

The Future of Work for Australian Graduates:

*The Changing Landscape of University-
Employment Transitions in Australia*

By Alison Pennington and Dr Jim Stanford
The Centre for Future Work at the Australia Institute

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About the Centre for Future Work

The Centre for Future Work is a research centre, housed within the Australia Institute, to conduct and publish progressive economic research on work, employment, and labour markets. It serves as a unique centre of excellence on the economic issues facing working people: including the future of jobs, wages and income distribution, skills and training, sector and industry policies, globalisation, the role of government, public services, and more. The Centre also develops timely and practical policy proposals to help make the world of work better for working people and their families.

This report was commissioned by Graduate Careers Australia. A 12-page summary of the report is available at futurework.org.au or graduatecareers.com.au.



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Introduction and Summary

The world of work is being transformed by a complex and interdependent set of forces – including technology, changes in workplace organisation and employment relationships, environmental and demographic challenges, and more. These changes affect all participants in the labour market; no industry or occupation is immune to the flux and uncertainty created by these multiple disruptions, and Australians’ general concern with the future of work has been heightened accordingly. But no group of workers will confront the reality of constant change more directly than young workers. As new entrants to the labour market, they cannot count on the protection of previous structures or practices to insulate them from coming changes. They immediately face the challenges of an increasingly precarious job market – one in which less than half of all employed Australians now fill a traditional “standard” job (full-time, permanent, paid work offering normal entitlements like paid leave and superannuation).

Holding a university degree is still a vital and valuable asset for young workers entering this challenging and unstable milieu for the first time. Individuals with university degrees are more likely to be employed, to have more stable jobs, and to be paid more. But this relative advantage enjoyed by university graduates does not negate the fact that employment conditions have become much more challenging even for graduates. Rates of graduate employment in full-time work are down significantly over the past decade, and there is evidence of a growing mismatch and underutilisation of university graduates in positions that do not fully or even partly utilise their hard-won knowledge and skills. At the same time, employer complaints about supposed skills shortages and the dearth of “job-ready” graduates are as loud as ever. (As will be discussed and documented in the report, those complaints need to be interpreted with considerable scepticism.)

It is evident that Australia’s higher education system could do a better job at anticipating the needs for highly-skilled workers in the future, evolving their program offerings in light of those needs, and then assisting students as they traverse their university educations and find meaningful, relevant work. This report provides an overview of the prospects and challenges faced by future university graduates, in the context of major changes expected in the world of work – including the application of new technologies, evolving requirements of employers for new skills and capabilities, new business models and forms of employment, and other challenges. The report confirms that university education makes a vital, essential, and valuable contribution to Australians’ prosperity: both at an individual level for those who have attained

higher education, and at the macroeconomic and social level. But it catalogues gaps and failures in crucial education-to-jobs transitions, considers the most likely factors contributing to those gaps and failures (while dispensing with some commonly-cited but unconvincing myths and stereotypes), and then makes several concrete recommendations for policy change and innovation.

REPORT OVERVIEW

The report begins with a general overview of the major forces driving disruption and change in the Australian labour market. One, of course, is technology: rapid evolution in the scope, capacities, and employment impacts of new innovations like artificial intelligence, advanced robotics, and big data analysis. But technology is not the only disruptive force at work. Dramatic changes in work organisation, business models, and employment relationships are also changing jobs and how we perform them. And all this change occurs in the context of a world grappling with other structural change: from demographic change, environmental change, globalisation, and more. By considering this more complete context, we find that an undue focus on technology as the fundamental and supposedly inexorable driver of change is inappropriate – all the more so given that technology itself is neither neutral nor uncontrollable. Shifting focus back to the social and institutional influences on the world of work, and the collective capacity of society to regulate and shape that world, empowers society to take the future of work more actively into its own hands.

Section 2 of the report considers the ongoing evolution of employment patterns (by sector, occupation, and skillset) – both historically and prospectively. It turns out that dramatic structural change in employment patterns is hardly a new phenomenon in Australia. To the contrary, enormous shifts in the nature of employment have already occurred in past decades: with a marked shift from agriculture, and later manufacturing, into services, an equally dramatic shift from manual to cognitive labour, and the revolutionary growth of women’s labour force participation. Australia’s labour force adapted to these changes – and while the transitions were painful at times, they occurred without epochal crisis. Looking forward, all projections anticipate further change. But understanding structural change as a normal feature of the labour market helps defuse the undue hype and even panic that often accompanies current discussions about the future of work.

Section 3 dives deeper into changing requirements for skills in the future labour market. It directly challenges certain myths and fads regarding the evolution of skills requirements – including claims that demand for STEM skills will be both insatiable and dominant, claims that lack of “employability” is holding back Australian graduates, and

even far-fetched arguments that university degrees themselves will lose their value. Often surprising evidence quantifying skills needs and shortages is presented, confirming that narrow technical and business skills are not, in fact, the ones in shortest supply. A more balanced and nuanced description of the evolution of the skills and capabilities required of future graduates is presented. It turns out that more subtle and flexible skills – including communication, problem-solving, and teamwork – may prove to be the most valuable for a workforce that will have to confront never-ending fluidity in employment, technology, and workplace relationships.

Section 4 documents the daunting range of challenges facing young workers, including university graduates, in today's increasingly precarious labour market. For young people, the prospect of finding a decent, permanent, full-time job with normal entitlements (like paid leave and superannuation) is increasingly far-fetched. Young workers have been the "shock troops" of the precarious labour market: the ones sent in first to confront insecure positions, inadequate and irregular hours, contingent status, and low pay. Even university graduates are experiencing these hardships, as evidenced by the significant deterioration in employment outcomes for graduates since the Global Financial Crisis hit in 2008. Ample evidence attests to the widespread underutilisation of skills possessed by young workers today – who are the best-educated generation of workers in Australia's history. This leads us to question the very existence of a "skills shortage" in any general sense. To the contrary, rhetoric about the inadequate skills of workers (whether specific occupational skillsets, or broader base capacities) seems more motivated by a desire to blame young workers for their own hardships, rather than an accurate depiction of the real condition of the labour market.

Section 5 presents more granular data regarding the employment outcomes of university graduates by field of study, sector, and program. It identifies major trends and shifts in employability. It highlights a particular concern with the increasingly long periods of time required for graduates (especially those holding general degrees) to obtain full-time work – and documents the substantial and lasting costs incurred by graduates as a result. The existence of potential mismatches between the abilities and attributes of new graduates and the needs of employers is investigated.

The penultimate Section 6 of the report considers the strengths and weaknesses of current education-to-jobs policies and programs in Australian universities. Clearly more ambitious and flexible efforts are required to anticipate future higher-level skills, adjust curricula accordingly, and then assist graduates in the transition from university to employment. Several promising new initiatives to improve outcomes in this regard are considered, including experiments in expanded work-integrated learning, and the

redevelopment of curricula and program design to reflect the increasingly fluid and interdisciplinary nature of many modern occupations.

Finally, the report concludes by considering how all stakeholders in Australia's university system – including universities, governments, industry, the research community, trade unions, and of course students themselves – could collaborate more effectively. Working together, they can construct a system that does a better job of tailoring university offerings to the broad needs of the economy and society (not just specific training requirements of employers), and assist graduates to attain meaningful, decent employment which makes full use of their skills and dedication. Ten specific policy recommendations are presented, drawing directly on the evidence presented in earlier sections of the report. An overarching recommendation is the creation of a national-level higher education policy framework, together with a commitment to building the institutional capacity to implement sector-wide initiatives and undertake comprehensive planning around education-to-jobs processes. It is clear from the evidence assembled in this report that the tasks of anticipating future skills requirements, adjusting curricula and programs accordingly, and then facilitating the movement of students through the higher education process and into productive employment, cannot be left to the supposedly prescient market forces of demand and supply. To the contrary, Australia's future needs for top-quality university graduates, making their maximum potential contribution to both production and to society in general, are too important to be left to chance. A more deliberate, pro-active approach is needed to ensure that the future of work can be a great one for Australian university graduates.

METHODOLOGY

The preparation of this report was overseen by researchers at the Centre for Future Work, an independent labour policy research institute located at the Australia Institute. Economist Alison Pennington was the lead author, supported by Dr Jim Stanford, Economist and Director of the Centre.

Work on the report involved the following major components:

- Compilation and analysis of quantitative data from multiple official sources: including the ABS; the OECD; the Australian Graduate Survey (2000–15) and Graduate Outcomes Survey (2016–18); the Commonwealth Department of Education and Training; the Commonwealth Department of Employment, Skills, Small and Family Business; and the Workplace Gender Equality Agency.

- Review of extant literature and research on the impacts of automation on work, changing work organisation practices, the industry and occupational composition of Australia's current and future workforce, the evolution of graduate future skills, and the university sector's initiatives in the area of employment transitions for graduates.
- Interviews with key informants representing a range of policy stakeholders in the education and skills system including: Kylie Walker (Science and Technology Australia), Andrew Norton (Grattan Institute), Ben Reeves (Australian Association of Graduate Employers), Jenny Pizzica (Western Sydney University), Craig Fowler (National Centre for Vocational Education Research), and Jeff Borland (University of Melbourne).
- Review and testing of key findings with peer reviewers and affiliates of Graduate Careers Australia (the project's sponsor).

The authors welcome feedback and queries at futurework@tai.org.au.

1. Technology, Relationships and the Future of Work

There has been enormous public interest and concern expressed in recent years about the future of work. One thread in these discussions focuses on the rapid evolution of technology, and how it is affecting work and jobs. Long-standing fears that jobs will be eliminated by technology, with workers “replaced” by robots and other labour-saving or labour-replacing innovations, have been rekindled. These concerns over the labour market impacts of technological changes are experienced in the context of a labour market that is already marked by widespread insecurity and widening inequality. And young people, who already confront the worst extremes of low pay and insecure work, now face the additional challenge of trying to predict what types of skills and credentials will most likely be “in demand” in the future – as they ponder their choices for higher education and vocational training.

A parallel theme in public discourse regarding the future of work focuses on the evolution of new business models, new employment forms, and new workplace relationships. The development of new businesses centred on the operation of digital platforms to coordinate and organise production has attracted great attention in the media, in popular culture, and among financial investors (who have bid up the seeming market value of not-yet-profitable start-ups to astounding heights). New companies have sprung up to aggregate and centralise formerly dispersed, relatively mundane activities – such as chauffeuring passengers, delivering fast food, and performing household maintenance and repair jobs. Some commentators portray these new businesses as the leading edge of a wave that will transform or eliminate the traditional conception of “employment.” Instead of jobs in the future, they suggest, workers will perform an ongoing series of “gigs”: moving from task to task, hired and compensated via an app, with no structured routine, hours, or income.

Indeed, changes in work organisation and employment relations are already having an impact on the working lives of Australians that is likely more important than the much-hyped development of robots and artificial intelligence. The traditional ideal of a stable, permanent, full-time, paid job with normal entitlements (like paid sick and holiday leave, and superannuation entitlements) is increasingly out of the reach of many Australians – especially young workers. Indeed, less than half of Australian workers now fill one of those “standard” positions (Carney and Stanford 2018a). Instead, temporary, part-time, casual, irregular, and nominally independent or self-

employed positions are now the norm for more than half of workers (and the overwhelming reality for most young workers). Some portray this scenario as a utopia, others as a dystopia – but the sense that digital platforms and other new business forms are deeply transforming traditional employment relationships is widespread among both camps.

In sum, the world of work is being transformed by parallel, interacting forces: new technologies, and new forms of work organisation. This has sparked a legitimate concern among many Australians about the future of work – both for themselves, and for their children. Of course, these fears about the disappearance of employment (whether resulting from technology, work organisation, or both) have been experienced and expressed before. Indeed, from the onset of the Industrial Revolution, workers have worried about how new machines would affect their livelihoods; and huge structural changes in labour markets (such as the mass depopulation of agriculture) also sparked concern and dislocation in the past.

Keeping some historical perspective on these issues is useful, given the often-superficial infatuation with all things “new” in popular culture and media. In reality, technological change has never produced long-lasting mass unemployment. Yes, widespread unemployment (including underemployment and other forms of “hidden” unemployment) is a normal (and painful) feature of labour markets; but it usually reflects other factors (like failed macroeconomic policies), not technology. Likewise, the specific organisational forms taken by businesses have also changed constantly through the history of capitalism: evolving from individually-owned undertakings, to partnerships, to early joint-stock companies, to enormous publicly-traded corporations, to modern and innovative financial structures such as private equity, benefit corporations, and crowd-sourcing. But throughout this history of business innovation, one constant has been the reliance of all these enterprises, however structured, on the productive labour of the people who work for them. The specific nature of the relationship between workers and owners can change (including norms regarding compensation, scheduling, mutual rights and responsibilities, investments in human and physical capital, etc.). But a core dependence on hired labour inputs – whether those workers are employees, contractors, or ‘gig’ workers – is always necessary to allow those businesses to function.

Therefore, despite rapid and visible flux in both the technology of production and the organisation of work, there is a fundamental and lasting centrality for paid work in the economy. Contrary to more spectacular predictions, “work” is not disappearing. While the specific tasks, skills, and tools associated with work will change, as will the specific features of employment relationships, paid work itself will remain the dominant way most Australians support themselves – even if the tasks they perform, the technology

they use, and the specific terms under which they are hired and compensated change. Moreover, the social context for work and working relationships is also an enduring and fundamental part of the overall picture. After all, work is an inherently social undertaking: we always work, directly or indirectly, with other people, and the nature and structure of those relationships is a crucial determinant of the quantity and the quality of work.

In short, paid work is not going to disappear. The economy cannot function without it. Future university graduates will continue to work: to support themselves and their families, and to underpin national macroeconomic success. But whether the world of work they enter is positive and uplifting, or desperate and exploitive, depends entirely on the economic, regulatory, and social context that they will experience. And this in turn depends on the collective choices and priorities determined and implemented through policy at the organisational, sectoral, and governmental levels of the labour market. Labour market outcomes are predetermined neither by the supposedly relentless march of technology, nor by the supposedly automatic economic mechanisms of supply and demand. Labour market outcomes depend primarily on the choices, decisions, and priorities of employers, educational institutions, governments, and workers.

Today, most parents fear their children will never enjoy the same economic opportunities they did – and with good reason. After all, young workers are already bearing the brunt of the harsh new reality of double-digit unemployment and underemployment; temporary, part-time, low-wage, and precarious work; massive higher education fees and debt; and a housing market they can't hope to enter. Young people deserve to know that their abundant knowledge and talents (indeed, they are the most knowledgeable and well-trained cohort of workers in our history) can be fully utilised in quality, secure jobs fit for a modern economy – rather than exploitive low-wage (or no-wage) “internships.”¹

Achieving great labour market outcomes for future graduates (measured by strong employment growth, rising participation, low un- and underemployment or better yet full employment, and improving job quality) is a realistic and achievable goal. Australia has achieved full employment, and good job quality and economic inclusion outcomes, in the past. And real-world experience in other countries today – where young workers are supported to acquire higher education, and then transition to relevant, quality jobs that use those skills – confirms these goals are indeed achievable. But it doesn't happen by accident, or automatically through the “magic” of market forces. It

¹ The widespread incidence of unpaid internships among new university graduates and other young workers is documented in Oliver et al. (2016).

will require conscious, collective, pro-active efforts to ensure that these outcomes are attained.

In short, the future of work for the next generation of graduates depends on what Australians decide collectively to make it.

THE TRAJECTORIES OF TECHNOLOGICAL CHANGE

Technology is always advancing, but the speed and scope of technological change in the last decade has both awed the public, and heightened concerns about its labour market impacts.

While innovation and technological change have been disrupting economies and societies for generations, there are some clear ways in which the current wave of technological change is indeed “different” from those that preceded it – and this implies that its labour market impacts may be less sanguine (Dunlop 2016). More specifically, current innovations in computing and automation are capable of undertaking new categories of tasks, that in the past were not amenable to machine-aided production. Table 1 illustrates the expanded scope for labour-saving or labour-replacing automation.

Table 1. The Growing Reach of Automation		
Type of Task →	Routine	Non-Routine
Form of Work ↓		
Manual	Routine/ Manual	Non-Routine/ Manual
Cognitive	Routine/ Cognitive	Non-Routine/ Cognitive

Source: Adapted from Autor et al. (2003).

Computing power continues to become dramatically less expensive, as the technology of microchips and processing advances exponentially. This trend is long-standing and well-known: famously reflected in “Moore’s Law” (Moore 1965), which predicted a doubling in the circuit capacity of processors every two years. What has changed, however, is the applicability of this ever-cheaper computing power to new tasks and categories of work. Traditionally, computer-assisted automation required the programmer to be able to precisely specify tasks, in a controlled environment. Programming code could direct a machine to perform an intricate and complex set of

functions, directed by an increasingly detailed set of data and prompts. But the functions being automated had to be routine and precisely described. These functions could include manual tasks (involving the movement of objects) or cognitive tasks (involving the processing and manipulation of information and data). But in either case, automation was only accessible to routine and replicable functions. This set of tasks is illustrated in the middle column of Table 1.

New dimensions in computing and automation are being facilitated by ongoing reductions in the cost of computing power (and exponential increases in the capacity of computers). But this growing computing power can now be applied to the mechanisation of *non-routine* tasks. Thus, the scope of automation is extending rightward in Table 1, to address non-routine tasks that require judgment, flexibility, and decision-making capacity, in the face of non-controllable or unpredictable environments and stimuli. Applications which embody this expanded scope for computer-controlled work include machine learning (ML), data mining, machine vision, computational statistics, artificial intelligence (AI), and mobile robotics. In every case, computers are informed by analyses of large databases of past experience, to develop the capacity to make best judgments in the face of unpredictable circumstances. This allows them to undertake non-routine functions, again covering both manual and cognitive tasks. Tasks in the right-hand column of Table 1 (non-routine manual and cognitive jobs) now face the prospect of partial or complete automation.

There are several specific directions of technological advance and application that may have particular potential for altering the quantity and nature of work in future years. Table 2 catalogues some of the most far-reaching current waves of technology, and a few of their possible applications and impacts. Of course, the very essence of innovation is its unpredictability. It would be folly to attempt to predict the various ways in which new computing capacities will be deployed, in ways that could transform current work. In this regard, focusing on enhancing the capacity of labour market participants and institutions to adapt to technological change will ultimately prove more effective than attempting to channel attention and resources into specific fields that may (or may not) prove to be as important as pundits currently predict. This theme of investing in broad, flexible capacities and attributes, rather than focusing unduly on particular technical knowledge and skills, will be a common thread throughout this report.

Table 2. A Dozen Game-Changing Technologies

Innovation	Nature	Applications and Impacts
Artificial intelligence, machine learning	Capacity of computers to perform tasks requiring judgment and to learn from experience	Automation of non-routine tasks; capacity to operate in uncontrolled environments; perception, speech recognition, and decision-making
Advanced robotics	Robots with precise and flexible capacities; use of sensors to allow visual and other interactions	Machine performance of complex, flexible tasks, including in mobile applications, homes and services
Autonomous transportation	Automated operation of transportation vehicles in controlled or public environments	Reduction of direct labour in transportation; improvements in safety, congestion and fuel efficiency
3D printing / additive manufacturing	Computerised creation of objects from digital models through application of repeated layers of material	Reduction of labour and cost in components and sub-assemblies; facilitates custom and localised prototypes and manufacturing
Internet of things	Internet-based connections of objects, appliances and machines operating without immediate human control	Applications in manufacturing, infrastructure, transportation; investments in sensors and communications systems
Mobile and cloud-based data processing	Expanded capacity for mobile or multi-location data transmission and processing, including via portable devices	Data streaming, matching, and financial applications; integration with transportation functions; long-distance specialised services
Big data analytics	Very large data sets compiled and analysed to identify patterns and associations	Predicts behavioural trends; facilitates machine learning; impacts for transportation and infrastructure
Blockchain	Expanding and tamper-proof list of records (“blocks”) linked through cryptography on multiple computers	Facilitates decentralisation of secure transactions; applications for identification and privacy; automation of financial services
Alternative energy systems	New technologies for generation, storage, and transmission of energy, using renewable sources	Energy systems; heating/cooling and transportation equipment manufacturing
Bio-engineering	Application of engineering and mechanical techniques to life sciences, medicine, and biology	Customised medical treatments; medical devices and imaging; biological and genetic programming
Nanotechnology	Manipulation and engineering of matter at the molecular or supramolecular scale	Fabrics and materials; pharmaceutical design and delivery; electro-mechanical systems; manufacturing
Virtual & augmented reality	Artificial or enriched sensory environments, through addition of digital and virtual elements	Entertainment applications; improvements in transportation, planning, machine control, medicine

Source: Authors’ compilation.

TECHNOLOGY AND JOBS: A PRAGMATIC VIEW

In light of the new capacities for computing and automation summarised above, some research has suggested that 40 percent or more of all jobs are highly vulnerable to automation and computerisation in coming decades. These predictions have reinforced fears that new technology will spur widespread dislocation and unemployment. This is a familiar refrain: previous periods of accelerating technological change were associated with similar concerns; even relatively recently, for example, futurists predicted that technology would make work largely obsolete (see, for example, Rifkin 1995).

Conventional, market-oriented approaches to labour market economics typically downplay such concerns over mass unemployment. According to this view, the automatic workings of supply and demand forces should ensure that any labour displaced by new technology is automatically redeployed in some other, more appropriate endeavours. And the resulting increase in general productivity will ensure that people are better off in the long run. The focus of policy, according to this view, should be limited to facilitating transition through retraining and mobility assistance, allowing displaced workers to move more easily into the better, alternative occupations that automatically open up.

However, there are ample reasons to doubt this relatively optimistic conclusion. In reality, labour markets do not function so smoothly or efficiently: unemployment and underemployment can persist for long periods of time, displaced workers may not be successful in transitioning into appropriate alternative roles, and income losses from restructuring can be both substantial and long-lasting. So it is not unreasonable to worry that rapid technological change may indeed undermine the livelihoods of large groups of workers.

At the same time, however, historical economic experience also gives cause to question ultra-pessimistic forecasts of mass technological unemployment. In practice, previous waves of technological change have not been associated with long-lived unemployment, for a range of reasons. In the past, the labour-displacing effects of new technology have been largely offset, in whole or in part, by other factors (see Table 3). Firstly, there is new work associated with the development, production, and operation of new technologies and machines themselves. Indirect labour required to develop, manufacture, install, operate and maintain automated machinery provides new opportunities, even as some existing jobs are being eliminated. Secondly, work is created to perform new tasks, in some cases in entirely new industries, that become conceivable only as a result of the capacities of new technology to produce new kinds of goods and services. Finally, there are some tasks and industries in which direct

productive labour is relatively unaffected by new productive technologies. The nature of direct labour in many human and personal services today has not been radically affected by new technologies; this includes public services such as education, health care, and community services, which have been accounting for a larger share of total employment in recent years.

Table 3. Employment Effects of New Technology	
Employment-displacing	Investments in automation can reduce or eliminate direct labour inputs in some functions (examples: automated production in manufacturing, transportation, some services).
Employment-supplementing	<p>Automated systems require significant inputs of labour in the design, manufacturing, programming, operation and maintenance of automated systems (examples: engineers, programmers, specialised installation and maintenance occupations).</p> <p>The capacities of new technologies stimulate demand for entirely new products and services, creating new labour demand (examples: on-line retailing; entertainment and gaming; personalised health care).</p> <p>Labour cost savings from automation of direct labour allow reallocation of labour (within existing cost envelope) to supplementary services (examples: expanded customer services in finance, retail, transportation).</p>
Employment-neutral	In many industries and occupations, the application of new technology in direct production has limited impacts on labour input and employment (examples: public, caring, personal, and hospitality services).
<i>Source: Authors' compilation.</i>	

The net effect of these employment-displacing, employment-supplementing and employment-neutral effects of technological change cannot be predicted; that balance will depend on the empirical outcome of complex and contrasting decisions and forces. Neither sanguine nor fatalistic responses to the labour market challenges posed by technological change are justified. And in addition to the complex and offsetting impacts summarised in Table 3, additional comfort is provided by recognising the capacity of policies and systems (including at the macroeconomic level) to adapt to changes, including technological disruptions and displacement. For example, government institutions (including the Reserve Bank of Australia) would be expected to respond to any generalised downturn in labour demand with monetary, fiscal and industrial policies to stimulate more growth in total output and hence support continued employment levels. Another shock-absorber in the event of strong

technological impacts on employment would be adjustments in working hours. In past history, strong productivity growth resulting from new technology was typically accompanied by a combination of reduced average lifetime working hours (reflecting innovation such as weekends, paid holidays, pensions, parental and personal leave, etc.) and higher real incomes – which in turn supported stronger consumer spending and hence demand in consumer industries.

Because of all these countervailing factors, there is no reason to expect that new technologies will produce a generalised reduction in labour demand. But this does not justify complacency about the problems and risks posed to workers by accelerating technological change. Instead, the policy response to those challenges should be grounded in a more balanced and complete assessment of the impacts of future technology on work and jobs.

It is also important to remember that technology is not the only force of change buffeting work and workers – and may not even be the most important factor behind the significant changes in job quality and stability that are already visible (as documented above). As noted, the organisation of work is also changing dramatically, with the shrinking importance of traditional “standard” employment (full-time, permanent, year-round jobs with entitlements) and the growth of alternative arrangements (part-time, casual, self-employed, and contractors) marked by generally higher degrees of instability and precarity. Numerous other factors will also disrupt work, including:

- Environmental pressures, as all sectors in the economy adapt to the increasingly binding constraints of climate change and other environmental challenges.
- Globalisation, as Australia’s economy confronts an increasingly integrated global marketplace, and competitive pressure from foreign providers.
- Fiscal pressures, as cash-strapped governments aim to reduce spending in the interests of deficit-reduction or tax reductions.
- Demographic pressures, as an ageing population shifts its consumption patterns in line with consumer life cycles and preferences.

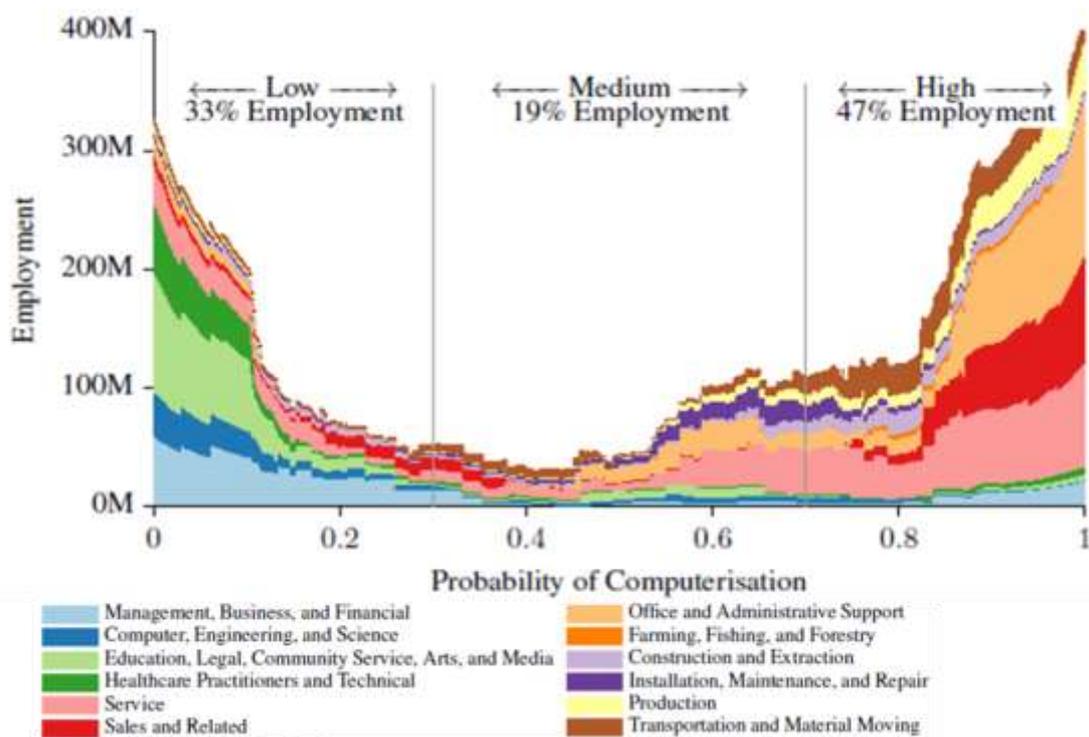
Amidst all of these complex and overlapping sources of change, it would be a mistake to focus solely or unduly on technology as the only “disruptor.” Moreover, it is wrong to interpret technology itself as an exogenous, uncontrollable force. After all, what we call “technology” is actually the composite of human knowledge about how to produce more advanced goods and services, using better tools and techniques. Innovation involves putting human ingenuity to solving certain problems (so-called “mission-based innovation,” as termed by Mazzucato 2011), based on particular identified concerns and interests. Technology, therefore, is neither “autonomous,” nor neutral:

the problems we turn our creative attention to, reflect the concerns and priorities of those sponsoring the innovation.

TECHNOLOGY AND JOBS: BIG PREDICTIONS

Since machine learning and other new computing strategies allow for a wider range of tasks to be computerized, economists are now considering the expanded potential impacts on employment patterns. One approach, pioneered by Frey and Osborne (2013, 2016), has been to conduct detailed skills audits of various occupations, to simulate their amenability to computerisation. These audits analyse the specific task content of different jobs, and develop judgments on the extent to which they could be automated on the strength of new capacities to apply computer capacities to non-routine functions.

Figure 1. Vulnerability of U.S. Occupations to Computerisation



Source: Frey and Osborne (2013).

This approach underpins the now-famous finding that close to half of jobs in the U.S. economy are highly vulnerable to computerisation. Frey and Osborne’s mapping of occupations is illustrated in Figure 1. In this figure, jobs are arrayed from left to right according to increasing vulnerability to computerisation. Occupations are grouped into broad sectoral categories by colour code. Occupations with likelihood of

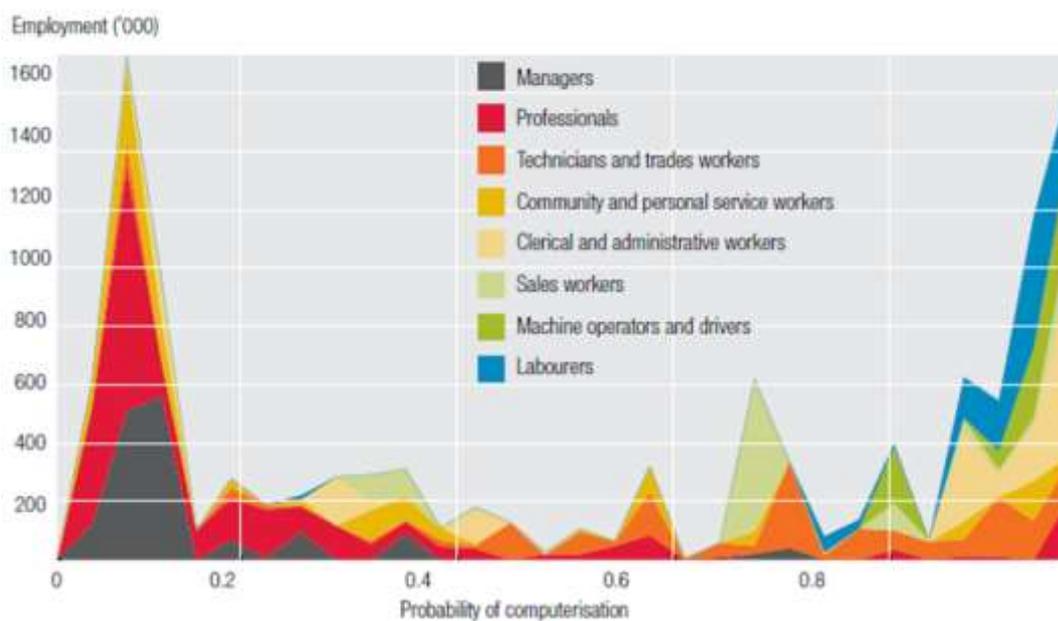
computerisation exceeding 70 percent are classified as “highly vulnerable,” while those with likelihood under 30 percent are considered to have low vulnerability, and those between 30 and 70 percent as having medium vulnerability. The area under the top line within each category represents the total number of jobs reflecting that range of vulnerability to computerisation.

Frey and Osborne find that 47 percent of all jobs face a 70 percent or higher likelihood of computerisation. This does not mean that 47 percent of jobs will disappear: as summarised in Table 2, there are many countervailing forces that will tend to create other work, as the process of automation unfolds. There will be new jobs associated with the design and engineering of the new technology, and new jobs created by virtue of the expanded capacity of new technology to produce a broader range of goods and services. Even within functions that have been automated, a continuing demand for labour will be experienced, associated with the operation and maintenance of the new machinery. Moreover, there are many prerequisites and hurdles that will be encountered (including challenges in job design, infrastructure, training, regulation, and social acceptance) before the full potential for computerisation is realised. But as an indicator of the order of magnitude of workers in an industrial economy whose work lives are likely to fundamentally changed by the new wave of automation, the Frey and Osborne results are insightful, and have sparked significant follow-up research extending, replicating and refining their results.

It is worth emphasizing additional conclusions derived from the Frey-Osborne analysis. First, most jobs tend to experience either a high vulnerability to automation, or a low vulnerability; there are relatively fewer jobs in “the middle” (and this explains the U-shape of Figure 1). Second, there are clear differences between sectors which seem highly vulnerable to computerisation (including transportation, sales, office and administration, and general service functions), and others which are characterised by less vulnerability (including caring and human services such as education and health care, management, and technical functions). Third, there is no obvious or consistent correlation between the “skill” or qualifications of specific jobs, and their vulnerability to automation. There are many traditionally high-skill occupations whose functions will soon be automatable (such as certain medical, legal, engineering, and other highly-qualified jobs). And there are many jobs considered “low skill” (or at least requiring relatively fewer formal qualifications) that are less likely to be computerised (including many support functions in human services, and many hospitality and personal service jobs). So it is wrong to assume, as often occurs in popular discourse, that only “low skill” jobs will be affected by automation, nor to conclude that the best way to “protect oneself” against technological displacement is simply to acquire new skills.

In an Australian context, researchers at the Committee for Economic Development of Australia (Durrant-Whyte et al. 2015) mapped the Frey-Osborne results onto the set of Australian occupations. They came to a similar conclusion regarding the potential expansion of computerisation and automation to a broader set of jobs (not surprisingly, since the range of jobs in Australia’s economy is not fundamentally different from that of other industrial countries). The ranking of Australian occupations according to degree of vulnerability to computerisation is illustrated in Figure 2, which replicates the U-shaped Frey-Osborne findings (although these results are less finely disaggregated).

Figure 2. Vulnerability of Australian Occupations to Computerisation



Source: Durrant-Whyte et al. (2015).

The Frey-Osborne findings have sparked a large body of subsequent research.² Some studies have disputed the dramatic Frey-Osborne conclusion that up to half of existing jobs could be subject to computerisation and automation. For example, a major OECD study (Arntz et al. 2016) considered the likelihood of automation based on a task-based rather than occupation-based mapping of current work. Because specific jobs within given occupations generally incorporate a heterogeneous mixture of specific tasks, it may not be possible to automate an entire job – even though some or many of the specific tasks associated with that job can be automated. Using this approach, they find that only 9 percent of existing jobs in industrial countries are automable, since some occupations considered “highly vulnerable” to computerisation according to the

² See Dunlop (2016); Bowles (2014); Autor (2015); Brynjolfsson and McAfee (2014); Manyika et al. (2017); and Graetz and Michaels (2015) for important contributions to this growing body of research.

Frey-Osborne approach nevertheless incorporate a significant share of tasks and functions that are not as amenable to machine-learning technologies and other innovations. However, it may simply require additional reorganisation and redefinition of jobs (creating a smaller number of jobs reconstituted from various hard-to-automate tasks) to allow the full potential of computerisation to be realised, and hence this more cautious OECD finding should not be a cause for complacency.

TECHNOLOGY AND JOBS: EVIDENCE SO FAR

A final bit of perspective on the general trajectory of labour markets in light of ongoing technological changes can be provided by reviewing real-world data regarding capital accumulation, productivity growth and employment. If in fact technological change was facilitating a generalised “replacement” of workers with machines and other forms of tangible capital, this should be visible through some critical metrics. First, employers should be using more capital in production, evidenced by accelerating investment in technology (both tangible capital, such as machinery and equipment, and intangible capital such as computer software and other intellectual property). Secondly, that expanding stock of capital should become larger relative to inputs of labour in production: by displacing or reducing required labour inputs, labour-saving technology should result in a greater ratio of capital used in production relative to labour. Finally, the resulting combination of more output with fewer workers must be visible in an acceleration of productivity growth: that is, the amount of value-added produced, on average, by each worker who is still employed in the wake of the new technology.

Perhaps surprisingly, none of these expected outcomes from automation and other labour-saving vectors of technological change are visible in the Australian context. In fact, to the contrary, if anything there has been a visible *deceleration* of capital accumulation and productivity growth – and a perhaps perverse *decline* in the general capital intensity of production. While work and production in certain enterprises, industries, or occupations may be being transformed by new technologies, there is no evidence that this is an economy-wide phenomenon.

Figure 3 plots the recent trend in business capital investment in Australia (including investment in intangible assets) as a share of national GDP. The longer-run trend in this series is strongly negative. Capital spending increased temporarily in the 2000s, driven by enormous investments in capital-intensive resource projects (such as mines and LNG plants). However, since peaking in 2013 (with the completion of several large resource projects), capital spending has plunged dramatically – to a near-record low (as a share of GDP) in the post-war era. So there is certainly no evidence that

employers, in general, are racing to install new capital; if anything, their willingness and/or capacity to undertake major capital investments seems to have moderated.

Figure 3. Business Capital Investment, Australia, 1960–2018



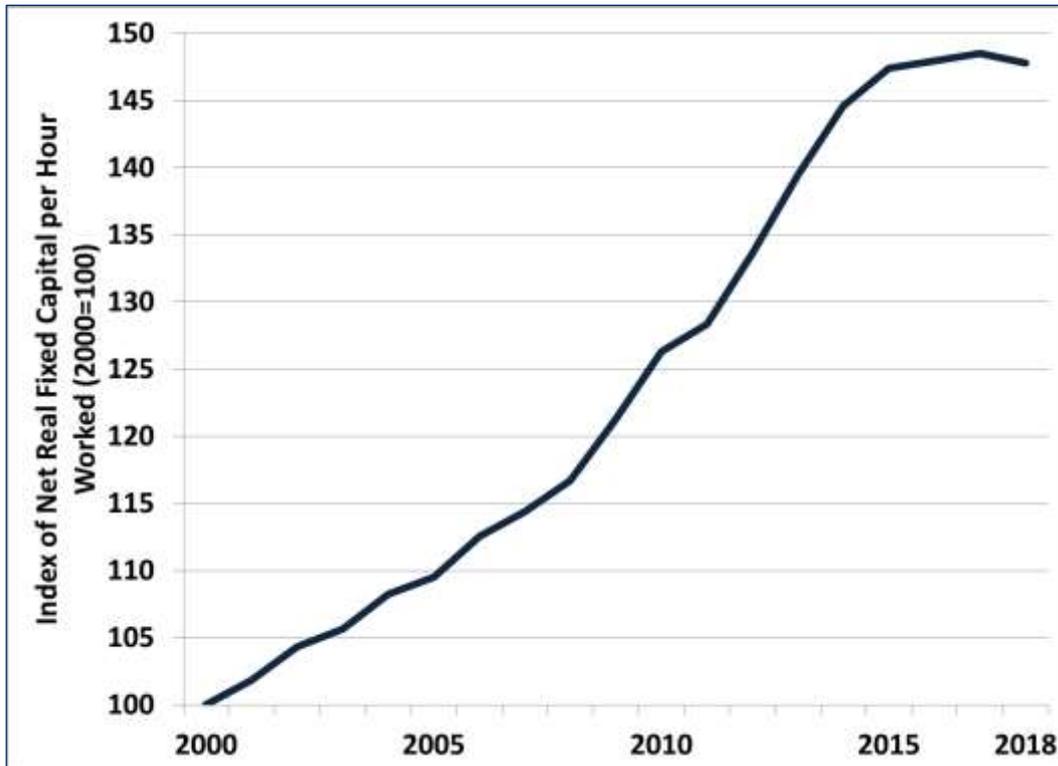
Data: Authors' calculations from ABS Catalogue 5206.0; smoothed 4-quarter avgs.

In fact, the pace of new capital spending in Australia has been so slow in recent years, that the stock of installed capital (net of regular ongoing depreciation) has not even kept up with the pace of new hiring in the labour market. This produces the counter-intuitive result that the aggregate ratio of capital to labour used in production in Australia has peaked and is now actually *falling* – completely counter to the common narrative that people are being replaced by machines (see Figure 4). Since 2015, the ratio of net fixed capital per worker (in inflation-adjusted dollars) has stopped growing, and now is declining. Without a pickup in the pace of business capital spending, that decline is likely to continue. Evidence suggests that a similar trend is visible in some other industrial countries (including the U.S., the U.K., and even Germany).³ The decline in capital intensity reflects two simultaneous forces: the weak pace of capital spending described above, and the apparent concentration of job-creation in recent

³ See Stanford (forthcoming); some OECD countries (such as Korea) continue to experience rising aggregate capital intensity of production.

years in relatively labour-intensive industries and occupations (such as retail, hospitality, personal, and some caring services).

Figure 4. Ratio of Net Fixed Capital to Hours Worked, Australia, 2000–18

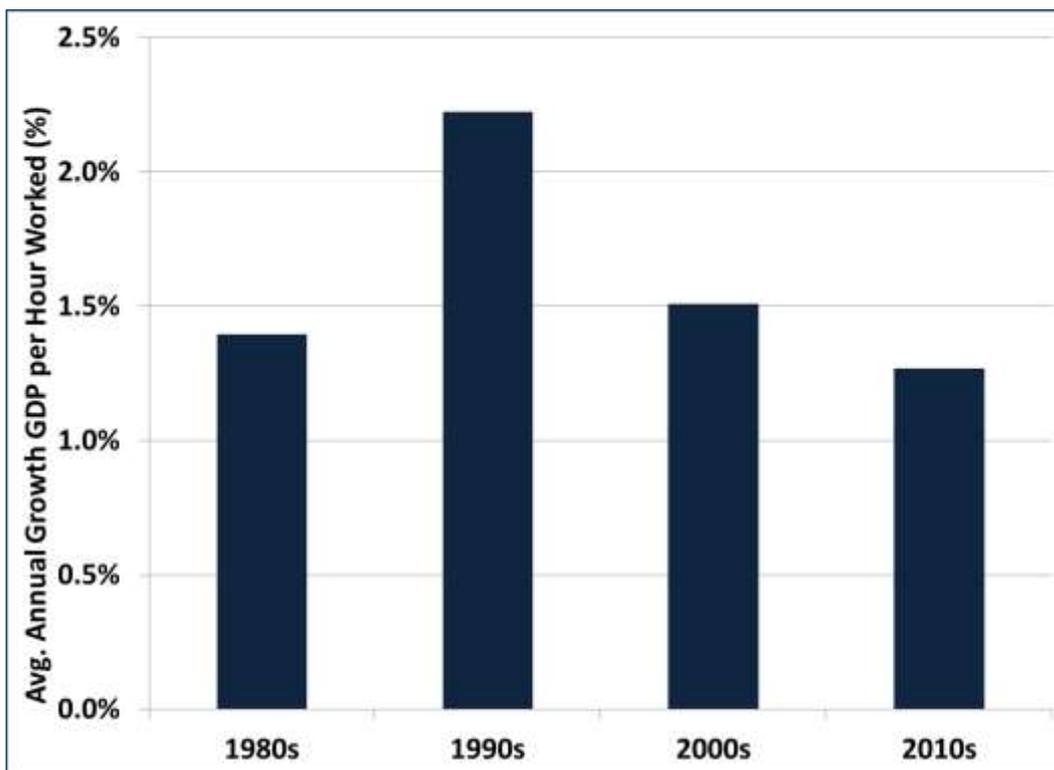


Data: Authors' calculations from ABS Catalogue 5204.0, Tables 15 and 56. Excludes dwellings.

A final piece of countervailing evidence is provided by the lacklustre performance of productivity growth in Australia's economy. Far from accelerating to unprecedented rates on the strength of widespread automation, productivity growth has declined in the current decade (Figure 5). The slow pace of capital investment (especially in machinery and equipment), the poor innovation record of Australian businesses, the concentration of the national economy in extraction of non-renewable resources (sectors which tend to demonstrate falling productivity over time as resources are depleted), and the continued creation of large numbers of jobs in relatively low-productivity private service industries all help to explain this poor productivity record.

Perhaps the world of work in the future may not be quite so dramatically different as it was in the past. There is no evidence that either technological innovation, or the creation and spread of new business and employment models, is fundamentally changing the central role and socio-economic position of paid labour in the functioning of the overall economy. The total quantity of labour required is unlikely to be

Figure 5. Real Labour Productivity Growth, Australia



Data: Authors' calculations from ABS Catalogue 5204.0. 2010s figure to 2018.

dramatically affected by either new technology or by new business models (like digital platforms). To be sure, the specific tasks performed by workers in the future will change, as will their required skills and attributes; the nature and stability of their jobs will also certainly change. Indeed, empirical evidence suggests that change has been faster and more evident in the *quality* of jobs (for example, as indicated by the expansion of insecure and precarious employment practices) than in their *quantity*. This is further reason to reject the “technological determinism” that characterises many breathless discussions of the future of work.

In this context, perhaps policy-makers and organisational leaders should be less concerned with overarching narratives about “disruption” and the end of work as we know it. Instead, a more pragmatic and concrete analysis of the incremental shifts in skills, jobs, and relationships would be in order, to develop policy responses and capacities to make university-to-work transitions for Australia’s future graduates less painful and more productive.

2. The Evolution of Employment in Australia

New technologies can transform the component tasks associated with existing jobs; they can drive economy-wide efficiencies; and they can allow some workers to engage in work that is more abstract, complex, and knowledge-intensive. This section considers how these various dimensions of change are visible in the changing structure of employment patterns in Australia. It then assesses the likely evolution of future skills demands through two main lenses:

(1) changes in employment by industry and occupation, considering changes in the last five years as well as forward-looking employment projections from the Department of Employment, Skills, Small and Family Business (ESSFB) employment forecasts, and;

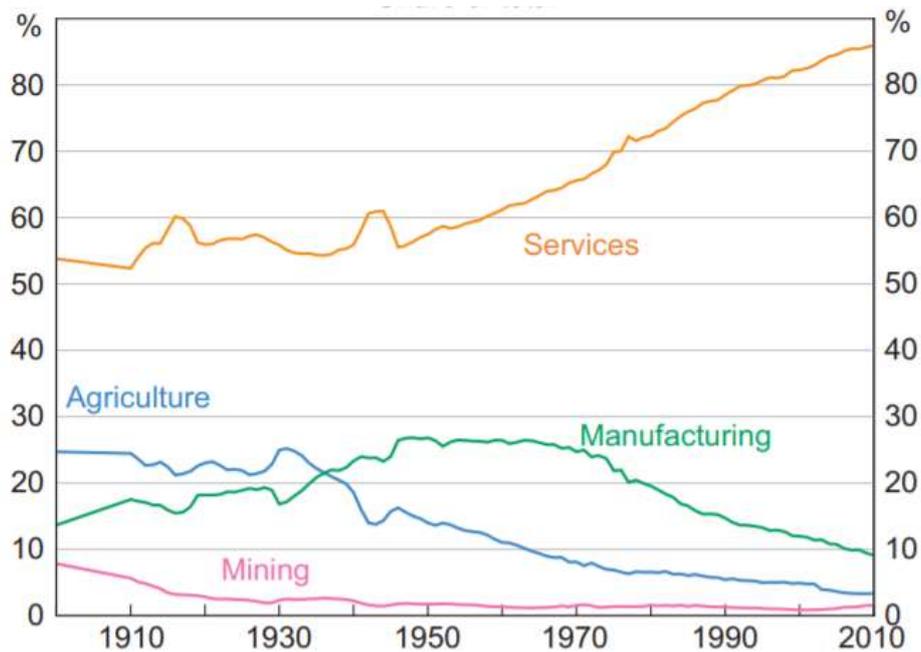
(2) skills shortages, considering employer self-reported survey data and comprehensive skills demand data from the OECD's *Skills for Jobs* database.

TECHNOLOGICAL CHANGE AND THE COMPOSITION OF EMPLOYMENT

As new technologies have been steadily implemented in production, the jobs Australians work over time have changed. But the overall amount of work available per person has increased, not decreased – contrary to fears of technological unemployment.

The overall rising trend in Australian employment is coincident with a shift in the composition of employment (and production) toward services, rather than goods. Figure 6 shows the evolution of jobs in agriculture, mining, manufacturing and services industries as a percentage of total employment from 1900–2010. At federation, employment in agriculture was high due to the central role of primary production in the economy, with a small manufacturing and mining employment base. Services industries comprised a relatively stable share (50–60 per cent) of total employment from federation through the 1950s. Strong demand for services was fuelled by high incomes fuelled by early 19th century mining booms, growing agricultural productivity, and Australia's geography (with long distances between population centres spurring transport and communications demands).

Figure 6. Employment by Industry, Australia 1900–2010

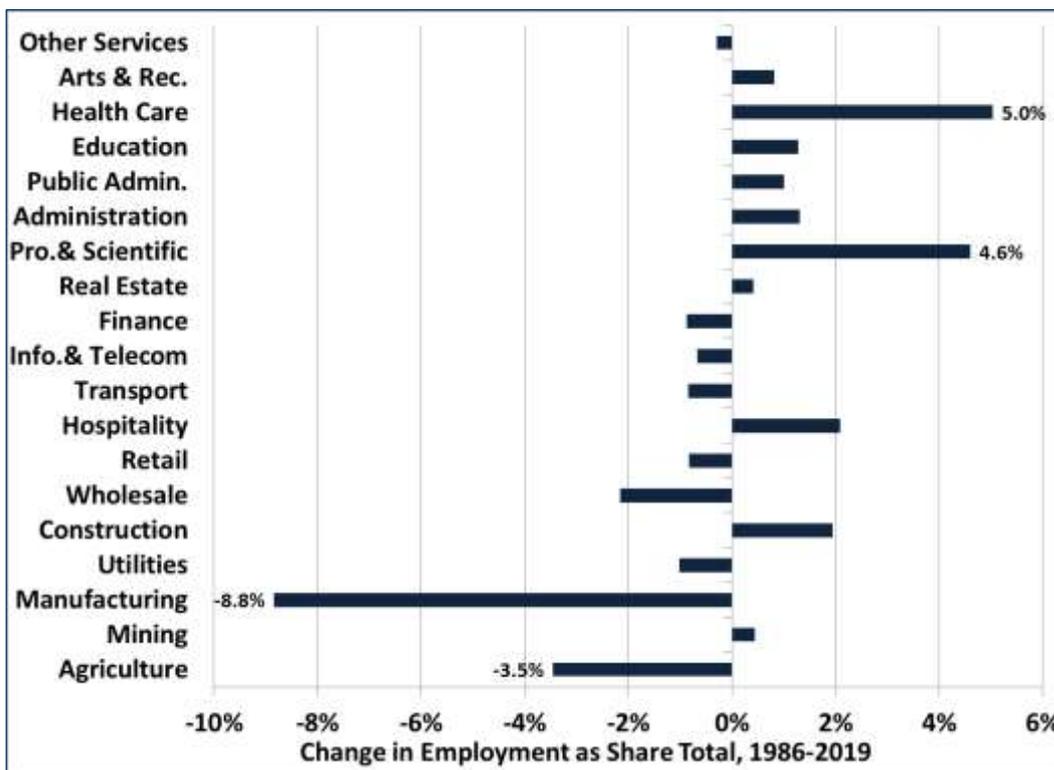


Source: Connolly & Lewis (2010).

At the turn of the 20th century, employment in agriculture and mining began declining as a percentage of total employment, and jobs in manufacturing rose for the next sixty years. This also fuelled ongoing demand for jobs in services (including in the distribution of manufactures). Since 1970, the employment share of manufacturing has declined, and services industries further increased their dominant employment share: rising from 60 per cent of total employment in 1960 to 85 per cent in 2010. This growth of services paralleled increased women’s workforce participation and employment. The composition of services work also shifted, from distribution, transportation and communication toward public services and business and professional services (some of which are produced for international markets).

The increasing importance of services is especially evident in the increase in health care and community services employment since the 1980s, which increased by 5 percentage points as a proportion of total employment from 1986 through 2019 (see Figure 7). This was supplemented by smaller but significant increases in other categories of public services (including education and public administration). Figures 6 and 7 both illustrate the major reductions in employment shares experienced in the goods-producing industries (especially manufacturing and agriculture). This confirms that structural change in employment patterns is hardly a novel development in Australia’s labour market.

Figure 7. Change in Employment by Industry (as proportion total employment), 1986–2019



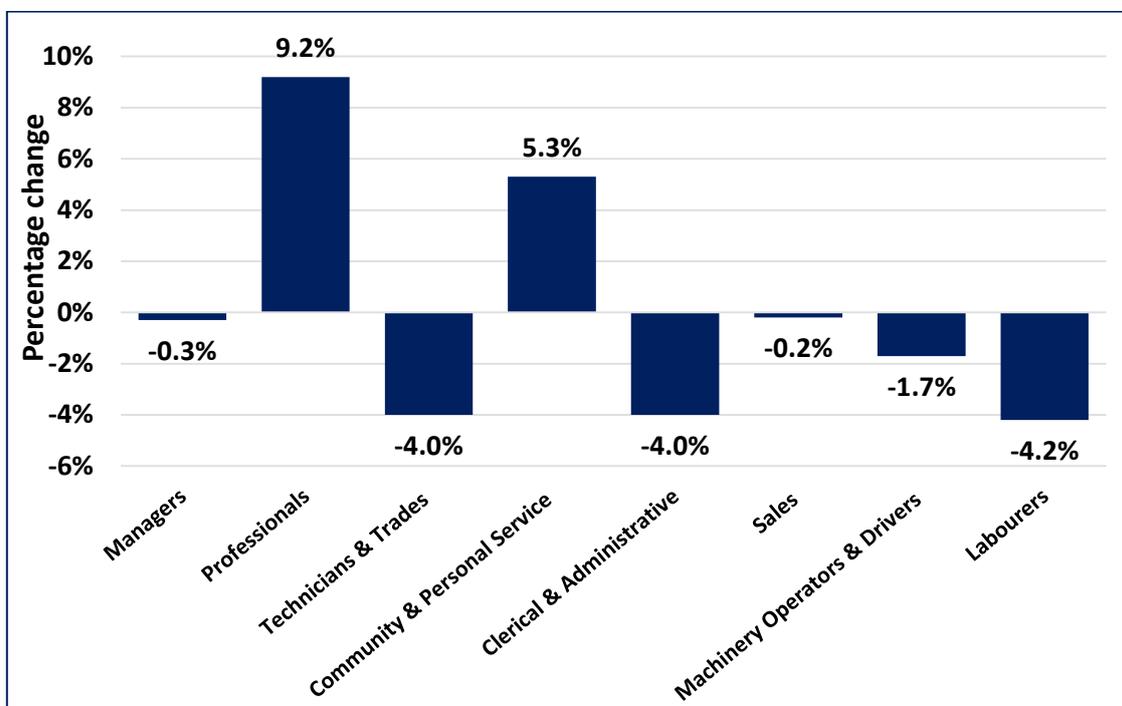
Data: Authors’ calculations from ABS Catalogue 6291.0.55.003, Table 7; 1986 figure calculated as annual average. Latest 2019 data for February.

As noted in Table 3 above, another channel through which technology can increase the overall amount of work available is by creating new jobs in industries that did not previously exist. The explosion of social media platforms and digital technologies, for instance, has led to the creation of many new digital roles that would not have been possible under earlier technologies. Demand for jobs where technology complements human labour, or “frees up” humans to undertake more abstract thinking, cognitive and emotional labour, has facilitated workers’ attainment of skills to undertake more non-routine, cognitive tasks. This higher-level thinking allows workers to understand and operate new technologies in the production process, as well as engage in more complex labour tasks.

While new digital technologies today are presented as a sudden and disruptive force, Australia’s growing reliance on more cognitive, non-routine work has been evident for decades. One indicator of this trend is the significant rise in bachelor’s degree attainment among the Australian working-age population – which rose from around 6

per cent in 1982, to 29 per cent of the population in 2018.⁴ It follows that since new technologies transform the component tasks of existing jobs, and drive efficiencies that allow workers to engage in more abstract, complex, and high-human-input work, this can explain the significant growth in *both* professional and social services employment in industrial economies like Australia. Figure 8 shows that since the mid-1980s, the economy has shifted from employment of technicians and trades, machinery operators and drivers, labourers, and clerical and administrative workers. The two occupational groupings which have expanded their share of total employment are professionals and community and personal service workers.

Figure 8. Change in Employment by Occupation (as proportion total employment), 1986–2019



Data: Authors' calculations from ABS Catalogue 6291.0.55.003, Table 7; 1986 figure calculated as annual average. Latest 2019 data for February.

Professionals—a broad occupational category that covers professional services work across all industries including, finance, education and healthcare—have increased as a proportion of the overall workforce more than any other occupational group, increasing by 9-percentage points between 1986 and 2019. More than one-quarter of all employed people are now professionals. Sales and manager occupations have remained largely steady as a proportion of the overall workforce over this period.

⁴ See ABS, Education and Work, Australia, May 2018 (Cat. No. 6227.0). Table 28; working age population defined here as 15-64 years of age.

Once again, this historical perspective confirms that major shifts in the occupational composition of the overall workforce are not new. The shifts in the structure of employment (from goods to services industries, and from manual and clerical jobs toward professionals and carers) have certainly imposed painful changes on those who were previously located in shrinking industries and occupations. Perhaps the loss of manufacturing employment (and employment in related occupations, such as machine operators and trades workers) has been most notable and disruptive – all the more so because of the regional concentration of those jobs in certain parts of Australia. Nevertheless, without diminishing the scope of this hardship, it is clear that structural change in employment patterns is a constant feature of the Australian labour market, and can be expected to remain so.

Digital technologies are often presented as a force that polarises opportunity between those with highly technical skills (who as a result are better paid), and those without high-level technical skills – who are penalised for the absence of these skills with lower pay and less secure employment. Counter-intuitively, however, the shift in the occupational composition of employment towards services industries suggests instead that some jobs that are typically considered non-knowledge-intensive or “low-skill” (a misleading and demeaning term) have in fact been relatively insulated from the impacts of technology. Employment shares have increased in caring and public services, and some private services (such as hospitality) which are not typically considered skill-intensive. So the common assumption that “high-skill” workers will benefit from automation, while “low-skill” workers will be displaced by it, seems unjustified. Ultimately, how a software programmer is remunerated compared to a teacher, an aged care worker, or a waiter may have more to do with social choices about the perceived importance of that work, and the institutional supports which those respective workers are able to bring to bear in support of their employment conditions, stability and compensation, than with their level of skill.

PROJECTING FUTURE SKILLS NEEDS

In light of the preceding review of historical shifts in the sectoral and occupational composition of employment, this section will consider possible paths for the future evolution of employment. This in turn informs expectations regarding likely demands for skills among future graduates. The discussion below includes four broad perspectives on those future projections: extrapolating past growth in industry and occupation employment levels, considering explicit forward projections of employment growth, reviewing data from employers regarding potential skills shortages, and considering the impact of ageing and retirement on future skills requirements.

i. **Past Employment Growth as an Indicator of Future Needs**

One approach to identifying future skills needs is to measure increases in the quantity of employment within a given industry. This is called an “employment pressure” analysis. An increase in employment presumably indicates rising demand in that industry which could, in turn, imply future shortages in relevant skills and qualifications.

Table 4. Top Ten Employment Growth Industries, Feb 2014–Feb 2019				
	Total employment at Feb 2019	% of total employment at Feb 2019	Total jobs added in past 5 yrs.	% of total new jobs
Health care & social assistance	1,702,700	13.3%	257,341	22.8%
Professional, scientific & tech. services	1,115,278	8.7%	134,969	12.0%
Construction	1,153,867	9.0%	123,893	11.0%
Public administration & safety	858,462	6.7%	122,104	10.8%
Education and training	1,032,363	8.1%	110,706	9.8%
Accommodation & food services	907,107	7.1%	79,581	7.1%
Transportation	666,095	5.2%	65,576	5.8%
Retail trade	1,284,695	10.1%	60,151	5.3%
Other services	515,651	4.0%	39,904	3.5%
Finance and insurance	445,510	3.5%	36,183	3.2%
Total: Top Ten Growth Industries	9,681,728	76%	1,030,408	91%
Total: All industries	12,774,625	12,774,625	1,127,313	100%

Data: Authors' calculations from ABS Catalogue 6291.0.55.003. Trend data. Measures change in total employment from Feb 2014 to Feb 2019.

Table 4 presents detailed ABS Labour Force survey data on total employment growth among the ten highest-job-growth industries over the 5 years ending February 2019. These ten high-growth sectors accounted for 91 per cent of total Australian job-creation in that period. These employment statistics include both full-time and part-time work, and hence the growth in total employment may overstate the actual amount of new work created. Part-time work is growing in Australia (with close to one in three employed Australians now working part-time), and many part-time workers

are underemployed – working very short or irregular hours. Thus total employment figures can overstate the quantity of hours on offer in a given job.

Similarly, changes in the quantity of employment do not convey information about changes in the quality of employment. By several indicators, typical jobs are less secure, and benefit from fewer contractual protections than was the case five years ago (Carney and Stanford 2018a). As such, the growth of total employment described in Table 4 should be considered in light of the fact that not all those new positions are “good jobs”—secure positions, with sufficient hours, adequate pay, and access to standard employment entitlements (like paid leave and superannuation).

Keeping these limitations in mind, the overwhelming majority of jobs added in the last five years have been in services industries; only one of the ten sectors listed in Table 4 (construction) is located in the goods-producing side of the economy. Many of these service sectors have been relatively unaffected by labour-saving technology due to the inability (so far, at any rate) to mechanise the work they perform – especially tasks requiring direct human connection between service providers and users.

Around 250,000 jobs were added in the broad healthcare and social assistance sector over the last five years, which represents almost one-quarter of all new employment created in Australia. This sector is the largest employer in Australia, and its leadership role in this regard has been accentuated by recent strong hiring. Professional, scientific and technological services added 135,000 further jobs in the last five years. Despite labourers declining by 4-percentage-points as a proportion of total employment since the mid-1980s, the manual-labour-intensive construction industry still employs a significant number of Australians: the sector accounts for 1.2 million jobs (close to one-tenth of all employment), with around 120,000 jobs added in the last five years – reflecting increased public infrastructure investments and strong housing construction. Reflecting increased demand for publically-funded services, public administration and education and training both experienced strong employment growth over the five years -- with each adding 110,000–120,000 jobs. It is notable that three of the five largest job-creating sectors (health care, education, and public administration) are marked primarily by public provision. This reflects the strong and rising demand for more public services by Australians (including new areas of public service such as child care, aged care, and disability services). This shift of employment into caring and human service provision, primarily (but not exclusively) within the public sector, is an important structural trend that will continue to shape Australia’s labour market.

Other industries that added significant but smaller numbers of new jobs in the five years to February 2019 include the relatively low-wage, part-time-dominated accommodation and food services and retail trade sectors. These industries also

employ a disproportionate number of young workers, including many university graduates who have been unable to find more appealing positions. Employment growth in these large private service industries has been constrained by stagnant real incomes and slowing consumption spending among Australian households.

Transportation, “other services”, and finance and insurance round out our list of the ten biggest job-creating sectors, each adding between 35,000 and 65,000 positions in the five years to 2019. It is interesting to note that some of the high-job-growth sectors listed in Table 4 (such as transportation, retail trade, and finance) are typically considered to be among the industries most at risk of technological employment displacement; this is another piece of countervailing evidence suggesting that some of those more pessimistic forecasts of technology-induced job loss should be viewed with considerable scepticism.

In sum, based on employment growth in the last 5 years, industries for which a human connection is still vital to production (particularly in human, caring and public services) seem positioned to experience continuing strong demand for labour. In most cases, these jobs require higher education qualifications. At the same time, some sectors which are still adding jobs are more dependent on vocational and trades training for developing their future workforce: including construction and transportation. Finally, some low-wage private service sectors (notably hospitality and retail trade) experience relatively modest skills requirements, exacerbated by the precarious and low-paid nature of the jobs on offer.

ii. Employment Projections and Future Skills Needs

Five-year employment projections (by industry and occupation) are published annually by the Commonwealth Department of Employment, Skills, Small and Family Business (ESSFB) the latest projections run from 2018 through 2023. These projections are created beginning with the extrapolation of historical ABS time series data on the basis of moving average techniques. Adjustments to those extrapolations are then made to reflect internal research undertaken by the Department of ESSFB and the impact of “known future industry developments.” These projections are therefore necessarily subjective and highly contingent. Once again, projections of total employment growth must be approached with caution, as they do not explicitly take into account changes in job quality (such as the incidence of part-time work).

Employment in Australia’s near future will be strongly influenced by demographic changes like the ageing population, the continued growth of dual-income households, rising women’s workforce participation, and increased demands for both public and private services. These underlying drivers further reinforce growing employment demand in the human and caring services industries – jobs with high labour inputs

which are relatively impervious to automation. Strong employment growth in both healthcare and education is projected to continue over the next five years, at around the same rate identified in the historical analysis above. Table 5 shows healthcare is projected to add another 250,000 jobs to 2023, predominantly in aged and disabled carers, registered nurses, and child carers; education is projected to expand by over 100,000 jobs in the next five years, with particular demand for education aides and primary school teachers.

Table 5. Projected Highest Job Growth Industries to 2023			
Industry	Percentage of total employment (Feb 2019)	Projected new jobs 5 yrs. to 2023	Top hiring occupations*
Health care & social assistance	13%	250,300	Aged & disabled carers; registered nurses; child carers
Construction	9%	119,000	Construction managers
Education & training	8%	113,000	Education aides; primary school teachers
Professional, scientific & technical services	9%	107,000	Software & applications programmers
<i>Data: Authors' calculations from Department of Employment, Skills, Small and Family Business (2018) employment projections from May 2018 to May 2023. * Top hiring occupations are those projected to experience strongest growth within highest employment growth industries.</i>			

Construction, having already experienced five years of strong employment growth, is projected to continue growing to 2023 at around the same pace, with close to another 120,000 jobs to be added; construction management occupations will be in particularly high demand. Employment in professional, scientific and technical services is projected to also continue on its previous trajectory, with around 100,000 further jobs added to 2023; software and applications programmers is the occupation in highest demand within that industry.

Conversely, process-focused administrative and managerial occupations are projected to face the biggest declines in total employment in the five years to 2023 (see Table 6). This reflects the increased adoption of automated technologies that make administering business processes cheaper and more efficient. Personal assistants and

secretaries will lose almost 20,000 positions to 2023 – one in five of the existing positions. Office and program managers will lose over 12,500 jobs, and agriculture will lose another 4500 managers. Operators in machine and stationary plants will lose close to 6,000 jobs.

Table 6. Projected Occupations with Largest Employment Decline to 2023			
Industry	Projected employment level May 2023	Number of jobs projected to decline in 5 yrs. to 2023	% employment decline 2018–2023
Personal Assistants and Secretaries	75,172	-19,381	-20.5%
Office Managers and Program Administrators	221,241	-12,592	-5.4%
Machine and Stationary Plant Operators	156,353	-5,843	-3.6%
Farmers and Farm Managers	155,721	-4,529	-2.8%
Clerical and Office Support Workers	82,662	-1,040	-1.2%
<i>Data: Authors' calculations from Department of Employment, Skills, Small and Family Business (2018) employment projections from May 2018 to May 2023. ANZSCO second-digit occupational level.</i>			

iii. Skills Shortages

Another lens for predicting future skills demands is to consider current skills shortages reported by employers. The Department of Employment, Skills, Small and Family Business undertakes skills shortages assessments through its Survey of Employers who have Recently Advertised (SERA). SERA collects two kinds of information: data on employers' recruitment, including the proportion of vacancies filled, the number of applicants, and the number of qualified and suitable applicants; and qualitative information on employer experiences with recruitment.⁵ These data are then compiled to generate composite labour shortage scores, with an employer-reported skills shortage score recorded against each occupation.

⁵ See Department of Employment, Skills, Small and Family Business (2017) for more information on its methodology for measuring skill shortages.

Self-reported labour shortage data must always be considered with a degree of critical perspective. After several years of excess labour supply in the overall economy, most employers have become accustomed to being readily able to recruit incremental labour needs from a perpetual pool of unemployed or underemployed workers. They may therefore experience any diminishment in that pool of available labour, including applicants with workforce-ready skills, as an emerging “shortage.” Further, seeming shortages may arise when employers are unable to recruit staff with the necessary skills at a given level of pay and conditions. In theory, those shortages should lead to adjustments to wages and conditions on offer, in order to recruit additional labour supply, but this market mechanism does not always work in practice – and employers are likely to resist lifting their wage offers. For these reasons, reported skills shortages should not be interpreted as an indication that the labour market is at or nearing capacity, nor that labour is scarce in any fundamental or general way. Certainly, the continuing surplus of qualified graduates that remain unemployed and underemployed while ready and prepared to work in Australia confirms this possibility (graduate labour market conditions are discussed further in Section 5).

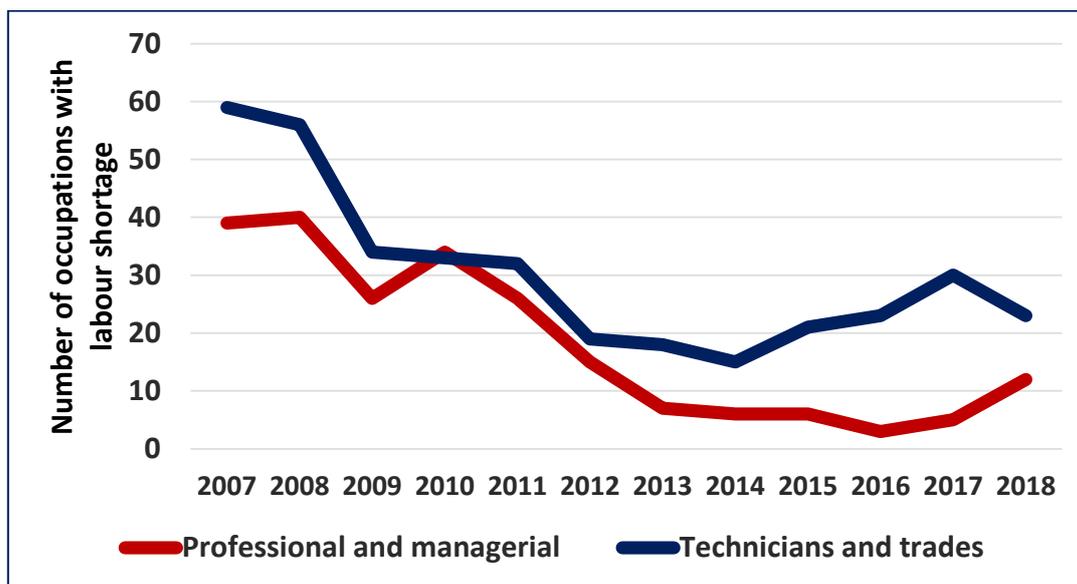
Figure 9 shows the number of specific occupations for which employers have reported skills shortages within two key categories: professional and managerial occupations, and technicians and trades. We review the evolution of reported shortages from 2007 through 2018. This time period selected captures skills demands through three distinct periods: the years leading to the economic slowdown associated with the Global Financial Crisis pre-GFC; the subsequent mining-led recovery when broader labour market demand conditions were strong; and the subsequent cooling of labour market conditions (correlating with the downturn in resource investments after 2012). This overall period also incorporates large swings in university graduate full-time employment rates – which ranged from a higher of 85 per cent in 2007 to a low of 68 per cent in 2014.⁶ One caveat to be kept in mind with these data is that they report labour shortages within an occupation on a simple binary basis (“0” or “1”); this approach provides no information regarding the intensity of the shortage, nor the total number of qualified workers actually required to meet that shortage.

Skills shortages reported in both professional and managerial occupations and technicians and trades occupations were at a peak level in 2007; shortages then declined at a similar rate in both categories to 2014. After 2014, a rising number of technician and trades occupations registered labour shortages; reported skills shortages were less intense in professional occupations. This divergence after 2014 reflects the success of the university sector in meeting high demand for professional

⁶ These data are discussed further in Section 4. 1997–15 employment data from GCA’s Australian Graduate Surveys. 2016–18 data from Graduate Outcomes Surveys by QILT.

and management skills – partly due to the introduction of demand-driven university funding in 2012 (see Section 6 for more discussion on this policy). In contrast, experimental deregulation and privatisation policies pursued in the VET sector have disrupted vocational education, and led to a collapse in the flow of apprenticeships and traineeships. This disruption in the training pipeline for technicians and trades occupations is visible in the more acute skills shortages they have experienced since 2014.

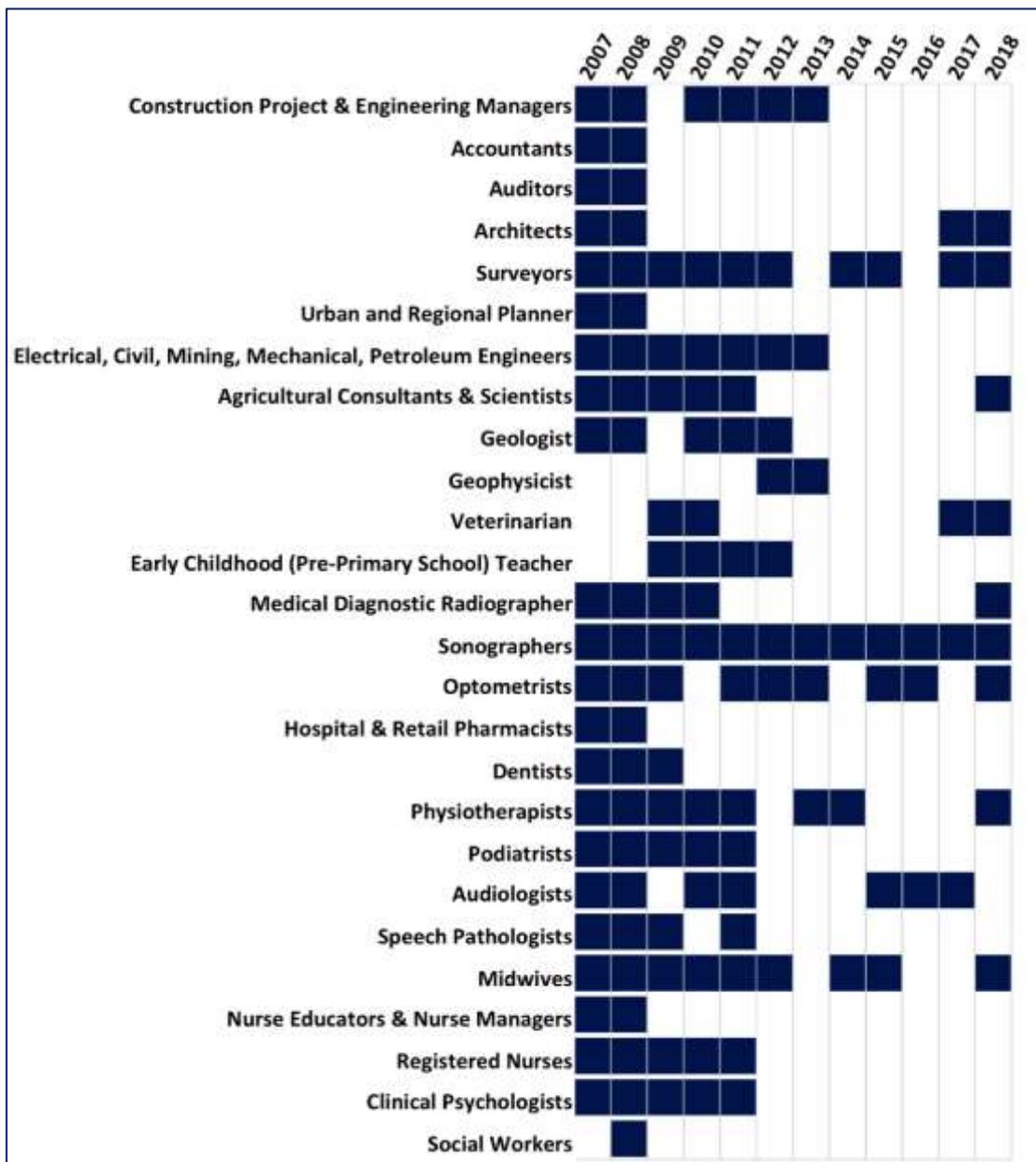
Figure 9. Number of Professional and Managerial Occupations, and Technicians and Trades Occupations with Reported Skills Shortages 2007–18



Data: Department of Employment, Skills, Small and Family Business (2019).

To get a more detailed view of the specific professional and managerial occupations experiencing skills shortages, Figure 10 presents a list of selected professional and managerial occupations that registered skills shortages at some point during the 2007–2018 period. It shows a cluster of shortages within healthcare and professional, scientific and technical industries, particularly before 2012 – including for registered nurses, midwives, psychologists, and physiotherapists. Shortages then eased across most professional categories after 2013. This is clear for engineers (including civil, mining, and petroleum engineers), where shortages disappeared after seven consecutive years of recorded shortages. Shortages remained more acute in some professional occupations, including for surveyors, sonographers, optometrists, audiologists and midwives. The 2018 uptick in reported shortages for professionals is due to new reported shortages for architects, veterinarians, and physiotherapists – along with continuing acute shortages in several healthcare professions.

Figure 10. Skills Shortages Within Selected Professional & Management Occupations 2007–18



Data: Department of ESSFB (2019), “Historical list of skill shortages in Australia.” For ease of representation, occupations with comparable skillsets with the same or very similar labour shortage patterns are combined. Occupations without shortages recorded over the time period were removed.

A more comprehensive analysis of skills imbalances has been developed using the OECD’s (2019c) *Skills for Jobs* database – a comprehensive, multi-indicator database measuring the magnitude of skills shortages and mismatch within countries over time. The methodology used by OECD to compile the database aims to overcome the

limitations of employer self-reported skills shortage data by using quantitative data from large household surveys. Sub-indices of hourly wage growth (wage pressure analysis), employment growth, hours worked, and underqualification are combined to provide a more holistic picture of labour market pressure at the occupational level. Using the occupation–skills taxonomy utilised in the O*NET database, occupations are then mapped across a variety of attributes to identify and categorise specific requirements and shortages.⁷ Those attributes are grouped by the O*NET database into three broad domains of competences required to perform the tasks related to any job: knowledge, skills, and abilities.

- “Knowledge” encompasses the body of knowledge and principles applied at work, usually of a factual or procedural nature, which make performance of the job possible. For instance, knowledge in wound care, or knowledge of teaching methods for children with autism.
- “Skills” refer to the developed capabilities – manual, verbal, and mental – that facilitate job performance. Skills are acquired through both experience and training and represent the ability of an individual to mobilise knowledge in the job. For example, skills in driving a vehicle, or skills in manipulating data with statistics software programs.
- “Abilities” are the enduring physical and social attributes that influence job performance, but, unlike skills, do not link necessarily to a job. Examples of abilities are physical strength, fine manipulative dexterity, memory, and reasoning ability.

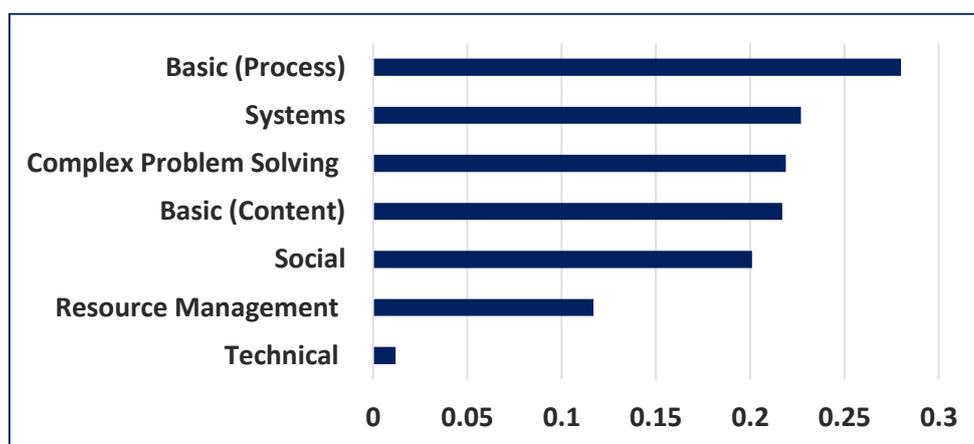
The following charts present the OECD findings on shortages for each of the three major categories of competences in Australia. Results are presented on a scale ranging between -1 and +1; positive values indicate a shortage, and negative values indicate a surplus (hence, the larger the absolute value, the greater the imbalance).

Figure 11 reports the OECD findings in the Skills category. This category encompasses both basic skills (e.g. active listening, writing, critical thinking) and cross-functional skills (e.g. negotiation, programming, time management). The OECD data indicate that there are pressing shortages in Australia in basic skills. These are capacities that facilitate learning or the rapid acquisition of new knowledge, and are comprised of two categories of subskills: process skills and content skills. Process skills were in highest shortage of all skills in Australia and include conscious application of learning

⁷ The OECD uses the US-based Occupation Information Network (O*NET) database to map occupations to different skills. This occupation–skills taxonomy has been used widely in studies internationally on impacts of automation on skills and jobs. For more information on how the OECD constructs its skills demand indicator, see Chapter 2 in OECD (2017).

strategies, critical thinking, and monitoring of an individual’s learning progress. The occupations with the most basic process skills shortages were in the health professions. Basic content skills – those broad literacy and numeracy skills – experienced less shortages in Australia than process skills, but shortages were still evident. The subskills that contributed most to basic content skills shortages were reading comprehension, listening, writing, and speaking, and to a lesser extent, science and mathematics. Science and engineering professionals were the hardest-to-fill occupations using this skill.

Figure 11. Skills Shortages in Australia – OECD



Data: OECD Skills for Jobs (2019). Data for 2015.

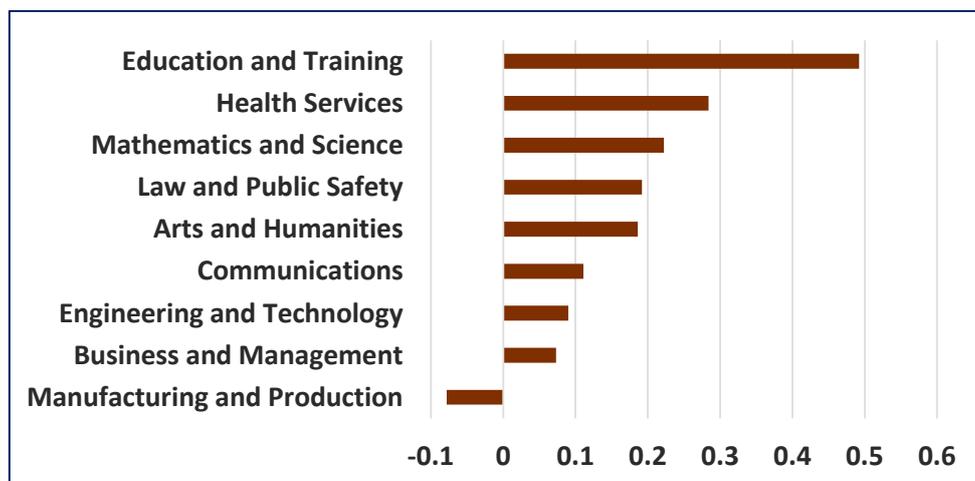
Less pronounced but still significant skills shortages exist in systems skills. Systems skills are those capacities needed to understand, monitor, and improve socio-technical systems, including judgement and decision-making, and systems analysis. Shortages also exist in complex problem-solving skills which include capacity to solve novel, imprecise, complex real-world problems. The hardest-to-fill occupations across both of systems and complex problem-solving skills were in science and engineering professions.

Social skills are the capacities required to work with other people and achieve positive outcomes, including instructing, social perceptiveness, service orientation, and coordination. Australia recorded the most acute social skills shortages in health professions. There were less severe shortages in resource management skills (including time, personnel, and finance resources management), and almost no shortages identified in technical skills. This is not consistent with the most recent Department of ESSFB skills shortage data presented earlier – which suggested that the vast majority of labour shortages (including 23 out of a total of 35 occupations experiencing shortages in 2018) were for technicians and trades occupations. Since the OECD data was

collected in 2015, one possible interpretation of this difference is that the recent rise in technical skills shortages has not been captured in the OECD data.

Worryingly, Australia faces critical knowledge shortages in education and training and significant knowledge shortages in health services and mathematics and sciences (see Figure 12). This presents a serious challenge since these knowledge areas are all crucial in the fastest growing industries. Disaggregated data for mathematics and sciences show that knowledge shortages in psychology made the largest single contribution to this category, while therapy and counselling knowledge was the largest shortage contributor in the health services category. In both cases, therefore, the growth of demand for health and social services is a key factor behind reported shortages. On the other end of the spectrum, the OECD identified surplus knowledge in manufacturing and production; this presumably reflects long-term decline in that sector.⁸ Despite the intense focus on graduates being skilled to meet the supposedly insatiable appetite of employers for technological expertise and entrepreneurial knowledge, by this reading Australia actually experiences minimal knowledge shortages in both engineering and technology and business and management.

Figure 12. Knowledge Shortages in Australia – OECD

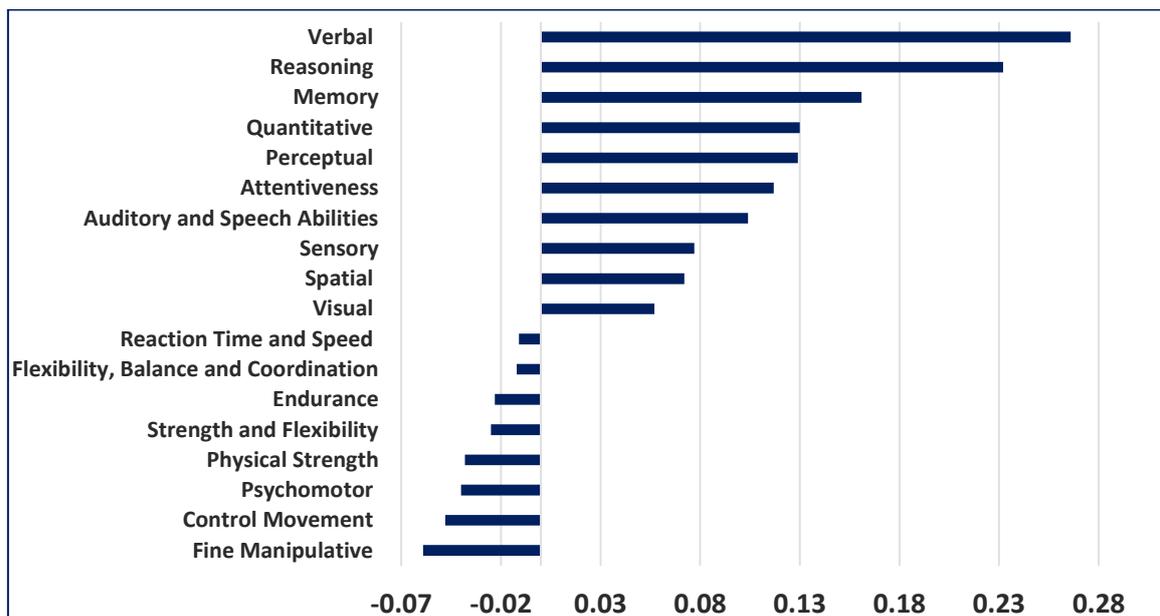


Data: OECD Skills for Jobs (2019). Data for 2015.

Finally, within the OECD’s “abilities” category, consistent with Australia’s shift toward more employment in services industries, the OECD finds shortages in many of the social abilities required for social, emotional and cognitive labour. Abilities shortages are most acute in verbal, reasoning, and memory abilities; physical abilities like fine manipulative abilities, control movement, and physical strength are found to be in surplus.

⁸ See Carney and Stanford (2018b) for a recent appraisal of skills and training demands in the manufacturing sector.

Figure 13. Physical and Social Abilities Shortages in Australia – OECD



Data: OECD Skills for Jobs (2019). Data for 2015.

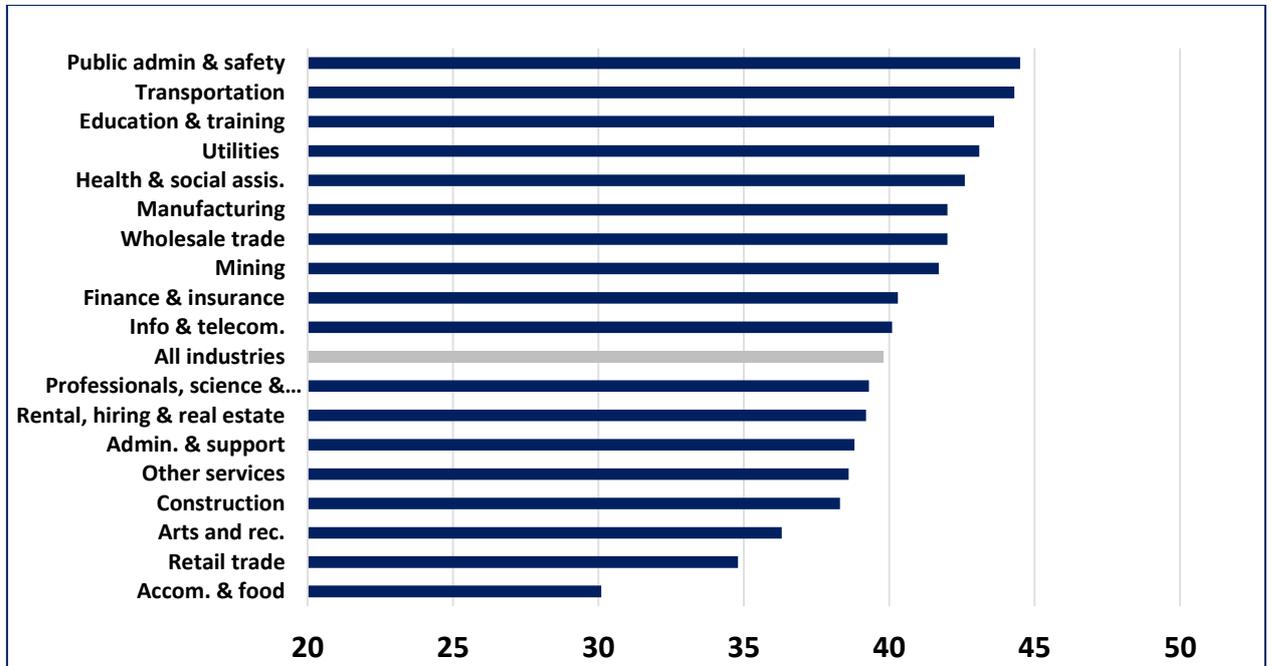
Comparing the absolute shortage scores across all three attribute categories, it is clear that knowledge-type shortages represent the most pressing concern for Australia – particularly in education, health services, and mathematics and science. This reinforces the key role of universities in facilitating knowledge acquisition in a modern, high-skill labour market.

iv. Ageing of the Workforce

A final lens for detecting and anticipating future skills shortages relates to the demographic transition of Australia’s workforce. Many of today’s experienced workers began their careers during earlier expansionary phases of their respective industries, and are now approaching retirement age. For instance, public administration employment expanded rapidly in the 1980s; it is now the oldest industry, on average. The imminent retirement of many workers in these older sectors presents a looming skills crisis if labour force renewal and skills development is not planned and prepared for. As indicated in Figure 14, the average age of workers in the healthcare and education sectors was also quite old: over 42 years on average in 2018, almost three years older than the average for the entire workforce. The rapid growth of employment in public service sectors, combined with the advanced age of the existing workforce, could create a doubly intense skills challenge in those industries in future years – as experienced workers retire, compounding potential labour shortages. Other sectors with relatively older existing workforces include transportation, utilities, manufacturing, wholesale trade, and mining. Even in sectors which have experienced a

decline in total employment (such as manufacturing and wholesale trade), this demographic transition could still create significant challenges in planning for the development of an adequately skilled workforce.

Figure 14. Average Age of Employees by Industry 2018



Data: ABS Catalogue 6306.0, Table 4.

3. Skills, Attributes and Future Employment

New technologies and global economic, political and environmental change are creating great uncertainty about the skills future graduates will need in order to participate fully and positively in the future of work. All too often this conversation is portrayed as a race to attain “the right skills,” in the face of inevitable and impersonal forces of change. Digital developments in particular are presented as a force that will lead to the dramatic upending of human labour, after which only tech-savvy individuals will remain relevant; technology is portrayed as an exogenous, irresistible force that threatens to outpace our ability to retrain workers into new roles.

This section explores widely accepted but incorrect assumptions about the supremacy of hard technical skills (such as engineering or programming), and more generally the assumed primacy of STEM skillsets, in the future economy. It also explores (and debunks) claims about the declining significance of university degrees in providing relevant knowledge and skills. The section then considers alternative frameworks for analysing graduate skills in the future, based on “job clustering” analyses; it outlines how vocational/occupational streams can best prepare for coming disruption in traditional occupational structures. To begin, the section assesses the validity of the currently popular focus on workforce and employability skills of university graduates – and considers the critical, creative and whole-of-system knowledge-base that graduates will need to negotiate the world of work they will inhabit.

BEYOND GENERAL “EMPLOYABILITY”

A focus on “employability skills” has been the dominant approach to facilitating university graduate transitions among governments, the higher education sector, and employers since the 1980s. Then, the Australian economy was undergoing deep structural changes: computer technologies were expanding, and new services industries demanded a newly-skilled workforce, at the same time as some traditional industries were contracting in the face of new global and policy realities. In response, governments pursued a dual education strategy: involving a broad, high-skilled and adaptable workforce trained in universities, alongside a competency-based vocationally trained workforce intended to meet the more specific needs of industry (and centred on the TAFE system). It was considered that multi-skilled, flexible, university-educated individuals should bear the main responsibility for adjusting to

changing market “signals” (rather than employers or government), by adjusting their own education and career paths in light of evolving market realities.

This focus on employability skills thus became the bedrock of the future skills system in the university sector. The approach focuses on enhancing students’ broad generic skills and capacities to succeed in a workplace setting; these employability skills include literacy and numeracy, project-based work, verbal and communication abilities (or “soft” skills), team work, and problem-solving. Employability skills are developed primarily through integration into course curricula (with varying degrees of success), and include practices like group assessments and work placement programs that can increase the value of formal education for students, generate contacts and networks, and give graduates greater confidence as they enter the workplace.

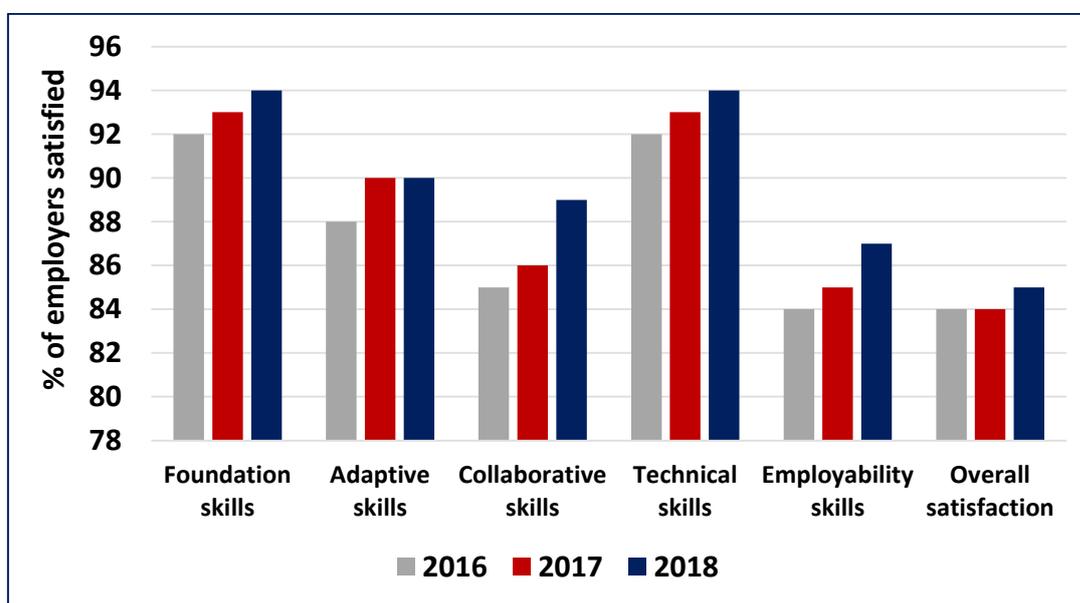
But in the wake of the composite challenges facing Australia’s modern labour market – an insufficient quantity of work, a decline in the quality of work, and stagnation in wages and salaries – the idea that an agile, flexible, university-educated workforce can negotiate any barriers it encounters has lost credibility. In reality, higher education provides no automatic protection against job insecurity or low pay, as evidenced by the growing number of un- or underemployed university graduates. By focusing on shaping “job ready” workers, the employability agenda shifts focus away from broader economic policy failures like unemployment, placing the main burden of responsibility on graduates themselves. For instance, rather than asking why businesses are downsizing their entry-level recruitment and on-the-job training activity, or asking why government is not investing in expanding job opportunities, graduates are instead asked: “Why are you not work ready?”

Over three decades later, as Australia confronts another historic economic, social and technological juncture, the employability skills agenda has been rebadged: now defined as the imperative to attain “21st century skills”. This 21st century skills framework teaches the same broad, generic skills as were previously emphasised (under the rubric of “employability”), but with a greater emphasis on fostering “enterprise skills” (such as entrepreneurship, small business management, etc.). Cloaked in the language of innovation, the addition of general business skills to the list of essential capacities for university graduates reinforces the notion that individuals bear the responsibility for navigating the labour market, rain or shine. Generating any kind of piecemeal economic activity to survive is now defined as an act of “entrepreneurialism”.

The shift in focus from macroeconomic policy failures to the purported shortcomings of graduates is evident in widely cited claims that employers face lasting shortages for skills and attributes that entry-level workers do not currently possess. But employer

data show Australian employers are actually very satisfied with graduate performance in the workplace; Figure 15 shows that 85 per cent of employers were satisfied overall with graduate employees' skills in 2018 (an increase from previous years). Employer satisfaction across all graduates' skillsets increased over the three years covered by this data (from 2016 through 2018), including for employability skills specifically (defined as the ability to perform and innovate in the workplace). Satisfaction with employability skills increased by 3 percentage points over this period, to 87 per cent. It is difficult to conclude from this evidence that there is any crisis in graduate employability skills.

Figure 15. Australian Employer Satisfaction with Graduate Skills, 2016–18



Data: QILT Employer Satisfaction Survey Reports (2016–18).

Graduates need skills to both adapt to changing circumstances, and meaningfully shape their work experience in a realistic, informed and ongoing way. If productive lifelong learning is to become part of everyday life, graduates will need much more than the acquisition of a list of generic employability skills. Strong learning dispositions that encourage deep knowledge that can connect with other knowledge bases (including other disciplines, other learning approaches, and networks beyond the university) and foster ongoing attachment to the learning and training process will be crucial. But underpinning strong learning dispositions and the ability to engage in abstract, critical, creative and whole-of-system thinking, is the enduring significance of expertise. Broad skills are often wrongly counterposed to the development of

expertise, but as research from many fields shows, the development of broad skills occurs only within the process of attaining domain-specific knowledge.⁹

While technical awareness and “hard skills” are needed to embrace technological capability, harnessing technological advances to maximise their benefits (and curtail negative social effects) will require a more creative response to complex problems facing the world today. As such, critical thinking, creativity, problem-solving, and leadership and people management are capacities that will be increasingly important in the future of work.¹⁰ Despite popular derision of arts degrees, industry leaders are now calling for more arts graduates in their workforce – given their training in abstract, critical methods of inquiry. Many Australian employers in creative digital fields, for instance, now prefer employing humanities and social sciences graduates (rather than programmers) because they “know how to learn” (Bridgestock 2016). Likewise, the global cybersecurity industry is working to recruit workers with more “human” skills to meet demand for an additional 3.5 million professionals by 2022: people who will need to be able to navigate the increasingly complex regulatory and geopolitical environment of cyberspace.¹¹

DO WE HAVE AN UNDERSUPPLY OF CODERS AND STEM QUALIFICATIONS?

Technologies continue reshaping the way we communicate, find information and transact; hence digital literacy skills will continue to be an important facet of working life. In fact, within 5 years the proportion of the workforce expected to require basic computer skills to perform their jobs is expected to rise to 90 percent (McPherson 2017). But despite the common claims of technologists, expertise in coding and digital systems may not be a universal workplace requirement in the future. For example, in a study of the implications of AI for education in Australia (Buchanan et al. 2018), experts in engineering agreed that students should be equipped with basic ICT skills, but none advocated for the mainstream teaching of computer coding. In fact, participants across all disciplines argued for the prioritisation of creativity and adaptation to changing conditions in the education system.

As digital technologies are increasingly integrated into work processes, equal access to those technologies in day-to-day life will be key to ensuring citizens are familiar with

⁹ See Buchanan et al. (2018) for a review of cross-disciplinary research on the attainment of broad skills and expertise.

¹⁰ This was recently argued by the World Economic Forum (2018).

¹¹ See Dixon and Jordan (2018) for a discussion on future skills demands in cybersecurity.

their operation. If the tools of everyday work and life are not extended to all people, a growing “digital divide” will amplify inequality. But because the implementation of technology is shaped by existing global trends, including rising inequality and unsustainable economic practices, workers (and all citizens) also require knowledge about how to use technologies critically, and need skills to effectively intervene and shape decisions about their use. The education system at all levels must meet rising demand for basic digital skills. But rather than mainstreaming narrow, high-level technical expertise, it is more important to prepare students to engage with the challenge of new technologies – like any other aspect of the economic and social world.

Science, technology, engineering and mathematics (STEM) capabilities are essential to building an innovative, productive, and growing economy. For this reason, future STEM workforce capability is worth planning for. Building a coordinated lifecycle approach to Australia’s STEM “pipeline” would include several initiatives: improving basic numeracy skills in schools, increasing uptake of science and mathematics post-primary school, and working to address under-representation of Australian women in STEM jobs.

But while advanced STEM attainment will be important to some occupations and industries, these so-called “hard” skills have received disproportionate attention. In a world of smart machines, STEM skillsets will not be the only route to high-performance, productive work lives. We will equally require people educated in the humanities, social sciences, and the skills of inquiry: skills that define our “human-ness” in an age of machine-learning and artificial intelligence. There is also the risk that focusing unduly on a supposed future shortage of advanced STEM capability will distract from serious knowledge gaps in traditional fields such as literacy, basic skills, and even in non-specialist mathematics and science courses. Those gaps already exist: for instance, 11 per cent fewer Year 12 secondary students studied mathematics in 2016 than in 1992 (CSIRO 2016), and Australian student academic performance in basic skills has been falling behind the OECD average since 2000 (Plunkett 2018).

In any case, claims of a crisis in undersupply of graduates holding STEM qualifications fly in the face of reality. A significant proportion of current STEM graduates cannot obtain full-time jobs. In fact, full-time employment outcomes for science and mathematics graduates are *below* the average for all graduates; only 65 per cent were in full-time employment in 2018, compared to an average of 73 per cent for all degree fields. STEM full-time employment rates were even below other generalist study areas like agriculture and environmental studies (68%), or business and management (78%). Australian employers are clearly not fully utilising the existing supply of STEM-qualified graduates.

More detail on the STEM graduate landscape is provided in Table 6, which reports the number of domestic undergraduate completions for different STEM subject fields for 2016 (the most recent subject-level disaggregated data available). It also presents full-time employment rates by study field for 2017, estimating how many STEM graduates in the 2016 cohort were underutilised upon entry into the 2017 labour market.

In 2016 around 32,000 domestic students completed STEM degrees (21 per cent of all degree completions that year). 33 per cent of these graduates, or around 10,700 people, were not in full-time work in 2017 after graduation. While we cannot assume all graduates desire full-time work (as some may be undertaking further study), survey data for three years 2016–18 shows that most STEM graduates working part-time desire more hours (QILT 2016–18).¹² Hence a general state of current labour market underutilisation for STEM graduates can be reasonably inferred. Sciences (natural, physical, biological and medical) had the highest number of completions of all STEM fields, but the lowest percentage of graduates in full-time work – at around 57 per cent. Engineering graduates experienced the strongest demand for their skills, with 78 per cent finding full-time employment. Mathematics had 405 completions nationally, yet below-average employment outcomes of 69 per cent full-time employment.

Table 6. STEM Graduate Completions and Full-time Employment Outcomes			
Field	Number of completions 2016	Percentage in full-time work after graduation in 2017	Number of graduates not in full-time work
Mathematics	405	69%	126
Sciences*	15,875	57%	6,826
Computing & info. systems	3,567	73%	963
Engineering	9,226	79%	1,937
Architecture and built environment	3,242	75%	810
Total	32,315	67%	10,662
<i>Data: AAGE UnitStats report, Department of Education and Training (2016). QILT (2017). *Represents average of full-time work outcomes for natural, physical, biological and medical sciences.</i>			

¹² Working full-time also does not guarantee graduates are working in their relevant study fields, with around 3 out of every 10 full-time employed graduates working in jobs outside of their qualification fields (QILT 2018a).

With so many STEM graduates failing to achieve adequate employment, this suggests the problem is not one of undersupply, but rather one of weak economic conditions that are restricting the demand side of the labour market. Australia's very low levels of both private and public research and development investment restrict demand for entry-level STEM graduates (discussed further in Section 6 of this report). Graduate labour market conditions and inadequate full-time employment outcomes for graduates are discussed further in Section 5 of this report. Certainly, education and industry policies are insufficiently linked, in order to better connect STEM graduates to meaningful employment opportunities.

DO DEGREES STILL MATTER?

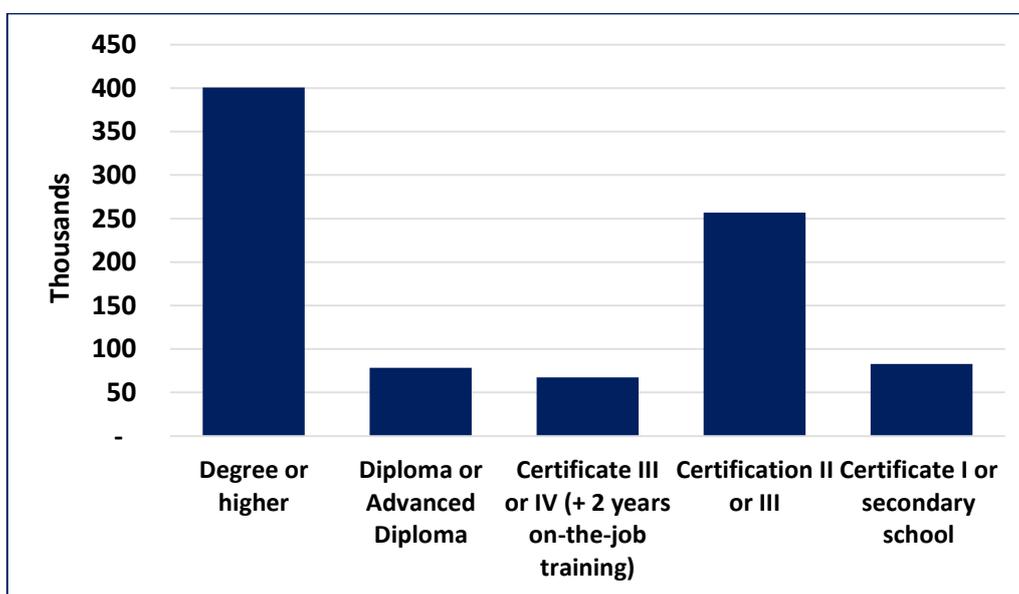
Much commentary speaks of a supposedly growing gap between what workers learn in university, and the skills actually needed to perform a job. If indeed university graduates are ill-prepared for the world of work, we may be alarmed given the large number of people graduating from university: almost 52 per cent of 25–34-year-olds in Australia now hold a university degree (compared to an OECD average of 45 per cent) (OECD 2018b). But questions of whether graduates' studies prepare them to contribute to the workplace have now traversed into questions about the value of a degree itself. For instance, Chamorro and Premuzic (2019) argue there is only a weak correlation between education and job performance, and propose employer-developed indicators of a person's broader ability to learn, reason and think logically (called "intelligence scores") as alternatives to degrees for screening, hiring and assigning labour market entrants.

Inquiring into the actual value, rather than just perceived value, of university degrees is instructive. For instance, higher intellectual competence is often wrongly assigned to bachelor's degrees over other vocational qualifications (such as TAFE diplomas and certificates). However, headline-grabbing statements from employers questioning the value of university education might be more accurately interpreted as a reflection of employer recruitment strategies. That is, employers are always seeking new strategies to identify the best-performing applicants from within any current pool of workers; in a slack entry-level market where degree qualifications are in high supply, employers can afford to hold higher expectations of graduates to be "job ready," with more specific qualifications and experience. The "job ready" mantra is influential but counter-productive; it leads individuals to accept responsibility for bearing incremental costs of further skilling, and/or to undertake unpaid work experience in order to better compete for the limited number of paying jobs. In addition to placing downward pressure on entry-level wages, and providing employers with additional opportunities

to pre-screen new recruits, this practice also allows employers to reduce their own on-the-job training costs.

But the question of whether degrees still prepare people for jobs should be followed by a corollary: “Did they ever?” Knowledge gained through a formal degree can never substitute for training in the specific skills needed to apply that knowledge in any particular workplace. This is well understood in the vocational education system, which traditionally combines formal classroom education with on-the-job training. So why do we not think the same way about degrees and university education?

Figure 16: Projected New Jobs to 2023 by Qualification



Data: Department of ESSFB (2018), Skill level projections, five years to May 2023.

In an age of disruption and growing demand for critical, abstract, and human-led inquiry, the knowledge acquired through university degrees will be crucial to the future economy. In Australia, degrees have an enduring and growing importance as job market entry qualifications; 32 per cent of all jobs worked in May 2018 required a bachelor’s degree or higher qualification, and this share is projected to increase by 1 percentage point to 33 per cent of all jobs by 2023 (Department of ESSFB 2019). Figure 16 shows total employment across the economy is expected to increase by 886,100 over those five years; over 400,000 of those new jobs—45 per cent of total employment growth—will require a university degree or higher qualification. But as degrees will continue to be important for future jobs, so will vocational qualifications; the second-largest qualification in new demand over the next five years will be at the Certificate II or III level, with around 257,000 jobs expected to be added by 2023 (29 per cent of total employment growth). The importance of this level of vocational

qualification largely reflects growing employment in the disability services, childcare, and aged care industries.

As well as being an important advantage in entry into growing occupations, university graduates presently enjoy greater success in the job market compared to those without degree qualifications. 80 per cent of all persons with a bachelor's degree or higher are employed, compared with only 63 per cent of all persons without higher education (including those with diplomas, certificates, or no non-school qualifications).¹³ People with bachelor's degrees or higher are also more likely to be employed on a full-time basis (63%) compared to persons without higher education qualifications (41%).

Higher education attainment also underpins higher average incomes for university graduates – called the “graduate premium.” Using 2016 Census data, the Grattan Institute (2018b) estimated career earnings for Australian graduates with a bachelor's degree as their highest qualification, compared to persons with Year 12 as their highest qualification. Due to the presence of a persistent gender pay gap in Australia's labour market (female university graduates were estimated at 2018 to earn 27% less than male graduates¹⁴), the graduate premium for graduates and their counterparts is calculated for men and women separately. Over her career, the median female graduate will earn over \$600,000 more than the median female with no post-school qualifications. Male graduates enjoy a larger graduate earnings premium over their lifetime, at around \$790,000 more than males without non-school qualifications.¹⁵

A further data source for assessing the impacts of higher education on earnings is the Household Income and Labour Dynamics in Australia (HILDA). HILDA data for 2016 shows that a bachelor's degree increases individual earnings by 56 per cent for men, and 38 per cent for women – compared with attainment of Year 11 or below. A master's degree or doctorate increases earnings even more, by 67 per cent for men, and 48 per cent for women. By comparison, holding a Certificate III or IV increased earnings for men by 25 per cent; shockingly, due to the low-paid and undervalued status of women's work in community and personal services, Certificate III and IV qualification did not result in any increase in earnings for women (compared to women with Year 11 or below) (Gilfillan 2018).

¹³ Authors' calculations from ABS Catalogue 6227.0, Table 10. Figures for May 2018.

¹⁴ See Norton 2018a.

¹⁵ See Grattan Institute 2018b, Figure 10.16.

JOB CLUSTERING AND DISRUPTED OCCUPATIONS

Skill combinations or “job clustering” analyses provide another valuable perspective to our understanding of future skills requirements. By identifying skillsets common across multiple occupations, job clustering highlights flows of workers between different types of jobs — the horizontal occupational movements that workers actually experience during their working lives. The Foundation for Young Australians (FYA 2016) undertook one of the first job clustering analyses to assess future graduate careers.¹⁶ In their report, job clusters were constructed by disaggregating the various distinct tasks comprising an occupation. Seven job clusters were identified, within which skillsets of occupations were internally related and portable. The resulting job clusters included:

1. Generators: high-level interpersonal interaction in retail, sales, hospitality and entertainment;
2. Artisans: jobs needing skills in manual tasks relating to construction, maintenance, production or technical customer service;
3. Carers: medical, care and support workers;
4. Informers: professionals providing information, education or business services;
5. Coordinators: repetitive administrative, coordination work;
6. Designers: jobs that involve deploying skills and knowledge of science, mathematics and design to construct or engineer products or buildings; and
7. Technologists: jobs with a demand for manipulation of digital technology.

The future job prospects of each cluster were assessed through two tests: employment growth over the five-year period 2010–15 (using ABS Labour Force data), and likelihood of automation over the next 10–15 years using data provided by Durrant-Whyte et al. (2015).¹⁷ Consistent with the industry and occupation job growth projections presented in Section 2 of this report, FYA finds that the Carer, Informer and Technologist clusters are likely to experience highest growth. Artisans and Coordinators are at the highest risk of lost jobs. However, beyond helping to assess automation pressures and threats, the strongest contribution of the job clustering method is to emphasise the adaptability of workers and their skillsets, and their importance in facilitating movement and adjustment within clusters. Those skillsets never become redundant because they are common and transferrable across multiple occupations.

¹⁶ Job clustering analyses have also been undertaken outside Australia. See Manyika et al. (2017) for a US study.

¹⁷ Recall from Section 1 above that Durrant Whyte et al. (2015) mapped the Frey-Osborne (2013) automation probability results from the US onto Australian occupations.

By widening the scope of analysis to consider clusters rather than specific occupational categories, clustering analysis also empowers graduates to identify their portable skills within the current labour market and skills systems. But there is a need to ensure the education system “catches up” with, and impacts back upon, a labour market increasingly defined by ubiquitous non-standard work (including casual, part-time, gig work, and other forms of self-employment), and the erosion of traditional occupational structures. Universities could contribute to this effort through reorganising course offerings in ways that are aligned with those broad occupational streams and clusters, pro-actively recognising and encouraging the mobility that will be so important to the ability of future graduates to navigate technological and economic change during their careers.

Growing non-standard and insecure work arrangements disrupt concepts of traditional career progression. Many commentators celebrate the breakdown of these traditional career paths, heralding a new era of the “microentrepreneur” where it’s up to individuals to manage (and fund) their own path to success. Traditionally, workers would progress throughout their careers, with advancement tied to the recognition of incremental experience and skills, and formalised through the attainment of higher classifications and the payment of higher wages. However, the rise of non-standard work even within purportedly high-skill occupations (such as graphic design or IT programming) means workers’ economic contributions (and hence, their pay) become increasingly detached from the formal skills and qualification system. Australia’s existing labour practices such as the Awards system, which assign legal minimum pay rates to skills progression based on *internal* movement within industries and occupations, are insufficient in the wake of this severing of work from formal qualification and skills paths.

To this end, the concept of “vocational streams” is receiving growing attention, whereby occupations are conceived less as a set of skills and knowledge specific to a distinct occupation, but instead as a combination of skills, knowledge and attributes common to multiple occupations (Wheelahan et al. 2012). This has much in common with the cluster analysis discussed above. Occupations are grouped into vocational streams, and students would then be trained within an entire stream of similar vocations – with the explicit goal of recognising and enhancing capacity for mobility between them. For instance, students could prepare for entry into the fast-growing healthcare sector with training in a “care work” vocational stream – that would deliver aged care, disability support, and rehabilitation support training. Graduates would then have capacity to undertake varying roles within that stream over their careers. Vocational streams have been considered predominantly for the VET system, but an occupational streams framework holds great potential for the university sector, as

well. It would help universities to “ground” their generalised employability skills initiatives with a better recognition of real-world job opportunities. Further innovative developments in curriculum re-design around occupational streams are outlined in Section 7 of the report.

4. Getting a Foot in the Door: Young Workers in the Future Labour Market

University graduates experience a labour market today that is dramatically different to that of their parents' generation, and different to any point since the expansion of the Australian higher education system in the 1980s. While 52 per cent of workers aged 25–34 have completed tertiary education (one of the highest post-secondary education rates in the world) (OECD 2018b), young people nevertheless confront the worst features of a precarious labour market. High levels of insecure and non-standard work are preventing most graduates from applying their newly-acquired skills to the fullest. University graduate transitions from education to work are becoming harder as full-time job opportunities have diminished. Under current labour market conditions, preparing graduates with more skills will not be a panacea for un- and underemployment. This section outlines the key labour market trends facing young workers, including graduates' full-time work and wages outcomes.

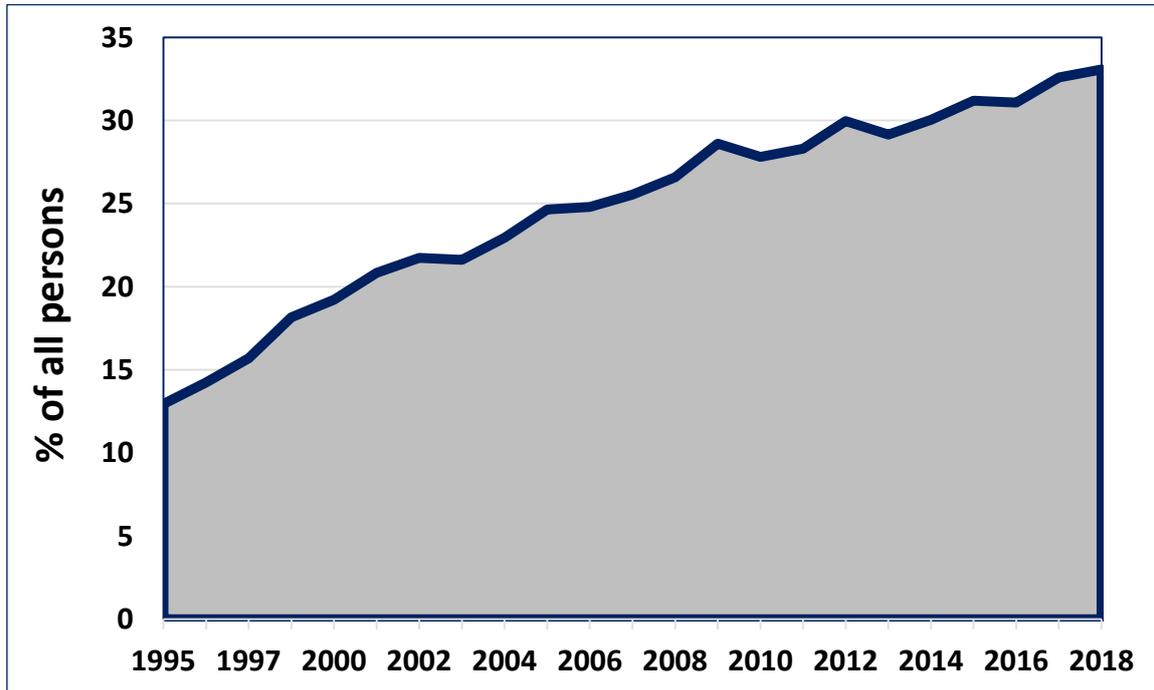
MORE EDUCATED

Young people are undertaking higher education at an increasing rate. The percentage of young Australians aged 20–34 who have attained a bachelor's degree or higher (including postgraduate degree, graduate diploma and graduate certificate) has been increasing steadily, rising from 13 per cent in 1995 to around 33 per cent of all 20–34-year-olds by 2018 (see Figure 17).

While obtaining the skills and knowledge needed for a job is a primary motivation for study, education is not undertaken purely as a ticket to employment. Research shows education is valued “for education's sake,” with many Australian students undertaking their first and second qualifications for personal enjoyment or interest, and to improve general educational skills.¹⁸ In fact, most students today say they would still pursue a degree even if employers did not require it (EY 2018).

¹⁸ See research for National Centre for Vocational Education Research by Wheelahan et al. (2012).

Figure 17. Percentage of Persons Aged 20–34 with a Bachelor’s Degree or Higher

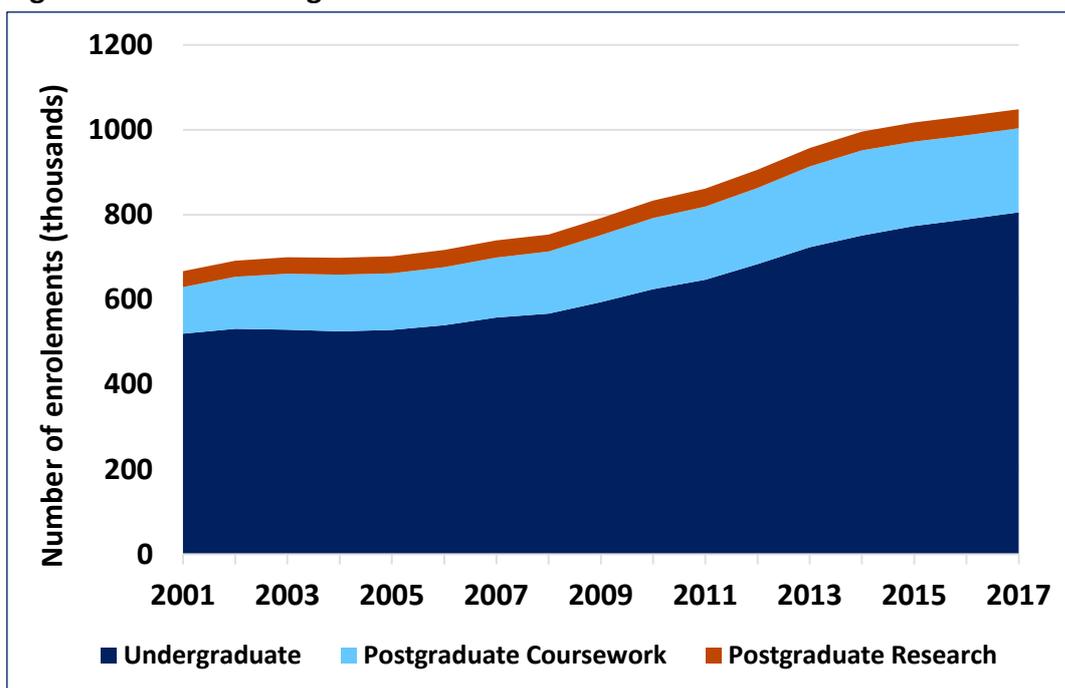


Data: Authors’ calculations from ABS Catalogue 6227.0, 1998–2018; ABS Catalogue 6226.0, 1995–97.

The Australian education system is comprised of schools, vocational education and training institutions, and higher education institutions. Higher education qualifications include any course at a bachelor’s degree level and above; they are predominantly delivered by universities, and to a lesser degree by academies, colleges, institutes of technology and vocational schools. Enrolments in higher education in Australia have significantly expanded over the last three decades, more than tripling from approximately 300,000 in the late 1980s to over 1 million in 2017.¹⁹ Figure 18 shows the number of domestic undergraduate enrolments rose from around 520,000 in early 2001 to around 800,000 in 2017. Domestic enrolments in postgraduate courses have also slightly increased, alongside the stronger growth in undergraduate enrolments, reaching approximately 240,000 in 2017. The expansion of postgraduate coursework enrolments explains most of the increase in postgraduate study, at 82 per cent of all postgraduate enrolments. There were around 45,000 enrolments in postgraduate research courses in 2017, representing the remaining 18 per cent of total postgraduate enrolments.

¹⁹ The 1980s figure is for all enrolments since disaggregated data by domestic and international enrolments before 2001 was not available. However the number of international student enrolments in Australian universities was very small in the late 1980s.

Figure 18. Domestic Higher Education Enrolments



Data: Department of Education and Training - HES Data Cube. Domestic enrolments only. Undergraduate figures a composite of bachelor's degree and 'Undergraduate other' enrolment data.

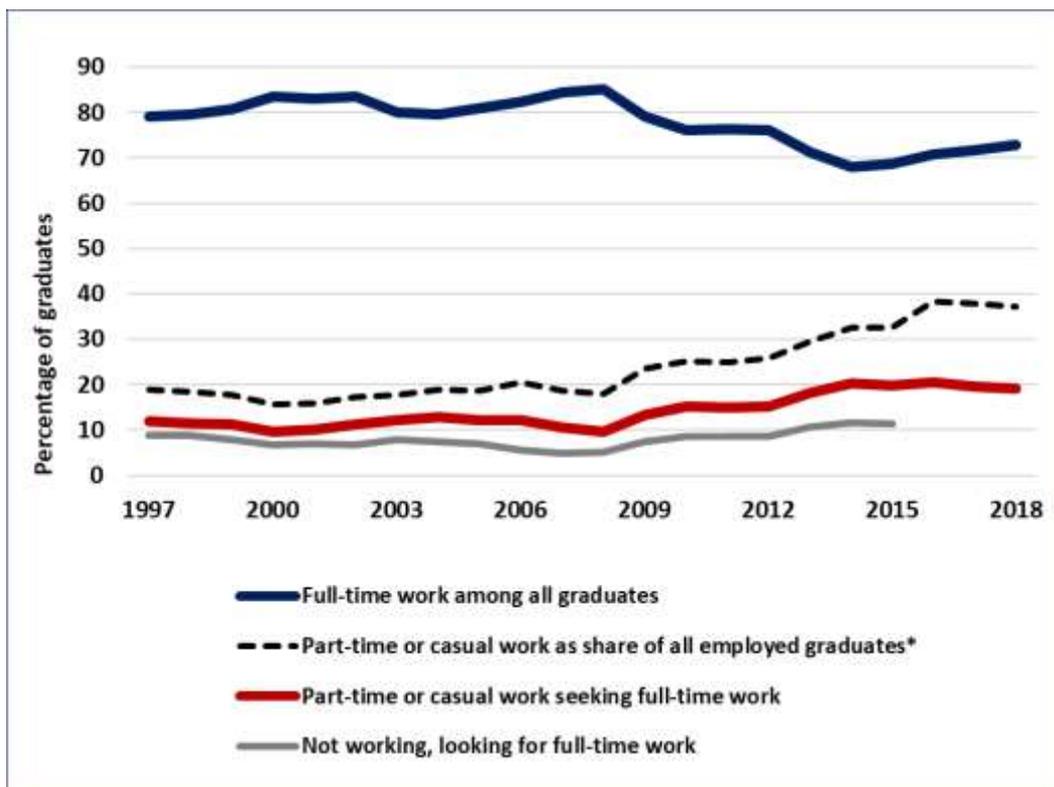
Total enrolments increased notably after the GFC in 2008, coinciding with a deterioration in labour market conditions for young workers. This means the substantial increase in university qualification attainment since then has not been reflected in sufficient graduate employment opportunities.

LESS FULL-TIME WORK OPPORTUNITIES

While young workers are attaining higher levels of education and skills, their efforts are not translating into better work outcomes. Full-time work opportunities for graduates have been less abundant since the GFC, after which labour market conditions for young workers generally worsened. The number of bachelor's degree graduates in full-time employment as a percentage of those available for full-time hours steadily increased from the late 1990s until 2008, rising from around 80 per cent, to a high of 85 per cent in 2008. But the share of bachelor's-level graduates in full-time work then declined markedly, falling to its lowest rate in 17 years in 2014 at only 68 per cent. There has been some improvement in recent years, bouncing back to around 73 per cent in 2018. But that remains a significant 12 percentage points below the pre-GFC peak in 2008.

As full-time work opportunities have become scarce, the percentage of employed graduates in part-time or casual work has doubled from around 20 per cent in 2008 to almost 40 per cent in 2018. The percentage of part-time working graduates who would like to work full-time hours has increased. This indicator of underemployment (employed, but working fewer hours than desired) has increased from around 10 per cent of all bachelor's degree graduates in 2008 to around 20 per cent at present – 1 in 5 graduates. The percentage of part-time working graduates not seeking more hours increased from 8 per cent in 2008 to 14 per cent in 2018. While data for the total percentage of graduates not in work but looking for full-time work was discontinued after 2016 (with the advent of the new Graduate Outcomes Survey), earlier Australian Graduate Survey data from 1997 to 2015 painted a worrying picture of an increasing proportion of graduates seeking full-time hours but not in any work at all since the GFC. That measure of graduate unemployment grew from just 5 per cent in 2008, more than doubling to around 11 per cent of all graduates in 2015.

Figure 19. Bachelor's Degree Graduates Working Full-time, Part-Time or Unemployed, 1997–2018



Data: GCA (1997–15), QILT (2016–18). Graduates surveyed four months after graduation. QILT survey discontinued measurement of graduates not working but seeking full-time work in 2016. Part time employment measured as percentage of all employed graduates and not graduates overall. *Includes graduates employed part-time where preference for additional hours is unknown.

When employment opportunities diminish for new graduates, older degree-holders can become relatively more competitive due to factors such as more years of work experience, wider networks, and more developed social and interpersonal skills. This is evidenced by recent Australian experience: 75 per cent of bachelor's degree-level graduates aged over 30 were in full-time work in 2018, slightly higher than the 73 per cent of graduates under 30. However, that 2 percentage point employment advantage for older graduates is a smaller difference than in previous years (when the employment advantage for older degree-holders was twice as large). This indicates that older degree-holders are also facing challenging labour market conditions.

By type of degree, postgraduates attain full-time work after graduation at a higher rate than bachelor's degree-holders; and coursework graduates (87 per cent in full-time work) do better than graduates of higher research degrees (82 per cent in full-time work). Bachelor's degree graduates have taken the largest hit in a slackening labour market with a 12-percentage-point decline in full-time work since 2008. But the employment rate also fell substantially among those with postgraduate qualifications. Employment success declined more severely for research degree holders, declining by around 5 percentage-points since 2008; coursework degree holders' full-time work attainment declined by 3 percentage points over the same period (QILT 2018a). This suggests coursework options have been facilitating somewhat stronger pathways to employment than research degrees. However, since coursework students are more likely to work full-time during study and still hold that work upon graduation, they may have a "head start" in the employment figures.

Longitudinal survey data show that graduates' employment prospects do gradually improve in the years after graduation. For example, full-time employment rates among graduates four months after graduation in 2015 was around 67 per cent; three years later in 2018, it was around 89 per cent for the same cohort (QILT 2018b). Long-run employment outcomes are particularly significant for graduates of more generalist degrees like business management and society and culture; they take approximately three years to catch up with the employment outcomes of vocational degrees with clearer occupational pathways (like engineering and education).

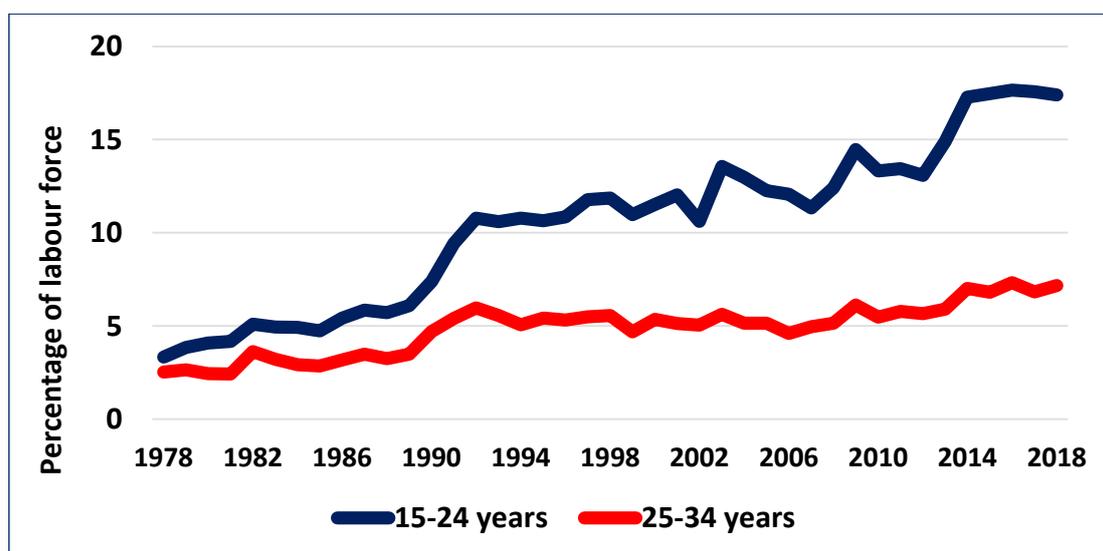
Further research shows specific characteristics of graduates are attributed with higher employment outcomes. Employers are selecting Australian graduates based on what can be broadly termed "employability" criteria like technical expertise and generic skill proficiency. However, graduate employment opportunities are not based on merit alone; employers also favour graduates who studied part-time, those whose studies involved components of on-campus learning, and graduates of more prestigious universities. In fact, graduating from a G08 university was found to increase the odds of attaining a full-time position by 38 per cent (Jackson 2014). This demonstrates how

deteriorating labour market conditions can compound disadvantage, with graduates of suburban universities (more likely to be lower socio-economic and migrant students), as well as those facing limitations to on-campus learning (such as those with caring responsibilities), facing greater challenges in finding employment after graduation.

PRECARITY AND UNDEREMPLOYMENT

At the same time as Australian university graduates have struggled to attain full-time employment, precarity in working hours has increased for all young workers across the labour market. Claims that young workers lack entrepreneurial skills or that “enterprise” skills are in short supply are refuted by the highly tactical and creative skills demonstrated by young people as they navigate the current weak labour market – invoking a wide range of entrepreneurial and creative strategies to support themselves. Young workers must increasingly juggle part-time employment with study, and many work multiple jobs before they obtain a formal, standard full-time job (if they ever do). The percentage of young people working full-time in casual jobs (without job security and normal paid leave entitlements) has more than doubled since 1992: from around 10 per cent of workers aged 15–24 in 1992, to 21 per cent in 2017. Multiple-job holding is also prevalent, with 18 per cent of full-time workers aged 15–24 combining multiple jobs in an effort to generate enough hours and income (FYA 2018, p. 13).

Figure 20. Underemployment Among Young Workers, 1978–2018



Data: Authors’ calculations from ABS Catalogue 6202.0; Table 22. Annual averages.

Young workers are disproportionately affected by underemployment; the proportion of young workers unable to secure sufficient hours of work is actually higher than

during the 1990s recession. Figure 20 illustrates the proportion of underemployed young workers in two age cohorts, 15–24 and 25–34 (as a percentage of the labour force). Underemployment rose significantly through the early 1990s, plateauing in the years to 2008 for the 25–34 cohort, but continuing to rise for the younger 15–24 cohort. Underemployment for this younger group reached a worrisome 18 per cent of the total labour force in 2016, where it has remained since. Underemployment has also worryingly extended into the older age cohort since 2008; the percentage of people aged 25–34 experiencing inadequate hours of work now at its highest rate in 40 years, at around 7 per cent of the labour force.

Growing precarity in young peoples' experience of work, including the incidence of multiple job-holding, creates challenges for understanding and evaluating education-to-employment pathways. The definition of "full-time" work used by graduate data collection surveys (as adopted from the ABS) requires total hours worked per week of over 35 hours; perhaps this definition has become outdated. As non-standard employment grows, hours worked becomes a less accurate indicator of the attainment of a high-quality job – which may be better measured by security in the employment contract, access to paid leave entitlements such as annual and sick leave, and the opportunity for graduates to meaningfully apply their newly acquired knowledge and skills.

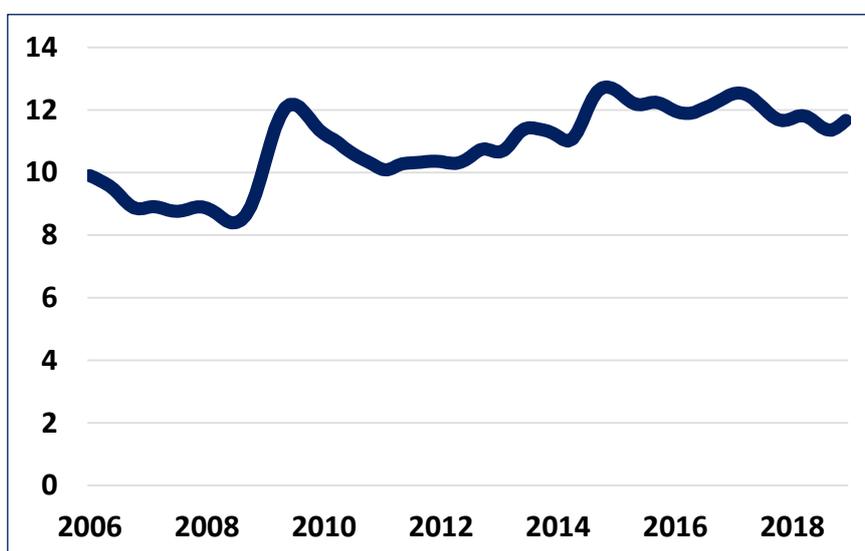
The standard permanent full-time job with entitlements is an increasingly elusive prospect for Australian graduates. The combination of increasing part-time work, the erosion of full-time employment, and growing employment precarity (including in casual work, self-employment, and contracting) creates a landscape of pervasive insecurity. Less than half of all employed Australians now fill standard, full-time paid positions with basic entitlements like paid sick leave (Carney and Stanford 2018a). In short, insecurity is the new normal. The erosion of higher-quality full-time jobs has been experienced most directly by young workers who confront the prevalence of insecure work head on, unprotected by traditional arrangements that carry over in many long-standing jobs. In 2018 only 58 per cent of 20–24-year-old employees were in work (whether full-time or part-time) with paid leave entitlements—2 percentage points lower than at 2014.²⁰ The job quality picture is deteriorating for older cohorts too, with the percentage of 25–34-year-old workers in jobs with access to paid leave entitlements declining by around 3 percentage points over the last four years, from 82 per cent in 2014 to 79 per cent in 2018. This confirms the relationship between an insufficient quantity of work, and the deteriorating quality of jobs filled by young people.

²⁰ Authors' calculations from ABS Catalogue 6333.0.

Box 1: Underutilisation Among 25-34-year-olds

Deterioration in the quality and quantity of work available since the GFC has led to a rise in the proportion of people aged 25–34 who are underutilised (including both unemployed and underemployed). This is especially worrying given that this is the age group for which underutilisation is thought to “resolve” as workers gain more experience to navigate the labour market, thus attaining sufficient hours work (Fair Work Commission 2007). The underutilisation rate for workers in their late 20s to early 30s rose sharply in 2008–09; after dropping 2 percentage points to 2011 it resumed a trend increase and peaked at almost 13 per cent by end-2014. Since 2014, the rate has declined modestly, but remains high. Almost 12 per cent of workers aged 25–34 are now underutilised, very close to the GFC peak in 2009.

Figure 21. Underutilisation Rate of Persons Aged 25-34, 2006-18



Data: Authors' calculations from ABS Catalogue 6202.0, Table 22. Annual average data. Underutilisation rate combines unemployment and underemployment as percentage of labour force.

Young workers consequently face prolonged difficulties transitioning from education into jobs. Trend data shows that the average transition time from graduation into full-time work is now 2.6 years, compared to just one year in 1986.²¹ This transition time rises to 4.7 years if gap years and further education time are included (decisions arguably at least partly motivated by slack labour market conditions). Increased transition times to full-time work for Australian graduates have negative consequences for their lifelong financial security, including lost superannuation contributions, and greater barriers to accessing finance for secure housing.

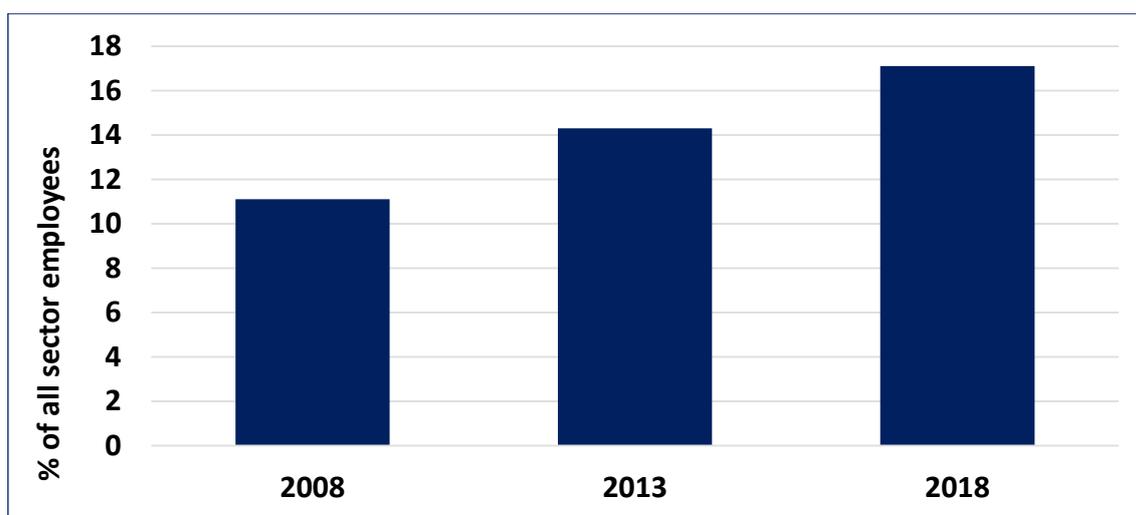
²¹ FYA (2018); ABS Catalogue 6291.0.55.001.

Despite claims that young people embrace job-hopping forced upon them by the casual and insecure labour market, there is abundant evidence that young Australians really desire secure, stable work. Job security rates as more important to young workers than rates of pay, flexible hours, and having full-time hours. (Melbourne Graduate School of Education 2015). This suggests that if employers want to attract and foster a future qualified workforce with the right skills that meet future industry demands, their use of insecure employment models may create disincentives to graduates in acquiring the certain knowledge and skills required for entry into these professions.

OVER-EDUCATED, OVER-SKILLED

A secure full-time role is associated with an opportunity to apply relevant skills and knowledge in the workplace, to access career progression, and to perform meaningful work. Yet as graduates' prospects of attaining meaningful full-time employment diminish, they also report working in jobs which do not utilise their education and skills. In 2018, 39 per cent of all undergraduates employed (full-time and part-time) and 27 per cent of graduates in full-time work said their jobs did not allow them to fully use their skills or education. Three out of five graduates in full-time work in 2018 took a job unrelated to their study area due to labour market factors – including lack of relevant work, employer requirements for more work experience, and because only part-time or casual work was available (QILT 2018).

Figure 22. Employees with Bachelor's Degree or Above in Clerical, Sales and Labourer Occupations



Data: Authors' calculations from ABS Catalogue 6227.0. Includes bachelor's degree, graduate diploma and postgraduate qualifications.

As low-paid service industries like retail and hospitality expanded, it became commonplace to claim young entry-level workers were best-suited to take these jobs due to an endowment of “transferrable skills.” Working a part-time job (often casual) would be a “placeholder” for students while they gathered the knowledge and skills needed to enter the world of formal full-time employment and get a “real” job. However, the reality is that many graduates are becoming more entrenched in jobs that do not need their qualifications. Figure 22 shows that in 2008, 11 per cent of employees in clerical, sales and labourer occupations held a bachelor’s degree or above; 5 years later in 2013, the rate of degree-holding employees within these occupations rose to 14 per cent, and further again to 17 per cent of all workers by 2018.

Research by the Fair Work Commission (2017) shows that the consequences for graduates who cannot move out of occupations for which they are overqualified are significant and lasting. They experience a lower likelihood of working full-time and a higher likelihood of working part-time and being underemployed.²² Moreover, performing a job that requires lower education and qualifications results in long-term wage penalties and less satisfaction in work. Research conducted in 2013 by Mavromaras et al. among Australian bachelor’s- and higher-degree holders estimated that around 6 per cent were both over-educated and over-skilled for their jobs. Compared to all graduates, this cohort of underemployed graduates had the lowest average earnings, the lowest job satisfaction, and the highest voluntary resignation rate. Other research has confirmed that performing work outside of one’s study field negatively affects job satisfaction, increasing chances of voluntary resignation (Verbruggen et al. 2015).

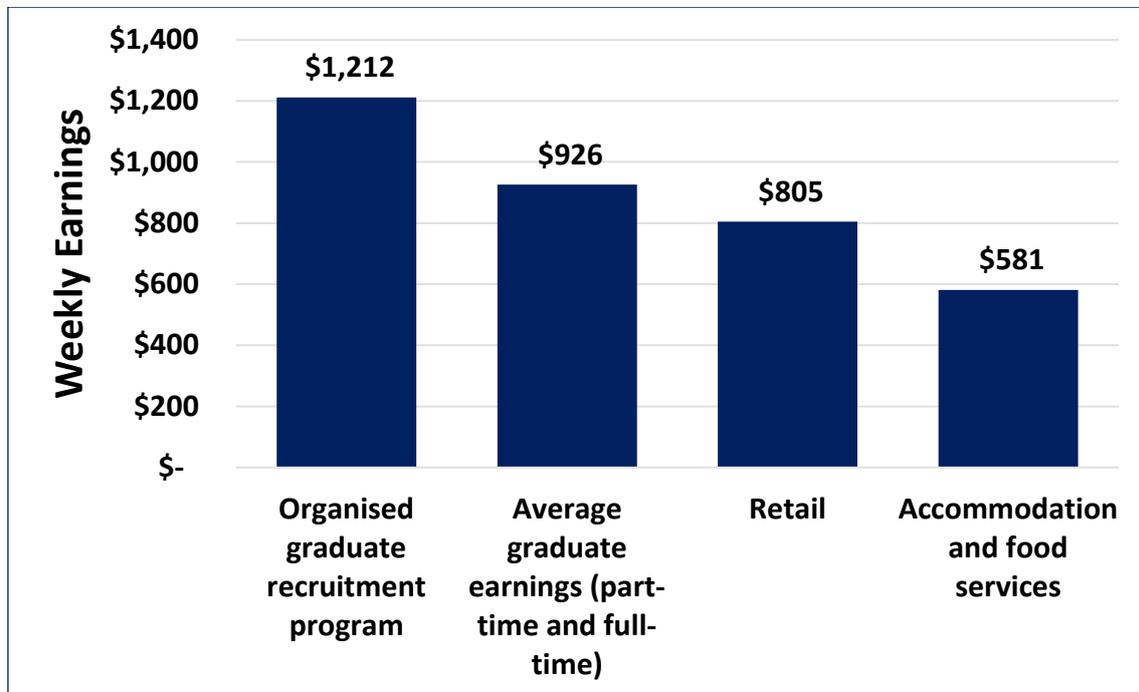
The costs of declining access to decent full-time roles for graduates are substantial, with graduates experiencing career commencement opportunity costs, lack of access to paid leave entitlements, and lower earnings. This is shown in declining mean weekly earnings of graduates employed after graduation (and not in full-time study) over time. The most recent graduate earnings data from HILDA (2017) shows graduates finishing university between 2006–09 had an average weekly wage of \$947 in their first year of employment. This starting income declined significantly to \$792 for graduates commencing their first year of employment who finished their studies in 2012–13.²³ Some graduates who start out working for lower-paying employers may eventually shift to higher-paying employers over time – but years of initial low-pay nevertheless negatively affect lifetime earnings. For instance, US data indicate that graduating

²² For retail trade, accommodation and food services industries. See Rozenbes et al. (2017).

²³ December 2015 prices. See Melbourne Institute of Applied Economic and Social Research (2017).

during a recession results in a wage penalty that can last for up to 10 years (Heisz et al. (2012).

Figure 23. Average Weekly Earnings for Different Graduate Pathways



Data: Authors' calculations from Australian Association of Graduate Employers' Employer Survey (2017); HILDA average graduate earnings for 2015, 2 years post-graduation (2013 graduation); ABS Catalogue 6333.0, Table 6.1. Weekly earnings for bachelor's degree-holders in Retail & Accommodation & food services are median figures.²⁴

This is easy to confirm in the Australian context, where dramatic disparities exist in weekly earnings across different “gateway” employment opportunities for graduates. Figure 23 shows that a graduate who is able to gain full-time employment through an organised graduate recruitment program – an entry-level full-time role defined by a program of professional development and training while employed – earned an average of \$1,212 per week in 2017, compared to the average graduate who earned approximately \$926 per week (a measure averaging graduate earnings across part-time, casual and full-time roles). Graduates with a bachelor’s degree who are unable to move on from low-paid occupations in retail or accommodation and food services can expect to earn significantly lower weekly pay packets of \$805 and \$581 per week, respectively—the latter less than half the weekly earnings of a full-time, salaried graduate role.

²⁴ Average weekly earnings data for bachelor’s-degree holders by industry was unavailable.

The earnings disadvantage from not attaining a full-time role compounds for graduates over time. Table 7 shows the earnings loss that can accumulate with a longer transition time to full-time employment. These estimates are based on the Foundation for Young Australians' (2018) calculations of the average transition time from study to full-time work. This research indicates that it takes graduates an average of 2.6 years to find full-time work; our estimates of lost earnings do not reflect loss of other benefits and entitlements such as superannuation and paid leave. Since gap years and further education time are excluded from this 2.6-year transition time, the figure can be seen as conservative. Moreover, our Retail and Accommodation food services earnings figures assume year-round work (52 weeks earnings), which likely overestimates real earnings due to the seasonal work patterns and high levels of casualisation in these industries.

Table 7. Earnings Lost in Average Transition Time to Full-Time Work After Graduation			
	Annual average earnings	Income over 2.6 years	Lost earnings relative to organised program
Full-time organised graduate program position	\$63,024	\$163,862	
Average graduate earnings (part-time and full-time)	\$48,152	\$125,195	-\$38,667
Retail*	\$41,860	\$108,836	-\$55,026
Accommodation and food services*	\$30,212	\$78,551	-\$85,311
<i>Data: Authors' calculations as noted in Figure 23, and FYA (2018).</i>			

The average annual salary for a graduate in an organised graduate recruitment program in 2017 was around \$63,000. Annual earnings for the average graduate two-years after graduation in 2015 (most recent data available) was around \$48,000, which reflects the average earnings of all employed graduates, including part-time-employed graduates. Average annual earnings for graduates in retail work in 2018 were around \$42,000, and around \$30,000 in accommodation and food services (in both cases assuming 52 weeks of work per year). Factoring in the average transition period graduates now face in finding full-time work, the average graduate will be almost \$40,000 worse off than a graduate who immediately attained a full-time role through an organised graduate recruitment program. And graduates who spend a full 2.6-year transition working in retail or hospitality will experience an earnings disadvantage of

\$55,000–\$85,000, compared to workers placed through organised graduate recruitment programs.

BACK TO THE BOOKS

The theme of endless “disruption” in the future world of work dominates much labour market analysis and commentary. Technology pundits claim capacities for flexibility, re-skilling and mobility in jobs will be key for workers in transitioning out of unviable jobs. However, due to insecure labour market conditions for young workers, many are living this “future work scenario” right now: undertaking second qualifications, postgraduate qualifications, or re-skilling in new areas in an attempt to finally achieve a more secure career path.

Longitudinal survey data on young Australians aged 25 who finished secondary school in 2006 found that by 2015, 52 per cent had at least a bachelor’s degree. At 2015, 13 per cent of the 2006 cohort already had two post-school credentials, and a further 26 per cent were studying for their second tertiary degree (Melbourne Graduate School of Education 2015). Rather than second qualifications being undertaken to deepen skills within an existing field, the majority of second qualifications were undertaken in different fields to the first; the main reason given was that the first qualification did not translate into adequate employment outcomes (NCVER 2012). This inability to translate qualifications in chosen fields of study into employment is at odds with Australian students’ continuing belief that they will be working in the same field in which they are studying in 5–10 years’ time. This suggests a deep expectations mismatch in study and work for young people. Deteriorating labour market conditions for young workers after the GFC explain the high rates of additional qualification study, as young graduates seek other pathways to jobs – or go back to school as an alternative to unemployment. The impact of recession on higher qualification attainment was also observed in the US; undergraduates were found by Kahn (2010) to be 7 percentage points more likely to obtain a further degree when faced with higher unemployment.

The combination of an increasing number of bachelor’s graduates with a lacklustre job market has inspired universities to mainstream postgraduate study – especially through increasingly common coursework master’s programs. As graduates have undertaken postgraduate qualifications in an attempt to stand out, employers have further lifted their expectations of entry-level workers: now more of them expect a master’s degree for jobs that may or may not require graduate-level training. Postgraduate qualification attainment has also risen due to increased study requirements to access some professions, such as teaching. But there is ample

evidence that slack labour market conditions are driving a process of inflation in qualifications, as graduates seek to better compete for scarce job opportunities. For instance, in 2018 between 10–30 per cent of all graduates hired through large organised graduate recruitment programs held a postgraduate qualification (e.g. master’s, PhD), despite these programs being designed for entry-level undergraduates. Though postgraduate qualifications do not necessarily “match” the job responsibilities of entry-level jobs, the data indicate increased postgraduate degree attainment among Australian graduates has increased individuals’ chances of gaining work – even if it does nothing to improve the inadequate number of job openings.

5. Employment Outcomes by Field and Graduate Program

This section presents data on job placement trends across different study fields, including for vocational and generalist degrees. The data highlight the significance of public investment to achieving better full-time work outcomes for vocational degree graduates. Details of the fields graduates have recently completed their studies in are provided, along with discussion of current formal graduate placement programs offered in the public and private sectors.

FULL-TIME WORK OUTCOMES BY STUDY FIELD

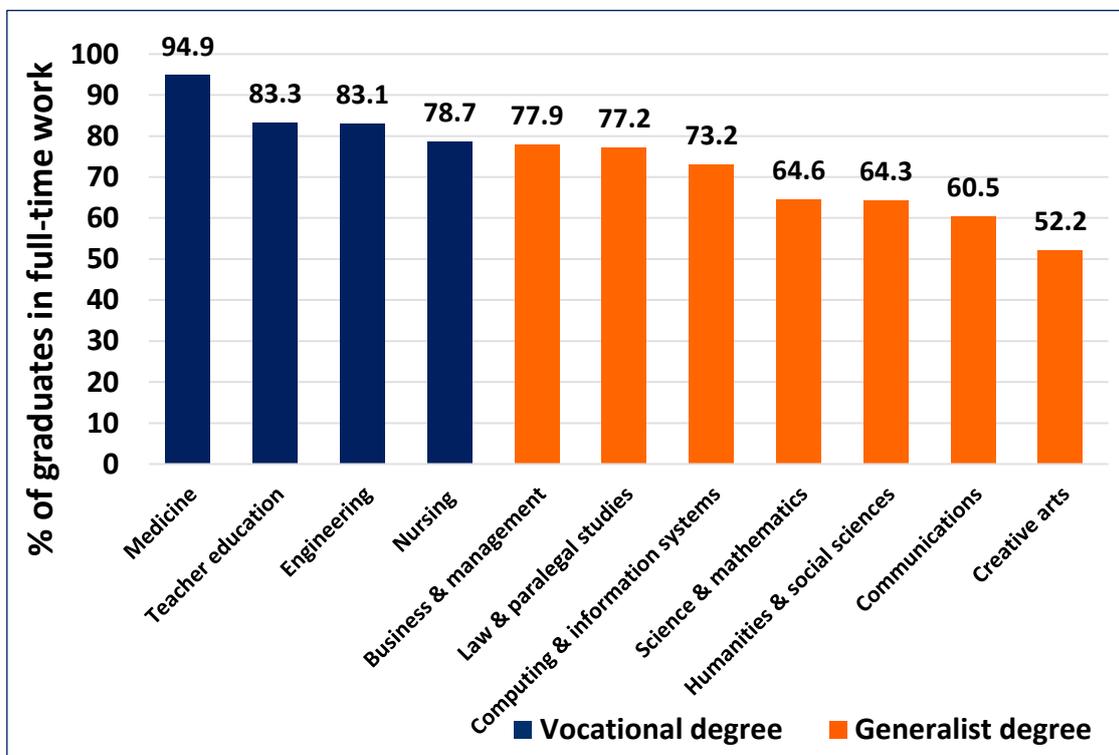
Behind the average full-time graduate employment rate lie important differences in employment outcomes by field of study. These differences are particularly obvious in comparing vocational and generalist degrees. Vocational degrees often are attached to accreditation for entry into the occupation linked to the qualification: such as medicine or teaching. Accreditation is also usually linked to the completion of practical job placement or on-the-job experience; upon completion, graduates then enter into more defined occupational pathways. In contrast, generalist degrees cover a wide range of disciplines, including arts, science, law, humanities and social sciences. They tend not to feed into defined occupational pathways, instead providing broad and transferrable skills that are important for a larger variety of careers.

Full-time employment outcomes for graduates of vocational degrees are markedly better than for graduates of generalist degrees. Figure 24 presents the most recent 2018 data for these two broad degree categories. It shows that pathways from education into full-time work are relatively weak for Australian graduates of general degree programs.

Among generalist degrees (appearing in orange in Figure 24), graduates of business and management had the highest percentage in full-time employment in 2018, at around 78 per cent, followed by law and paralegal studies at 77 per cent. In contrast, the degrees with the lowest rates of full-time employment were creative arts (52 per cent) and communications (61 per cent). Despite claims of a STEM graduate deficiency, science and mathematics graduates actually experienced some of the worst full-time work outcomes, with only 65 per cent finding full-time jobs within 4 months of graduation. Conversely, vocational degrees in teacher education, engineering and

nursing all realised between 79 and 83 per cent full-time employment rates; medicine graduates had the highest percentage of full-time work among all fields of study at almost 95 per cent.²⁵

Figure 24. Employment Outcomes for Graduates by Study Field, 2018



Data: QILT (2018), 4 months post-graduation for undergraduate degrees.

Additional survey data shows that while graduates of generalist degrees have poorer full-time work outcomes after graduation, they tend to eventually get a foot in the labour market door—but it takes around three years longer. For instance, in 2015 only 48 per cent of creative arts and science and mathematics graduates were in full-time work four months after graduation; however, by 2018 the full-time employment rate for the same cohort (i.e. those who graduated in 2015) increased to 80 per cent for creative arts graduates and 86 per cent for mathematics graduates (QILT 2018b).

²⁵ Vocational degrees generally link into tighter education-to-jobs pathways; this partly reflects professional registration requirements.

Table 8. Domestic Graduate Completions by Field of Study, 2016

Study field	Number of completions (2016)
Management and commerce	20,625
Social sciences	20,412
Sciences	15,875
Teaching and education	12,557
Nursing	11,894
Engineering	9,226
Radiography	7,119
Law	7,103
Creative arts	6,644
Health	5,835
Psychology	5,635
Communication and media Studies	5,113
Rehabilitation	4,206
Computing and information systems	3,567
Architecture and built environment	3,242
Medicine	2,783
Accounting	2,157
Agriculture and environmental studies	1,969
Economics	1,795
Pharmacy	1,045
Banking, finance and related fields	983
Dentistry and optical	939
Veterinary science	737
Mathematics	405
Total completions	152,264
<i>Data: Department of Education and Training (2016), Australian Association of Graduate Employers (AAGE) UnitStats report. Figures for 70 narrow subject fields have been 'pooled' into broader study field categories.</i>	

From the vocational and generalist divide, we now move to a more detailed disaggregation of employment outcomes according to field of study. Table 8 presents data on the number of domestic students who completed an undergraduate degree course in 2016 by study field. 2016 was selected to compare graduation numbers with the number of full-time graduate program jobs available in the subsequent year

(2017). Around 152,000 domestic undergraduates completed degrees in 2016. The generalist degrees of management/commerce and social sciences had the highest number of completions, at over 20,000 each. Each of these large courses thus accounted for around 14 per cent of all completions. They were followed by sciences with around 16,000 completions. A cluster of vocational degrees had the next-highest number of undergraduate completions: with about 12,500 completions in teaching and education; 11,900 in nursing; and just under 10,000 completions in engineering. More specialised vocational fields recorded lower numbers of completions, including veterinary science, dentistry and pharmacy with around 1,000 or less completions. At the bottom of the completions table was mathematics: with only 405 individuals completing their degrees in 2016.

ORGANISED GRADUATE RECRUITMENT PROGRAMS

We now consider current employer demand for graduates to work in full-time standard jobs across Australia's public and private sector. Unfortunately, there are no national workforce statistics on the number of graduates employed each year in Australia. In lieu of any comprehensive economy-wide assessment of how many graduates are being employed and where, data on the number of graduates who are employed through organised graduate recruitment programs can provide one insight into the state of labour market demand for new graduates.

Organised graduate recruitment programs involve major employers who recruit a cohort of graduates (usually at the same time), who then progress through a defined program of professional development and training (both on and off the job). Organised graduate recruitment programs differ from other standard entry-level jobs because they provide a rare pathway into permanent full-time roles – rather than requiring graduates to first negotiate a series of fixed-term contracts or part-time and casual roles. Thus, organised graduate recruitment data provides an important window into the placement of graduates into more “traditional” standard jobs: featuring steady work, access to paid leave entitlements, and other appealing features. Employers taking on graduates into these full-time programs are also more likely to invest in ongoing training and development, since there is an intention to retain these new employees and prepare them for lasting, flexible roles in their organisations.

We have compiled data on organised graduate recruitment programs across the largest private sector graduate employers, and major public sector employers (Commonwealth and state governments). From this data we can present an account of current graduate entry-level demand. Public sector organised graduate recruitment program figures are for number of graduates currently participating as of 30 June

2017. Private sector graduate program data covers the 2016–17 financial year. Organised graduate recruitment program figures are then compared with the 2016 undergraduate university completions data above; this provides some insight into the state of the 2017 jobs market for graduates who completed their studies in 2016.

Public Sector Graduate Programs

The broader public sector is a key source of full-time, relatively secure work in Australia. It employs around 13 per cent of the total workforce across federal, state and local levels of government and public services; it accounts for a slightly larger share (14 per cent) of all full-time employment.²⁶ The public service also recruits across a diverse range of skillsets and knowledge bases, as well as hiring from more diverse economic and ethnic backgrounds. State-level formal public sector graduate programs are typically coordinated across multiple agencies, offering opportunities that generally cross government departments (including policy, corporate services and information technology). Federal graduate programs are usually coordinated in-house by each department or agency. There is high interest among graduates in public sector graduate programs; many federal departments report receiving over one thousand applications per program in 2017 (Whyte 2018), where the average number of positions available per program was only 29.²⁷

There is no consolidated data on total public sector graduate recruitment across Australia since the federal and state levels of government administer their own programs and workforces. Therefore, data regarding the number of organised graduate recruitment roles undertaken across the federal and state levels of government have been compiled through inquiries and government annual reports. These figures do not include appointment of recent university graduates into entry-level roles that fall outside of organised graduate development programs (such as graduate doctors, teachers, nurses, ambulance officers, and administration officers). Most states do not record the employment of entry-level workers into occupations as “graduates” in their workforce statistics, and only record organised graduate recruitment program employment. Since state governments administer most of the front-line public services that employ so many public sector workers, the number of graduates completing university and entering public employment is much larger than the intake into these organised graduate recruitment programs. For instance, Queensland’s organised graduate recruitment program intake in 2017 offered just 169

²⁶ Authors’ calculations from ABS Catalogue 6291.0.55.003, Table 26a.

²⁷ APS Statistical Bulletin 2016-17 – data tables, Table 5. Average across all APS graduate programs, excluding Defence which employed 334 graduates in 2017.

positions, but the state’s nursing and midwifery program alone appointed over 1,600 entry-level staff the same year.²⁸

Table 9. Organised Graduate Recruitment Program Intake in Public Sector of States and Territories	
Government	Graduates at 30 June 2017
Australian Public Service (federal)	1,362
South Australia	139
Western Australia	51
Queensland	169
New South Wales	107
Tasmania	17
Victoria	99
Northern Territory	24
Australian Capital Territory	16
Total	1,984

Data: APSC, APS Statistical Bulletin 2016–17, Table 5; Government of SA, Workforce Information Report 2016–17, Table 10; Government of WA, State of the Sectors, p. 22; Qld Public Service Commission data inquiry; Government of NSW, Progress: State of the NSW Public Sector Report 2017. Tasmanian Government, Annual Report 2016–17; Victorian Public Service Commission data inquiry (GRADS team); NT Department of Corporate and Information Services data inquiry; ACT Government. State of the Service Report. Appendix 2, Table 46.

A total of 1,984 new graduates were employed in organised graduate recruitment programs across the federal, state and Territory public sectors at 30 June 2017 (see Table 9). The federal public service employed the most across its multiple organisations, with 1,362 graduates (about two-thirds of the total). The number of graduates in organised graduate recruitment programs across individual states varied, with smaller jurisdictions like Tasmania hiring only 17 graduates, compared to 169 graduates in Queensland. This provides a stark picture of the very low number of graduates accepted into public sector programs – particularly compared to over 150,000 undergraduate completions in the previous year.

Private Sector Graduate Programs

The private sector comprises 87 per cent of the total workforce and 86 per cent of all full-time jobs.²⁹ The Workplace Gender Equality Agency’s (WGEA) graduate labour

²⁸ Data inquiry to Queensland Public Service Commission, 15 October 2018.

²⁹ Authors’ calculations from ABS Catalogue 6291.0.55.003; August 2018.

market reporting system provides census data on graduate employment in private sector organisations with more than 100 employees. Organisations are required to report to the WGEA each year on the number of graduates who graduated from a tertiary institution and are employed in an organised graduate recruitment program. Data was available for two financial years (2015–16 and 2016–17), with total graduate appointments presented by industry each year.³⁰ These figures are considered broadly representative of private sector organised graduate recruitment program employment trends since larger firms are the most likely to invest in the development and

Table 10. Number of Graduate Program Positions in Private Sector Companies (+100 Employees) By Industry

Industry	2015–16	2016–17
Accommodation and Food Services	59	10
Administrative and Support Services	23	19
Agriculture, Forestry and Fishing	92	11
Arts and Recreation Services	24	14
Construction	1,099	1,143
Education and Training	397	543
Electricity, Gas, Water and Waste Services	120	82
Financial and Insurance Services	1,154	1,209
Health Care and Social Assistance	3,018	2,710
Information Media and Telecommunications	411	548
Manufacturing	677	738
Mining	1,558	1,221
Other Services	77	51
Professional, Scientific and Technical Services	7,481	7,650
Public Administration and Safety	111	90
Rental, Hiring and Real Estate Services	125	159
Retail Trade	460	625
Transport, Postal and Warehousing	125	113
Wholesale Trade	90	99
Total	17,101	17,035
<i>Data: Workplace Gender Equality Agency (2017), summary statistics for employers.</i>		

³⁰ Data was provided by the Australian Association of Graduate Employers who receive summary statistics to assist members benchmark the gender mix of their graduate program against other organisations and industries.

operation of organised graduate recruitment programs due to economies-of-scale advantages, compared to smaller organisations (which are not captured by the WGEA reporting requirements).

Private firms surveyed by WGEA employed a total of 17,035 graduates through organised graduate recruitment programs in 2016–17. This was similar to 2015–16 appointments of 17,101 graduate positions (see Table 10). By industry, professional, scientific and technical services was the largest source for formal graduate placements, with 7,670 graduates. Other major employers through formal graduate programs include healthcare and social assistance (with 2,710 graduates employed), mining (1,221), and financial and insurance services (1,209). The private sector industries that employed the lowest number of graduates in 2016–17 were accommodation and food services, agriculture, forestry and fishing, arts and recreation services, and administrative and support services; each of these sectors offered less than 20 graduate positions through formal placement programs. These low-graduate-emplying industries also decreased the already-low number of graduates employed from 2015–16 levels.

THE “WRONG” DEGREES?

As graduate transitions to employment have become harder, it has become common to blame graduates for having studied the “wrong” degrees. This “wrong degree” lens reflects an analytical preoccupation with the *supply* of skilled workers to the labour market; weakness on the labour demand side is ignored in the analysis. The logic of this narrow analysis implies, then, that below-average employment outcomes for graduates in a given field like mathematics are an indication that the economy needs fewer graduates with mathematics qualifications in the workforce. A skills and employment framework focused on the supply-side only is often accompanied by proposals to introduce new mechanisms to control the supply of workers with certain knowledge and skills – perhaps through changes in the prices of particular degrees, or enrolment caps. By extension, the reduction in demand for entry-level graduate workers in the full-time workforce is interpreted as an “oversupply” problem, implying that the Australian economy needs fewer workers with higher education. But with evidence showing that higher qualifications will in fact be necessary for a larger number of jobs of the future (as discussed in Section 2), decisions by young workers to forego further education (in response to this supposed “oversupply”) could in fact damage the economy’s future capacity for growth, innovation and transition.

The underperformance of certain degrees as measured by current job placements should not be interpreted as an indication of the quality and value of these skills to

society now, or into the future. While graduates of generalist degrees have poorer immediate full-time work outcomes, generalist degrees nevertheless provide a base of the broader knowledge and skills for workers today and in the future. Higher education qualifications and a continuing supply of generalist degrees will be necessary if the workforce is to be able to navigate technological, social, environmental and political change into the future. Rather than limiting the frame of analysis to what employers are currently willing to employ, education policy should have a more well-rounded vision of the value that higher education, including generalist degrees, can add to the future economy.

While a lacklustre labour market can explain poor employment outcomes for graduates, the stronger performance of vocational degrees in healthcare and education fields (such as nursing, teaching, and medicine) are powered by sustained public sector investment in the public services that underpin these occupations. The stability of public funding for public services ensures stronger linkages between students obtaining education and skills, and the immediate application of these skills in their jobs. Conversely, as private sector capital investment has contracted since the peak in resource investments in 2012, so too have private sector employers' incentives and capacity to invest in the long-term skills and training of their own workforce.

While government provision of education, health and infrastructure services links many vocational degrees directly to relatively high-quality jobs, declining government expenditure in research and development (R&D) threatens "blue sky" innovation and research (a key investment input that ultimately also fuels private sector investment). This harms job prospects for many graduates, including those in generalist degrees (such as sciences). Government expenditure on R&D (including basic, applied and experimental research) as a percentage of GDP is at its lowest level in 10 years at only 0.78 per cent in 2016 – down from 1.1 per cent in 2010.³¹ Moreover, government constraints on direct hiring (especially within public administration and management) and compensation in the public sector have also undermined hiring and promotion opportunities for graduates in the public sector. Since the 1980s, when concepts of "New Public Management" and a commitment to government downsizing and privatisation first took hold, entry-level graduate recruitment has declined accordingly. This is one reason why the average age of workers in public sector workplaces is significantly higher than for most other sectors (as indicated in Figure 14 above). As such, students graduating with generalist degrees who might once have attained public sector positions in previous years, are all the more dependent on inadequate private sector employment opportunities that are less likely to provide strong career pathways in meaningful and secure work.

³¹ Authors' calculations from OECD (2019b).

Decline in public science research contributes to poorer employment outcomes for science graduates. Full-time work attainment for biological sciences graduates, for instance, was 15 percentage points lower than for the general graduate population in 2018. It is in the context of the decline in public research that growing pressure on universities to restructure their STEM degrees to develop tighter linkages with industry can also be understood. However, closer matching of current employer skills demands to university course structures cannot in itself spur the investments in research, science and technology needed to build a modern innovative economy, with consequent benefits for employment both in STEM and in other generalist fields. Public investment will continue to be critical to creating jobs in fields and projects that are not immediately profitable in the short-term, but are of significant value to the economy and society in the long-term.

6. Planning for University-to-Work Transitions

After painting a more realistic and data-informed picture of the experiences of work for Australian graduates and young workers, this section will assess how Australia's education-to-jobs system functions to facilitate graduate transitions. It will outline how universities, a core component part of the education-to-jobs system, operate in the current environment of policy instability and funding limitations that constrain their capacity to anticipate future skills needs, adjust curricula and programs, and support their students' effort to find relevant, quality employment after graduation. In light of these challenges, the section then critically assesses major future skills initiatives and programs currently underway in the higher education sector, including work-integrated learning and innovative redevelopments of course curricula.

THE EDUCATION-TO-JOBS SYSTEM

Characteristic of liberal market economies, Australia has no comprehensive labour market policy. Individuals are largely responsible for navigating the education and training system based on their own interests, capacities and means. Education policy is fragmented across multiple institutions (schools, universities, vocational education, and employers), and governed through multiple agreements between the state and federal governments. This "light touch" approach to managing education-to-jobs pathways begins in the secondary schooling system, as high-school-aged students are urged early on to begin choosing their career pathway(s).

Within the overall post-secondary education system, universities, VET, and on-the-job training each play distinct roles in workforce development in Australia. However, each of these streams has encountered major problems arising from a lack of fiscal support and a lack of coherent, long-term planning:

- Universities are the major degree-granting institutions that produce a pool of graduates with broad knowledge and skills; graduates compete for jobs, with the links between qualifications and jobs influenced largely by employer preferences and market forces. Despite increased efforts by universities to foster more developed and reliable employment pathways for their graduates, these pathways remain underdeveloped. The major exception is regulated

occupations such as teaching and medicine, which have mandatory integrated work placements (Wheelahan et al. 2012).

- Australia's vocational education system was once the source of well-established and dependable education-to-jobs pathways through apprenticeship and traineeship programs. However, the system underwent dramatic restructuring after 2012, with funding cuts to public institutions (primarily the TAFEs), expanded scope for private training providers, and delivery of large public subsidies through individual students. The collapse of private providers, the declining capacity of the TAFEs, and scandals involving the misallocation of public subsidies have deeply damaged once-reliable vocational pathways. Enrolments in apprenticeships and traineeships have halved since 2012 (NCVER 2017, Carney and Stanford 2018b). Consequently, employers now report stubborn skills shortages for trades and technicians (AiG 2018).
- Weak business investment, high underemployment, and job precarity have coincided with an employer retreat from investment in on-the-job training and skills. An industrial relations system that encourages competition on low wages, low-trust employment relations, and access to an abundant supply of underutilised labour, all encourage employers to manage workforce retention and skills development on the assumption that labour is transient and disposable. This reinforces reluctance for individual firms to invest in better on-the-job training for fear that trained workers will simply leave for other jobs, hence allowing other firms to benefit from their own investment. Evidencing the lack of skills investments by Australian employers, a 2018 survey of firms employing a total of over 110,000 employees found that only half planned to increase training expenditure in future years (AiG 2018).
- Declining employer investment in education and on-the-job training is also related to the dramatic decline in recent years in collective agreement coverage, especially in the private sector. With less than 12 per cent of private sector workers now covered by a current enterprise agreement at 2017 (down sharply from 19 per cent at end-2013),³² the erosion of this important instrument for regularising training and skills programs has further reinforced a "race to the bottom" in workforce practices. Workers have fewer enforceable rights to education and training entitlements (though reimbursements and allowances, for example) with corresponding threats to the successful implementation of innovative, productivity-enhancing technologies and work practices needed to drive economic growth.

³² See Pennington (2018) for a detailed report on the decline of enterprise agreement coverage in Australia's private sector.

UNIVERSITY PLANNING AND FUNDING

Australian universities face key challenges in preparing for changing requirements of education-to-work transitions. They have been constrained by uncertainty and fiscal restraint in national higher education policy. Universities were once fully publicly funded, with tuition fees abolished in the 1970s to improve accessibility to higher education – not to mention accommodate the demands of growing professional services industries. Public funding of Australian universities began to decline after the mid-1980s, dropping to only 0.7 per cent of GDP in 2008, compared to an OECD average of 1.1 per cent; public funding increased modestly to 0.9 per cent of GDP in 2015 (most recent data), but is still trailing the OECD average (OECD 2018a).

Direct public funding comprises only 38 per cent of all higher education expenditure in Australia – barely half the OECD average of 73 per cent (and second-lowest in the OECD after the U.K). Due to low levels of public funding, private expenditure is more significant in the Australian university system, and at one of the highest rates as a proportion of total university spending in the world. 37 per cent of all universities' spending comes from private funding, compared to an OECD average of 21 per cent (see Table 11). The remaining 26 per cent of higher education funding is delivered through public-to-private transfers: in Australia's case primarily consisting of publicly-provided loans to students.

Table 11. Share of Expenditure on Higher Education by Funding Source in Australia and OECD Average, 2015

	Australia	OECD average
Public expenditure	38%	73%
Private expenditure	37%	21%
Public to private transfers*	26%	6%

*Data: OECD (2018a) *Public transfers include public loans for tuition (Higher Education Loan Program)*

Facing relatively scarce public funds, universities have focused on expanding the international education export industry. The growth of international education has both been a response to the reduction in public spending on higher education, and served to facilitate continued fiscal restraint (as universities are seen to make up for lost public funding through expanded international education revenue). International university education is now Australia's third-largest export, worth \$32 billion per year.

International enrolments have climbed every year, with a record 350,000 international students in 2018 – an increase of 100,000 over three years (Gothe-Snape 2018).

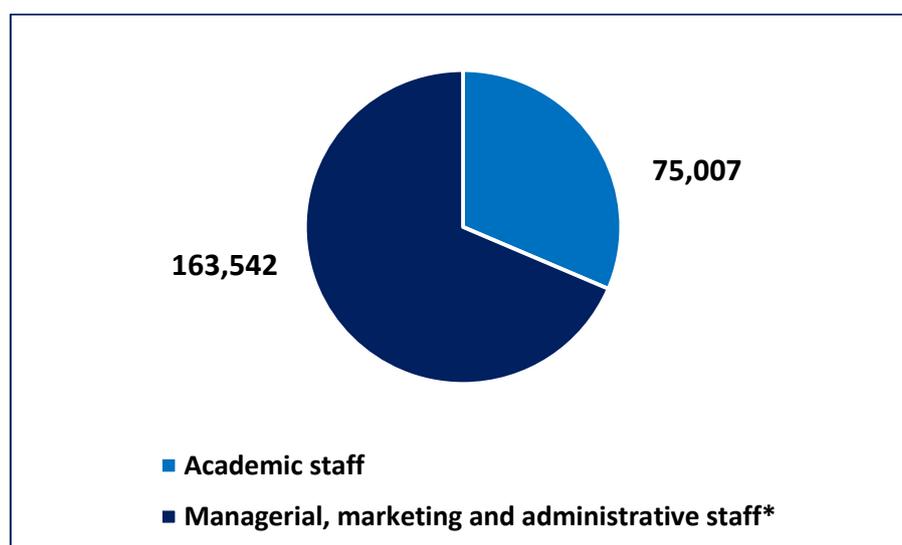
Public higher education funding is made more complex by a financing policy tool unique to Australia: the student loans scheme or Higher Education Loan Program (HELP). HELP provides loans to domestic students; loan amounts are indexed annually to CPI, and repayable as a proportion of earnings once a defined post-graduation income threshold is reached. Legislation introduced by the Commonwealth government in August 2018 lowered the repayment threshold to \$43,800, thus requiring lower-income graduates to begin repaying their study debts sooner. OECD data show public-to-private institution transfers (of which HELP loans are the main component) represent 26 per cent of all university expenditure in Australia, much higher than the OECD average for this type of funding (just 6 per cent). The value of these public-to-private transfers supplements the scale of direct public funding, however the debts remain primarily private liabilities and cannot reasonably be characterised as true public funding. An estimated 25 per cent of the \$52 billion outstanding HELP debt at 2017–18 is projected to not be repaid (West 2018).

Box 2. Demand-Driven Funding

Demand-driven funding has been the main policy architecture for university education since it was introduced in 2012. The policy provided uncapped government funding for bachelor's degree studies based on enrolments: which grew from 1 million in 2008 when the policy was announced by the Gillard Labor government, to 1.4 million in 2015 (Department of Education and Training 2015). In 2008, 40 high-skill occupations faced skills shortages; this was part of the rationale for the new policy (Norton 2018b). Demand-driven funding was introduced alongside a failed experiment in VET deregulation and privatisation, which led to large spikes in up-front fees for VET courses. Consequently, vocational education was effectively discouraged, since universities allowed for full fee deferral through HELP. Demand-driven funding supported many who may not have ordinarily had access to university education, including many low-income first-in-family students. However, insufficient study and income supports increased the drop-out rate: almost 50,000 students commencing in 2018 ceased their studies, leaving with an average debt of \$12,000 for incomplete courses, in addition to the cost of foregone earnings from time out of work (Grattan Institute 2018a). The absence of integrated policy coordination across the two post-secondary education systems has led to skills shortages in technical and trades occupations, and disrupted skills pathways for many young Australians. Demand-driven funding was frozen for two years by the Commonwealth government in January 2018, as part of its plan to deregulate fees.

Reliance on private funding sources can hinder the capacity of universities to innovate, respond, reorganise and restructure to better adjust to future workforce demands and better support their graduates' transitions to employment. Exposing universities to market incentives and the pressures of private funding elevates the importance of private commercial interests in shaping the sector's mandate and programs. Less public funds combined with higher returns from international fee-paying students has imposed a trade-off between commercial international student growth and subsidised domestic student growth, with the more lucrative commercial industry attracting increased resources. As a result, employees in higher education who perform non-academic administrative roles such as marketing, management and services now comprise around two-thirds of total employment in the sector; academic teaching staff comprise only one-third of total employment (see Figure 25).

Figure 25. Employment Share in Australian Higher Education Sector, 2016



*Data: Authors' calculations from ABS Census 2016. *Includes Managerial, marketing, HR and business, clerical and administrative, design, engineering, ICT, legal and other services.*

Another challenge to universities' capacity to respond to future challenges in education-to-jobs transitions is the risk of path dependency in curriculum planning. Courses of study may become "locked in," independent of concrete assessments of the actual needs of a future workforce. For instance, the Bachelor of Business Studies is a commercial success in the international education industry; but its value in Australia's labour market may be less evident. After all, knowledge in business and management ranked the lowest of all fields of knowledge in the OECD's skills shortage analysis (see Figure 12 in Section 2). The evolution of international and domestic education as distinct entities also presents missed opportunities in the areas of research collaboration. Education policy has failed to interlink these two "arms." While most

international fee-paying students are from Asia, most of Australia’s research collaborations have remained with the U.S, the U.K and Europe (Marginson 2011). The failure of policy to systematically link education exports to real investment projects, including expanded international research opportunities for Australian graduates, represents another large opportunity cost.

NAVIGATING THE GRADUATE LABOUR MARKET WILDERNESS

Graduates trying to get a foothold in secure work, but who remain stuck in low-quality, low-paid employment (often jobs in which they cannot meaningfully mobilise their skills and knowledge), face a tough “each for themselves” education-to-jobs system. But they are also living the consequences of decades of government policies more enamoured with fiscal austerity than with active and well-resourced labour market programs.

Table 12. Graduate Labour Market Job-Matching Mechanisms

Mechanism	Organisation(s)	Service role
Data for planning and recruitment	Higher Education Statistics Data (gathered by Department of Education and Training)	Collects university data on enrolments and completions including degree-level, study fields, state/region
Industry and cross-sector employer associations	Australian Association of Graduate Employers	Recruitment and training across industries, including connecting employers and universities
Universities	Internal careers services and information hubs	Programs linking employers to universities (e.g. internships, mentoring), careers counselling, and advertising employer vacancies through online platforms.
Commercial job platforms	GradAustralia, GradConnect and Graduate Opportunities	Advertising graduate job vacancies for fee, predominantly online

Source: Authors’ compilation

Just as there is nothing magic or mysterious about how jobs are created, there is no automatic force or “invisible hand” connecting graduates to jobs. The lack of a comprehensive, national employment education-to-jobs policy framework for the university sector places immense pressure on graduates as they attempt to navigate the labour market and identify appropriate employment opportunities – largely on their own.

Filling this job-matching void, some employers have developed their own mechanisms and organisations to recruit appropriate graduates (see Table 12). Online job vacancy platforms such as GradAustralia and GradConnect have become “one-stop shops” for graduate recruitment; 86 per cent of the largest graduate employers said this low-cost tool was the most effective method for identifying suitable graduates (Australian Association of Graduate Employers 2018).

University careers services coordinate industry-university networks through designated internship and mentoring programs, careers counselling, and online platforms for employers to advertise vacancies. But over 50 per cent of the largest employers said traditional careers fairs, guides and newsletters were either not used at all or were ineffective for recruiting suitable graduates (Australian Association of Graduate Employers 2018). In any case, due to the prevailing “employer’s market” marked by an oversupply of qualified entry-level workers, and the inability of universities to ensure adequate employment opportunities for their graduates, these initiatives at best reach only small numbers of the most competitive candidates (usually within specific high-demand fields). More cynically, they may also function as marketing schemes to promote university branding.

Comprehensive and accessible data on university completions and employment transitions is an essential tool for modern labour market planning, which will become even more important amidst the coming changes in the world of work. The Department of Education and Training (DET) manages Higher Education Statistics (HES). It is the only federal data on enrolments and completions, including information on degree types (i.e. undergraduate, postgraduate, diploma), field of study, and the state/region of study. The data is publicly available online, prepared annually, but not available until one year later (only 2017 data was available at time of this report). The HES data is also highly aggregated, with finer detailed data prepared on request from DET at cost. The slow and costly release of higher education data reduces its usefulness for employers’ forecasting and planning purposes. They are keen to ascertain how many graduates have recently completed, or are soon to be completing degrees and seeking employment, in what study fields, and in what cities or regions, and they need this data in a more timely and efficient manner. There is presently no integrated higher education and labour market dataset available in Australia. Such

information would also greatly enhance individuals' ability to identify courses of interest in relation to tangible forecast employment opportunities – to inform their decisions before enrolling, over the course of their studies, and upon graduation.

Box 3. Stronger Education to Employment Transitions Abroad

The “laissez-faire” approach to graduate-to-work transitions in Australia differs from countries which provided more active labour market policies to facilitate young workers' transitions from education to jobs. In response to a significant rise in youth unemployment (especially in southern Europe) after the GFC, many countries established new (or strengthened existing) youth labour market programs. For instance in Italy, AlmaLaurea – a public consortium of 64 Italian universities and social partners – operates a centralised online database of graduate profiles (including 70% of all graduates in the country) and job vacancies, that mediates between job seekers and employers who advertise vacancies and undertake entry-level recruitment (Eurofound 2014). France introduced a program extending internship roles to university students, bound by a legal contract called “convention de stage.” Contracts must outline the professional learning objectives of internships, how the objectives relate to the student's university studies, and the hours and conditions of the role to protect against exploitation. Internships longer than two months must legally be paid positions. Sweden offers a job guarantee for young people that provides individualised job search assistance to all participants and a guarantee of either a job offer, study opportunity or access to small business start-up funds (Eurofound 2014). Sweden emphasises precise matching of young participants to companies for training and work experience to increase retention of young workers in companies at the completion of the scheme. On the other hand, countries like Germany, Austria and Switzerland did not experience a large rise in youth unemployment after the GFC largely due to the success of their public-funded dual-training systems. These provide hands-on work experience to young people while undertaking theoretical components of training in vocational schools (Klatt 2019).

UNIVERSITY-INDUSTRY NETWORKS AND FUTURE SKILLS INITIATIVES

There has not been a time in the history of the Australian higher education system when the magnitude of course completions contrasted so glaringly with poor labour market conditions. Universities face greater pressure on their core function to deliver a knowledgeable, skilled and appropriately qualified workforce. This challenge is exacerbated by the shifting public/private balancing act performed since the mid-

1980s, when government funding began to decline and reliance on private sources of funds (including revenue from international education) became dominant. This challenge will only intensify amidst coming global, technological, economic and environmental changes.

As such, future of work initiatives developed by universities reflect the complex policy and economic environment they operate in. Universities must simultaneously compete on graduate employment outcomes,³³ deliver skills that meet the future needs of the economy, and establish a new education-to-jobs infrastructure based in part on stronger ties between research and industry.³⁴ At present 16,000 businesses have formal relationships with Australian universities: collaborations that are estimated to generate more than \$10 billion per year in company revenue, and add \$19.4 billion per year to GDP (Universities Australia 2018). Further collaborations could drive productivity and economic growth. However, Australian university-industry engagement is weak, lagging behind that achieved in other industrial economies.

The weak state of university-industry linkages is also visible in weak research and development expenditure as a proportion of GDP. Considering public and private spending across companies, universities and government institutions, Australia's total R&D investments equalled only 1.9 per cent in 2015–16, well below the OECD average of 2.4 per cent. Ominously, 2015–16 marked a decline in total R&D spending (falling from 2.1 per cent of GDP in 2013–14) (OECD 2019b); private R&D spending in particular has been shrinking for several years. This highlights the decreasing appeal of Australia for large companies engaged in more capital-intensive, innovative and high-value activities (including R&D). Australia's underdeveloped value-added industrial base, dependence on extractive resource industries, and relatively large role for small business are also limiting factors. In a climate of weak business investment and fiscal restraint in public education policy, creating stronger ties with industry as part of a future education-to-jobs strategy is a mammoth task for universities.

The remainder of this section considers two categories of university initiatives in the face of this challenge: the expansion of work-integrated learning, and the redevelopment of curricula to better address workplace transitions for graduates.

³³ One example of the complex funding and policy climate universities operate within is a current proposal from the Coalition government to link public funding to university performance on graduate employment outcomes.

³⁴ Remembering that a systematic, direct and hands-on government policy approach to long-term skills development was required for initial establishment of the national vocational and training education system.

Work-Integrated Learning

Work-Integrated learning (WIL) is presently the dominant employability strategy in the university sector. WIL is already part of the fabric of many vocational degrees (such as healthcare, teaching and engineering), but is now extending into a wider array of generalist programs. Curiously, though, STEM-related firms have been the least likely to participate in WIL initiatives (Orrell 2018). Research shows that where WIL programs are adequately planned and managed, students have increased confidence in professional practice, and improved their transferable skills, digital literacy, and problem-solving abilities in team environments.³⁵ A national WIL strategy was launched in 2014 across business and universities to fast-track university–industry partnerships and expand WIL programs (Universities Australia 2015). However, little progress has been made on coordinating this national strategy. WIL program implementation is therefore uneven, and there is presently no data gathered on national student uptake or results.

Individual universities have also continued to build their own industry networks and simulated work environments. One notable example is Swinburne University of Technology’s Centre in Surface Engineering for Advanced Materials, which aims to integrate new graduates directly into jobs, and in so doing enhance the materials capacity of Australian manufacturing (see Table 13). Other innovation hubs have been established across universities with varying degrees of direct industry participation.

While WIL has allowed universities to begin forging more vocational ties with industry, there are several long-standing problems with this model for strengthening career pathways for graduates. First, WIL programs are not always designed with attention to future employment forecasting, including changes in professional roles, critical industry perspectives, or changes in employment regulations. Second, the WIL learning process flow is very unidirectional. By simply matching students with employer’s immediate needs (many of whom do not have the capacity to determine their future skills demands), WIL is not modelled on co-determined student outcomes; there is thus limited capacity to integrate students’ university learning with workplace processes. Finally, WIL programs are usually unpaid, with no systematic oversight regarding employment law compliance. Without a comprehensive policy framework for WIL, inconsistent and unregulated programs carry the risk of student exploitation, and greater fragmentation in education and training standards. Overall, without a more consistent and comprehensive policy framework, efforts to collect national data on placements and outcomes, and the establishment of clear benchmarks regarding

³⁵ See Jackson (2017, 2018), OECD (2014), and Purdie et al. (2013).

fair treatment for students placed in these roles, WIL could inadvertently undermine Australia's efforts to better link the education system to industry.

New Directions in Curriculum Redevelopment

Generic employability skills like problem solving and team work lose value if they are not linked to more specific and concrete subject areas of knowledge and expertise. After all, for people to work effectively in teams to solve problems, they must have sufficient knowledge to meaningfully contribute to those solutions. This means university education-to-jobs programs must accommodate both the continuing development of specialised expertise, and a deepening of problem-solving skills through better links between the formal curriculum and real-world work processes. Employers are also calling for students to be exposed to more open-ended problems and inquiry-oriented learning (Sarkara et al. 2016). For these reasons, universities are undertaking new curriculum initiatives based on a recognition that higher education cannot simply prepare students for today's jobs, nor can they accurately and precisely predict what jobs will exist in the future. Instead, universities need to facilitate students' knowledge and skill acquisition with explicit acknowledgement of the uncertainty of the current economic and social context – and prepare graduates to respond to change and actively shape their futures.

Connected learning strategies assess how university curriculums can be re-designed to achieve these goals (see Table 13). Advancements in course and degree construction harness cross-disciplinary curricula, centred on broad student capabilities rather than isolated discipline-specific skillsets. For instance, Western Sydney University is developing new interdisciplinary degrees called "21st Century Specialisations;" they are intended to allow students to acquire complex sets of knowledge and skills appropriate for tackling equally complex technological, economic and social policy problems. One example of these new multi-disciplinary courses is Social Technology, which teaches concrete training in technical skills alongside study of the social implications of new technologies and the ethics of data usage.

These are just a few examples of approaches aimed at developing creative and critical multi-disciplinary thinking among future graduates, preparing them to take complex and compounding technological, social and environmental challenges – referred to as "wicked problems." These cross-disciplinary streams can expose students to different types of thinking and people, enhancing their capacity for meaningful engagement with colleagues and the broader community after they leave the university.

Table 13. Selected Innovative Future Skills Approaches

Institution	Program/course	Details
Monash University	Bachelor of Science Advanced (Global Challenges)	Students develop an in-depth science discipline as well as skills to address complex global challenges, and convert theories into tangible policy solutions.
Swinburne University of Technology's engineering hub	Centre in Surface Engineering for Advanced Materials	Aims to build the capacity of advanced Australian manufacturing industry and direct job pathways into this industry.
Western Sydney University	21 st Century Specialisations	Inter-disciplinary specialisations built around core future-facing policy problems including Social Technology, Sustainability, and Innovation Ecosystems
Western Sydney University	Partnership Pedagogies	Working with local businesses, councils and communities to infuse co-design principles into the creation of curriculums.
<i>Source: Authors' compilation.</i>		

Careers Registration

Career advising and planning for Australian university students is an activity that is currently undertaken, if at all, only towards the final semester(s) of the student's program and is mostly initiated by the students themselves. Careers Registration (CR) is an alternate approach that has become commonplace in many UK universities since 2012 – with at least 85 UK universities reporting the implementation of CR by 2019 (Cobb 2019). CR, however, is only now being piloted in a small number of Australian universities. With the potential to significantly impact employment prospects for students and strengthen career advising in universities, it is an approach that should be high on the horizon of all higher education institutions.

The CR methodology effectively integrates the “Decide-Plan-Complete-Sorted” career development continuum strapline. It is an institution-wide strategy, integrated into the institution's student enrolment process each semester, with two or three simple

survey questions asked repeatedly to gather individual data on career development progress. CR is intended to encourage engagement with career services for all students, not just those already engaged. After collecting data for several years and fine-tuning the CR process, these UK universities have datasets at the student, program, faculty and institutional levels which help them to manage career advising for students, provide institutional performance measures to supplement the externally measured student outcomes, and enable better targeting of employer involvement in campus recruiting (Cobb 2019).

7. Policy Implications and Recommendations

There is no doubt that technological, social, environmental and political change will continue remaking the world of work. Higher education will have an enduring and central role in providing the skills and knowledge society needs to confront, and shape, those forces of change.

Australia's education-to-jobs system has largely operated on the mistaken assumption that a highly-skilled, flexible workforce could self-adjust to changing labour market and skills needs. But this faith in the effectiveness of individual responsibility and decentralised, market-driven adjustment has unravelled in the wake of the real-world failure of competitive labour markets to either create adequate quality employment opportunities, or to effectively match new graduates with those opportunities that do exist. University graduates today are at the "coalface" of this shattered social compact: their impressive university qualifications no longer provide reliable pathways to jobs, or protection against un- and underemployment.

The university sector faces immense challenges to do a better job linking its graduates with meaningful, quality employment. These challenges are exacerbated by slowing business investment (including in capital, research, and on-the-job training initiatives), weakening labour market conditions, fiscal restraints on public education funding, and an absence of national education policy leadership. This is why Australia needs a new education compact for higher education: one which engages all stakeholders; supports graduate transitions with practical resources, data and planning; balances the immediate skills needs of employers with the broader interests of society in education and knowledge; and prioritises quality and fairness in employment. Education policy must also be complemented by a vision for long-term economic policy focused on stimulating increased employment in quality, full-time, meaningful jobs; after all, merely achieving a flow of well-trained graduates does not imply the creation of quality jobs for them to transition toward. The following recommendations are offered as potential building blocks for an integrated, inclusive, and more effective approach to achieving better education-to-jobs transitions:

#1: Establish a National Higher Education Policy Framework and Capacity

One perverse outcome of balancing both public and private incentives is that universities market their degrees as pathways to secure and meaningful work, but in

reality, lack the national coordination, regulatory and policy tools to bring these marketed “dreams” to fruition. There have been no co-ordinated approaches for meeting Australia’s needs from higher education over the last decade. Without a long-term higher education plan that facilitates coordination between individual competing institutions, and better linkages between universities and employers, a timely and effective response to better addressing future skills demands will be harder to achieve.

A long-term national policy for higher education would provide a framework linking university funding to real outcomes, such as expanding public research capabilities, deepening industry partnerships for graduate learning and employment opportunities, and contributing to the development of public labour market planning tools. To this end, a new national higher education governance body should be established to provide policy advice and coordination. The Commonwealth Tertiary Education Commission that was in place from 1942–1988 demonstrates this is possible. Such a Commission would be comprised of representatives from both state and Commonwealth governments, industry, universities and other key stakeholders. It would reflect an agreed balance of representation and responsibility between the Commonwealth and the states. The Commission could help guide the university sector regarding curriculum offerings and employment placement supports; share information on innovations and best practices in education-to-jobs planning; and encourage and facilitate greater links between universities and industry.

#2: Link Universities into an Innovation-Intensive, Value-Added, Export-Oriented Industry Policy

At present universities are largely “rudderless” when it comes to establishing industry partnerships and future skills frameworks, in part because Australia lacks any long-term industry policy agenda. Universities should be engaged as an active and central stakeholder in a conscious strategy to support the expansion of advanced, innovative, high-value industries. These industries can renew productivity growth, improve export quality, and boost research and innovation activity (which has perversely diminished in Australia in recent years). And they can serve as sources of high-quality employment opportunities for university graduates. This strategy is particularly important for Australia’s struggling SME sector: which is currently experiencing a broad decline, and lacks the dynamism and export-orientation of SME sectors in countries like Germany. Training workers with the skills to support the expansion of innovation-intensive advanced sectors will be important for Australia’s future economic development. Economic research also shows that sectors using high-skilled workers, technology and an orientation to export are associated with higher-wage, better quality employment. Better avenues for the commercialisation of research and development undertaken in

universities would be another valuable role for universities in a revitalised Australian industry policy.

#3: Reliable Public Funding for Universities

Direct public funding of Australian universities has been declining relative to the economy since the mid-1980s, and now constitutes only 0.9 per cent of GDP (well below the OECD average) (OECD 2018a). As a result, the university sector has developed alternative funding structures that prioritise securing revenues for individual institutions, in large part through private contributions. This distorts their public mandate to provide quality education and research as a service to the whole of society.

Demand-driven funding has successfully expanded access to university education, and facilitated labour market responsiveness to changing skills demands. The funding model ended in 2017 and should be re-instated. However, allocating funding based solely on subsidising costs per student is an unduly restrictive and narrow fiscal tool. It produces both an inadequate level of funding, and weakens requirements on universities to deliver outcomes (due to the lack of an overarching policy framework to set benchmarks and targets). Universities need increased public core funding, which should be attached to targets for improving course quality – as well as requiring institutions to participate in national-level skills coordination, and expand their employment-to-jobs programming.

#4: Expanded Public Funding for Research

Publicly-funded research (including broader “blue-sky” or basic research, in addition to more immediate applied innovation efforts) lies behind some of Australia’s most important innovations; they are also key inputs that fuel private sector investment in both additional research and in commercialisation. Public investment in research, thanks to its freedom from immediate commercial constraints, is also critical to creating knowledge-intensive jobs in fields and projects that may not be immediately profitable in the short-term, but are of significant value to the economy and society in the long-term. Worryingly, R&D spending in Australia is declining as a share of GDP. Australia must invest more in public research in universities and in public institutions such as the CSIRO, to expand innovation, support private sector R&D, and provide meaningful employment for Australia’s graduates (including those in STEM). More broadly, Australia should pursue policy measures that encourage firms to participate in research and commercialisation partnerships with the university sector, which are currently relatively rare.

#5: Inform Curricula and Programs with Job Clustering Analysis

The current structure of most degrees around distinct occupations must be reviewed in light of changing patterns of occupational mobility and the fragmentation of traditional careers. Rather than providing broad employability skills, universities should seek to provide graduates with the ability to obtain and identify areas of expertise and transferrable skills that may be “ported” across different roles throughout their working lives. Occupational stream models based on comprehensive jobs clustering analysis provide one strong vehicle for identifying and nurturing this transferability earlier in students’ courses of studies. These more flexible and multi-disciplinary occupational streams in higher education could draw insight from the vocational streams research emerging in the VET sector, as well as from curriculum innovations focused on inter-disciplinary problem-solving (such as the 21st Century Specialisation model implemented at Western Sydney University). Occupational streams should also be explored as tools for deepening industry and educational partnerships and building tighter links between academia and real-world practice.

#6: Improve Labour Market Information Systems, and Create an Education/Skills/Jobs Data Portal

Governments should ensure the labour market functions to facilitate effective mobility and adjustment of workers, and the quicker matching of willing and capable workers with available job opportunities. Both workers and employers need access to timely and high-quality labour market information to facilitate job matching and fast transitions. There is presently no integrated higher education and labour market data source available in Australia. Investment in a world-class labour market information system would need to integrate the efforts of existing institutions (like the ABS and the Department of ESSFB), along with information gathered from the VET sector, universities, and employers. The goal is to create a comprehensive labour market portal accessible for employers, students, graduates, and educational institutions. Access to this information would enhance students’ capacity to identify and respond to labour market developments as they select and pursue their courses of study. It would also assist employers to anticipate future supply of graduates in different disciplines, and thus plan to meet their future skills needs.

#7: More Comprehensive and Timely National Employment and Skills Forecasts

A related informational priority should be to enhance the quality and timeliness of labour market forecasting by industry, occupation, and skillset. The Department of Employment, Skills, Small and Family Business presently conducts annual employment forecasts by industry and occupation, based on 5-year forecasts. However, the methodology for these forecasts is mostly based on extrapolating simple time series

data on employment growth, and is often viewed as unreliable. Government should invest in developing more sophisticated, detailed and publicly available employment forecasts, which help to identify longer term labour market needs and skills demands (over 10-year as well as 5-year periods). These forecasts would be valuable input to education and training planning, and broader industry policy.

#8: Social Partnerships in Governance of the Education-to-Jobs System

Australia has very weak stakeholder involvement in the governance of the education and vocational systems. This differs from more effective and inclusive systems used in most other OECD countries. Coordinated market economies like Germany, Denmark and Sweden have developed much stronger education-to-jobs pathways (including advanced apprenticeships, and lifelong learning systems). This success is based on a comprehensive “training rights” framework that is administered through social partnerships – engaging employers, unions, government and education institutions. According to the OECD (2019), key features of social partnership in skills planning include cooperation between government and employer and employee representatives to anticipate training needs; the expansion of collective agreements to ensure education and training entitlements; and the introduction of employer levies to finance adult learning systems, thus overcoming the “free rider” problem that tends to undermine private spending on on-the-job training (OECD 2017). Social partnerships between employers and unions are also essential to constructing robust continuous adult learning systems capable of meeting demands for job re-skilling and building a more responsive and inclusive labour market.

#9: Coordinating Employee Voice with Skills and Training Initiatives

Building these stronger social partnerships in Australia’s skills system will require developing a more consistent, respected and coordinated system of employee voice. Unions play an essential role in governing skills systems across many industrial economies, but that potential role is badly undeveloped in Australia. Unions’ functions can include workplace implementation of new productivity-enhancing technologies, alerting employers to skills and training demands, and assisting displaced workers to be retrained in new roles. In many advanced economies, unions also play an important role in coordinating and implementing the broader future skills system – for instance, through active participation in vocational training institutions and planning. Unions increasingly represent university-trained workers (with higher rates of union membership than among less educated workers), and hence are particularly relevant to interventions aimed at facilitating strong and sustainable employment transitions for university graduates.

Unions' role in collective bargaining to attain better pay and conditions for labour is important for delivering an adequate standard of living for workers. But collective agreements can also play a bigger role in fostering investment in productivity-enhancing measures (such as new technologies, software and upskilling), limiting the scope for business models based on unsustainable competition to reduce labour costs. Collective agreements can also facilitate employee co-determination of technology implementation plans, and engagement of unions in the governance of continuous learning systems. Institutional and legal barriers preventing unions from undertaking representation and bargaining (such as unusual restrictions on permissible matters in collective bargaining) should be lifted, alongside reforms to strengthen the collective bargaining system to lift the presently very low coverage rates. For example, multi-employer and industry-wide agreements are coordination tools with great potential for strengthening and managing skills initiatives in Australia.

Conclusion

The future of work will be marked by an increased role for jobs where technology complements human labour, and “frees up” humans to undertake more abstract, cognitive and emotional labour. While new digital technologies are commonly presented as a sudden and exogenous “disruptive” force, Australia’s higher education system has already been facilitating adjustment to more cognitive, non-routine work for decades. This successful role is visible in both rising bachelor’s degree attainment among the working-age population, and the shift in employment share from manual and routine work, toward a higher share of professional and community and social services.

What is clear is that industries for which a human connection is still vital to production will continue to experience strong demand for skills. This is especially true in human, caring and public services, which have been strong sources of new job-creation in recent years, and important sectors for graduate employment opportunities; it is also evident in the strong employment growth in professional and scientific fields. A university degree will remain a key and valuable labour market entry qualification. Despite the intense focus on graduates acquiring specific technical and business skills – to meet the supposedly insatiable appetite of employers for technological expertise and entrepreneurial knowledge – more balanced evidence indicates that Australia actually has experienced surprisingly minimal shortages in engineering, technology, and business and management knowledge. With increased pressure on universities to divert resources to ensuring students are “job ready”, universities should take heed of evidence that employers’ strongest demands are for basic and flexible skills like critical thinking, communication, and problem-solving.

The graduate skills debate has been marred by a fixation with “hard skills” and, to a lesser extent, STEM programs. Employers’ expectations that graduates be “fully formed” from the day they commence employment also distort discussions about how to prepare graduates for a world of work which will require constant ability to adjust and transition to a variety of roles and workplaces in their working lives. But if productive lifelong learning is to become part of everyday life, graduates will need more than generic employability skills. They need the capacity to both adapt to changing circumstances, and to meaningfully shape their work experience in a realistic, informed and ongoing way. Critical thinking, creativity, problem-solving, leadership and people management skills will all be important in that regard. “Job clustering” analyses provide a more realistic account of how future graduates must be ready to

move through various positions and roles, emphasising transferrable skills applicable to a multitude of occupations. A conscious recognition of and planning for occupational streams (modelled on those which have been identified in vocational education research) should be embedded in the university system to reflect this new framework.

But ultimately, preparing graduates with “the right skills” will never be the panacea for the problems in Australia’s labour market. A more balanced and realistic view of graduates’ future skills must acknowledge the current negative labour market trends facing young workers. Despite being the best-educated generation in Australia’s history, young people nevertheless confront the worst features of a precarious labour market – with high levels of insecure work and underemployment preventing most from applying their skills to the fullest. Graduate transitions from education to work are becoming harder as secure, full-time job opportunities have diminished. The pervasive underutilisation of graduate labour represents huge wasted opportunity for individuals and society at large. Strengthening the macroeconomic environment facing young workers will thus be an essential part of improving graduates’ employment outcomes.

Universities should be integrated into a comprehensive continuous learning system (along with VET and other post-secondary training providers), underpinned by social partnerships in governance, supported by adequate and reliable public funding, and informed by high-quality and timely labour market planning data. Education policy must have a vision of its role in supporting long-term economic and social development, centred on stimulating the creation of quality, full-time, meaningful jobs; education policy should not be unduly focused on specific, immediate needs of employers, nor shaped solely by what employers and other private donors are currently willing to invest in. To this end, universities need more public funding. That funding should be attached to requirements for national policy coordination among universities, and stronger mechanisms for connecting public higher education research to the development of an innovation-intensive, high-value export-oriented industry policy.

With more public resources, better coordination among higher education institutions and other stakeholders, and stronger pipelines linking universities and their graduates to high-quality employment opportunities, Australia’s universities can make an enormous contribution to preparing Australia’s future workers for the uncertain but exciting world they will face.

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