

The Changes and Challenges Facing Regional Labour Markets

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Abstract

The Australian economy has experienced a high degree of structural and technological change over the past three decades. Significant changes will continue, with the decline of the manufacturing sector, the increasing use of mechanisation and technology in the mining and agricultural sectors, and with the growing role of computerisation and robotics in the workplace in general. The effects of such changes to date have included better pay and more employment opportunities for those whose skills are in demand, but it has also meant lower relative pay and fewer job opportunities for low-skilled and unskilled workers and for workers whose jobs have been replaced by technological development. Structural change leaves workers in industries that are in long-term relative decline with fewer employment opportunities which can lead to entrenched long-term unemployment. Technological change impacts on the types of jobs available within industries and the skills required. The purpose of this paper is to examine the regional dimension to labour market change and determine which areas are likely to be most at risk as the economy continues to experience changes in sectoral mix and in the types of jobs and the skills required.

Keywords: unemployment, structure of labour force, regional labour markets, education

JEL Classification: R23, J21, J64, I24

1. Introduction

The Australian economy has been through considerable structural and technological change over the past three decades, with significant impacts on both metropolitan and regional areas (Connolly & Lewis 2010; Lewis 2015; Lowe 2012). Structural change over time refers to the change in the way in which an economy operates, with the usual development process involving production moving from primary industries to manufacturing then to service-based industries. Employment growth in Australia has moved from the industrial sector to the service sector and the demand for skills has moved from manual skills to interactive (people) skills and more advanced technological skills as Australia moves toward becoming a knowledge-based economy (Kelly & Lewis 2003, 2010; Mahoney & Lewis 2007). The effects of structural change has therefore meant better pay and more employment opportunities for those whose skills are in demand, but it has also meant lower relative pay and fewer job opportunities for low-skilled and unskilled workers.

Technological change refers to new production techniques, processes and inventions that enable an economy to increase production using the same amount of inputs. Significant change due to new technologies is not new and it has been argued that the current changes due to robotics and computerisation are affecting not only manual (blue-collar) jobs but also white-collar jobs in the service sector in much the same way that mechanisation affected manual jobs from the 1950s to the 1990s in the agriculture, mining and manufacturing sectors (Borland & Coelli 2017; Bradley 2015; Wohl 2017).

There has been substantial research demonstrating a strong regional dimension to economic disadvantage such as unemployment and social exclusion (see for example, Andrews *et.al.* 2004; Baum *et.al.* 2005; Hunter & Daly 2013; Kilmartin 1993; Mangan & Stephen 2007; Sorensen 2000). It follows that it is important to identify regions at high risk of unemployment and negative jobs growth due to structural and technological change if relevant policy is to reach some of the most disadvantaged people. Further, the incidence of unemployment is a good predictor of the likelihood of long-term unemployment (ABS 2011; Chapman & Kapuscinski 2000). As unemployment rises in some industries and regions this is likely to lead to a rise in entrenched long-term unemployment. The long-term unemployed are among the most disadvantaged in the labour market and are generally characterised by low levels of education and training. Due to long absences from paid employment they are not developing skills from labour market experience which is a major determinant of wages and job opportunities (Chapman & Kapuscinski, 2000).

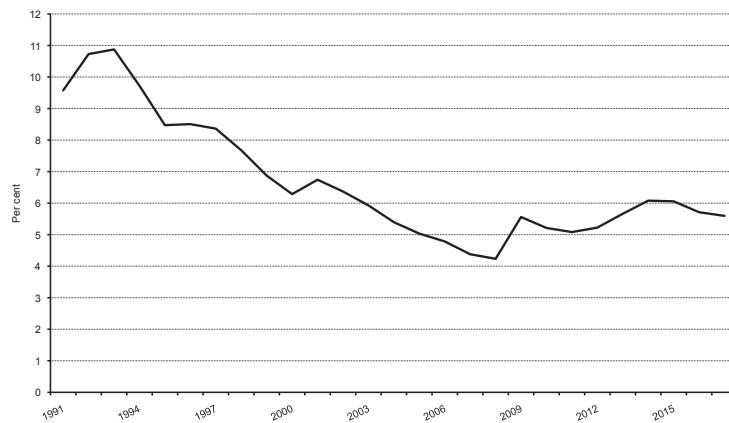
This paper first examines the changes in unemployment due to typical business cycle fluctuations and due to economic shocks. It then investigates the significant structural and technological changes that have occurred over the past few decades in the main sectors across Australia. Following this, the paper identifies those regions in Australia at most risk of low or negative jobs growth given the changing characteristics of jobs and the skills required in the workplace.

2. Unemployment changes over time

The following provides an overview of the fluctuations in unemployment and long-term unemployment since the early 1990s. These changes are largely due to the business cycle and economic shocks. The typical business cycle ups-and-downs in unemployment are not primarily due to structural or technological change, but are none-the-less important to examine, since the business cycle and economic shocks do not affect all industries, types of labour and regions equally (Lewis 2015). Further, economic shocks can be the instigator of structural change if they impact on the choice of inputs used in production, for example, an oil-price shock that leads to reduced reliance on oil and increased investment in alternative sources of energy.

Figure 1 shows the average annual unemployment rate in Australia. The recession of 1990-91 saw the unemployment rate peak at over 12 per cent in February 1993 and average around 11 per cent for that year. After this time Australia experienced a long period of economic growth and unemployment fell almost continuously until shortly after the 2007-08 global financial crisis (GFC). The exception was the temporary rise in unemployment during the 1996-97 Asian Financial Crisis. Following the GFC the unemployment rate jumped in 2009 and 2010, fell following a short economic recovery, before again trending upward until the end of 2015, due to below-trend economic growth.

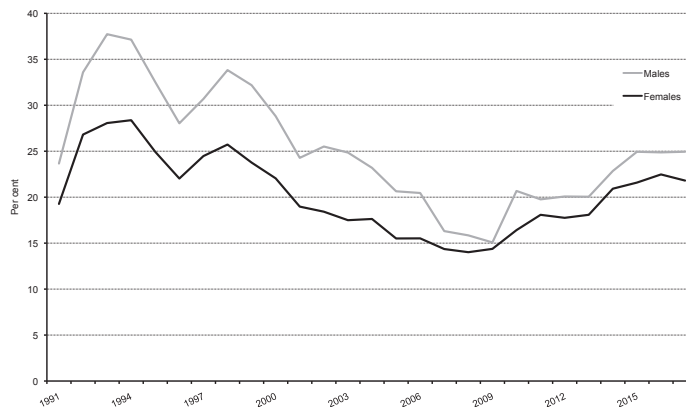
Figure 1: Average annual unemployment rate, Australia, 1991-2017, (per cent)



Source: Australian Bureau of Statistics (2018a).

Figure 2 shows the long-term unemployment ratio, which is the number of long-term unemployed expressed as a proportion of total unemployment. The rise in the long-term unemployment ratio following the 1990-91 recession is clearly evident. It has been well documented that when people become unemployed as the result of a recession, the likelihood of becoming long-term unemployed rises (Chapman 1993; Chapman & Kapuscinski 2000). The decline in long-term unemployment as a proportion of all unemployment occurred during the subsequent period of almost continual economic growth, falling remarkably from around one in three of all who were unemployed to only one in seven by early 2009. Figure 2 also shows that male long-term unemployment is almost always higher than for females, although the directional trend for both is much the same.

Figure 2: Long-term unemployment, Australia, 1991-2017, (per cent)

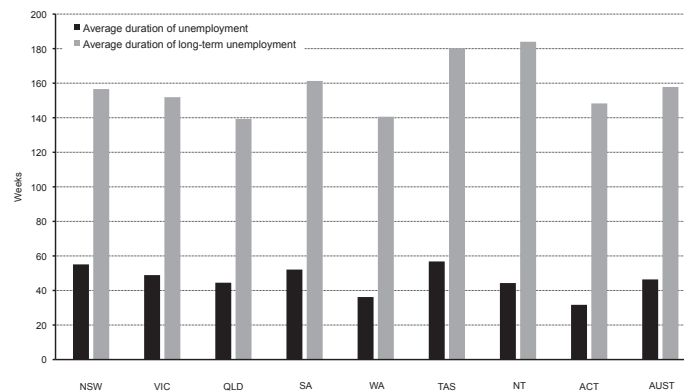


Source: Australian Bureau of Statistics (2018a).

The overall effect of the GFC and subsequent sovereign debt crises in a number of countries, and the wide-spread economic contractions and recessions, flowed on to a lengthy period of economic contraction in Australia. Other factors involved in the contraction included the effect of a slowing Chinese economy on the demand for Australia's minerals, and in particular, iron-ore, with many commodity prices falling during this time. The rise in unemployment and long-term unemployment since 2009 was significant, with the unemployment rate rising from 3.9 per cent in August 2008 (its lowest point) to 6 per cent by March 2009. After a short recovery between 2010 and 2012, the unemployment rate at times reached over 6 per cent in each year from 2013 to 2017, until it began falling during the latter part of 2017. The long-term unemployment ratio for men and women rose from an annual average of around 15 per cent in 2008 to almost 25 per cent for men and 22.5 per cent for women during 2016, or to almost one in four people, falling slightly for women by the end of 2017 (ABS 2018a; ABS 2018b).

Figure 3 shows the average duration of unemployment and long-term unemployment by state and territory. Although long-term unemployment is measured as those who are continuously unemployed for 12 months or more, very often the average duration of long-term unemployment is much longer. Figure 3 shows that in 2017 this was indeed the case, with the duration of long-term unemployment averaging 158 weeks (around 3 years) for Australia as a whole. The average duration of long-term unemployment over the post-GFC (post-2008) period has varied between 1.5 years and 3 years (ABS 2018a). Figure 3 shows that when examining the duration by state and territory, it was longest for the Northern Territory, at 184 weeks (3.5 years) closely followed by Tasmania at 180 weeks. Queensland and Western Australia had the shortest average duration at around 140 weeks (2.7 years).

Figure 3: Average duration of unemployment and long-term unemployment by state and territory, 2017, (weeks)



Source: Australian Bureau of Statistics (2018a).

Interestingly, a high average duration of long-term unemployment is not always associated with a high average duration of unemployment as a whole. For example, Figure 3 shows that although the Northern Territory had by far the longest average duration of long-term unemployment, in contrast, duration in all unemployment was relatively low – 44 weeks – when compared to other states, and even a little below the national average of 46 weeks. This implies that on average, a person in the Northern Territory is likely to find a job relatively quickly, but if they become long-term unemployed, they are likely to stay long-term unemployed for a longer time compared to other states and territories. The lowest average duration of unemployment as a whole was in Canberra (ACT) at a little below 32 weeks.

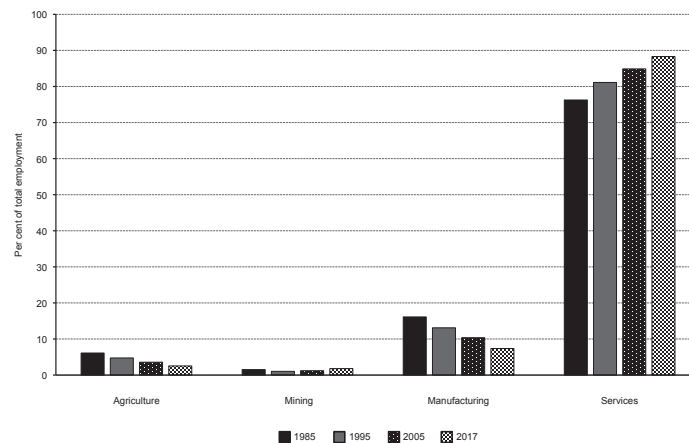
3. Employment changes over time

As outlined earlier, the structural changes in the Australian economy have been extensive in recent decades. The movement of jobs out of industrial sectors into the service sector, which began in earlier decades, has continued in recent years, and the demand for skills has moved from manual skills to interactive and knowledge-based skills. This section provides details of the effect of structural and technological change on jobs to reinforce how extensive the changes have been in a relatively short period of time. This will be followed by an analysis of the effects on jobs at the regional level.

Long-term trends in employment by sector from 1985 to 2017 are shown in Figure 4. There has clearly been a decline in jobs in agriculture as a proportion of total employment, with agriculture employing over 6 per cent of the labour force in 1985 compared with 2.5 per cent in 2017. This decline has also been in absolute numbers, and has accelerated downward since 2007, with the number of jobs in agriculture falling by almost 10 per cent between 2007 and 2017 (ABS 2018b). The fall in jobs in agriculture has primarily occurred in full-time jobs among those who are self-employed. The self-employed comprise around 55 per cent and employees around 45 per cent of jobs in agriculture (ABS 2018e). While the number of full-time self-employed remained stable throughout the 1990s, it began to fall during the 2000s, particularly following the 2002-03 drought, and fell again during the 2010s. For example, over the most recent decade – 2007 and 2017 – full-time self-employed in agriculture fell by 27 per cent (ABS 2018e). The number of employees has fluctuated over time, and as expected, can fluctuate considerably from year to year, depending on agricultural output, falling during drought years, and rising during years of higher than average production levels. It is important to note that the demand for casual, seasonal labour exceeds supply in broadacre farming (cereals, sheep and cattle) and in horticulture industries (NFF 2017). In horticulture, overseas visitors on working holiday visas comprise the majority of its casual workforce (NFF 2017). Seasonal and temporary work visas have also assisted in meeting the shortage in casual labour in agriculture, bringing in people largely from Pacific Island countries.

Mechanisation has progressively reduced the demand for labour in agriculture since the 1950s, but this is continuing today as technology continues to advance, for example, with the use of drones, apps and also of global positioning systems (GPS) for soil sampling and guided tractors. The number of farms has also fallen significantly, with farm size increasing, particularly in broadacre farming. Between 2000 and 2016, the number of farms in Australia fell by over 41 per cent, from 146 371 to 85 681 (ABARES 2017). While this has led to increased efficiency due to economies of scale, it is also a contributing factor in the fall in demand for labour, and as discussed above, is very visible in the fall in the number of full-time self-employed in agriculture. With fewer people working directly in agriculture, this also has flow-on effects, decreasing the demand for goods and services in regional towns, affecting the number of jobs in support industries. Regions with a relatively greater reliance on agriculture have experienced job losses, particularly among the unskilled or low-skilled, and among those who are not mobile between towns and regions.

Figure 4: Employment by sector, 1985 – 2017, (per cent)



Source: Australian Bureau of Statistics (2018b)

Figure 4 shows that employment in mining is generally low, as expected, given the capital-intensive nature of the industry. However the minerals and energy boom from the early 2000s to around 2012, fuelled by the rapid economic growth in Asia, particularly China and India, led to a huge increase in the demand for Australia's minerals and energy. This drove the construction of new mines and the expansion of existing facilities, leading to a large increase in jobs in mining, with the number of jobs rising from around 80 000 in 2000 to over 270 000 by mid-2012, before falling to around 220 000 by the end of 2017. In terms of mining employment as a proportion of the labour force between 2000 and 2017, this doubled from 0.9 per cent to 1.8 per cent (ABS 2018b). Temporary and permanent skilled migrants, under the Regional Sponsored Migration Scheme and Enterprise Migration Agreements, assisted in meeting the increased demand for skilled labour in mining in regional areas, with mining companies unable to find sufficient domestic labour willing to work in these regions (Connolly & Orsmond 2011; Garnett 2012b). Commodity prices fell substantially after the peak of the minerals and energy boom, with the subsequent mining slow-down impacting on jobs in some remote and very remote regions. It is important to note that a large proportion of the fall in jobs from around 2013 onwards was due to the movement from the construction phase to the operational phase of mines, which requires far less workers (Garnett 2012a). While substantial employment was fly-in-fly out, and some was also met by temporary immigration for jobs that were only ever going to be for a few years during the construction phase, the fall in commodity prices and the subsequent reduction in operations and closure of some mines has impacted regional employment, with flow-on effects on the regional localities that provide inputs such as transport, housing, food, health and other support services. However, despite the fall in commodity prices, mining production and employment has remained higher than pre-boom levels.

The decline in the manufacturing sector in Australia is well known, with the move toward offshoring gaining momentum in the 1990s, together with the progressive impact of the removal of the previously high levels of tariff protection from the 1980s onwards, exposing industries that neither had a comparative advantage nor economies of scale. In more recent years it has been the closure of all four motor vehicle companies that has received attention, with all four companies pulling out of Australia by the end of 2017. While as Figure 4 shows, the decline in manufacturing has been occurring since the 1980s, (and although not shown here, also throughout the 1970s), interestingly the most rapid fall in jobs occurred after 2005. For example, in a period of less than 10 years, from 2008 to 2017, employment in manufacturing fell by more than 16 per cent, (ABS 2018b).

Figure 4 also shows the growth in employment in the service sector which characterises the structural change that has occurred in most developed economies. The strong upward trajectory, in stark contrast with other sectors, reflects the move in employment away from industrial skills into people-based, service industries. Employment in services as a proportion of total jobs grew from 76 per cent in 1985 to 88 per cent by 2017. The service sector is large and diverse, comprising many subsectors with vastly different labour requirements, for example, highly skilled managerial and professional workers and relatively low-skilled workers in areas such as retail and data entry. Therefore, the effect of structural and technological change on employment growth will vary between subsectors within the service sector.

While the service sector has seen significant jobs growth up until 2017, the rapid adoption of technology such as software programs in white-collar jobs will lead to marked changes in the skills required for jobs in the future (Beitz 2015; Borland & Coelli 2017). In the past it was developments like the assembly line and advancements in machinery that reduced the demand for physical labour in manufacturing, agriculture and mining. The changes in service industries are predicted to be widespread across professions and regions, as computerisation (also referred to as robotics) has now enabled many services to be moved online and advanced software programs are now capable of knowledge processing. For example, the number and nature of jobs is expected to change in areas such as data entry, tellers, bookkeeping, accounting, legal services and programming services, right through to jobs such as umpiring, taxi drivers, university lecturers and economists (Frey & Osborne 2017; Wohl 2017).

The regional impacts of sectoral changes vary substantially, depending on the industrial structure of the regions. For example, the decline in manufacturing jobs has impacted most on locations near to major cities which have typically been characterised by a greater proportion of manufacturing jobs relative to other areas and are therefore most affected. The decline in jobs in agriculture and mining have a relatively greater effect on rural, remote and very remote areas. The following section uses Census data over a 10-year time period to analyse the impact of sectoral changes on jobs at the regional level.

4. Impact on regional labour markets

As seen above, the changes experienced by the Australian economy over the past three decades or so has clearly reduced jobs in some industries and increased jobs in others. Since some regions in Australia are characterised by a greater proportion of industries in which jobs are in decline, there is likely to be a disparate impact from business cycles, economic shocks, structural change and technological change. This section will first examine the population, employment and industrial structure of regions in Australia, and in particular, highlight changes over time. It will then examine the changes to employment by industry to determine which regions have been most affected and which are likely to continue to be most affected.

When examining labour markets at the regional level, there are many different methods that can be used to create spatial regions (for example, ABS 2001; Department of Health and Ageing 2001; Department of Employment and Workplace Relations 2006; Garnaut et.al. 2001; Productivity Commission 1999). Often, in practice, the choice of classification method depends on the purpose of the research and the availability of data. However, the general aim is to create groupings that have similar characteristics in terms of economic, geographic, social, cultural and possibly environmental amenity characteristics. This study uses the ABS Remoteness Structure (ABS 2018f) which has been widely used in regional analyses. It is based on the Department of Health and Ageing's ARIA Plus (ARIA+) system (1999; 2001), but with some adaptations such as increasing the relative size of the remote categories and changing the names of the categories. Unlike the majority of other (non-ARIA) classification systems, the ABS Remoteness Structure contains both 'remote' and 'very remote' classifications which is important as some remote and very remote localities are characterised by quite a different set of industrial, population, infrastructure and even cultural factors than non-remote areas. The ARIA+ system defines remoteness based on the physical road distance people travel to reach Service Centres (defined as Urban Centres with populations of 5000 or more), which are then categorised into four levels based on the level of services available (Department of Health and Ageing 2001). A population locality is given an ARIA+ score between 0 and 12, based on the shortest road distance between it and each of the four levels of Service Centres, with the higher the score, the greater the degree of remoteness. The ABS Remoteness Structure regions based on Australian Statistical Geography Standard (ASGS) statistical areas at level 1 (ABS 2018f), are:

- Major Cities: ARIA+ value ranges: 0 – 0.2
- Inner Regional: ARIA+ value ranges: >0.2 – 2.4
- Outer Regional: ARIA+ value ranges: >2.4 – 5.92
- Remote: ARIA+ value ranges: >5.92 – 10.53
- Very Remote: ARIA+ value ranges: >10.53

Table 1 provides an overview of population and employment by region, using data from the 2016 Census of Population and Housing (ABS 2018c). This shows that around 29 per cent of the population live outside major cities and around 27 per cent of employment is in regions outside major cities. As expected, remote and very remote regions contain a very small proportion of both the population and jobs, at around 2 per cent combined.

Table 1: Population and employment by region, 2016

<i>Region</i>	<i>Population</i>	<i>Per cent</i>	<i>Employment</i>	<i>Per cent</i>
Major Cities	16 634 082	71.3	7 449 815	73.1
Inner Regional	4 254 984	18.2	1 728 247	16.9
Outer Regional	1 992 712	8.5	823 075	8.1
Remote	282 895	1.2	123 055	1.2
Very Remote	186 331	0.8	70 231	0.7
Australia	23 351 004	100	10 195 053	100

Source: Australian Bureau of Statistics (2018c).

Table 2 shows employment by industry grouping and region based on Census data for 2016. The agricultural and mining sectors are clearly far more important in providing jobs in outer regional, remote and very remote regions than in inner regional areas and major cities. For example, while the agricultural and mining sectors directly employ only 0.6 per cent and 1.1 per cent of the labour force respectively in major cities, they employ 16.6 per cent and 10.9 per cent respectively in remote areas and 13.2 per cent and 16.6 per cent respectively in very remote areas. The percentage of employment in manufacturing is similar in major cities, inner regional and outer regional areas, although highest in inner regional areas, while far less in remote and very remote areas. Jobs in services comprise less than 70 per cent in remote and very remote areas, while reaching over 90 per cent of all jobs in major cities. These differences are significant and will lead to differing effects from sectoral changes on regions throughout Australia.

Table 2: Employment by industry and region, 2016, per cent

<i>Region</i>	<i>Agriculture</i>	<i>Mining</i>	<i>Manufacturing</i>	<i>Services</i>
Major Cities	0.6	1.1	6.7	91.7
Inner Regional	5.4	2.2	7.7	84.8
Outer Regional	12.2	3.8	6.0	78.0
Remote	16.6	10.9	3.0	69.5
Very Remote	13.2	16.6	2.0	68.2
Australia	2.6	1.7	6.7	89.0

Source: Australian Bureau of Statistics (2018c).

Table 3 shows the changes in regional population and employment between the 2006 and 2011 Census period and between the 2011 and 2016 Census period. The effect of the mining boom in Australia during this time is clearly evident, with national jobs growth of 10.8 per cent over the five-year period from 2006 to 2011, while jobs growth in very remote regions, where much direct mining activity is located, was almost three times that level, at 27 per cent. This represents the construction phase of many mines and reflects the huge increase in commodity prices discussed earlier. The impact on the population growth of very remote communities is also significant during the peak mining boom years. The reversal of both the population and employment growth rates is equally clear as captured by the rate of change between 2011 and 2016. Table 3 shows the falling population and jobs growth rates in remote and very remote areas, with the highest negative jobs growth rate, -12.4 per cent, experienced in remote areas, closely followed by very remote areas, at -10.6 per cent. The end of the mining boom had flow-on effects to the demand for services, however, as will be shown in Tables 4(a) and 4(b), the fall in employment was experienced by all sectors, indicating that numerous factors were at play, not just the downturn in mining.

Table 3: Regional population growth and employment growth by region, 2006-2011 and 2011-2016, percentage change

Region	2006 - 2011		2011 - 2016	
	Population	Employment	Population	Employment
Major Cities	10.5	13.0	10.9	6.2
Inner Regional	2.2	4.6	6.4	0.7
Outer Regional	5.0	6.2	1.5	-4.1
Remote	1.8	5.4	-5.7	-12.4
Very Remote	23.9	27.0	-2.1	-10.6
Australia	8.3	10.8	8.8	3.9

Source: Australian Bureau of Statistics (2013; 2018c).

Also important from Table 3 is that the rate of population growth in major cities increased between the 2006-2011 period and the 2011-2016 period, rising from 10.5 per cent to 10.9 per cent, while the rate of employment growth fell from 13 per cent to 6.2 per cent. The fall in the jobs growth rate is consistent with the below-trend economic growth rates that occurred between 2011 and 2016 in the aftermath of the 2007-08 GFC. Employment growth in major cities more than halved during this time, while for inner regional areas, jobs grew by only 0.7 per cent – a result not only from the GFC but also due to the decline in manufacturing.

Tables 4(a) and 4(b) show the percentage changes in employment by sector and region between the Census periods 2006-2011 and 2011-2016, which provide details of the significant structural change that occurred during these years. The rate of growth in employment provides a more useful means of assessing the state of the labour market in the regions than the unemployment rate since inter-regional

migration can lead to the appearance of low unemployment rates, thereby masking the true state of the labour market. In some remote and very remote regions there are also lower participation rates due to the high proportion of discouraged workers and the long-term issue of lower levels of involvement in the labour market by Indigenous Australians (Department of Prime Minister and Cabinet 2018; Hunter 2002; Altman & Daly 1992). In Tables 4(a) and 4(b) the mining and manufacturing sectors stand out. The fortune and then reversal of fortune in the mining sector in terms of employment is clear, with major jobs growth between 2006 and 2011 and the reversal of that jobs growth in non-metropolitan areas between 2011 and 2016. For example, in very remote areas, jobs growth in mining stood at 143.2 per cent between 2006 and 2011, before falling to a negative jobs growth rate, at -15.5 per cent, between 2011 and 2016. It should be remembered that while mining employs a very small proportion of the total labour force at the national level – below 2 per cent – in some regional areas it is far more significant, for example, close to 11 per cent and 17 per cent in remote and very remote areas in 2016 (see Table 2). Hence a fall in direct employment in mining is significant, together with the effects on indirect employment in these regions. However, as previously noted, employment in mining, although declining, remains higher than the pre-boom period (ABS 2018c).

Interestingly, while the mining sector in major cities employs only a little over 1 per cent of the labour force, there has been some growth in jobs, in part due to the technological change occurring in the mining sector due to the advancement of GPS, computer software and robotics. For example, jobs such as truck driving that were previously carried out by truck drivers on-site in remote and very remote areas have increasingly been transferred to major cities, where autonomous (driverless) mining trucks are operated. Similarly, the West Angelas iron ore mine in the Pilbara in Western Australia has all of its large production drills working autonomously and operated remotely (Gollschewski 2015). This type of technological change will continue, as in 2018 the largest iron-ore company in Western Australia, Rio Tinto, began installing 'AutoHaul' technology on all 200 of its trains that transport minerals to ports for shipping, operating the driverless trains remotely from offices in Perth, Western Australia (Rio Tinto 2018).

Table 4(a) Employment growth by industry and region, 2006 – 2011, per cent

<i>Region</i>	<i>Agriculture</i>	<i>Mining</i>	<i>Manufacturing</i>	<i>Services</i>
Major Cities	-3.7	85.2	-4.5	14.8
Inner Regional	-11.1	53.4	-7.9	6.6
Outer Regional	-13.6	43.3	-4.4	9.8
Remote	-12.2	28.4	-3.9	8.1
Very Remote	0.1	143.2	-0.9	19.9
Australia	-11.1	65.2	-5.2	12.9

Source: Australian Bureau of Statistics (2013).

Table 4(b) Employment growth by industry and region, 2011 – 2016, per cent

<i>Region</i>	<i>Agriculture</i>	<i>Mining</i>	<i>Manufacturing</i>	<i>Services</i>
Major Cities	44.3	8.5	-24.8	9.2
Inner Regional	8.4	3.5	-20.7	2.7
Outer Regional	0.3	-6.9	-25.5	-2.5
Remote	-11.7	-13.9	-33.4	-11.1
Very Remote	-8.1	-15.5	-51.1	-7.5
Australia	6.8	0.7	-24.3	6.9

Source: Australian Bureau of Statistics (2018c).

In terms of employment, the agricultural sector generally fared badly between both Census periods, with falls in employment in almost all regions between 2006 and 2011, and continual falls in jobs in agriculture between 2011 and 2016 in remote and very remote areas. This is consistent with the ABS survey data shown earlier in Figure 4, which illustrated a general downward trend. As with mining, agriculture is far more important in terms of direct and indirect employment in rural and remote areas than in metropolitan areas, so the continual decline in jobs in these areas has a far greater impact on rural communities. The flow-on effects can lead to the closure of some local services, with local community members needing to travel to larger centres for services. The apparent jobs growth in agriculture in major cities between 2011 and 2016, at over 40 per cent, should be treated with caution, since agriculture employs just 0.6 per cent of the workforce in major cities, and this is actually only an increase from around 0.4 per cent to 0.6 per cent between the 2011 and 2016 period. A similar story is also generally true for inner regional areas, with agriculture employing just 5 per cent of the total workforce in 2016.

The increase in the rate of job losses in the manufacturing sector is dramatic across all regions. Table 4(a) shows single-digit negative jobs growth across all regions between 2006 and 2011. As seen in Table 4(b), this accelerated between the 2011 and 2016 period, with all regions experiencing negative jobs growth ranging between around -20 per cent and -50 per cent in this sector. As the majority of manufacturing jobs are in major cities and inner and outer regional areas, (see Table 2), where the main factories and facilities tend to be located, these areas have borne the brunt of the rapid decline in manufacturing in Australia. The proportion of the labour force working in manufacturing in major cities fell from 9.4 per cent in 2011 to 6.2 per cent by 2016 – close to a reduction of 25 per cent, as shown in Table 4(b). The figures are very similar for inner regional and outer regional areas, where factories and processing plants are often located – it is clear that the reduction in manufacturing jobs has been extraordinary. While it appears the effect has also been large in remote and very remote areas, with falls in manufacturing jobs of over 33 per cent and 51 per cent respectively, it should be noted that in 2016 manufacturing employed only 3 per cent and 2 per cent of the total workforce respectively in these regions (ABS 2018c).

The service sector experienced strong growth in jobs in all regions between 2006 and 2011, although the rate of growth was slowing toward the end of this period as the after-effects of the GFC and the mining slowdown began to be felt (ABS 2018a). Major cities had a rate of jobs growth in services of almost 15 per cent over this time, with very remote regions measuring a growth rate of almost 20 per cent, fuelled by the flow-on demand for services from the mining boom. The 2011 to 2016 Census period was largely a time of below-trend economic growth nationally, which is reflected in the slower rates of jobs growth in services. However, major cities still recorded jobs growth in services, at 9.2 per cent. As seen earlier, the fall in jobs in major cities was experienced most by the manufacturing sector. While major cities still experienced jobs growth in services, most other regions had jobs losses in services during the 2011 and 2016 period, with the exception of inner regional areas, who recorded a meagre growth rate of 2.7 per cent. Outer-regional, remote and very remote regions all lost jobs in the service sector, consistent with the below-trend rate of economic growth, the slow-down in the mining sector, and at times due to severe droughts in rural areas. The overall falls in population in remote and very remote regions as shown previously in Table 3 – falls of almost 6 per cent and 2 per cent respectively – can lead to a continual downward spiral in the demand for services and more job losses in these regions.

5. Future risk of regional unemployment

The above analysis of sectoral changes in section 3 combined with the examination of Census data on employment changes by region and sector in section 4, reveals that remote and very remote regions are most at risk of unemployment and likely long-term unemployment from structural and technological change. The continual fall in employment in agriculture and manufacturing over the past 30 years, and mining in more recent years, has hit hard in remote and very remote regions, and impacts not only the number of jobs in these industries, but importantly, also support services in these regions. This is borne out by the negative jobs growth in service industries between 2011 and 2016 in outer regional, remote and very remote areas (Table 4(b)). The loss in jobs in these regions has accelerated over the 2011 to 2016 Census period.

By using ABS *Labour Force* data that estimate the duration of job search by ASGS more can be learned about the regional dimension of unemployment. ASGS statistical areas (SAs) are far from homogeneous in terms of industry structure, economic, geographic and other amenity characteristics, however, the data can still provide insight into broad areas most at risk of unemployment and long-term unemployment. A detailed analysis of ASGS SAs at level 4 by state and territory reveals that the majority of SAs with job search duration time above the state or territory average are not located within major cities (ABS 2018d). However, there are exceptions to this, with SAs located in major cities in Western Australia and South Australia, together with particular areas within Sydney, such as Sydney's City and Inner South, that have above average job search duration. Table 5 shows those SAs with the average duration of job search (in weeks) for 2017 that are substantially higher than the state or territory average. The second column in the table shows the average duration for the state or territory as a whole which allows for a better

comparison between the SAs and the state average. The area with the highest average duration of job search was Far West and Orana (NSW) – a remote area – where the average duration was more than three times the state average and the national average. Unsurprisingly, outback areas in South Australia, Western Australia and the Northern Territory all experienced higher than average job search time. An examination of data from previous years shows little variation from the 2017 data in which SAs are characterised by above-average duration of job search.

Table 5: Average duration of job search by state/territory and selected statistical area, 2017, (weeks)

	<i>State average (weeks)</i>					
<i>NSW</i>	55.1	Far West and Orana 167.9	Mid North Coast 141.4	Southern Highlands and Shoalhaven 85.7	Murray 79.5	Coffs Harbour – Grafton 69.6
<i>VIC</i>	48.9	Ballarat 111.2	Victoria – North West 89.8	La-Trobe – Gippsland 64.7	Warrnambool and South West 58.5	Bendigo 58.3
<i>QLD</i>	44.5	Wide Bay 70.6	Ipswich 64.8	Toowoomba 53.3	Moreton Bay South 52.6	Moreton Bay North 52.3
<i>SA</i>	52.1	Adelaide – South 68.6	Adelaide – North 61.6	South Australia – Outback 53.5	-	-
<i>WA</i>	36.2	Perth North-West 50.1	Mandurah 47.6	Perth South-West 46.1	Perth South-East 40.5	Western Australia – Outback 40.0
<i>TAS</i>	56.8	Launceston and North East 66.4	Tasmania – South East 64.5	-	-	-
<i>NT</i>	44.3	Northern Territory – Outback 57.0	-	-	-	-
<i>ACT</i>	31.7	na				
<i>AUST</i>	46.4	na				

Note: Empty cells indicate no other regions with job search duration above the state/territory average.
Source: Australian Bureau of Statistics (2018d).

There are a number of coastal areas with above-average job search duration, such as Mid North Coast in New South Wales, Wide Bay in Queensland and Mandurah in Western Australia. These areas are also characterised by higher than average unemployment rates in general and yet often also have higher rates of population growth. Studies indicate that outward migration from rural and remote areas to coastal areas can be due to lack of job opportunities and lack of amenity (push factors), while others move from major cities to coastal outer-metropolitan areas due to amenities and lower living costs (pull factors), (Garnett 2007; Lawson and Dwyer 2002; Rasheed 2000). There is also evidence that unemployed people leave rural and remote areas to live in coastal areas despite coastal areas having high or higher unemployment rates and lower jobs growth rates, which is indicative that some unemployed are likely to be moving to coastal areas due to other factors such as amenities, facilities and the availability of government services (Garnett 2007).

Inter-regional migration occurs to some extent following structural change and job losses, which, as discussed earlier, can mask the full impact of structural change on regional labour markets (Garnett 2007). Importantly, not everyone in remote and very remote regions can easily migrate when jobs become scarce. For example, people in the agricultural sector are sometimes less mobile due to their ownership or lease of stations and properties. Family and cultural links to rural communities and lifestyles also hinder inter-regional migration. Further, Indigenous Australians have a much higher unemployment rate than non-Indigenous Australians and have a higher concentration in remote and very remote regions (ABS 2018c; Hunter 2002; Altman & Daly 1992). They have also demonstrated a low propensity to migrate in search of employment relative to non-Indigenous labour (Taylor & Stanley 2005). There is also evidence that supports the claim that even if Indigenous labour were to migrate, this would not necessarily lead to better labour market outcomes or improved lifestyles (Biddle & Hunter 2006). Clearly there is a strong regional dimension to economic disadvantage such as unemployment and social exclusion, and from the recent data on structural and technological change and negative jobs growth presented here, this is likely to continue.

As discussed earlier, industrial composition is a major reason why employment growth varies between areas. Lawson & Dwyer (2002) and Rasheed (2000) found that the lack of a diversified industrial base in some rural and remote areas is a limiting factor for employment growth. These factors reflect the demand for labour, but there are also supply-side factors such as educational attainment, skills and work experience that characterise the supply of labour in regional and remote areas. As will be shown in the following section, recent data support the continued association between lower levels of educational attainment and the likelihood of long-term unemployment.

In addition to the above economic factors, social factors such as education levels, have an important impact on the likelihood of becoming unemployed (Birch & Marshall 2016; Savvas 2011). This too has an important regional dimension to it, as the following demonstrates. Not all jobs require higher education qualifications or vocational training, however the historic and current changes in manufacturing, mining and agriculture due to mechanisation, automation and robotics has reduced, and continues to reduce, the proportion of jobs requiring skilled manual labour and

semi-skilled and unskilled labour (Beitz 2015; Borland & Coelli 2017; Lewis 2015). Technology and new machinery have seen these industries evolve from labour-intensive industries typically characterised by hard and often dangerous jobs to industries that are highly-capital intensive, employing relatively few workers. With the rapid adoption of computerisation and software programs in the service sector, many jobs, particularly those requiring lower levels of education and training, are now becoming redundant. Much has been written in recent times about software replacing jobs in areas such as data entry, accounts clerks, telemarketers, bank-tellers, stock clerks, meter readers, and checkout operators (see, for example, Coelli 2015; Durrant-Whyte *et.al.* 2015; Frey & Osborne 2013). Software, computerisation and robotics are exceptional at doing the tasks that people often do poorly such as repetitive, monotonous tasks that require concentration for long periods of time. The new technologies are also not limited to jobs that require lower levels of skills and education, since software programs can now replace some work performed by accountants, auditors, book-keepers, legal secretaries, editors, tertiary educators and statisticians. These developments indicate that the nature and types of jobs will continue to change which means that one of the most important labour market issues revolves around education, reskilling and retraining.

When comparing education levels between regions, the highest year of school completion is a useful indicator (OECD 2015; Savvas, *et.al.* 2011). Data from the 2016 Census show that when looking at year 12 as the highest level of educational attainment, this remains much lower in outer-regional, remote and very remote areas than in major cities and outer-metropolitan areas. For example, in New South Wales in 2016, in major cities, 62 per cent of the applicable population had completed year 12 (ABS 2018c). (Note – ABS Censuses measure the applicable or relevant population here as those aged 15 years and over). This compares with 42 per cent for inner regional areas, 37 per cent for both outer regional and remote areas, and below 33 per cent for very remote areas (ABS 2018c). There is a clear significant disparity in year 12 completion levels between major cities and all other areas, with the greatest difference occurring between major cities and very remote areas, where completion rates are almost half that of major cities. The year 12 completion rates differ a little between states, however the consistent trend is that outer-regional, remote and very remote areas have much lower completion rates than major cities and are somewhat lower than inner-regional areas (ABS 2018c).

The following graphs in Figure 5 provide evidence of this by showing the correlation between the average duration of job search (in weeks) and the proportion of the population whose highest level of school completion was year 12. The data are Census data by ASGS statistical areas (SAs) at level 4. Three states are shown – New South Wales, Victoria and Queensland – since they have a sufficient number of observations (SAs) to allow for a trend to be reasonably determined. All other states and territories have only between two and nine SAs, although there is no reason to believe that the general trends would be different. Figures 5(a), 5(b) and 5(c) all show a very similar correlation whereby lower levels of educational attainment are associated with a higher average duration of job search. For example, looking at Figure 5(a), there is a large grouping of SAs where only between 40 per cent and 50 per cent of the

population have completed year 12 and whose job search time ranges from between 40 and 80 weeks. Moving rightwards along the figure, it is clear that, generally, the greater the proportion of the population who have completed year 12, the quicker they are able to obtain jobs, with job search time falling to between 20 and 60 weeks. There are two areas in Figure 5(a) in the top left quadrant with very low completion rates and very high job search time – Mid North Coast (coastal area north of Newcastle), where only around 35 per cent of the population have completed year 12 and it takes, on average, around 144 weeks to find a job, and Far West and Orana (remote and very remote regions) where 37 per cent of the population have completed year 12 and it takes an average of 168 weeks to find a job. Areas with high rates of completion of year 12 and low job search time are in Sydney and include North Sydney and Hornsby, Northern Beaches and Ryde.

In Victoria, as shown in Figure 5(b), there are only two areas that are clear outliers, with very low year 12 completion rates and very high jobs search time – Ballarat (largely inner regional) and North West (outer regional and remote regions). In Queensland, Figure 5(c), the average time for job search among those areas with the lowest levels of educational attainment is, interestingly, generally lower than for both New South Wales and Victoria, while the job search time for those with higher levels of education is consistent with other states.

Figure 5(a) Average duration of job search and proportion of the population who completed year 12, New South Wales, 2016

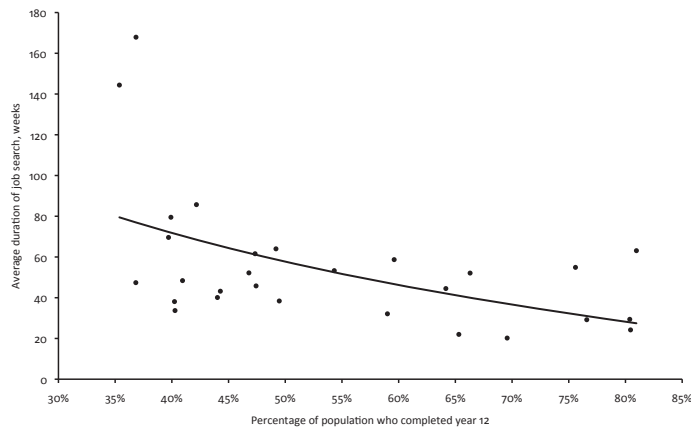


Figure 5(b) Average duration of job search and proportion of the population who completed year 12, Victoria, 2016

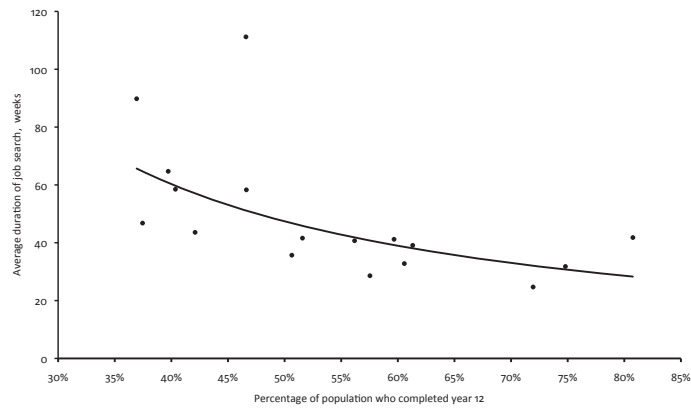
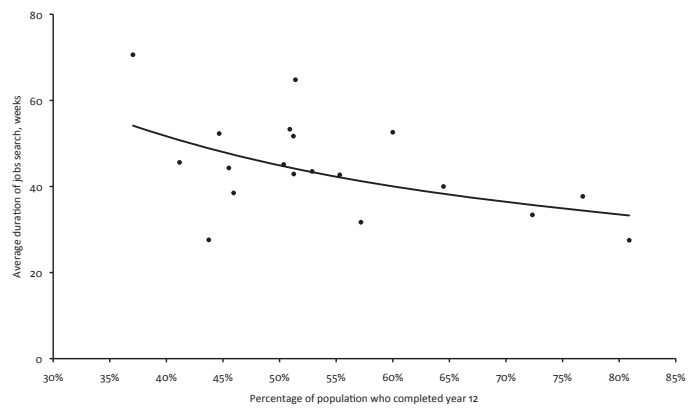


Figure 5(c) Average duration of job search and proportion of the population who completed year 12, Queensland, 2016



Note: Population refers to those aged 15 years and over.
Source: Australian Bureau of Statistics (2018c; 2018d).

Since lower levels of educational attainment are likely to affect employment and long-term unemployment levels, the recent data above show that this will continue to be a problem. Addressing this issue is particularly challenging in remote and very remote areas due to the lack of availability of, and distance to, educational institutions, particularly for upper high school and beyond. The availability and cost of transport, the expense and emotional impact of living away from home, and in some cases, seasonal commitments to family farms are additional complicating factors that can reduce the level of education completed in these areas (Mageean 1993; Scott 1993; Garnett 2007). In addition, the levels of formal education among Indigenous Australians remain lower than non-Indigenous Australians, which contributes to the metropolitan/rural-remote educational gap and to the employment gap (Birch & Marshall 2016; Kalb *et.al.* 2011). The most recent *Closing the Gap* report indicates that this gap has been closing – falling by 12.6 per cent between 2006 and 2016 among 20-24 year olds – with the goal to halve the gap of year 12 completion on track to be reached by 2020 (Department of Prime Minister and Cabinet 2018). However, unfortunately the difference in year 12 completion rates is still substantial, with a 24 percentage point gap between non-Indigenous and Indigenous Australians in 2016. This exacerbates the already large employment gap between non-Indigenous and Indigenous Australians, which has been found to be substantially worse in the remote areas in Australia (Gray *et. al.* 2014).

6. Conclusion

Significant structural change and technological change has occurred in Australia over a relatively short time period. Structural change is not a new phenomenon, with the movement away from jobs in primary industries into tertiary industries characterising the structural change over time of most developed economies. Also, wide-spread technological change involving mechanisation and automation has continued to occur and affect jobs in employment in the agriculture, manufacturing and mining sectors. The effects of technological change have spread further, from the more manual jobs, into ‘white-collar’ service sector jobs with computerisation and software developments making some jobs in services redundant while changing the skills required in other jobs. However, while the characteristics of many jobs have changed, jobs have continued to grow in the service sector, while data from the 2006-2011 and 2011-2016 Census periods show that all other sectors have seen jobs fall, particularly in outer regional, remote and very remote areas.

The huge decline in manufacturing jobs has not only been due to technological development, but also due to the progressive opening up of the economy to international trade which has exposed inefficient industries. As demonstrated here, the decline in jobs in manufacturing has been felt in all regions, but more-so in inner- and outer-regional areas and major cities, since the proportion of jobs in manufacturing has comprised a significantly higher proportion of the labour force than in remote and very remote regions. Some people will retrain and move into the service sector, with government adjustment packages assisting with the transition. However some people may never retrain and are likely to become long-term unemployed, or exit the labour market.

Remote and very remote regions have seen falls in jobs in all sectors since 2011, including services, and jobs falling in agriculture since the 1980s. The picture has not been much better for outer-regional areas. The negative jobs growth in agriculture and mining is likely to have a particularly large impact on rural, remote and very remote communities, where jobs in these sectors make up a much greater proportion of the labour market relative to inner-regional areas and major cities. This fall in jobs is likely to lead to an increase in long-term unemployment in these regions since, on average, there are no growth sectors for labour to move into. Further, as discussed earlier, some labour is not mobile and is less able seek employment in other regions.

Educational attainment is a strong predictor of employment, and as has been shown here, lower levels of education attainment is strongly associated with regions having a longer duration of job search and therefore long-term unemployment. Since completing high school to year 12, and indeed gaining other forms of training, is more difficult in rural and remote regions, many of whom are already characterised by economic and social disadvantage, this will further hinder the ability of labour in these regions to adapt to the structural and technological change that is occurring. There are clearly policy implications, not just due to the impact of unemployment and long-term unemployment on macroeconomic efficiency, but to address the regional dimension of current and likely future entrenched unemployment. As has long been the case, relevant education and training will be crucial for all regions to meet the changes in skills and training due to structural and technological change. This appears to be even more urgent in remote and very remote regions, which are characterised by lower levels of education and have been experiencing falls in jobs growth across all sectors.

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