors' calculations from HILDA Waves 1 to 16.

Working from home has many potential benefits. It can offer the flexibility that workers look for in their jobs. Working from home can also save time commuting back and forth each day, boosting productivity. It can also be costly in some respects, however. Those who work from home may lack the social and communal aspects of workplaces. It can also have implications for home lives, extending to nights and weekends.

In spite of these potential drawbacks, workers who regularly work from home are on average more satisfied with their job overall than those who do not. Job satisfaction patterns between the two groups have followed largely similar trajectories throughout most of the past 15 years, with the gap between the two groups narrowing between 2009 and widening again in the most recent period, 2016.

Figure 36 Satisfaction and working from home, 2001 to 2016

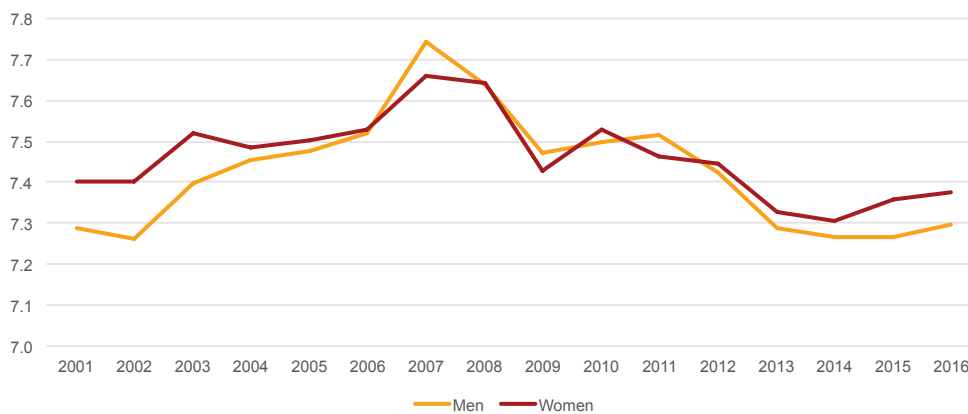


Source: Bankwest Curtin Economics Centre | Authors' calculations from HILDA Waves 1 to 16.

High hopes: Which workers are the most optimistic about their future prospects?

Lack of job prospects can have important implications for our overall life satisfaction. It can also affect our productivity at work. In 2016, women reported higher levels of satisfaction with job prospects than men (Figure 37). While this was the case in 2001, leading up to the peak of the mining boom, women and men tracked relatively close together post-GFC. Since 2012, however, we have seen the levels of satisfaction with future employment prospects diverge again. Women have perhaps good reasons to be optimistic about their job prospects: many are in occupations that are thriving and not as threatened by replacement with technology or as exposed to economic downturns.

Figure 37 Satisfaction with job prospects by gender, 2001 to 2016



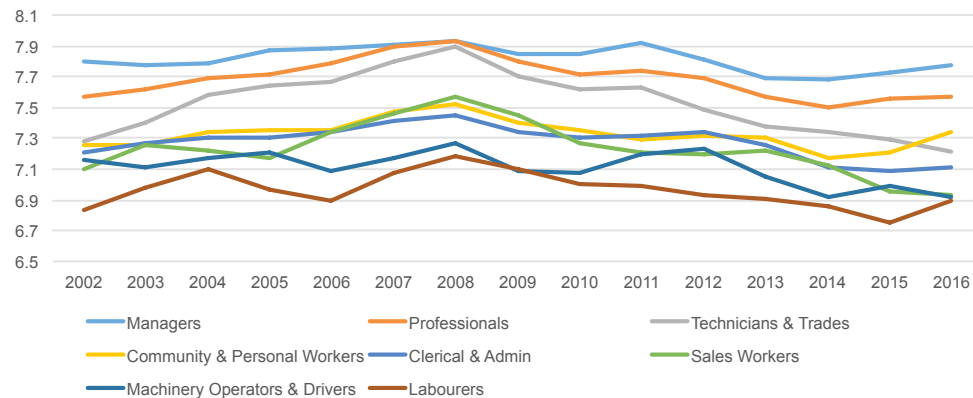
Source: Bankwest Curtin Economics Centre | Authors' calculations from HILDA Waves 1 to 16.

High skilled workers, including managers, professionals, and technicians and trades are more likely to report higher average levels of satisfaction with future job prospects than lower skilled workers (Figure 38). The satisfaction of community and personal care workers has picked up recently, which is likely due to the demand we're seeing for these workers (such as carers and aides) in the health care and social assistance sectors. Low skilled workers, such as machinery operators and drivers, report the least satisfaction with future job prospects. Several factors may be contributing to this, including the high exposure this occupation has to automation.

Women are more optimistic about their job prospects than men.

Machinery operators and drivers are the least satisfied with their future employment prospects.

Figure 38 Satisfaction with job prospects by occupation, 2001 to 2016



Source: Bankwest Curtin Economics Centre | Authors' calculations from HILDA Waves 1 to 16.

The types of industries people work in also plays an important role in shaping optimism towards future employment prospects. This can be related to a variety of factors such as the pattern of changes in the size of the industry, culture and the nature of work within the industry including the types of contracts on offer and typical working arrangements or schedules.

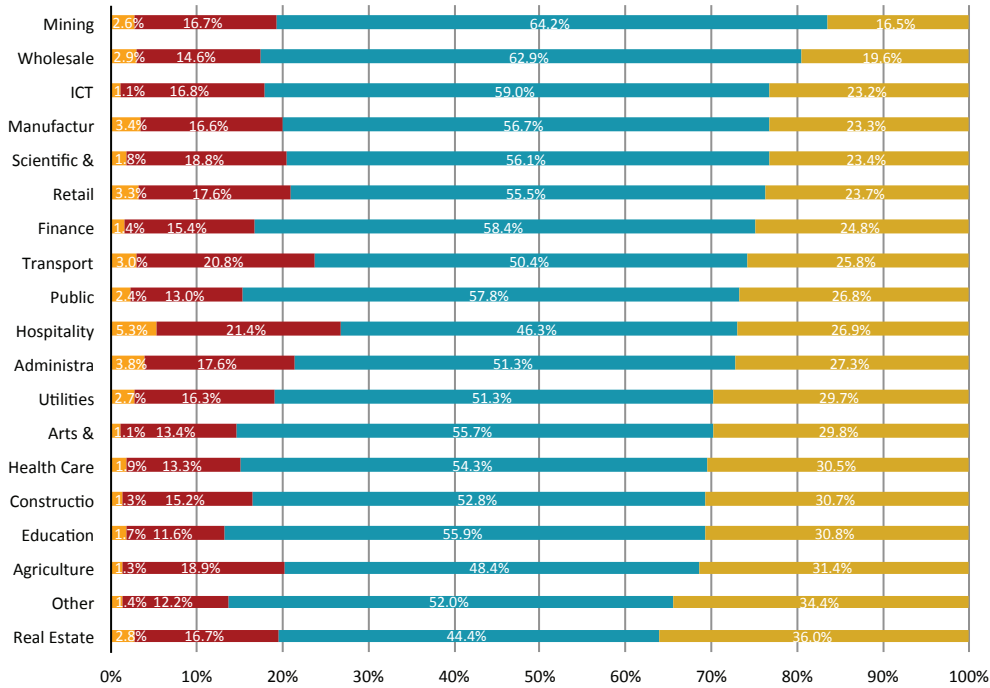
Hospitality has the highest share of workers who are dissatisfied with their job prospects.

It is likely to be due to the combination of some such factors that we see the highest share of workers, 5.3 per cent in 2016, dissatisfied with their job prospects in the Hospitality industry (Figure 40). Only 73 per cent of hospitality workers were satisfied with their job prospects – the smallest proportion reported across industries.

The Arts and Recreation industry, on the other hand, had the smallest share of dissatisfied workers: 1.1 per cent. Together with Education and Other services, Arts and Recreation was among the top three industries with the highest share of workers who are satisfied with their job prospects.

Not all of these workers are very satisfied with their job prospects, however. The share of very satisfied Arts and Recreation workers is just 29.8 per cent, for example. Real Estate has the largest share of workers reporting the highest degree of satisfaction with job prospects, 36 per cent. At the other extreme, the share of Mining workers who are highly satisfied with their job prospects is just 16.5 per cent.

Figure 39 Satisfaction with job prospects by industry



Source: Bankwest Curtin Economics Centre | Authors' calculations from HILDA Waves 1 to 16.

Will our wages increase?

Humans will work alongside AI and automation in the workplace of the future, taking advantage of new ways of producing, working and creating.

Hourly wage growth for full-time men has stalled since 2014.

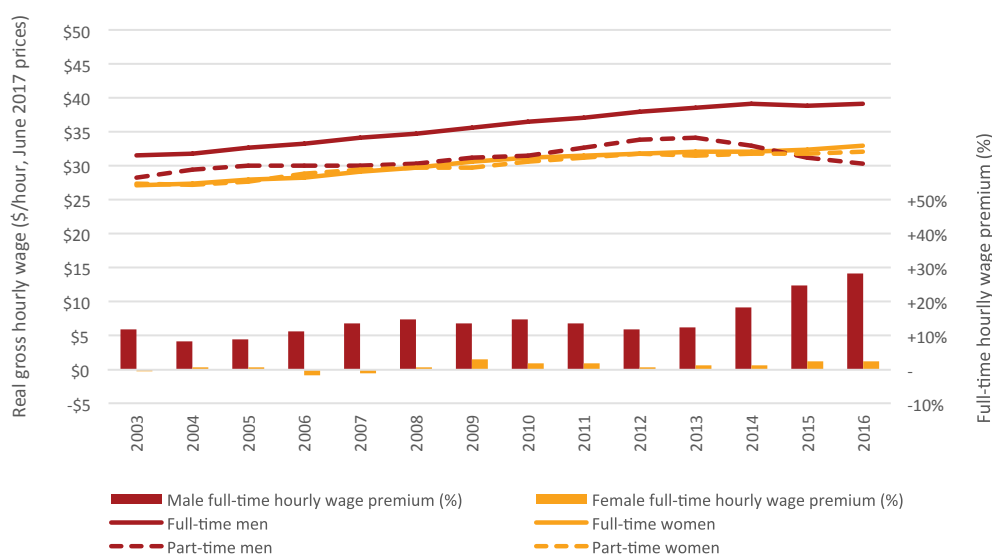
One of the greatest uncertainties in preparing for the future of work is the degree to which pay and remuneration will be affected for different jobs, careers and skill sets. Wage growth has been relatively stagnant post-GFC in Australia, as has been the case for many advanced economies around the world.

There are a number of factors at play that are likely to be driving the sluggish wage growth we're seeing. These include the globalisation of the labour market and the growing Gig Economy; an increase in contract work - especially among full-time workers; an increase in the propensity of young men to enter the full-time labour market later in life; the growth of mega-firms and their growing market share yet lower labour engagement; the lagging industrial relations system; and overall economic slowdown. The degree to which each of these factors are impacting wage growth is a challenge to discern. In this section, we examine changes in real hourly wages over time and how these have varied by different employment characteristics and gender.

Figure 40 shows the trajectory of real gross hourly wages, averaged over all occupations for full-time and part-time male and female workers. Wages are uprated to June 2017 prices for comparability over time. Wages for male workers grew consistently over much of the period, with gross hourly wages for those in full-time work rising from \$31.60 per hour in 2003 to \$39.10 by 2014. However, hourly wage growth for full-time men has stalled since 2014. And gross hourly wages have fallen in real terms since 2013 for part-time male workers, falling 11 per cent in three years to \$30.45 by 2016.

For women, average hourly wages rose gradually to 2010 before flattening in real terms thereafter. Interestingly, full-time and part-time wages for women have followed broadly the same path over the entire period.

Figure 40 Real growth in gross hourly wage, by gender and employment status: 2003 to 2016



Note: Average gross hourly wages are uprated to June 2017 prices using CPI.

Source: Bankwest Curtin Economics Centre | Authors' calculations based on unit record data from the HILDA survey waves 3 to 16.

Part of the explanation for stalling hourly wage growth is likely to come from the change to employment conditions facing more and more workers, and especially the greater prevalence of fixed-term contracts and part-time work in the new Australian labour market.

Figure 41 shows how rates of pay have grown for men and women on permanent, fixed-term and casual contracts. Real gross hourly wages have increased most strongly for men on fixed-term contracts, rising by 9.3 per cent between 2010 (the gold bars) and 2016 (in orange), to \$43.20. Real gross hourly pay rose over the same period for men employed on permanent or ongoing contracts, by 6.8 per cent to around \$39.10 in June 2017 prices. Average hourly pay has also grown the strongest for women on permanent or fixed-term contracts, by 5.9 per cent and 2.8 per cent respectively since 2010.

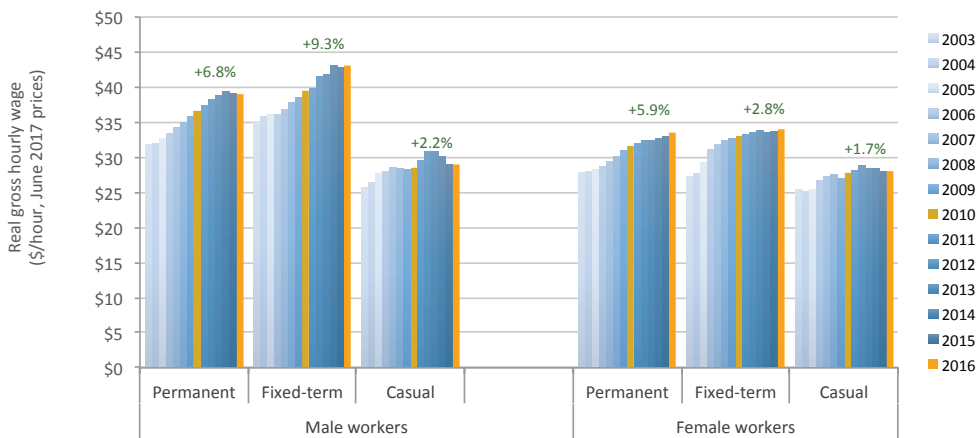
There has been far less growth in male casual pay, with hourly wages rising by a modest 2.2 per cent in real terms between 2010 and 2016. Indeed, real pay for casual workers has fallen by nearly 6 per cent since 2012, eroding many of the earlier real pay gains enjoyed to that point. Real growth in casual pay has been even slower for women – a mere 1.7 per cent since 2010.

This is not unexpected, given that casual workers are more likely to be in lower skilled, seasonal or part-time jobs, with many subject to pay awards that align closely to inflation. However, the issue becomes more of a concern in the future if workers are recruited on casual terms to positions that would previously have attracted a permanent or fixed-term contract.

Real pay for casual workers has fallen by nearly 6% since 2012, eroding many of the earlier pay gains enjoyed to that point.

Real growth in casual pay has been even slower for women – a mere 1.7% since 2010.

Figure 41 Real gross hourly wage trends by gender and type of employment contract: 2003 to 2016



Notes: Gross hourly wage rates are uprated to June 2017 prices using CPI. The percentage changes show the average real gross hourly wage growth between 2010 and 2016 for workers in each employment contract category.

Source: Bankwest Curtin Economics Centre | Authors' calculations based on unit record data from the HILDA survey, waves 3 to 16.

Casualisation will become a concern if workers are recruited on casual terms to positions that would previously have attracted a permanent or fixed-term contract.

Table 3 also compares real hourly pay for men and women across different occupations, and tracks how wages have travelled since 2010. Managers have seen pay rises since the start of the decade, more so for women (up 8.7% to just short of \$40 per hour since 2010) although remuneration per hour still remains substantially higher for men. Professional pay has risen at the same rate across genders, but there has been a disconnect between male and female technicians and trades workers, with women losing out in real terms. Between 2010 and 2016 real hourly pay among male technicians and trades grew by 7.6 per cent, yet declined among female trade workers by 7.5 per cent.

Wage growth for clerical and administrative occupations and sales workers have been either flat over the course of the decade for women (rising 1.9% over the period), or negative for men, while hourly rates for labourers have also accelerated more in real terms for men compared to women.

Table 3 Real gross hourly wages by occupation and employment status, 2010 and 2016

	Real gross hourly wage rates (updated to June 2017 prices)					
	Male workers			Female workers		
	2010	2016	Pct diff	2010	2016	Pct diff
	\$/hour	\$/hour	%	\$/hour	\$/hour	%
Occupations						
Managers	45.42	48.21	+6.1	36.79	39.98	+8.7
Professional	44.72	47.49	+6.2	38.52	40.90	+6.2
Technicians and trades	32.70	35.19	+7.6	27.55	25.48	-7.5
Community and personal	31.40	31.82	+1.3	25.82	26.59	+3.0
Clerical and administrative	32.87	32.85	-0.1	28.82	29.38	+1.9
Sales workers	29.35	26.42	-10.0	23.36	23.80	+1.9
Machinery operators and drivers	30.36	32.54	+7.2	24.57	25.47	+3.6
Labourers	25.80	27.16	+5.3	23.48	23.91	+1.8
Employment status						
Permanent or ongoing contract	36.59	39.09	+6.8	31.52	33.39	+5.9
Fixed term contract	39.48	43.16	+9.3	33.08	34.01	+2.8
Casual contract	28.42	29.05	+2.2	27.66	28.13	+1.7
All workers	36.00	38.09	+5.8	30.96	32.54	+5.1

Note: Average gross hourly wages are updated to June 2017 prices using CPI.

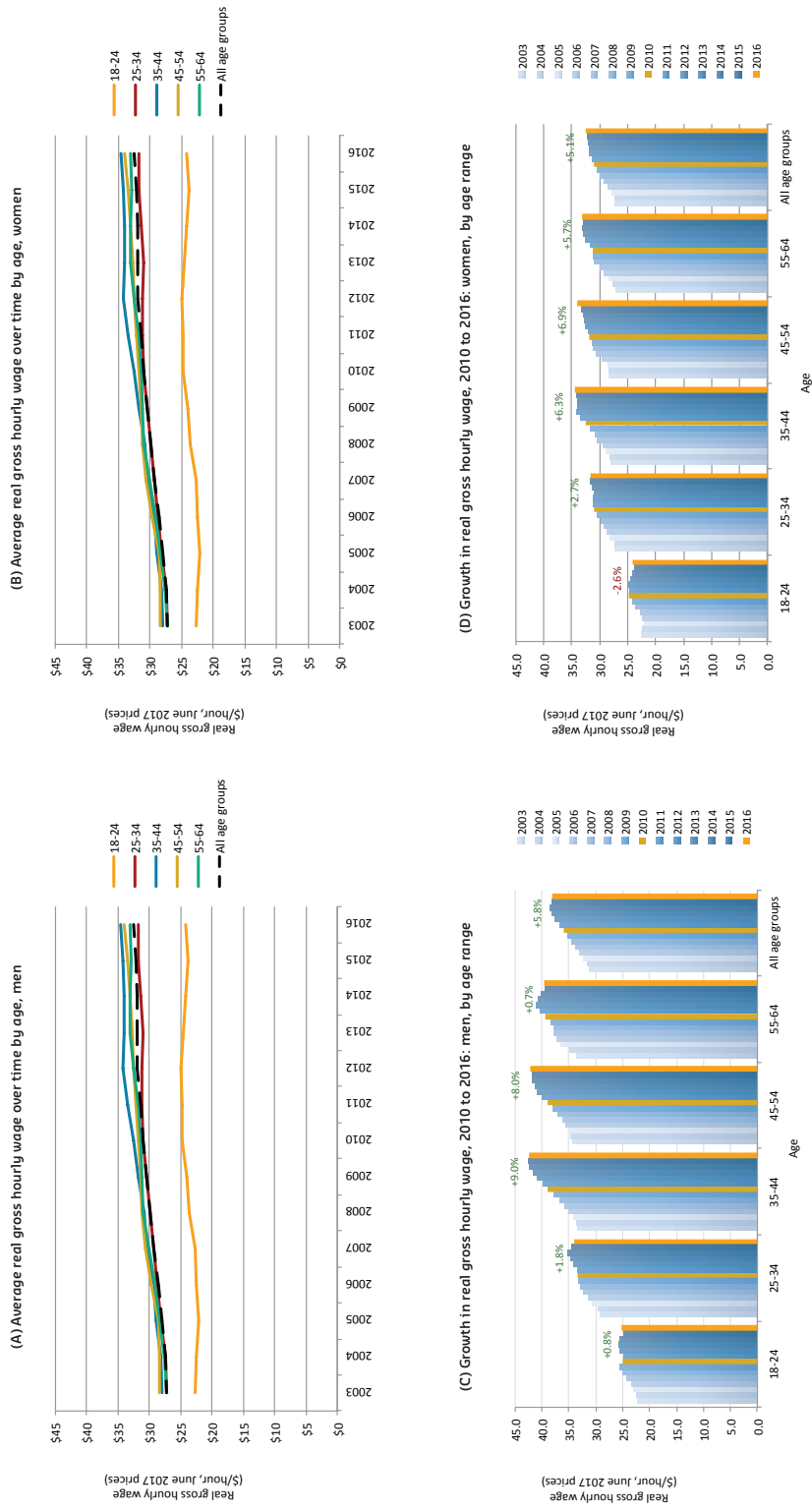
Source: Bankwest Curtin Economics Centre | Authors' calculations based on unit record data from the HILDA survey waves 10 and 16.

The overall gap in pay between the youngest cohort and older workers has widened by nearly 30% since the start of the decade.

How have younger workers fared? Has real average pay risen for workers in the first few years following school to the same extent as for older cohorts? Figure 42 breaks down the trajectory of real gross hourly wages for different age cohorts, and separately for men and women. As before, we use wage data drawn from the HILDA survey between 2003 and 2016. One significant take-home from this analysis is the stalling of growth in average hourly wages for the cohort of workers aged 18 to 24. There has been no progression in average pay rates since the GFC, either for young men or women. In fact, average real hourly pay for women has fallen by 2.6 per cent since 2010 (as shown in Figure 42 panel D). The overall gap in pay between the youngest cohort and older workers has widened by nearly 30 per cent since the start of the decade.

Real hourly pay rates have also stalled for the 55 to 64 age cohort of male workers, with negligible real growth of only 0.7 per cent since 2010 (Figure 42 panel D) and declining average real hourly wages since 2014 (Figure 42 panel A).

Figure 42 Trends in real gross hourly wage, by age and gender, 2003 to 2016



Notes: Gross hourly wage rates are updated to June 2017 prices using CPI. The percentages reported in panels (c) and (d) show the average growth in real gross hourly wages between 2010 and 2016 among workers in each age category.
 Source: Bankwest Curtin Economics Centre | Authors' calculations based on unit record data from the HILDA survey waves 3 to 16.

Which industries pay more?

Which industries deliver the greatest rates of pay to their workforce? Which are the sectors where workers have enjoyed strong wages growth, and which sectors have been on the decline?

The level and distribution of wages paid by businesses in different industry sectors is influenced by many factors, from the share of workers required in different occupational roles and hierarchies within an organisation, economic conditions, technological advances and automation, competitive market forces, as well as industry demands for the spectrum of specific, technical and generic skills.

Figure 43 presents estimates of the evolution of gross hourly wages paid to people working in different industry sectors (panel A) and occupations (panels B and C) over the period between 2003 to 2016. All figures are uprated to June 2017 prices to allow for comparisons to be made over time, with gross hourly wage values for 2010 (in gold) and 2016 (in orange) provided as reference points.

The mining workforce receives an average gross pay of \$53.85 per hour worked, up by nearly a tenth since the start of the decade.

As expected, the Mining sector has consistently delivered the highest average hourly wage across all industries. The mining workforce receives an average gross pay of \$53.85 per hour worked, up by nearly a tenth since the start of the decade. There has also been a strong and consistent pattern of average real wage growth in the Electricity, Water and Waste Services sector – up 14.7 per cent since 2010 – and for workers in Finance and Insurance Services and IT, Media and Telecommunications.

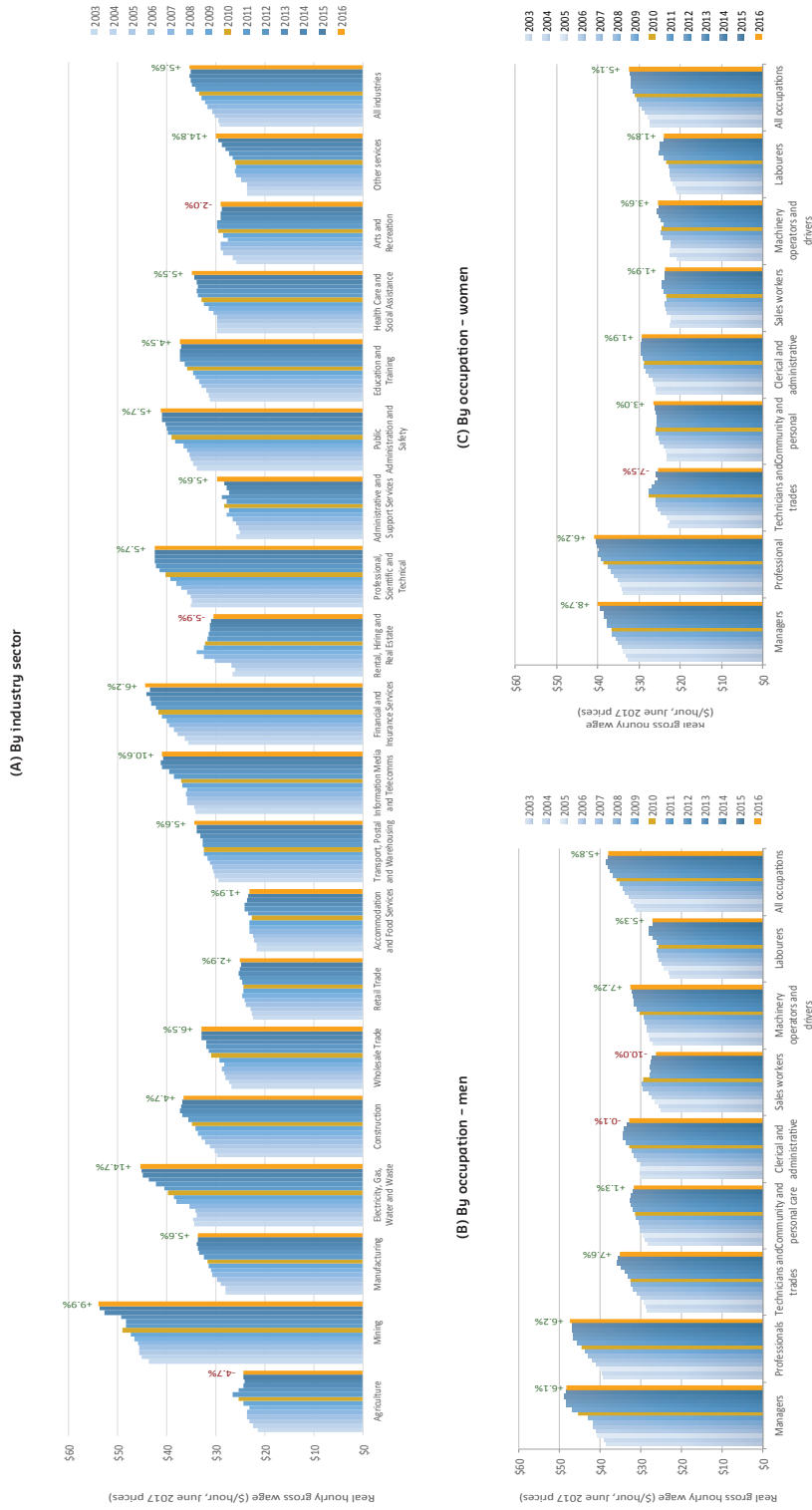
In contrast, the trajectories of real hourly wages have been relatively flat for Retail workers and those in the Accommodation and Food services sector – with real wage growth of 2.9 per cent and 1.9 per cent respectively since 2010. And real pay for Agriculture workers has actually fallen by 4.7 per cent since the start of the decade, delivering an average gross hourly wage of only \$24.25.

Panels B and C of Figure 44 give a comparison of hourly pay trends for men and women across occupations. These again show the contrast between the significant increase in real pay rewards to managers and professionals, both for men and women, and the shallow real wage growth trajectories for sales workers, and clerical and administrative support.

Of note also are the contrasting gender patterns over time in rewards for Technicians and Trades workers, where average real gross hourly wages have risen for men by 7.6 per cent since 2010 but fallen by 7.5 per cent for women over the same period. So too do we see a much lower rate of real hourly wage growth for female machinery operators and drivers, at around half the rate enjoyed by their male counterparts.

Real gross hourly wages for agriculture workers have fallen by 4.7% to \$24.25 since the start of the decade.

Figure 43 Real gross hourly wage trends by industry sector, Australia, 2003 to 2016



Notes: Gross hourly wage rates are updated to June 2017 prices using CPI. Percentages relate to the average growth in real gross hourly wages between 2010 and 2016 among workers in each category.

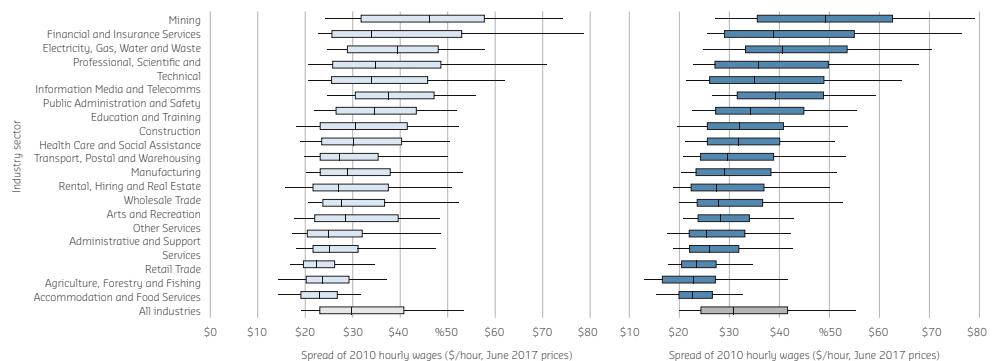
Source: Bankwest Curtin Economics Centre | Authors' calculations based on unit record data from the HILDA survey waves 3 to 16.

Which industry sectors give the greater opportunities for workers to achieve higher salaries as they progress in their careers, or as a reward for talent, experience or specialised skills? Looking at average or median wages gives a good indication of the relative remuneration patterns in different industry sectors, but provides no real idea about how wages are spread, how the pay distribution has changed in recent times, and how wages might evolve into the future.

Some industries show relatively little variation in rates of pay, especially in lower paying sectors such as Agriculture, Accommodation and Food, or Retail services (Table 4). While the spread of the wage distribution – and higher hourly pay rates – are especially pronounced in Mining, Finance and Insurance, and Electricity, Gas, Water and Waste Services.

Table 4 Distribution of real gross wages by industry, 2016 (uprated to June 2017)

	Real gross hourly wage percentile - 2011					Real gross hourly wage percentile - 2016					Change in 75th pctile real wage	
	Lower ← Typical → Higher					Lower ← Typical → Higher						
	Percentiles	10th	25th	50th	75th	90th	10th	25th	50th	75th		90th
		\$/hr	\$/hr	\$/hr	\$/hr	\$/hr	\$/hr	\$/hr	\$/hr	\$/hr	\$/hr	
Mining		24.39	31.89	46.31	57.78	74.46	26.93	35.68	49.16	62.70	79.28	+8.5%
Financial and Insurance Services		22.77	25.68	33.94	53.15	78.99	25.48	28.88	38.88	54.99	76.45	+3.5%
Electricity, Gas, Water and Waste		24.76	28.80	39.53	48.15	57.78	24.46	33.13	40.69	53.65	70.79	+11.4%
Professional, Scientific and Technical		20.57	25.85	34.82	48.65	70.92	22.65	27.00	35.68	49.69	68.03	+2.1%
Information Media and Telecomms		20.54	25.51	33.90	45.93	62.11	22.65	25.75	35.03	49.01	63.96	+6.7%
Public Administration and Safety		24.76	30.55	37.55	47.27	55.98	26.28	31.37	39.20	48.88	59.34	+3.4%
Education and Training		21.96	26.48	34.57	43.52	52.00	22.39	27.18	34.18	44.93	55.34	+3.2%
Construction		18.21	23.11	30.58	41.63	52.44	19.37	25.48	31.85	40.86	53.77	-1.9%
Health Care and Social Assistance		19.18	23.47	30.26	40.44	50.55	20.79	25.37	31.68	39.95	51.02	-1.2%
Transport, Postal and Warehousing		19.90	23.05	27.32	35.45	50.14	20.39	24.12	29.52	38.84	53.36	+9.5%
Manufacturing		20.22	23.11	28.89	38.01	53.33	20.12	23.29	28.84	38.23	51.42	+0.6%
Rental, Hiring and Real Estate		15.79	21.59	27.19	37.61	50.96	18.57	22.30	27.25	36.92	49.83	-1.8%
Wholesale Trade		20.80	23.65	27.69	36.76	52.52	19.73	23.30	27.80	36.65	52.78	-0.3%
Arts and Recreation		17.72	21.89	28.65	39.62	48.37	20.69	23.57	28.13	33.98	42.81	-14.2%
Other Services		17.19	20.41	24.96	32.12	40.44	17.33	21.84	25.48	33.13	42.35	+3.1%
Administrative and Support Services		18.27	21.70	25.27	31.23	47.81	18.57	21.81	25.95	31.81	42.76	+1.9%
Retail Trade		16.92	19.64	22.50	26.24	34.67	17.84	20.39	23.38	27.34	34.61	+4.2%
Agriculture, Forestry and Fishing		14.42	20.22	23.64	29.41	37.23	12.74	16.47	22.70	27.18	41.70	-7.6%
Accommodation and Food Services		14.44	19.14	23.08	26.96	31.78	15.93	19.81	22.65	26.53	32.81	-1.6%
All industries		19.26	23.11	29.83	40.93	53.39	20.17	24.14	30.58	41.69	55.42	+1.9%
Percentage change since 2010							4.8%	4.5%	2.5%	1.9%	3.8%	



Notes: Data are sorted according to values of the 75th percentile (the top quarter) of the 2016 gross real hourly wage distribution across industry sectors. All wage rates are uprated to June 2017 prices using CPI. The final column shows the percentage increase in the top quarter of real gross hourly wages (the 75th percentile) between 2010 and 2016. Boxplots indicate the lower quartile, median and upper quartile in gross hourly wages by industry sector for 2010 (in light blue) and 2016 (in dark blue), with whiskers stretching to the 10th and 90th percentile. See Glossary for further information.

Source: Bankwest Curtin Economics Centre | Authors' calculations from the HILDA survey, 2010 and 2016.

Future implications

There are signs that precarious employment is increasing

The extent to which work is becoming precarious is an issue that has been attracting increasing attention. We developed a precariousness index using HILDA data based on several dimensions of employment relating to job insecurity, control over working hours and conditions, and the extent of employment protections and other working conditions, especially relating to leave entitlements.

The calculated index showed that the overall state of the economy has a significant impact on the level of precariousness in the labour market. Between 2003 and 2009, precariousness dropped, but since then it has increased. For men, precariousness is now above 2003 levels, and while still below the levels for women, the two are beginning to converge. A major source of this trend is an increase in the self-reported probability of losing one's job, and accompanying dissatisfaction with job security. Despite relatively stable and low levels of unemployment, people seem to be increasingly concerned that their jobs are at risk. The same holds true for satisfaction with job prospects, which dropped significantly post-GFC and has yet to recover.

The distribution of precariousness across occupations and industries is as expected, with the industry people work in generally being a more significant influence than their occupation. Higher skill occupations such as professionals and managers have more stable employment, while labourers are in the most precarious job circumstances.

Industries with the lowest levels of precarious employment are Public Administration, Financial and Insurance Services, and Utilities. Working for government, a bank or insurance company appears to still be a relatively 'safe' option. By contrast, Accommodation and Food, Agriculture, Forestry and Fishing, and Arts and Recreation Services are much more precarious for their employees. Mining and to a lesser extent Education have become more precarious in recent years.

But are we happy in our work?

Measuring levels of satisfaction reported by workers in the HILDA survey allows us to see the extent to which workplaces are 'happy and healthy'. In general, it would appear that more workers are satisfied than 15 years ago although the percentage of 'very satisfied' workers has dropped. Again, managers and professionals have the highest levels of satisfaction, although managers are less happy with their long work hours. However, they appear prepared to trade-off longer hours for higher salaries, as managers have relatively high satisfaction levels concerning their pay.

Interestingly, people who work for themselves are happier than employees or employers, probably indicating a greater degree of control over their working lives. Relatedly, working from home is also linked to greater satisfaction with work.

And if we want to be optimistic about our future job prospects, gaining employment in a high-skilled occupation such as professionals or managers will give us a more positive outlook than other workers. In general, satisfaction with our future job prospects has been decreasing since the global financial crisis, particularly for sales workers, and technician and trade workers. Low-skilled workers - labourers and machinery operators and drivers - remain the least satisfied about their future job prospects. Several factors may be contributing to this - including higher exposure these occupations have to automation.

What about wages?

While employment levels have remained high, real growth in wages has been relatively flat. Hourly rates of pay rates for full-time men have stalled since 2014, with average real gross wages for part-time men falling 11 per cent in three years. This is a concern not just for workers but also for governments who need income tax revenues and for businesses who need paying customers.

How do younger workers fare in terms of remuneration? The overall pay gap between the youngest cohort and older workers has widened by nearly a third since the start of the decade, which raises important questions around whether the anticipated rise in productivity in the future employment landscape will be matched by corresponding growth in real wages for younger workers.

Some industry sectors in finance, mining and resources, professional scientific and technical services, and IT and communications, look to offer significant opportunities for high wage growth. Yet other sectors have offered very little growth in pay, with average hourly wages retail and accommodation and food services sectors rising only 2.9 per cent and 1.9 per cent respectively since 2010, and with pay rates for agriculture workers falling in real terms since the start of the decade.

So too have we seen very little growth in pay rates since the start of the decade for a number of low-skilled occupations, especially among labourers, machinery operators and drivers, and for those on casual contracts. The issue of casualisation will become an issue in the future if workers are recruited on casual terms to positions that would previously have attracted a permanent or fixed-term contract.

Technology

and jobs

Introduction

Technologies change rapidly. A new application of artificial intelligence is a regular feature of recent media headlines. Some argue that we may be in the early stages of a revolution.

Automation is not a new phenomenon – we've seen this before. As a result of agricultural revolution, tasks undertaken with our hands and pure grit were taken over by machinery that could do the work of ten men – tractors, harvesters. This no doubt put a buckle in the labour market for a time, but in the longer term, there were gains to be had. Living standards improved, there were gains in longevity, especially for men. The industrial revolution brought further advances in technology. Increased automation/processes are further removing the need for human labour and reducing human error.

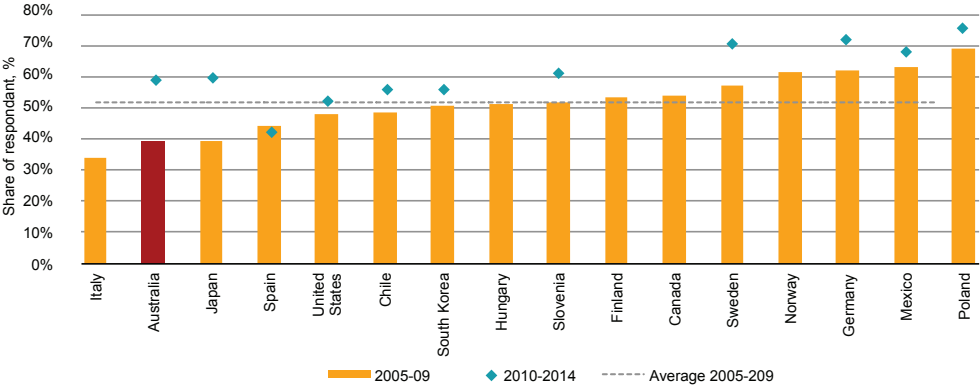
Automation will continue to make its mark on a number of industries and without a doubt it will disrupt the transport industry the most. But this may not necessarily be a bad thing. Machinery operators and drivers are one of the lowest paid and dissatisfied workers in the labour market. They typically work very long hours – averaging 44 hours each week, and work in environments that can often have safety concerns. As consumers of transport, we can expect this shift to reduce the costs of getting ourselves and the goods we buy from one place to another. This will mean more dollars to spend on other things.

Will automation replace more than just drivers? Recently, we have seen robots infiltrate areas that we hadn't thought possible. In Japan, trials are underway to use robots as childcare and aged care workers in order to stem the current shortage of workers in these areas. But rather than replacing human carers, this may simply leave them to focus on the more personal parts of the job.

So what shall we expect from the current phase of automation? Based on the World Values Surveys, a collection of nationally-representative individual-level surveys, there is a fair degree of optimism around future opportunities brought about by science and technology. Around 60 per cent of individuals surveyed in Australia in 2012 agreed that 'because of science and technology, there will be more opportunities for the next generation'. This represents an increase of more than 20 percentage points between 2005 and 2012, suggesting growing optimism related to opportunities created by technologies. Australia is very similar to Japan; both countries have seen the biggest shift in positive attitude towards the opportunities that science/technology will bring, well above the OECD average.

Around 60% of Australians believe that science and technology will create more opportunities for the next generation.

Figure 44 Share of individuals who believe that science and technology will create more opportunities for the next generation, selected OECD countries



Source: Bankwest Curtin Economics Centre | World Values Surveys.

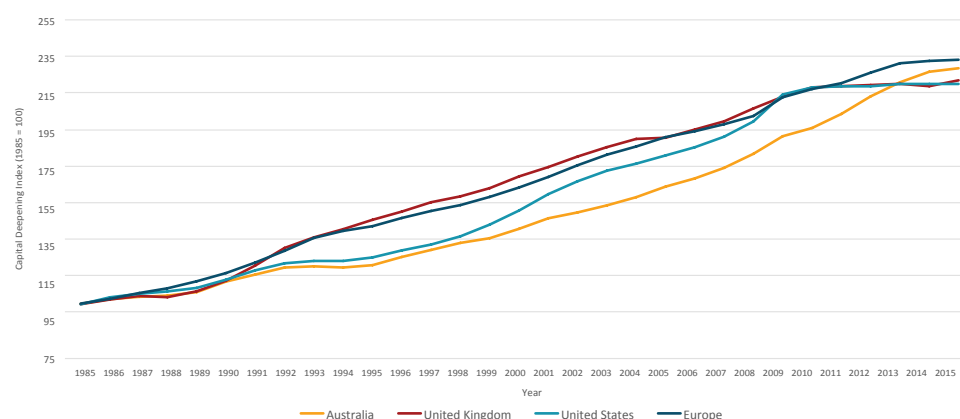
In this chapter, we first explore the patterns of technological penetration in Australia’s labour markets. We explore the extent of presence of robots and intelligent software systems in Australia’s economy and whether and how this varies by industry, firm size and skill level of occupations. We then study the changes that have taken place in the skill intensity and task content of jobs in Australia to assess whether these support the possibility of replacement of labour by technology.

Technological change

Capital deepening has increased by 82% over the last 20 years in Australia.

There are many ways to capture the effects of technology on the labour market. To set the scene, we first consider the concept of ‘capital deepening’. Capital deepening occurs when the amount of capital per worker increases, which means we have fewer workers to produce the same or an increasing amount of output. Figure 45 shows that there has been a steady increase in capital deepening across nearly all large OECD economies over the past decade. In the last 20 years, Australia’s capital deepening had grown by around 82 per cent. In 2015, the levels of capital deepening in Australia exceeded those in the UK and US. While there has been a flattening trend over the last few years post-GFC in the UK, US and Europe, this is hardly existent in Australia.

Figure 45 Capital Deepening Index, selected OECD countries, 1985 to 2015

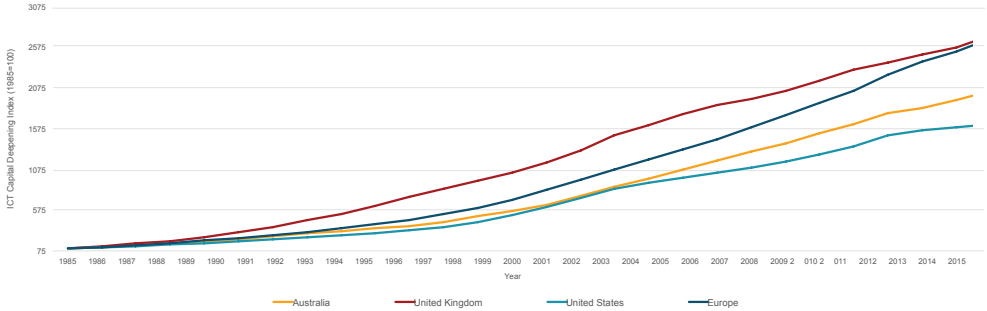


Note: Capital deepening is changes in the ratio of the total volume of capital to labour units, as captured through capital deepening index.
Source: Bankwest Curtin Economics Centre | OECD.Stats, Dataset: Growth in GDP per capita, productivity and ULC, 2015.

To shed light on the type of capital that has led to the increase in capital deepening, we examine changes in the two key components; those that are based on Information and Communications Technology (ICT) capital and those that are non-ICT capital-based (Figure 46 and Figure 47). ICT capital includes hardware, software and telecommunications while non-ICT includes machinery, etc.

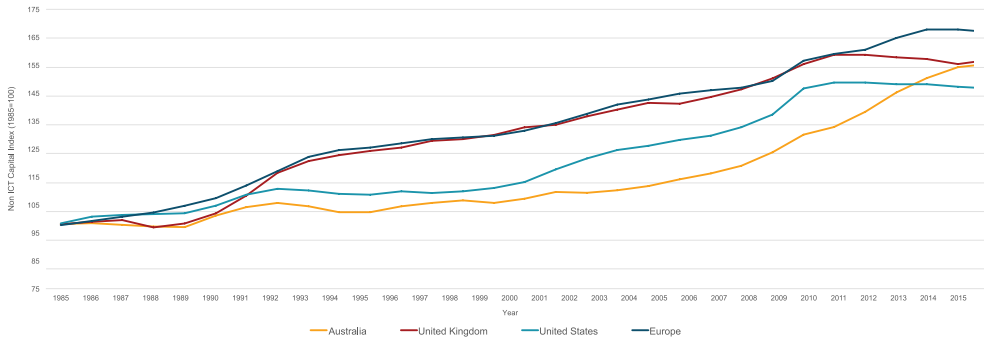
In most large OECD economies, ICT capital has grown far more rapidly than non-ICT capital. In Australia, the ICT capital deepening index has more than quadrupled in the last 20 years. While being lower than the levels observed in the UK and the rest of Europe, Australia’s ICT capital deepening index exceeded that of the US in 2015. Turning to the non-ICT capital deepening index analysed in Figure 47, we observe a significantly more moderate increase over time. The changes we observe may be due to several reasons. The shift towards the services sector and offshoring is one potential explanation. Automation is another one: these patterns are consistent with the rise of predominantly ICT-based robots and intelligent software systems in the past decade. The analysis of penetration of these two specific types of technologies into the labour markets is presented next.

Figure 46 ICT Capital Deepening Index, selected OECD countries, 1985 to 2015



Source: Bankwest Curtin Economics Centre | OECD.Stats, Dataset: Growth in GDP per capita, productivity and ULC, 2015.

Figure 47 Non ICT Capital Deepening Index, selected OECD countries, 1985 to 2015



Source: Bankwest Curtin Economics Centre | OECD.Stats, Dataset: Growth in GDP per capita, productivity and ULC, 2015.

Will robots take our jobs?

Robots are regularly featured in commentaries on the labour market. Typically seen as machines capable of carrying out a series of actions automatically, robots are often perceived as a threat to our jobs.

Some recent studies suggest that they will cause significant job destruction. A prominent prediction, inspired by the pioneering study by Frey and Osborne (2017), suggests that 40 per cent of jobs in Australia have a high probability of being susceptible to automation in the next 10 to 15 years (Durrant-Whyte *et al.*, 2015). This approach is based on classifying occupations with respect to their susceptibility to automation as assessed by robotics and artificial intelligence experts.

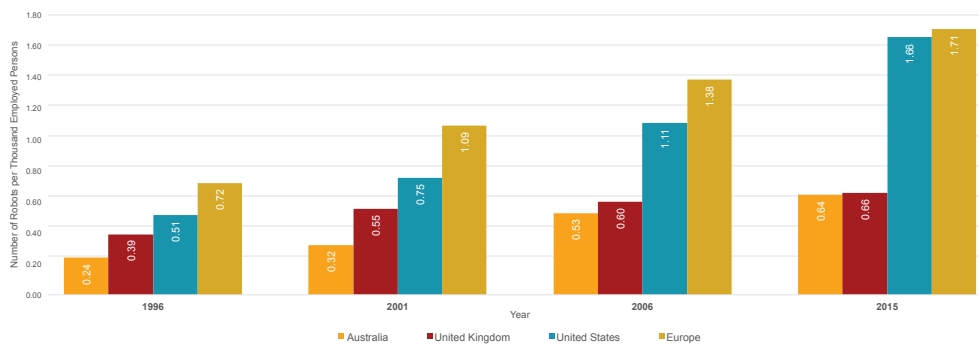
Refinements of the Frey and Osborne approach result in a significantly more optimistic picture of the future of jobs. These refinements draw on a criticism raised by Arntz *et al* (2017): that approaches *a la* Frey and Osborne neglect the substantial heterogeneity of tasks within occupations. Once these task variations within occupations are taken into account, a much smaller proportion of jobs in Australia are at risk of being displaced: around 9 per cent according to more recent estimates by Borland and Coelli (2017).

In spite of these refinements, several limitations of these predictions remain. One important limitation is that they assess the feasibility of automation of existing jobs but not how many jobs will actually be replaced by technology. This will depend on many factors, for example on whether the firms choose to adopt the technology, relative wage costs, and how other parts of the economy will respond and adjust to technological changes.

Prevalence of robots in the workplace

We analyse data on the counts of the stock of robots sourced from the International Federation of Robotics, which is based on yearly surveys of robot suppliers. In Figure 48, we observe that the number of robots per thousand employed persons has increased in most OECD economies. As of 2015, the number of robots per thousand employees in Australia was just over 0.6 in 2015 (for comparison, in the US and Europe, it was over 1.6). Nevertheless, this represents around a three-fold increase compared to the level observed in 1996.

Figure 48 Number of robots per thousand employed persons, selected OECD countries, 1996 to 2015

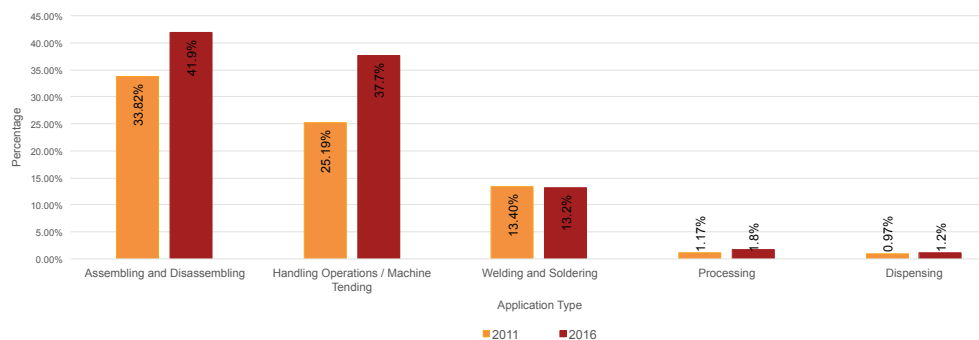


Source: Bankwest Curtin Economics Centre | International Federation of Robotics, World Robotics, 2017.

The number of robots per thousand employees in Australia has tripled in the last 20 years but still stands at a very low base.

What are some of the tasks the robots take up? To give some sense on this, Figure 49 presents the share of robots by their application type. As of 2016, the highest share of robots (over 40% of the total number of robots) were employed in assembling and disassembling tasks. This represents a growth of around 8 percentage points from 2011. The next significant category of application of robots is handling operations or machine tending, followed by welding and soldering categories of application. Over 37 per cent of the robots were performing handling operations or machine tending tasks in 2016, while the share of those engaged in welding and soldering was around 13 per cent. Processing and dispensing tasks were performed by relatively small share of the total number of robots between 2011 and 2016.

Figure 49 Share of robots by application type, Australia, 2011 and 2016



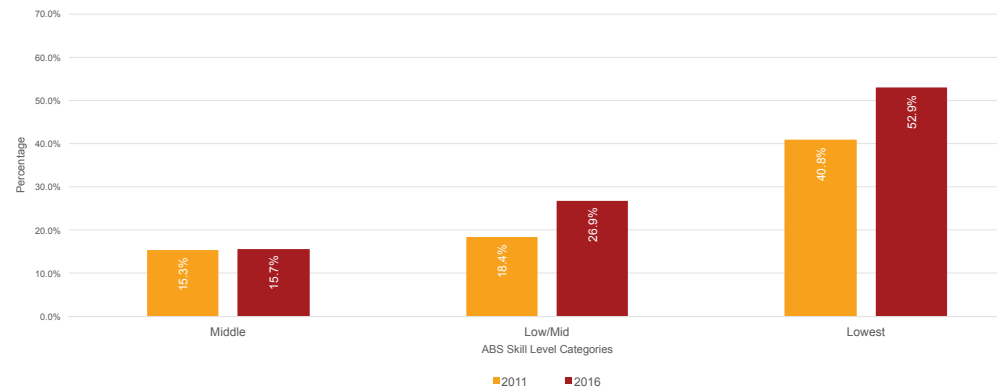
Source: Bankwest Curtin Economics Centre | International Federation of Robotics, World Robotics, 2017.

As of 2016, the highest share of robots (over 40% of the total number of robots) were employed in assembling and disassembling tasks.

Over half of robots in Australia are employed in the lowest skilled jobs.

Has the penetration of robots varied by the skill level of jobs? We map the data on application of robots to occupations to determine the skill level of jobs where robots are employed. In Figure 50, we present the share of robots employed in jobs with different levels of skills drawing comparisons in the 5 year-period between 2011 and 2016. By far the highest share of robots are observed in the lowest skilled jobs compared to those with low-middle and middle skilled levels (no robots employed in high-skilled jobs were observed in the data). Furthermore, these jobs have also seen the highest growth in robots in the preceding 5 years.

Figure 50 Share of robots by skill level of jobs, Australia, 2011 and 2016



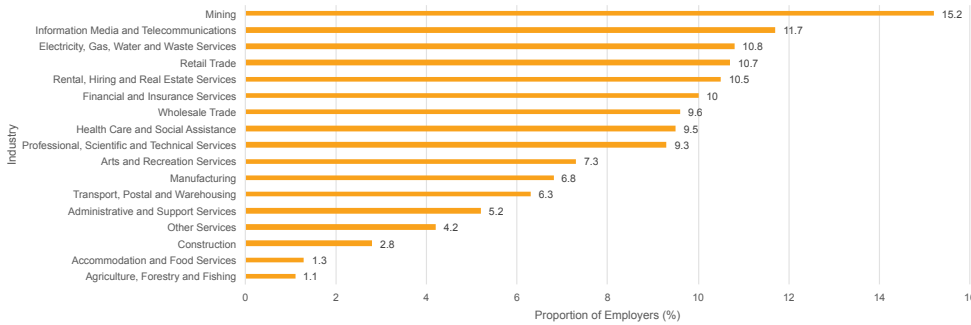
Source: Bankwest Curtin Economics Centre | International Federation of Robotics, World Robotics, 2017; Australian Bureau of Statistics (2013), Australian and New Zealand Standard Classification of Occupations, ABS Cat No. 1220.0.

Having the capacity to mimic cognitive functions associated with the human mind, such as learning and problem solving, artificial intelligence perhaps has the highest potential to transform the future of labour markets. How important is this form of technology in Australian organisations?

Intelligent software systems are of major importance in over 15% of mining businesses in Australia.

Figure 51 reports the proportion of employers where intelligent software systems, a software that uses artificial intelligence, are of major importance to business, by industry as of 2015-16. Mining leads the list, with over 15 per cent of employers in this industry reporting that intelligent software systems are of major importance to their organisation. Other industries where a significant share (over 10%) of employers report intelligent software systems to be of major importance are Information, Media and Telecommunications; Electricity, Gas, Water and Waste Services; Retail Trade; and Rental, Hiring, and Real Estate Services. The importance of intelligent software systems is relatively low in Agriculture, Forestry and Fishing; and Accommodation and Food Services industries.

Figure 51 Share of employers where intelligent software systems is of major importance, by industry, Australia, 2015-16

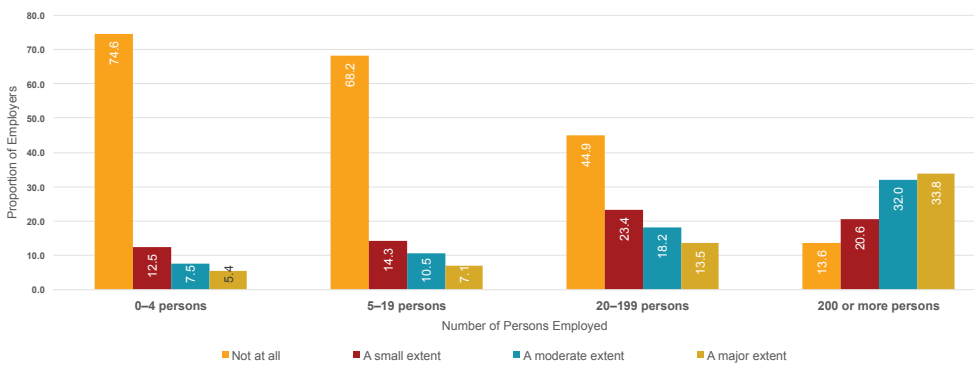


Source: Bankwest Curtin Economics Centre | Australian Bureau of Statistics (2016), Business Use of Information Technology, ABS Cat No. 8190.0.

The dispersion of the importance of intelligent software systems varies by employer size. As expected, larger employers are more likely to take up this technology compared to smaller ones. Figure 52 demonstrates that among employers with 200 or more employees, over 33 per cent report that intelligent software systems are of major importance to their organisation. Only around 5 per cent of employers with 0-4 employees report this. Instead, in this later group, almost 75 per cent report that artificial intelligence is not at all important for their organisation. In contrast, the share of employers with 200 or more employees who report that artificial intelligence is of no significance to their organisation is around 13 per cent.

Intelligent software systems are of major importance in over 33% of businesses with 200 or more employees.

Figure 52 The extent of importance of intelligent software systems by employer size, Australia, 2015-16



Source: Bankwest Curtin Economics Centre | Australian Bureau of Statistics (2016), Business Use of Information Technology, ABS Cat No. 8190.0. 0.

Overall, we have seen an increase in the importance of technology in Australia over the past decades. Intelligent software systems are of major importance to a significant share of Australian employers, particularly those with 200 or more employees. While the count of robots per thousand employees remains low compared to the US and parts of Europe, it has nearly tripled in the last 20 years. The majority of robots are employed in the lowest skilled jobs. What is the likely impact of these technological changes on employment?

Has the content of work changed?

The 'Skill-Biased Technological Change' hypothesis (e.g. Katz & Autor, 1999; Acemoglu & Autor, 2011) predicts a shift in demand in favour of more skilled workers as a result of technological change. The phenomenon of job polarisation, on the other hand, implies an increase in the share of employment in high skilled jobs and low skilled jobs, and a decrease in the share in middle skilled jobs (Autor *et al.*, 2006; 2008). Do we observe changes in the skill content of employment in Australia?

There can be multiple reasons why the skill content of employment may change. The demand for lower-skilled workers may decrease due to offshoring. The explanations linking the skill content of employment to technology are based on the so-called 'routinization hypothesis' (Autor *et al.*, 2003): the new technology is complementary to high-skilled workers and raises their productivity; at the same time it replaces the routine tasks undertaken by middle-skilled workers. The routinisation hypothesis does not directly explain why we should observe an increase in low-skilled employment share consistent with job polarisation, since these are also likely to be routinisable. One possibility is that employers may simply have more incentives to replace middle-skilled workers, if these are relatively better paid.

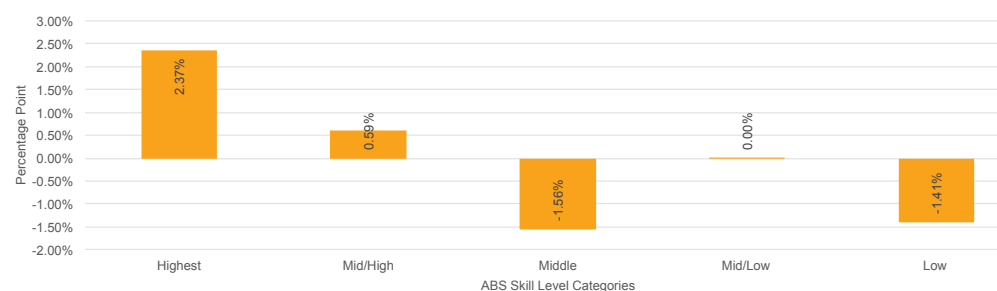
We start by looking at the changes in the skill content of employment in Australia in the past 10 years. We then consider the changes in task content of jobs and assess whether these are consistent with the routinisation scenario.

Employment changes and skill level

We've seen that the majority of robots in Australia are employed in low-skilled jobs. Have we seen a commensurate decrease in human employment in these jobs? We classify occupations into five skill levels, using ABS classifications based on the skill level required to complete tasks in each occupation. Occupations in the highest skill level include chief executives, managing directors and legislators, education and health professionals, etc. while examples of those in the lowest skill level are checkout operators and office cashiers, cleaners and laundry workers, among others. Classification of occupations by skill level has not changed during the period studied here.

Figure 53 presents the changes in employment share by skill level between the years 2006 and 2016. These are consistent with skilled-based technological change: in the last ten years, the share of employment in the highest skill jobs has increased by around 2.3 percentage points. There has also been a modest increase in mid/high skilled jobs. Conversely, the share of those employed in both middle- and low-skilled jobs has decreased.

Figure 53 Changes in employment share by skill level, Australia, between 2006 and 2016



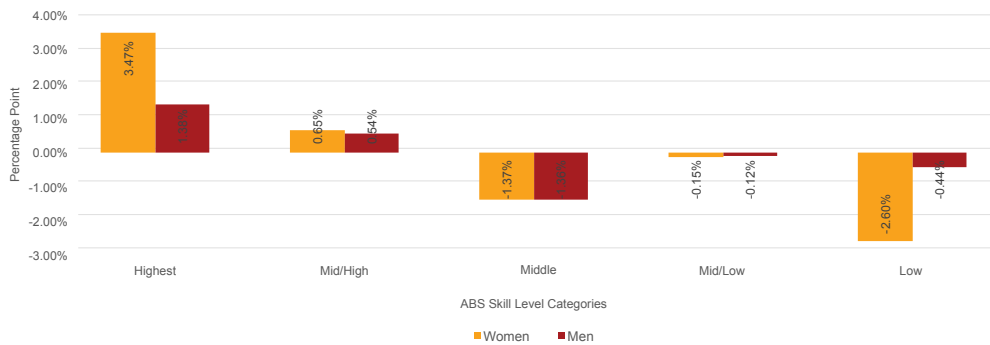
Source: Bankwest Curtin Economics Centre | Australian Bureau of Statistics Census Data, 2006 and 2016.

Low-skilled employment share in Australia has decreased in the last 10 years.

In Figure 54 we explore these changes by gender. Interesting differences emerge. The increase in the highest skill employment share appears to be largely driven by females. The employment share of this group has increased by almost 3.5 percentage points, compared to around 1.3 percentage points increase in the employment share of males in the highest skill category. However, it is also the case that the decline in the low-skill employment share is also significantly higher for females than for males.

High-skill employment has increased in the last 10 years, particularly for females.

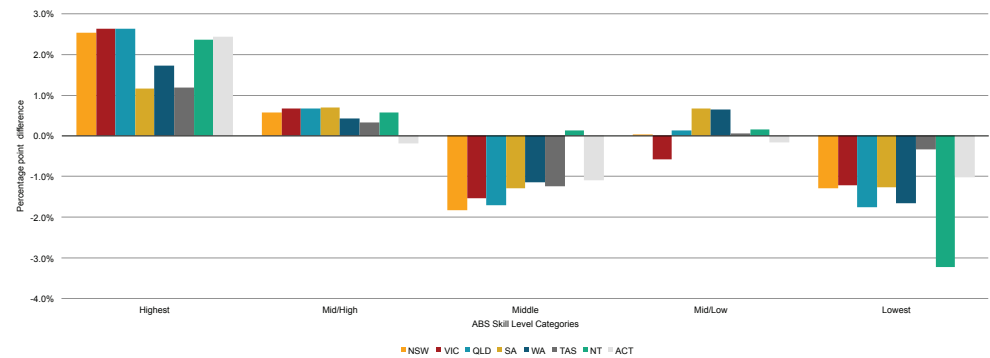
Figure 54 Changes in employment share by skill level and gender, Australia, between 2006 and 2016



Source: Bankwest Curtin Economics Centre | Australian Bureau of Statistics Census Data, 2006 and 2016.

Do we see significant differences in the ways the skill content of employment has changed across Australian states? Figure 55 demonstrates that significant positive changes in the employment share of the highest skill jobs have been observed in all states, although those in SA, WA and TAS are relatively more modest compared to the remaining states. The patterns of change in the middle and mid/low skill category jobs are mixed across states. While in most states there has been a decrease in the share of employment in these skill categories, there are some exceptions. For example, SA and WA have actually seen an increase in the share of employment in mid/low skill jobs (machinery operators and drivers occupations comprise a significant share of occupations at this skill level).

Figure 55 Changes in employment share by skill level, Australia, between 2006 and 2016



Source: Bankwest Curtin Economics Centre | Australian Bureau of Statistics Census Data, 2006 and 2016.

A significantly higher share of Australians report having a job with repetitive content rather than complex content.

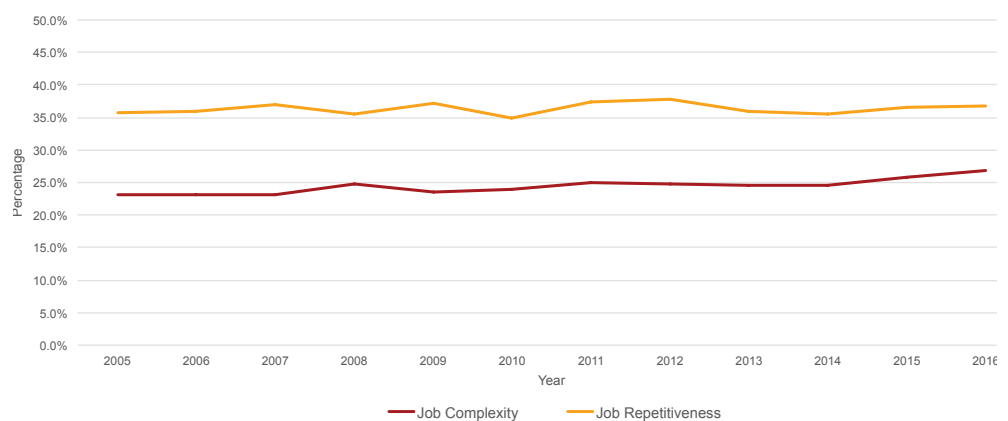
Job routinisation

Are the changes in the skill content of employment consistent with the routinization hypothesis: in other words, do we observe a decrease in the routine task content and an increase in non-routine abstract content of employment over time? Coelli and Borland (2016) study the changes in employment share by the type of task observed in the past five decades in Australia. They show that changes are consistent with the loss of jobs that are high in routine task intensity. However, this result is based on entirely compositional changes in employment; the task content of occupations is fixed as of 1966. We take a different approach: we rely on individual reports on the task content of jobs to explore the patterns of routinisation of tasks in Australia.

In HILDA surveys, individuals express their degree of agreement with first, the statement that their job is 'complex and difficult', and second, the statement that their job requires them to do 'the same thing over and over again'. Let's refer to the first content as 'complex' and to the second content as 'repetitive'.

Figure 56 presents the evolution of the shares of individuals who agreed their jobs were complex/repetitive over the period 2005 to 2016. Over this period, the share of individuals who described their job as complex has been consistently lower, by at least 10 percentage points, compared to the share of those who described their job as repetitive. There has been only a modest increase in the share of individuals with complex job content. These averages, however, are likely to conceal potentially large heterogeneities across various groups. We turn to a more disaggregated analysis next.

Figure 56 Share of individuals who strongly agree/agree that their job is complex; and their job is repetitive, 2005 to 2016, Australia

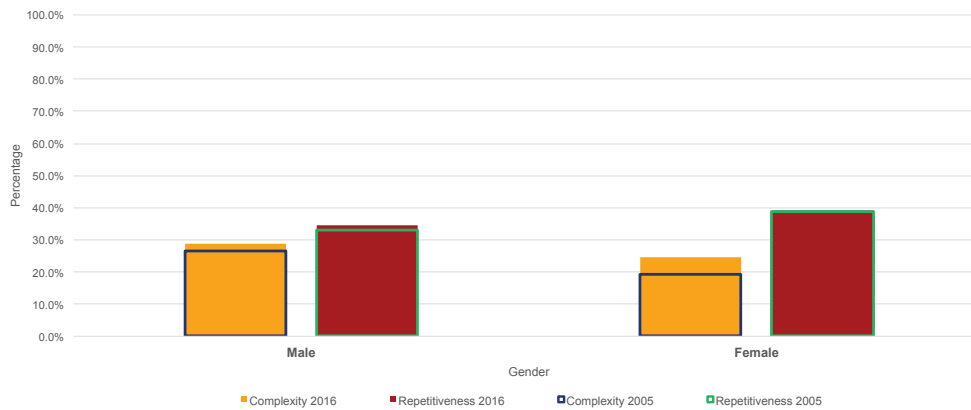


Source: Bankwest Curtin Economics Centre | HILDA.

The share of females reporting a complex job content has increased by nearly 30% in the last 11 years.

Figure 57 presents the shares of those with self-reported complex/repetitive jobs by gender. Repetitive job content is more prevalent among females, with little change in the share of females reporting their job as repetitive since 2005. Among males, the share of those with repetitive job content has slightly increased relative to 2005. The share of those reporting a complex job content has increased among both males and females, with a significant increase of nearly 30 per cent seen for females, resulting in the proportion of females with a complex job content rapidly approaching that of males.

Figure 57 Share of individuals who strongly agree/agree that their job is complex; and their job is repetitive, by gender 2005 and 2016, Australia

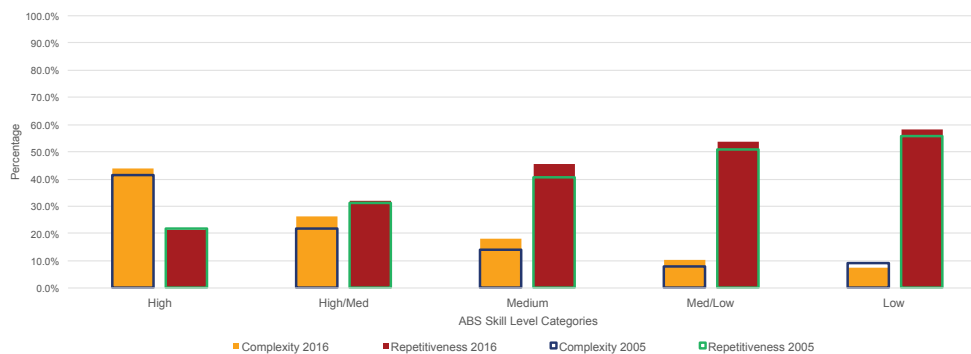


Source: Bankwest Curtin Economics Centre | HILDA.

Next, we consider the changes in self-reported job content by skill level (Figure 58) and educational attainment (Figure 58). As expected, the share of those describing their job as complex is by far the highest in the sample of high-skilled individuals – over 43 per cent in 2016. Only around 21 per cent of high-skilled individuals report a repetitive job content, with repetitive job content highest among the low-skilled, over 58 per cent in 2016. At the same time, the share of those with complex job content is the lowest in this group, at around 7.5 per cent. The share of individuals reporting complex job content has increased at medium to high skill levels in the past 11 years. However, there has also been an increase in the share of those reporting repetitive job content at medium to low skill levels.

Over 43% of high-skilled individuals in 2016 had a complex and difficult job.

Figure 58 Percentage of all individuals who strongly agree/agree that their job is complex; and their job is repetitive, by ABS skill level 2005 and 2016, Australia

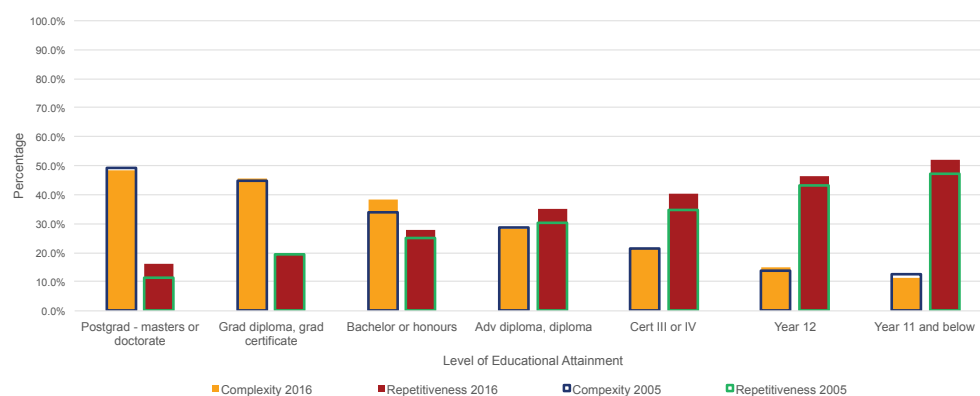


Source: Bankwest Curtin Economics Centre | HILDA.

Similar patterns emerge when considering the task content of jobs by educational attainment. Complex jobs are more prevalent than repetitive jobs among undergraduate, graduate and postgraduate degree holders. In the group of postgraduate degree holders, for example, over 48 per cent describe their jobs as complex while only around 16 per cent describe their jobs as repetitive (the repetitive job content has increased, however, relative to 2005). The share of individuals with repetitive job content increases with decreases in educational attainment, with over 52 per cent of those with year 11 and below education reporting repetitive job content.

This is an increase of 5 percentage points since 2005. Conversely, the share of jobs with complex task content in this group, at around 11.5 per cent, has decreased slightly from 2005 levels.

Figure 59 Percentage of all individuals who strongly agree/agree that their job is complex; and their job is repetitive, by educational attainment 2005 and 2016, Australia



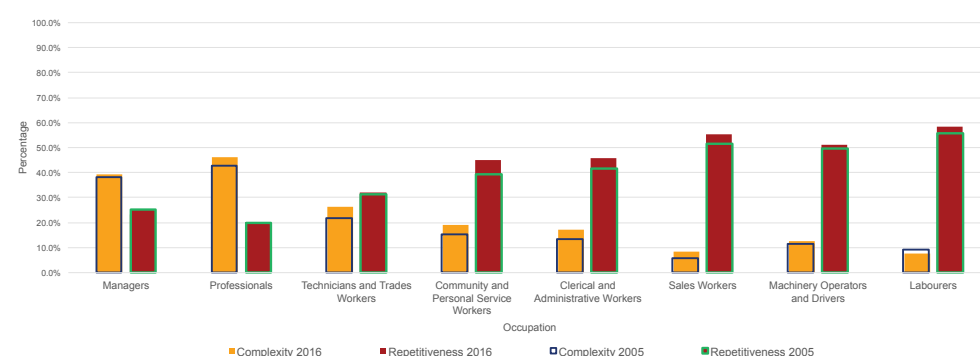
Source: Bankwest Curtin Economics Centre | HILDA.

Over 52% of individuals with year 11 and below education held jobs with repetitive content in 2016.

There are differences in the content of jobs across occupations that are broadly consistent with the patterns observed above. In Figure 60, we see that the prevalence of complex jobs is the highest among professionals and managers. The share of individuals who perceive their job as complex has increased in these two occupations since 2005, while the share of repetitive job holders has remained largely unchanged. In some occupations, the increase in the share of individuals reporting a complex job content relative to the level observed in 2005 is significant. For example, we observe around 41 per cent increase in the share of sales workers who report complex job content.

There have also been significant increases (over 20%) in the shares of individuals describing their jobs as complex among technicians and trade workers, community and personal service workers and clerical and administrative workers. Meanwhile, repetitive jobs have become more prevalent over time in some of the occupations such as community and personal service workers, clerical and administrative workers and sales workers. Labourers have the highest prevalence of repetitive job content – over 58 per cent in 2016.

Figure 60 Percentage of all individuals who strongly agree/agree that their job is complex; and their job is repetitive, by occupation, 2005 to 2016, Australia

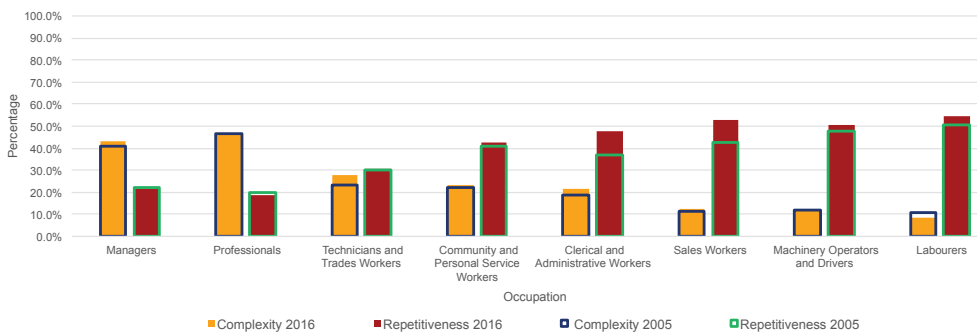


Source: Bankwest Curtin Economics Centre | HILDA.

The observed patterns are not uniform across genders, potentially due to the fact that men and women perform different tasks within occupations. As Figure 61 and Figure 62 demonstrate, among male managers, the jobs with complex content are significantly more prevalent than the jobs with repetitive content. Female managers, on the other hand, are less likely to hold a complex job, and more likely to hold a repetitive job, compared to their male counterparts. The differences in the relative prevalence of repetitive versus complex jobs for many occupations are more expressed among females. Among labourers, for example, over 65 per cent of females report repetitive content, while only around 5 per cent report a complex content. Among male labourers, the jobs with repetitive content are less prevalent (54.6%), while the jobs with complex content are more prevalent (8.7%), compared to females. Machinery operators and drivers are the only occupational category, in addition to managers, that has seen a decrease in the share of repetitive jobs among females. Combined with an increase in the share of complex jobs, the changes observed in the task content of the two occupations for females are consistent with the routinization hypothesis.

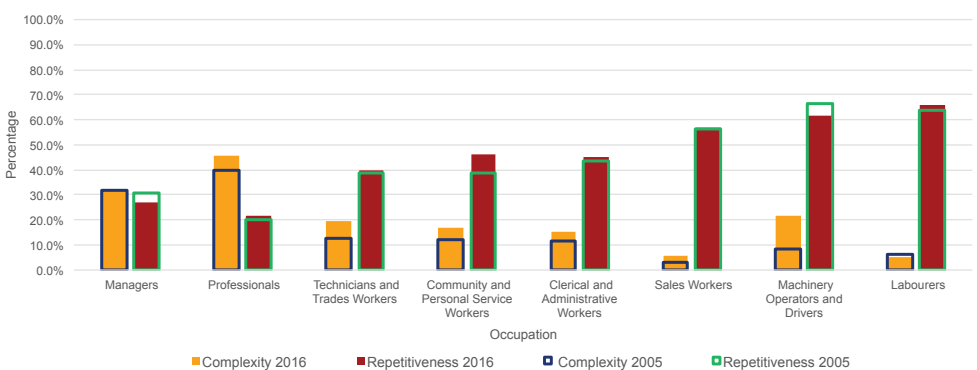
Female managers are less likely to hold a complex job and more likely to hold a repetitive job, compared to their male counterparts.

Figure 61 Percentage of all individuals who strongly agree/agree that their job is complex; and their job is repetitive, by occupation, males, 2005 to 2016, Australia



Source: Bankwest Curtin Economics Centre | HILDA.

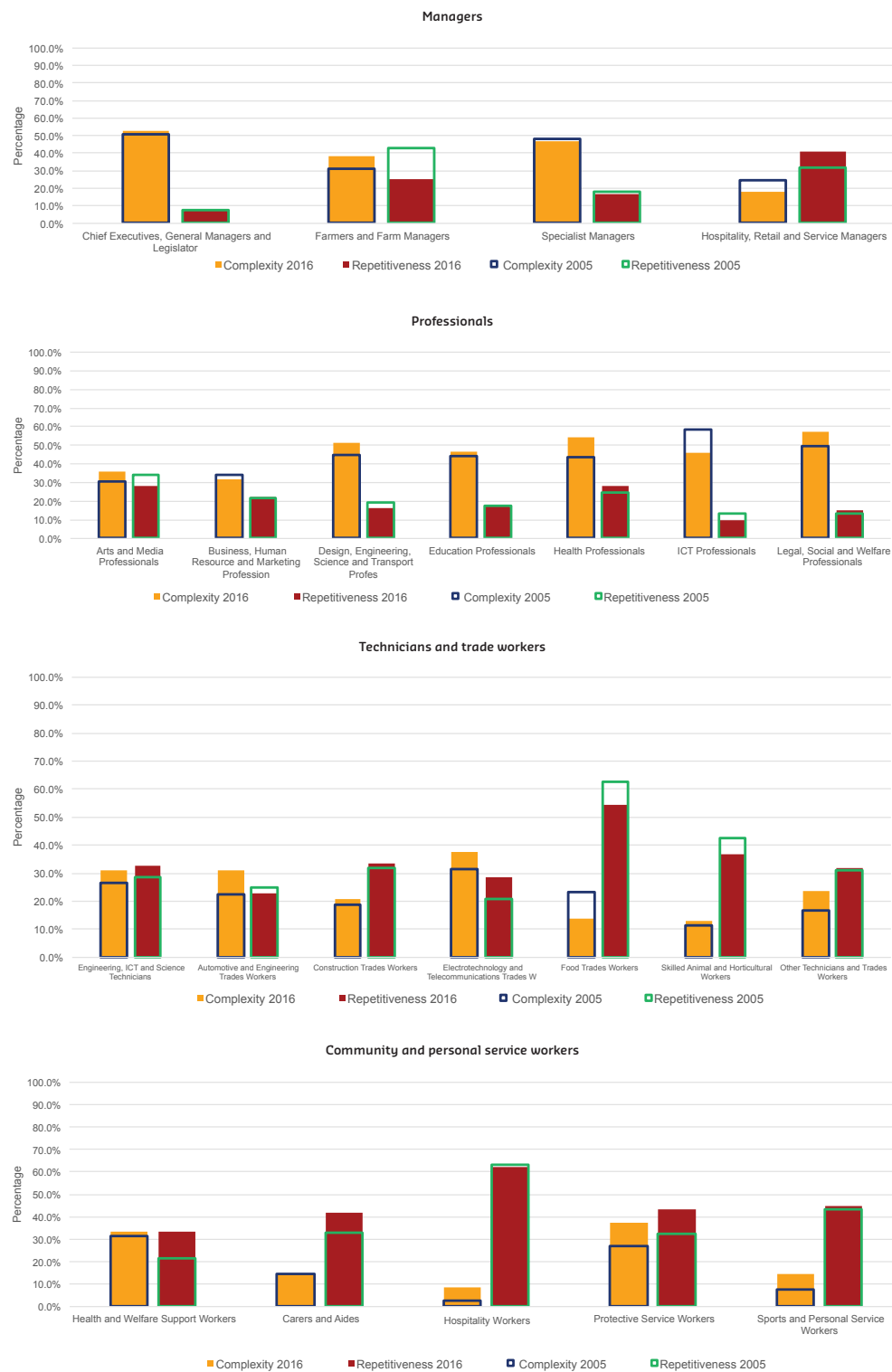
Figure 62 Percentage of all individuals who strongly agree/agree that their job is complex; and their job is repetitive, by occupation, females, 2005 to 2016, Australia



Source: Bankwest Curtin Economics Centre | HILDA.

Considering patterns by detailed occupational categories in Figure 63 reveals further heterogeneity in the patterns of change in the complexity and repetitiveness of jobs. Among managers, for example, we see evidence of routinisation among farmers and farm managers: Since 2005, the share of those reporting complex job content has increased while the share of those reporting repetitiveness has decreased. Further, changes consistent with the routinization hypothesis are observed for some professionals, including arts and media professionals and design, engineering, science and transport professionals. Other examples of sub-occupations that have seen similar changes include automotive and engineering trades workers, hospitality workers and mobile plant operators.

Figure 63 Percentage of all individuals who strongly agree/agree that their job is complex; and their job is repetitive, by detailed occupation, 2005 to 2016, Australia



Source: Bankwest Curtin Economics Centre | HILDA.

Figure 63 Percentage of all individuals who strongly agree/agree that their job is complex; and their job is repetitive, by detailed occupation, 2005 to 2016, Australia

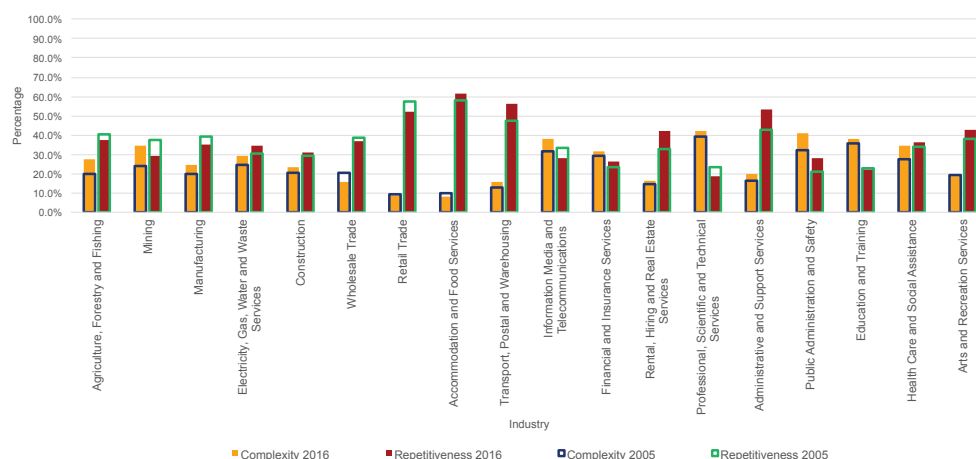


Source: Bankwest Curtin Economics Centre | HILDA.

There is evidence of a decrease in routine tasks in jobs in the Agriculture, Mining and Manufacturing sectors.

Industry differences in the task content of jobs are presented in Figure 64. Some industries, such as Agriculture, Forestry and Fishing, Mining, Manufacturing, Information, Media and Telecommunications, and Professional, Scientific and Technical services, have seen increases in the share of complex jobs and decreases in the share of repetitive jobs – patterns consistent with the routinization hypotheses. However, this doesn't apply to all industries. For example, Transport, Postal and Warehousing, Rental, Hiring and Real Estate Services, and Administrative and Support Services among others, have in fact seen significant increases in the share of repetitive jobs, while Wholesale Trade has seen a decrease in the share of complex jobs.

Figure 64 Percentage of all individuals who strongly agree/agree that their job is complex; and their job is repetitive, by industry, 2005 to 2016, Australia

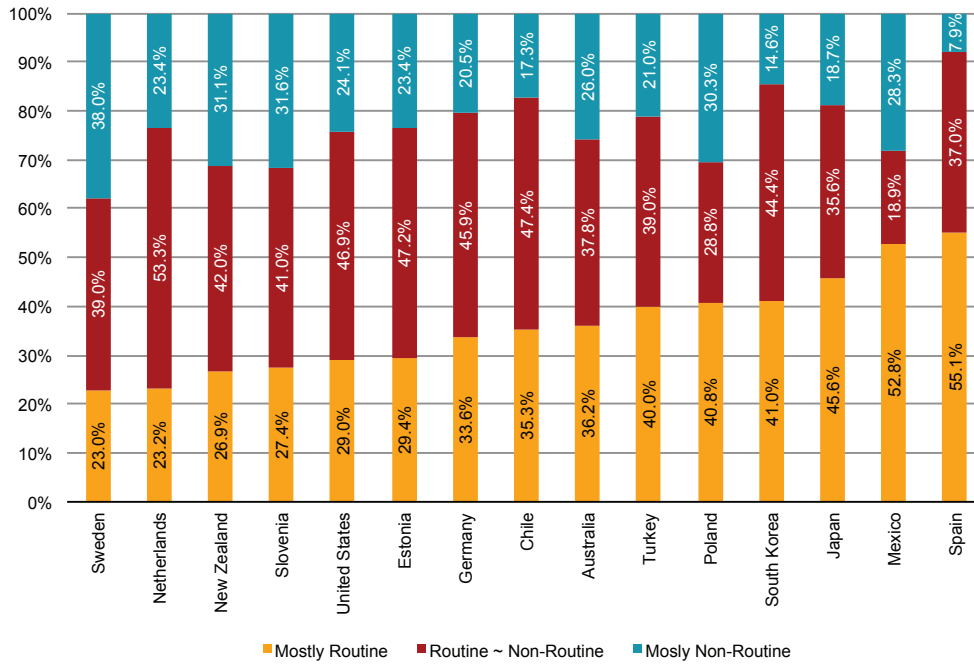


Source: Bankwest Curtin Economics Centre | HILDA.

Routine task content is higher in Australia compared to New Zealand and United States.

How does the task content of jobs in Australia compare to those observed in other OECD countries? To address this question, we use another source, the World Values Surveys, which contains information on the degree of routineness of jobs across a number of countries. According to this measure, around 36 per cent of Australians have jobs with mostly routine content, while the jobs of 26 per cent are mostly non-routine (re-assuringly, these numbers are very similar to those obtained from HILDA in the earlier analysis). The remaining jobs have elements of both. Routine job content reported by individuals in countries such as New Zealand and United States is smaller relative to Australia's. However, routine job content appears to be more prevalent among individuals in other countries in Asia Pacific, including South Korea and Japan.

Figure 65 Routineness in jobs in OECD countries, 2010 to 2014



Source: Bankwest Curtin Economics Centre | World Values Surveys.

In summary, we've seen a decrease in low-skilled employment share in Australia over the last 10 years. Meanwhile, high-skilled employment has increased, particularly for females. These changes are consistent with the skill-biased technological change hypothesis that predicts a shift in demand, favouring skilled workers as a result of technological change.

Are these patterns consistent with the decline in the routine task content of occupations? There has been an increase in non-routine abstract content and a decrease in the routine task content of employment for some but not all groups of workers. In fact, for many the routine task content has increased. This suggests that explanations other than routinisation are likely to play a role as well. The decrease in the low-skilled employment share due to offshoring is an important one. Exploring these is outside the scope of this section, however.

Future implications

We've been here before. New technology has been impacting on people's jobs from at least the beginning of the industrial revolution over 200 years ago. The great majority of people used to work in agriculture - now less than 5 per cent do. Then manufacturing jobs proliferated as people moved to cities to work in factories. But those days are gone too, with only around 7 per cent of Australians working in manufacturing. Most people now work in service and knowledge-based occupations and industries.

But these massive changes have not meant mass unemployment or misery. In fact, over the long run, economies are now vastly more productive, society is much richer, jobs are safer, lives have extended and we have more leisure time. However, transitions can be difficult and in particular, those people losing their jobs to technological developments often suffer loss of income, status and wellbeing. They often do not easily find replacement jobs. Even those people in the new technology sectors may not see rising incomes for several years. But eventually, technology has created new and better jobs in sufficient numbers to raise almost everyone's living standard. The long-term tendency has been for brains to replace brawn, with a consequent rise in education.

Now though, there is widespread concern that 'this time may be different'. It is fairly easy in retrospect to see how manufacturing offered jobs to the excess agricultural workforce, and how services soaked up the labour released by the mechanisation of factories. But it is not so simple to see where the new jobs will come from in the face of digital disruption and artificial intelligence, which may put more skilled and knowledge-based workers out of a job. Yes, we know new jobs are being created, but what is the likely balance between job creation and destruction - and what sort of jobs are going to be left? Will they require more or less skill, and will they pay better or worse? And if we don't adopt new technology, will that just leave all of us even further behind?

Our analysis in this chapter suggests that so far, at least, Australia is slightly behind comparable countries in terms of adopting ICT capital and robots. But we are catching up. And as a nation, we are among the most positive about the future in our belief that science and technology will create more opportunities for the next generation.

Encouragingly, Australia is so far experiencing 'skill biased technological change' rather than 'job polarisation'. In other words, employment is shifting towards higher skill jobs, especially for women, rather than seeing a hollowed out middle flanked by an increase in high and low skill jobs. That scenario would likely increase inequality - but so far we seem to be avoiding it. Similarly, routinisation within jobs is declining relative to the number of jobs requiring more complexity, although this is not universal across industries and occupations.

Nevertheless, we can't be complacent, for at least two reasons. First, there is a great need to support workers with lower skills and in vulnerable industries and occupations who are at greater risk of losing their jobs. Second, technology is not standing still, and the potential for even higher skill jobs and industries to be replaced is ever present. Expert estimates based on the potential for AI to replace existing jobs and tasks range from a concerning 9 per cent to an alarming 40 per cent or more. No one can be certain of the outcome.

We can, however, plan and prepare. One way is to become strong in leading edge industries and technologies - to be the disrupters, not just the disrupted. Another is to organise our workplaces so that robots, AI and digital technology complement and assist workers to do their jobs better, rather than simply replacing them. A third is to invest in sectors that are less vulnerable to automation - personal services, health and caring professions, lifelong education, and creative industries. And a fourth is to ensure that we provide support for the most vulnerable - the young unskilled and people in industries and jobs in structural decline.

Preparing

for the future

Introduction

The changes in the structure and nature of employment necessitate changes in the workforce. Not only do we see changes by industry and occupation, we see some of the work we do become more complex. This has implications for the types of skills we choose to learn as well as the amount of study we take up. No longer may it suffice to have a degree, we may need to spend more time re-skilling throughout our careers.

Some of the changes in the labour market have important gender implications. We may not be able to afford carrying on with gendered patterns of education for much longer if we want to have a society where everyone has a fair chance of getting a job. And not only changes in what we study may be required. There may be the need for change in the overall mindset and attitudes on gender roles around work.

In this chapter, we first provide a detailed picture of recent changes in the composition of degrees delivered through Australia's tertiary education sector. We also review the patterns of employer training, given its role in helping workers deal with the challenges of continuously changing job tasks. The second part of this section reviews the changes in the gendered nature of education and provides an assessment of whether and how the share of female enrolments in different degrees has changed over the past 15 years. We conclude by focusing on those with limited education. How have the patterns of their employment changed? And what may it take to boost the future employment chances of this group of workers?

Preparing for the future: The role of education

There are good reasons for investing in human capital, including its contribution to social mobility, economic growth and innovation. Education is also commonly seen as the key pathway to addressing the changing demand for labour. The share of university graduates has increased considerably over time in Australia, but what training are we delivering through the tertiary education sector, and is this likely to address the demand for future jobs in Australia?

In this section we provide a detailed picture of recent changes in the composition of degrees delivered through Australia's tertiary education sector. We also review the patterns of employer training, given its role in helping workers deal with the challenges of continuously changing new role job tasks.

Our analysis of the number of enrolments in tertiary degree programs since 2001 shows that management and commerce, and society and culture attracted by far the largest number of domestic male students (Figure 66). Not only are the enrolments in these degrees exceeding those in others, they had been steadily rising since 2001. Management and commerce has also attracted the largest number of overseas male enrolments from 2001 to 2016. However, overseas enrolments in society and culture degrees were considerably lower, potentially due to limited immigration possibilities associated with such degrees or lack of employment opportunity on return to home countries.

Other areas that have seen a relatively large number of domestic male enrolments include engineering and related technologies, health, and natural and physical sciences. Especially in health, we have seen a very rapid increase in domestic male enrolments since 2001. It is, however, relatively unpopular among overseas males. Engineering and related technologies attracted the second largest number of overseas male enrolments in 2016. Following periods of decline, enrolments by both domestic and international students in information technology degrees have started to rise since 2012.

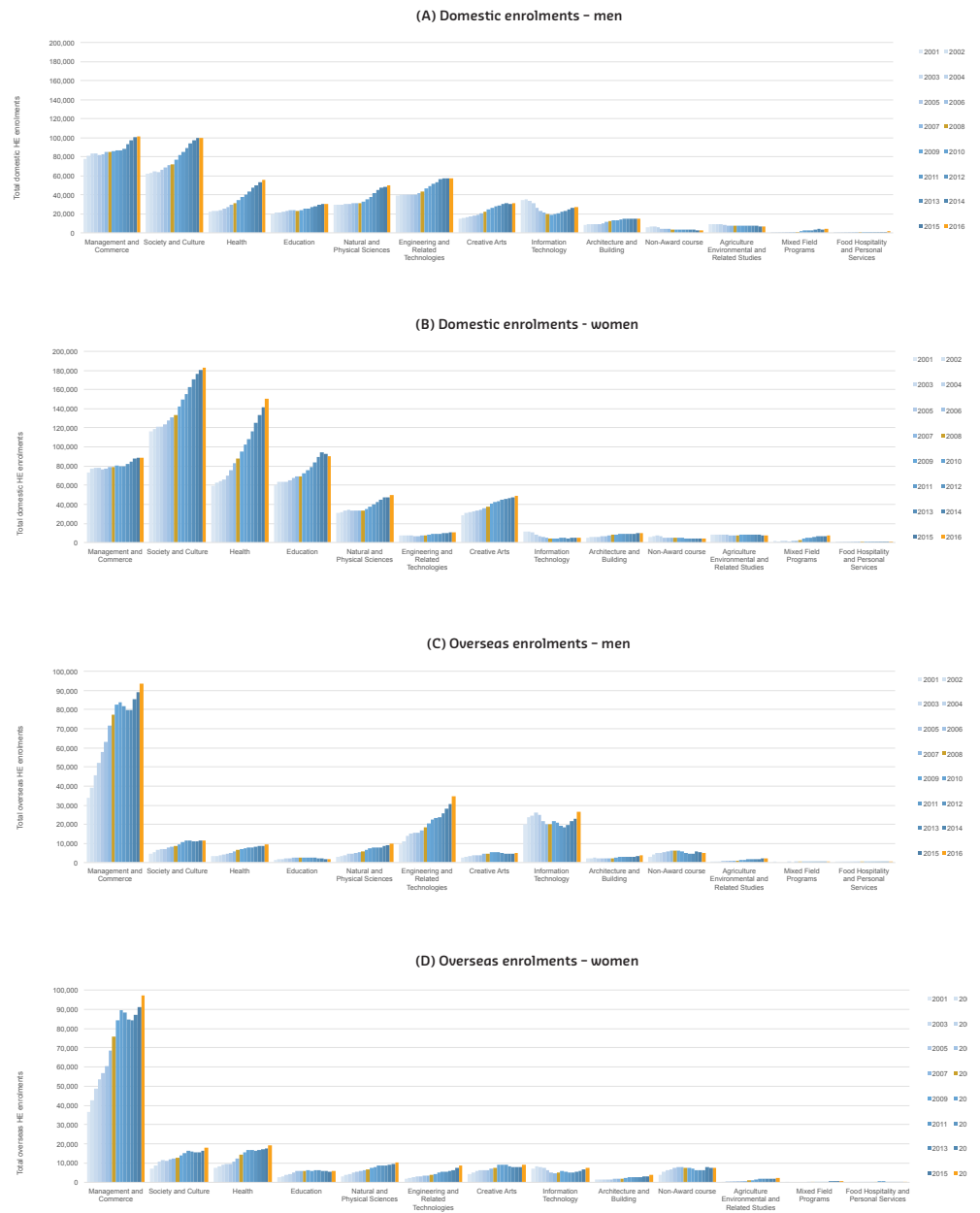
The popularity of management and commerce degrees is not limited to males. Over half of overseas females were enrolled in such degrees in 2016. Among domestic females students, however, it is society and culture, and health degrees that attracted the largest number of students. In 2016, 54 per cent of domestic females were enrolled in one of the two degrees. We have seen a three-fold increase in domestic female enrolments in health degrees since 2001.

Management and commerce attract the largest number of male students in Australia.

Increasingly large number of overseas male students enrol in engineering and IT degrees.

Domestic enrolments in health degrees have been rapidly rising in the last 15 years.

Figure 66 Enrolments in tertiary degree programs, by gender and field, Australia, 2001 to 2016

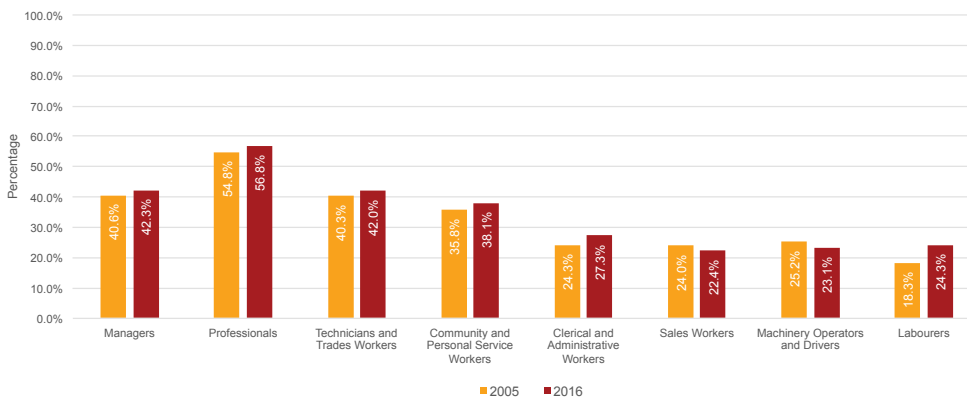


Source: Bankwest Curtin Economics Centre | Authors' calculations based on Australian Government Department of Education and Training statistics (<http://highereducationstatistics.education.gov.au>).

A degree at the start of a career does not address the need for continuous acquisition of skills in times of rapid technological change. In many jobs, it becomes essential to regularly acquire new skills throughout careers. As Figure 67 demonstrates, this has become increasingly so in most occupations over time. Over 56 per cent of professionals, for example, often require learning new skills as part of their jobs. Around 42 per cent of managers, and technicians and trade workers do so too. In some middle-skilled occupations, however, such as sales workers, and machinery operators and drivers, there has been a slight decrease in the need to learn new skills in a job. Nevertheless, the share of those who require new skills for their jobs remains significant in these occupations.

Over 56% of professionals often require learning new skills for their job.

Figure 67 Jobs that often require learning new skills by occupation, Australia, 2005 and 2016

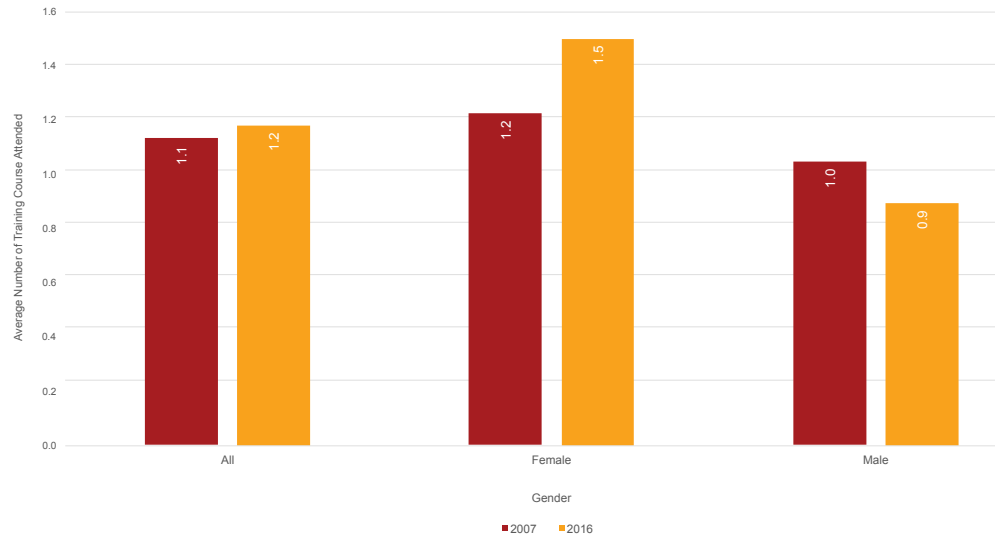


Source: Bankwest Curtin Economics Centre | HILDA.

The fact that many workers need to learn new skills as part of their jobs necessitates the acquisition of such skills on a continuing basis. Employers have a role to play in this. Employer-provided training can be crucial for helping the employees adapt to the changing nature of their jobs. As Figure 68 shows, an average Australian employee takes more than a single training course in a year, with a slight increase in the number of employer-provided training courses since 2007. However, it is largely driven by an increase in the number of trainings taken up by females. The trainings by males have in fact decreased relative to 2007.

Attendance of training courses has increased among females but decreased among males in the last 10 years.

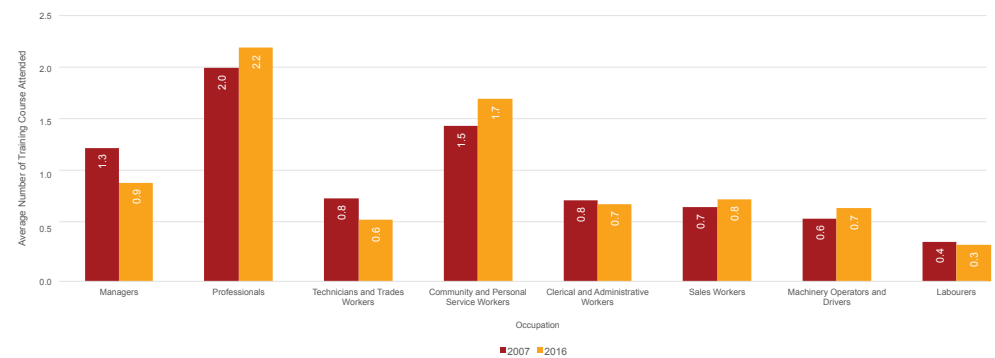
Figure 68 Average number of training courses attended by gender, Australia, 2007 to 2016



Source: Bankwest Curtin Economics Centre | HILDA.

Consistent with the patterns of training attendance by gender, in Figure 69 we see an increase in the number of trainings by professionals and community and personal service workers – occupations with high female representation. Among occupations where the number of trainings undertaken by employees has decreased are technicians and trades workers and labourers, where males comprise a significant share. Interestingly, the number of trainings attended by managers has also decreased in the last 10 years.

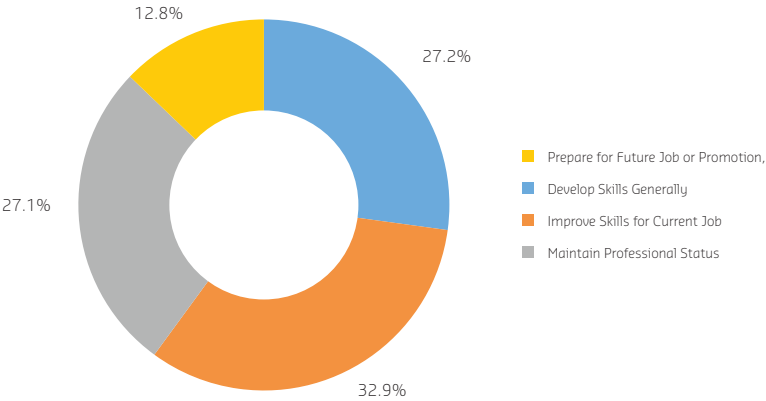
Figure 69 Average number of training courses attended by occupation, Australia, 2007 to 2016



Source: Bankwest Curtin Economics Centre | HILDA.

Why do workers attend a training course? Figure 70 shows that preparing for a future job (or a promotion) comprises the smallest proportion, (12.8%), of training goals. Around 33 per cent of trainings in 2016 had the purpose of improving the skills for current jobs, while maintaining professional status and developing skills generally were each the purpose of 27 per cent of trainings.

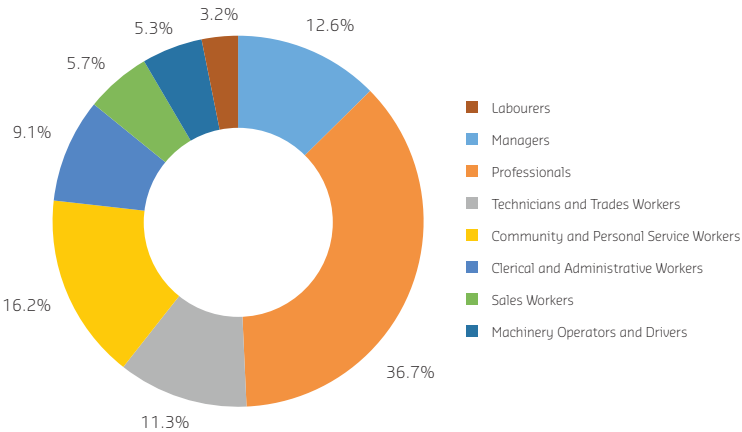
Figure 70 Training courses by aim of the training, 2016



Source: Bankwest Curtin Economics Centre | HILDA.

Focusing on training courses explicitly targeted at preparing for future opportunities in Figure 71, we find that nearly half of these are attended by professionals and managers. Future-oriented training attendance is also prevalent among community and personal service workers. Training undertaken by this group comprises over 16 per cent of trainings taken to prepare for future job or promotion.

Figure 71 Training courses to prepare for future job or promotion by occupation, 2016



Source: Bankwest Curtin Economics Centre | HILDA.

Gender and educational choice

There has been a 5 ppt increase in the share of tertiary enrolments in health in the last 15 years.

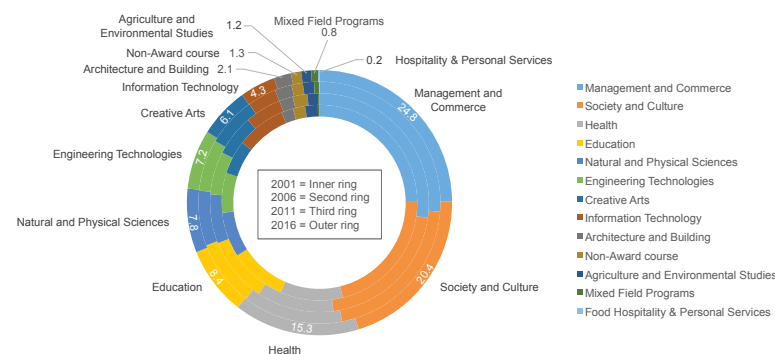
IT's share of total tertiary enrolments has nearly halved between 2001 to 2016.

The share of female enrolments in IT has decreased by nearly 10 ppts since 2001.

There has been a significant increase in the number of domestic enrolments over time. We had over 71 per cent more students enrolled in tertiary degrees in 2016 than we had in 2001. However, as Figure 69 demonstrates, this increase has not equally applied to all disciplines. The most remarkable increase has been in health. The discipline moved from comprising around 10 per cent of enrolments in 2001 to around 15 per cent of enrolments in 2016. Some disciplines, on the other hand, have lost some of their shares in total enrolments. IT leads the list - the discipline's share of enrolments dropped from 8.2 per cent in 2001 to 4.3 per cent in 2016.

In 2016, over 45 per cent of enrolments were in either management and commerce, or in society and culture. Other major fields of enrolments in 2016 included education, natural and physical sciences and engineering technologies, jointly comprising around another quarter of total enrolments.

Figure 72 Share of higher education enrolments in Australia, by field, 2001 to 2016

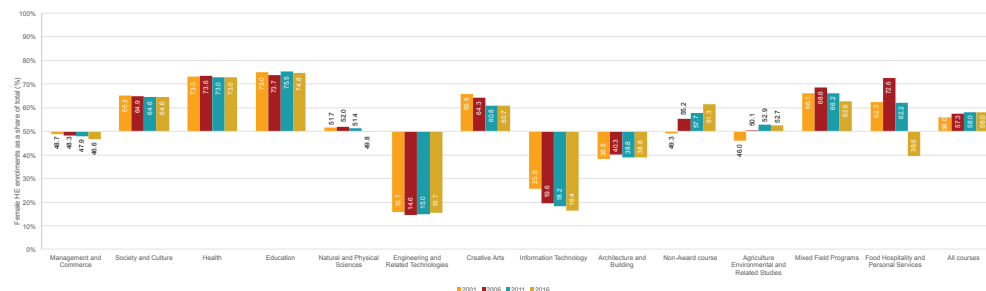


Source: Bankwest Curtin Economics Centre | Authors' calculations based on Australian Government Department of Education and Training statistics (<http://highereducationstatistics.education.gov.au>).

Education choices are gendered. Traditionally, we have seen more female representation in humanities and social sciences and much less in STEM disciplines. Gender disbalance in some disciplines has potentially profound implications for productivity due to lack of diversity in perspectives and experiences. There has been significant effort in recent years to raise awareness and counter gender stereotypes around professional paths men and women may take. Have we seen changes in the choice of subjects of study by gender? As Figure 70 tells us, not so much in most cases.

The share of females in traditionally female-dominated disciplines, such as society and culture, has hardly changed in the last 15 years. Distribution of males and females in some male-dominated disciplines such as engineering and related technologies, and architecture and building has also changed remarkably little over time. In other cases, most notably in IT, not only we do not see an improvement in gender balance, we see a decrease in already small representation of females. The proportion of females in this discipline has dropped from 25.8 per cent in 2001 to 16.4 per cent in 2016.

Figure 73 Share of female higher education enrolments in Australia, by field, 2001 to 2016



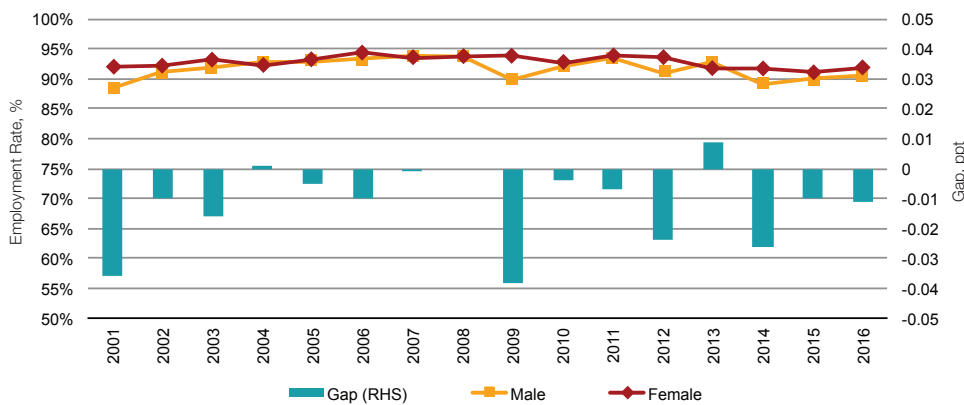
Source: Bankwest Curtin Economics Centre | Authors' calculations based on Australian Government Department of Education and Training statistics (<http://highereducationstatistics.education.gov.au>).

The future of lower-educated workers

In this section we focus on a special group of workers - those with very limited formal education. There are good reasons to be pessimistic about the labour market outcomes of some workers in this group. Both technology and the increase in supply of high-skilled workers may contribute to the displacement of lower-educated workers. To what extent are these concerns justified? Do they affect men and women differently? And what can we do to ensure that everyone is able to cope with the changes in the labour market?

Figure 74 demonstrates the evolution of employment rates for those whose highest educational attainment is at Year 11 or below, by gender. Over the period 2002 to 2015 the employment rate of females consistently exceeded that of males, with some convergence reached in 2016. This is in contrast to labour market outcomes observed among those with university education where men often have the advantage.

Figure 74 Employment rates of lower-educated workers by gender, 2002 to 2016



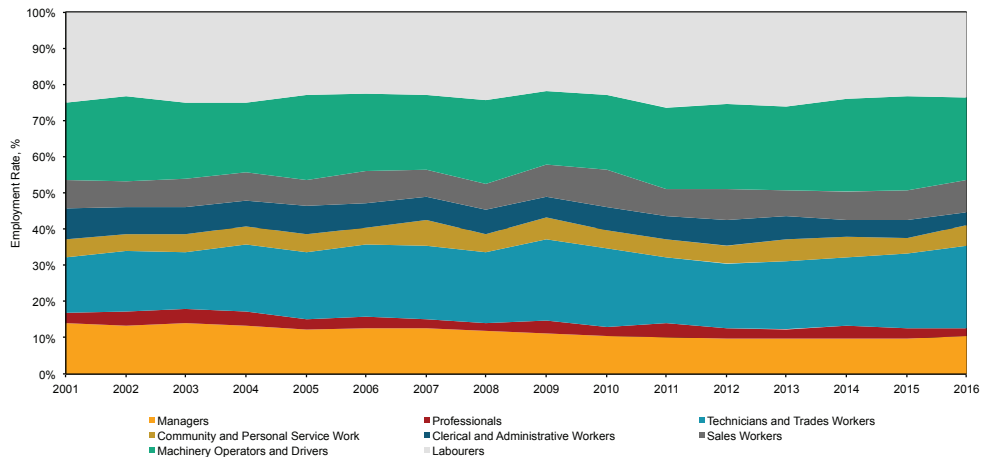
Source: Bankwest Curtin Economics Centre | HILDA.

In Figure 75 and Figure 76, we look at the types of jobs lower-educated males and females do. In 2016, over half of lower-educated females were employed as clerical and administrative workers and sales workers – occupations that often require social and communication skills. The majority of males employed in low-skilled jobs are at high risk of technological disruption. In 2016, for example, a quarter of lower-educated males worked as machinery operators and drivers. Labourers, and technicians and trades workers are among the other major occupations employing lower-educated males.

Employment rates of lower-educated females has been higher compared to males during most of the last 15 years.

The majority of lower-educated males are employed in jobs that are at high risk of technological disruption.

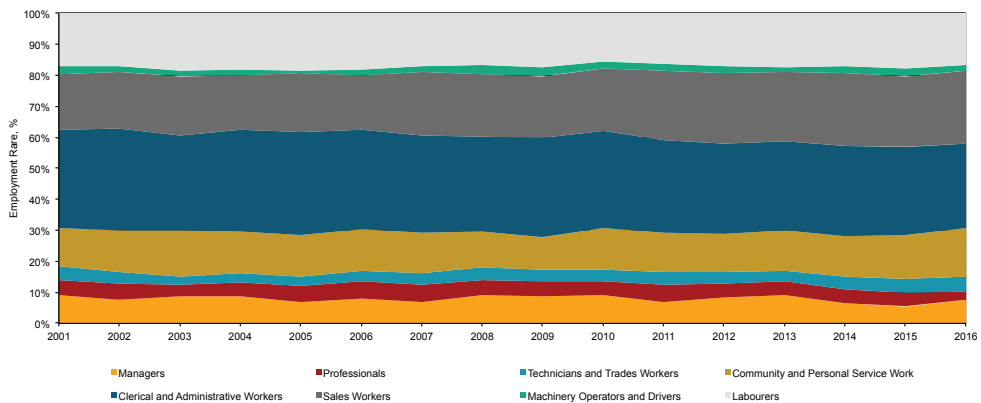
Figure 75 Share of employment by occupation, lower-educated males, 2001 to 2016



Source: Bankwest Curtin Economics Centre | HILDA.

In contrast, employment of lower-educated females appears to be in occupations where the risk of technological disruption is relatively low. In 2016, over half of lower-educated females were employed as clerical and administration workers and sales workers – occupations that often require strong social and communication skills.

Figure 76 Share of employment by occupation, lower-educated females, 2001 to 2016



Source: Bankwest Curtin Economics Centre | HILDA.

Figure 74 and Figure 75 present the numbers of lower-educated workers by occupation and age cohort. Some differences across the cohorts emerge. These are at times consistent with the possibility of replacement of one cohort of workers with another in an occupation.

We see an increase in the number of 15 to 24 years old technicians and trades workers, one of the major occupations for lower-educated males, in the pre-GFC period. In the post-GFC period, however, there has been a decrease in 15 to 24 years old males in this occupation. Instead, we have seen a tangible increase in the numbers of 25 to 34 old males employed as technicians and trades workers in the past few years. Somewhat similar patterns emerge for sales workers - we see a decrease in 15 to 24 years old sales workers in the period from 2010 to 2015. This has been accompanied by increases in the numbers of 45 to 64 years old sales persons, although not at the same rate.

Not all cases have seen a decrease in the number of 15 to 24 years old males employed in an occupation. Among labourers, for example, the number of 15 to 24 years olds has started to increase after 2010, before gradually decreasing again after 2012. At the same time we have seen a steady decline in the number of 25 to 34 years old male labourers.

Turning to the numbers of lower-educated female workers, we see an increase in 15 to 24 years old community and personal service workers following the GFC period. The number of community and personal service workers aged 25 to 54 years old has decreased throughout most of the same period only starting to increase in the last couple of years.

Sales workers, an occupation employing a large share of lower-educated females, has seen changes by cohort largely similar to those observed for males: a decrease in the number of 15 to 24 years old females accompanied by increases in the numbers of females from some of the older cohorts.

The number of female clerical and administrative workers - another occupation employing a large number of lower-educated females - in 35 to 54 years old group has decreased over time. At the same time, we observe an increase in 55 to 64 years old female clerical and administrative workers in the pre-GFC period, which has started to decrease, albeit at a lower rate, following the GFC.

Figure 77 Number of low-skilled workers by occupation and age cohort, males, 2002 to 2016



Note: Values are smoothed using 2 years moving average.
 Source: Bankwest Curtin Economics Centre | HILDA.

Figure 78 Number of low-skilled workers by occupation and age cohort, females, 2002 to 2016



Note: Values are smoothed using 2 years moving average.
 Source: Bankwest Curtin Economics Centre | HILDA.

The role of culture

If the jobs that currently have strong representation of women are harder to automate than men's, and female-dominated occupations are growing more rapidly than male-dominated roles, society will need to make adjustments to traditional attitudes around gender roles at work. While Australia has made progress in promoting the value of gender equity, there is still some work to be done.

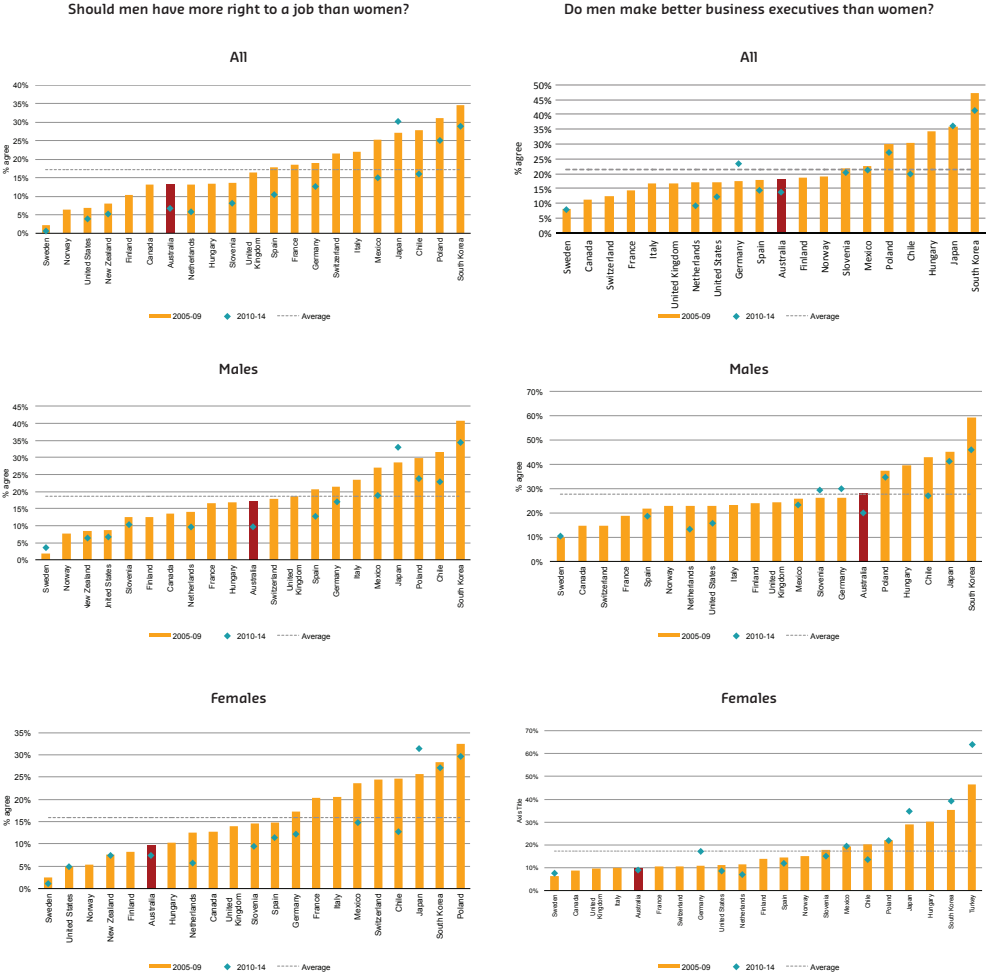
We used the World Values Survey to analyse individuals' attitudes to gender roles in work across a group of OECD countries. In the first chart in Figure 79 we report the share of those who agree with the statement that men should have more right to a job than women if jobs are scarce. While gender role values are more equitable compared to the average of selected OECD countries, a significant share of Australians believe men should have preferential right to a job. In 2012, around 8.5 per cent of Australians shared this view, an improvement from around 13 per cent observed from 2005 to 2009.

In 2012, around 10% of men and 7.5% of women in Australia believed that men should have more right to a job than women.

Interestingly, these results are not driven by men's attitudes alone. It is true that a significantly higher share of men, around 9.7 per cent in 2012, believed that men should have more right to a job than women. However, 7.5 per cent of women did so too.

Values diverge around access to jobs, but also around job performance. Gender discriminatory attitudes are significantly less prevalent in the US and New Zealand, but more prevalent in other Asian Pacific countries, most notably Japan and Korea. Individuals across OECD countries hold different opinions on a gender's superiority in performing a given job. Here, we consider views on who makes better business executives. As we see from the second column of Figure 79, in 2012, 13.45 per cent of Australians believed that men perform better as business executives. While a decrease from 18.16 per cent observed in 2005 to 2009, this still highlights that a significant share of the country's population hold gendered views relating to job performance. However, patterns by gender, suggest this view is more strongly held by men, with over 20 per cent agreeing that men make better business executives than women in 2010 to 2014, while under 8 per cent of women held the same view.

Figure 79 Gender role attitudes on work, OECD countries, 2005-09 and 2010-14

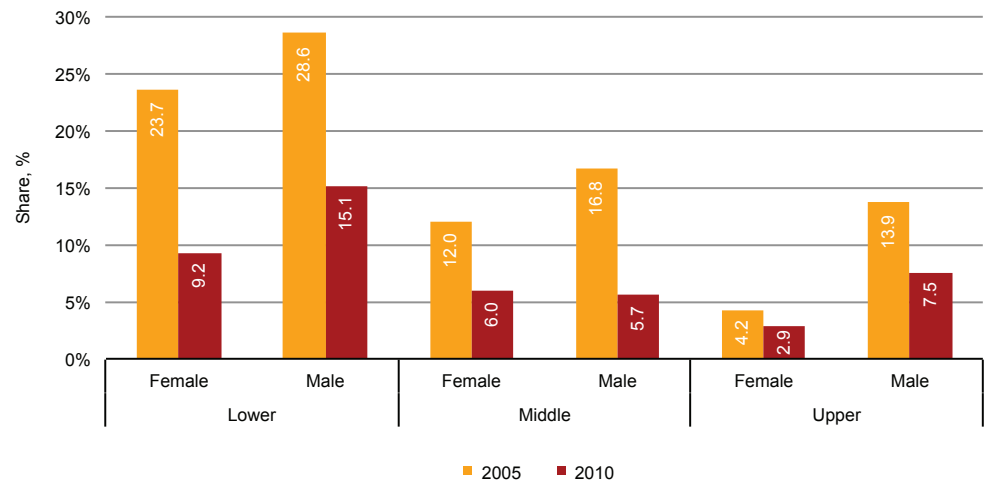


Source: Bankwest Curtin Economics Centre | World Value Surveys.

Gender biased attitudes are particularly prevalent among those with lower education levels.

Those at the highest risk of technological disruption are low-educated males. Conversely, some female-dominated jobs at a comparable skill level, are harder to automate, and as such are likely to grow in the future due to increasing demand. To adapt, changes in gender role attitudes are particularly pertinent for this group of workers. Yet, as Figure 80 demonstrates, gender-biased attitudes relating to access to jobs are particularly prevalent among those with lower education. In 2012, around 15 per cent of males and around 9 per cent of females in this group believed men should have more right to a job than women if the jobs are scarce. However, there has been improvement in attitudes across all education levels over time. Encouragingly, the biggest improvement is among the lowest educated individuals.

Figure 80 Share of individuals who agree that men should have more right to a job than women by educational attainment, Australia, 2005 and 2010



Source: Bankwest Curtin Economics Centre | World Value Surveys.

Future implications

We have seen from previous chapters that the jobs that are increasing in number are generally those that require higher skills. Professionals now comprise the largest occupational grouping in Australia. At the same time, low skill occupations and industries are in decline, while jobs are tending to become more complex and less routine.

All these developments point to the need for more education and training, and this is true across the whole of people's working lives, not just at the start. Education may not quite be a silver bullet – but a lack of education and a failure by employers to train their workforce is surely not a sensible alternative. A good education is still the best insurance that individuals and society can have as they face the challenges of an uncertain labour market in the future.

The analysis presented in this chapter showed a mixed picture in terms of how well Australia is preparing for the future.

While higher education enrolments have been increasing, they remain highly gender segregated, with women dominating enrolments in health and education (around 75% of the total) while men continue to dominate engineering and IT enrolments (over 80%). Looking at enrolments as a whole, health enrolments are increasing rapidly reflecting the ongoing strong demand for graduates in this field. However, there has been a worrying fall in domestic student IT enrolments over the past 15 years, although this has begun to reverse to some extent since 2008. Given the likely significance of AI, IT and robotics to future industries and work, Australia should expect to have much larger numbers of graduates in IT.

The need for ongoing learning is evident, with almost all occupations seeing an increase in jobs that often require learning new skills. Unsurprisingly, the amount of training courses people are doing is also increasing, but this is only because women are doing more training – reflecting their concentration in jobs such as professionals, community and service workers. Men on the other hand are concentrated in occupations such as labourers, and technician and trade workers, where the amount of training declined over the past decade.

Surprisingly, managers reduced the number of training courses attended over the past ten years – this does not augur well for Australian industry. It needs to be reversed, if Australia is to remain competitive in an era of digital technology and globalisation.

As Chapter 3 noted, Australia does not appear to be experiencing job polarisation (i.e. an increase in high and low skill jobs as middle skill jobs hollow out). Rather, there is a generally upward skill profile, as jobs in more highly skilled occupations and sectors increase and low skill work and sectors decline. On the one hand, this is a positive development as it implies higher wages and employment on average. But it does place low skilled workers in the firing line.

There are differences within the low skilled population. Men are at particular risk, as they tend to be in jobs more susceptible to technological displacement, such as machine operators and drivers, than low skilled women. The latter tend to be in jobs that may not be as vulnerable, as they require social and communication skills - sales workers, for example.

The social and cultural implications of these variable job prospects amongst the lower skilled also need to be taken into account. There remains a sizeable segment of society who believe men should receive preference for a job over women in situations where jobs are scarce. This belief is stronger amongst people with lower educational attainment who are themselves more likely to be in lower skilled jobs. Yet as we have seen, displaced men may not have the necessary skills to take up new jobs, even in other low skill sectors and occupations, without retraining and more education. Their disappointment and resentment at their place in the labour market could be profound. Policy needs to target support to these low skilled men in order to assist their transition into other employment.

Summary

and conclusions

Summary and conclusions

One way or another, work affects everyone. Understanding the evolution of work is critical to Australia's economic and social future. This sixth report in BCEC's *Focus on the States* series examines how patterns of employment are changing, what is happening to the quality of jobs, the way technology is impacting the labour market, and what we can do to prepare for the future. Labour markets are undergoing rapid change. Technology – such as digital disruption, automation and artificial intelligence – is a key driver, as are changing industry structures and globalisation.

Overall more of us are working, with a record 77 per cent of 15 to 64 year olds now in the labour force. The main reason for this is the massive rise in female labour participation, which has more than offset a decline in male participation. This has been accompanied by a doubling in the proportion of employees who work part-time compared to 40 years ago.

Work is becoming more 'feminised', as Australia shifts to a service economy. Sectors in which women dominate – such as Health Care, Social Assistance and Education – are growing fastest, while the situation for men is more mixed. The fall in Manufacturing is only just counter-balanced by the rise in Mining and Construction, and Mining is likely to be subject greater automation in future.

As a result of these industry changes, professionals are now the largest occupational grouping. But the fear of a hollowing out of medium-skilled workers is not necessarily justified - while trades and technicians have fallen back as a share of the workforce, other low-middle skill jobs such as in community and personal service workers are increasing in number. But there are clearly important gender implications here.

The 'gig' or freelance economy has received a large amount of attention, but so far the evidence is not clear that it is increasing to the extent that many anticipate. Working from home and multiple job holdings have not risen substantially over the last decade, but this may well change in the future. We need more research to find out what is really happening.

The quality of jobs is as important an issue as the quantity. There are signs that precarious employment is increasing. The precariousness index introduced in this report indicates that there has been some increase in precariousness, although the overall state of the economy (and of unemployment in particular) play a major role here.

What seems clear is that people are increasingly concerned for their job security, with more people worrying that their jobs are at risk. This is particularly the case for lower skill occupations. Some industries, such as Public Administration and Finance, still appear to offer better quality jobs in terms of security and benefits.

The fear of job loss is not translating over into job dissatisfaction. More workers are satisfied with their work than 15 years ago, while people who work for themselves or work at home are happier than employees or employers. Having control over your working hours and environment makes a positive difference. So does having a high-skill job. Professionals and managers have a more positive outlook than other workers, with labourers and machinery operators and drivers being the least satisfied about their future job prospects, possibly because of the threat posed by automation.

Worryingly, despite high employment levels, real wages growth has stalled for full-time men, and fell for part-time men by 11 per cent in three years. Younger workers are losing out relatively speaking as well, with the pay gap between the youngest cohort and older workers widening by nearly a third since the start of the decade. All these trends point to difficulties for government tax revenues, for business growth, and for equity, as there appears to be a prospect of real wages not matching productivity over time. While casualisation has been relatively high and stable for many years, it could become an issue if younger workers (who have the highest levels of casualisation) are unable to convert to a permanent or fixed-term contract.

The impact of technology on jobs has been a principal concern for analysts, policy makers and the community at large. While historically, manufacturing soaked up the loss of agricultural jobs, and services jobs replaced factory workers, where will the jobs come from if robots and AI can do the work currently being done by service and knowledge workers?

Our analysis suggests that we are not in a doomsday scenario when it comes to jobs and technology – or at least not yet! Much of the fear is based on an overly simplistic analysis of which occupations could be automated. However, societies have choices, about how they wish to organise work and how to use technology – in particular, whether it substitutes for human labour, or complements and supports it. We need to work with technology to raise our productivity, eliminate the dangerous and routine tasks, and leave room to use our personal, creative and critical thinking skills

It also seems that initial estimates of job displacement were overblown. A commonly cited study that predicts that 47 per cent of jobs are at risk from automation has been widely criticised. Other analysts put the figure at around 9 per cent once we look at the combination of tasks within a job that can be automated, rather than the job itself. As this occurs, many occupations increase in skill level rather than disappear. And these job loss estimates do not include the new jobs that will be created through the implementation of new technology. The net effects may well be positive.

The good news so far is that the Australian labour market is generally moving its whole skill profile upwards towards a greater proportion of higher skill jobs, rather than hollowing out the middle. That should help to reduce inequality as long as those being displaced from lower skilled occupations and industries are given opportunities to enter new, higher skill fields. This requires Australian industry to invest and compete in new and higher paying industry sectors, as well as a continuation of the growth in less automatable jobs and industries such as personal and human services, the creative industries, and artisanal trades.

These trends point to the need for much greater investment in education and training across the whole of people's working lives – and not just by governments and individuals. Industry needs to play its part too. We also need to look at how, if possible, we can shift the growing gender segregation in higher education, where women comprise three quarters of the growth areas of health and education, while men continue to dominate engineering and IT. As a nation, we are not giving our industries, or our citizens, access to the full range of talents and opportunities if this situation continues. Our lack of growth in domestic IT students is also a major concern, if we want to be at the forefront of the key industries of the future.

Having a more highly skilled occupational profile is positive in terms of the prospects of higher wages and employment. But how do we ensure everyone benefits from the new world of work? There is a shared responsibility on governments, employers, and education and training organisations to ensure that no-one is left behind.

Lower-skilled men are particularly vulnerable to the changing labour market landscape. The jobs they currently hold are more susceptible to technological displacement, and they may be less equipped with the necessary social and communication skills to take up the growing number of human services jobs that will be on offer. Transitional support programs for vulnerable workers and industries are a minimum requirement.

This report has analysed a wide range of important issues dealing with the future of work. But as we have seen, many of the trends – such as the convergence of working patterns between men and women – are of long standing. Nothing is inevitable about how technology will impact on work. Societies, companies, governments, and individuals have choices about how and whether technology is introduced, how we engage with automation, and how we prepare ourselves for the future.

In fact, the future of work is already here.

And preparing for tomorrow's world of work needs to start today.

Glossary

and technical notes

Glossary and technical notes

Casualisation

Refers to the trend towards a higher proportion of casual employment, often in place of permanent work arrangements.

Consumer Price Index (CPI)

The Consumer Price Index measures quarterly changes in the price of a 'basket' of goods and services which account for a high proportion of expenditure by metropolitan households.

Gross Domestic Product (GDP)

Gross Domestic Product (GDP) is an economic indicator of the value of a country's total output, calculated as the sum of the following measures: consumption expenditures; business investment; government spending; and net exports (defined as exports minus imports).

Employment rate

The number of employed persons expressed as a percentage of the civilian population in the same group.

HILDA survey

The Household, Income and Labour Dynamics in Australia is a household-based panel study which began in 2001. It tracks information on economic and subjective wellbeing of the respondents along with family and labour market dynamics.

Labour force participation rate

The labour force participation rate is defined as the proportion of the population aged 15 years and over that is in the labour force, i.e. either employed or looking for work.

Percentiles

A percentile is a measure indicating the value below which a given percentage of observations in a group of observations fall. For example, the 20th percentile is the value (or score) below which 20% of the observations may be found.

Principle component analysis

Principle component analysis (PCA) is a statistical procedure that can be used to reduce a large set of variables to a small set that still contains most of the information in the large set.

Satisfaction classifications

Life satisfaction is a subjective measure of wellbeing. Survey respondents within HILDA are asked to rate their satisfaction levels with their job overall and certain aspects of their job on a scale of 0 to 10. Zero being totally dissatisfied and 10 being totally satisfied.

Distributional analysis was conducted to then classify responses into four categories as follows:

- 0-3: Dissatisfied
- 4-6: Not so satisfied
- 7-8: Satisfied
- 9-10: Very satisfied

Underemployment

Refers to the situation where employed persons who prefer and are available to work more hours than they currently do.

Unemployment rate

The unemployment rate is the proportion of the labour force that is unemployed.

Wage Price Index

The Wage Price Index measures quarterly changes in the price of wages. Changes in rates of pay arise from various sources including award variations, enterprise and workplace agreements, minimum wage setting, individual contracts and informal arrangements.

World Values Surveys (WVS)

The World Values Surveys is a collection of nationally representative surveys conducted in almost 100 countries which started in 1981. It is one of the largest cross-national, time series investigation of human beliefs and values, currently including interviews with almost 400,000 respondents.

References

References

- Acemoglu, D., and D. H. Autor (2011) Skills, tasks and technologies: Implications for employment and earnings, in O. Ashenfelter and D. E. Card (Eds) *Handbook of Labor Economics*. (4B, 1043-1171). Amsterdam: Elsevier.
- Arntz, M., Gregory, T., and Zierahn, U. (2017) Revisiting the risk of automation. *Economics Letters*, 159, 157-97.
- Australian Bureau of Statistics (ABS) (2006) Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006, Cat No. 1292.0. Canberra, ACT: Australian Bureau of Statistics.
- Autor, D., Levy, F., and Murnane, R. (2003) The skill content of recent technological change: An empirical exploration. *The Quarterly Journal of Economics*, 118(4), 1279-1333.
- Autor, D. H., Katz, L.F., and Kearney, M.S. (2006) The polarization of the labor market. *American Economic Review*, 96, 189-94.
- Autor, D. H., Katz, L.F., and Kearney, M.S. (2008) Trends in U.S. wage inequality: Revising the revisionists. *Review of Economics and Statistics*, 90, 300-23.
- Borland, J., and Coelli, M. (2017) Are robots taking our jobs? *The Australian Economic Review*, 50, 377-27.
- Burgess, J., and Campbell, I. (1998) The Nature and Dimensions of Precarious Employment in Australia. *Labour & Industry: a journal of the social and economic relations of work*, 8(3), 5-21.
- Cassells, R., Toohey, M., Keegan, M., and Mohanty, I. (2013) Modern Family: The changing shape of Australian families. *AMP.NATSEM Income and Wealth Report*, Issue 34.
- Coelli, M., and Borland, J. (2016) Job polarization and earnings inequality in Australia. *Economic Record*, 92, 1-27.
- Deci, E., and Ryan, R. (2008) Self-Determination theory: A macrotheory of human motivation, development and health. *Canadian Psychology/Psychologie canadienne*. 49(3), 182-185.
- Dockery, M. (2003) Happiness, life satisfaction and the role of work: Evidence from two Australian surveys. In E. Carlson (Ed), *The Full Employment Imperative*. Callaghan, NSW: University of Newcastle.
- Durrant-Whyte, H., McCalman, L., O'Callaghan, S., Reid, A. and Steinberg, D. (2015) *The impact of computerisation and automation on future employment*. In Australia's Future Workforce. Melbourne, Vic: Committee for Economic Development of Australia.
- Frey, C., and Osborne, M. (2017) The future of employment: How susceptible are jobs to computerisation?. *Technological Forecasting and Social Change*. 114, pp. 254-80.
- Iaffaldano, M. T., and Muchinsky, P. M. (1985) Job Satisfaction and Job Performance. A Meta-Analysis. *Psychological Bulletin* 97(2), 251-273.

Katz, L. F., and Autor, D. H. (1999) Changes in the wage structure and earnings inequality. In O. Ashenfelter and D. E. Card (Eds,) *Handbook of Labor Economics*. (3A, 1463-1555). Amsterdam: Elsevier.

Kristensen, N., and Westergaard-Nielsen, N. (2004) Does Low Job Satisfaction Lead to Job Mobility? *IZA Discussion Paper 1026*.

Oswald, A., Proto, E., and Sgropi, D. (2015) Happiness and Productivity. *Journal of Labor Economics* 33(4).

Standing, G. (2016) *The Precariat: The New Dangerous Class*: Bloomsbury Publishing.

Tweedie, D. (2013) Precarious work and Australian labour norms. *The Economic and Labour Relations Review* 24(3), 297-315.

Vosko, L. F., MacDonald, M., and Campbell, I. (2009) *Gender and the Contours of Precarious Employment*: Taylor & Francis.

Disclaimer

While every effort has been made to ensure the accuracy of this document, the uncertain nature of economic data, forecasting and analysis means that the centre, Curtin University and/or Bankwest are unable to make any warranties in relation to the information contained herein. Any person who relies on the information contained in this document does so at their own risk. The centre, Curtin University, Bankwest, and/or their employees and agents disclaim liability for any loss or damage, which may arise as a consequence of any person relying on the information contained in this document. Except where liability under any statute cannot be excluded, the centre, Curtin University, Bankwest and/or their advisors, employees and officers do not accept any liability (whether under contract, tort or otherwise) for any resulting loss or damage suffered by the reader or by any other person.

The views in this publication are those of the authors and do not represent the views of Curtin University and/or Bankwest or any of their affiliates. This publication is provided as general information only and does not consider anyone's specific objectives, situation or needs. Neither the authors nor the centre accept any duty of care or liability to anyone regarding this publication or any loss suffered in connection with the use of this publication or any of its content.

Authorised Use

© Bankwest Curtin Economics Centre, April 2018
Bankwest Curtin Economics Centre *Focus on the States* Report Series
ISBN: 978-1-925083-65-1

This report was written by: Rebecca Cassells, Alan Duncan, Astghik Mavisakalyan, John Phillimore, Richard Seymour and Yashar Tarverdi from the Bankwest Curtin Economics Centre and John Phillimore from the John Curtin Institute of Public Policy, Curtin University.

It can be cited as: Cassells R, Duncan A, Mavisakalyan A, Phillimore J, Seymour R and Tarverdi Y (2018), 'Future of Work in Australia: Preparing for tomorrow's world', Bankwest Curtin Economics Centre, *Focus on the States* Series, Issue #6, April 2018.

This report uses unit record data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey. The HILDA Project was initiated and is funded by the Australian Government Department of Social Services (DSS) and is managed by the Melbourne Institute of Applied Economic and Social Research (Melbourne Institute). The findings and views reported in this paper, however, are those of the authors and should not be attributed to either DSS or the Melbourne Institute.

This publication contains confidential and proprietary information of the Bankwest Curtin Economics Centre. All of the material in this publication is for your exclusive use and may not be otherwise used or modified for, or by, any other person or sold to or otherwise provided in whole or in part to any other person or entity without the prior written consent of the Bankwest Curtin Economics Centre.

A standard hard copy of, or electronic subscription to, this publication entitles employees of the same organisation and same physical location as the subscriber to the use of its contents for internal reporting purposes only. Multiple user licenses are available for organisations with more than one location.

Contact

Bankwest Curtin Economics Centre

Tel: +61 8 9266 2873

Email: bcec@curtin.edu.au

bcec.edu.au

© Curtin University 2018
CRICOS Provider Code 00301J
ADV106660