

ECONOMIC RESTRUCTURING AND THE POLARISATION OF THE WORKFORCE: A REGIONAL PERSPECTIVE

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ABSTRACT: Closely associated with rising non-standard forms of work, under-employment and a lack of opportunity for young and new labour market entrants, workforce polarisation is an increasingly pervasive feature of economically restructuring regions. Recent scholarship regarding the causes of workforce polarisation has diverged, particularly since the global financial crisis (GFC). While most explanations for job polarisation rest with technological advancements, growing interregional economic divergence within nations suggests that the extent of job polarisation is pre-determined by historical socio-economic and industry structures. Other perspectives include the rise of the services sector and changes to the social organisation of care. Efforts to understand and project changes to the occupational distribution need a localised, regional lens. This article presents the evidence and discusses the implications of heightened job polarisation for Tasmania, Australia, pre and post GFC. Marked within skill level and occupation group changes, including increased spare capacity within the workforce, present considerable challenges for policy-makers.

KEY WORDS: Job polarisation; economic restructuring; technological change; globalisation; regional divergence.

1. INTRODUCTION

Polarisation of the workforce is an increasingly pervasive feature of advanced economies (Fernández-Macías, 2012; Goos *et al.*, 2014; McIntosh, 2013; Montresor, 2018; Salvatori, 2015). It is defined as a pattern of change within the labour market whereby the share of employment in high skill jobs and low skill jobs increases relative to the share of employment in middle (intermediate) skill jobs over time. Research into the causes and implications of job polarisation is gaining prominence, particularly in the UK, Europe and the US (Autor *et al.*, 2006; Cirillo, 2018; Goos *et al.*, 2009; Fernández-Macías, 2012; Montresor, 2018; Murphy and Oesch, 2018; Oesch and Rodríguez Menés, 2010; Salvatori, 2015). Critically, the emergence of polarisation in the labour market is in contrast to the historical trend of linear upskilling, or

professionalisation, of the populations of advanced economies (Maselli, 2012).

Scholarship on divergence in the experience of job polarisation at a sub-national level is only recently emerging alongside Storper's (2018) evidence that interregional economic divergence within nations is greater in many developed nations than it has been for decades. Increasing evidence suggests that the extent of job polarisation is pre-determined by the industry structure of a region and the share of routine intensive industries such as manufacturing (Autor and Dorn, 2013; Barany and Siegal, 2015; Cirillo, 2018; Consoli and Sánchez-Barrioluengo, 2019; Montresor, 2018; Rubæk Holm and Richter Østergaard, 2018). While substantial differences in the experience of polarisation by jurisdictions suggest there is no single factor to explain the diversity, that de-industrialisation and job polarisation are related in the process of regional diversification (Rubæk Holm and Richter Østergaard, 2018), future job polarisation may be predictable. As such, efforts to understand changes to the labour market and occupational distribution need a localised, regional lens.

Polarisation of the workforce is concerning for several reasons. Primarily, job polarisation threatens productivity improvement, social mobility and inclusive growth, providing income redistribution challenges for governments. These issues are evident in the increase in non-standard forms of work, differences in hours of work between skill levels, increasing levels of under-employment, impact on the quality of work, reduced opportunities for young graduates to enter the labour force, increasing levels of over-qualification, increasing job insecurity, limited opportunities for upward progression and career development from lower-skill level jobs, low wage growth, widening inequality, impact on retirement savings and overall health and well-being (Peat, 2016; Gallie, 2017; Greve, 2017).

This research identifies the existence of workforce polarisation in Tasmania, Australia, by analysing the change in the number and share of jobs by skill level over time using Australian Bureau of Statistics (ABS) Census of Population and Housing data for 2006 (pre GFC) and 2016 (post GFC), similar economic periods in Tasmania. To examine the existence of over- or under-qualification, analysis of job polarisation is extended to include the highest level of educational attainment of workers as an indication of workers skills to identify whether the relationship between the supply of skills (educational attainment) and demand for skills (occupations) has an impact on the composition of the workforce, noting that educational attainment is not the only proxy for skill (Quintini, 2011a).

The structure of the article is as follows. First, an overview of the evolution of job polarisation and its various causes. To provide a regional context and incorporate divergence within a nation, the article then outlines a number of Australian studies of labour market change before introducing the methodological approach. The findings are then presented and discussed. The article concludes by explaining that job polarisation has both heightened in Tasmania since the GFC and that the characteristics within skill and occupational groups have also changed, reflecting industry diversification rather than professionalisation, resulting in considerable economic and social implications for policy makers.

2. EXPLAINING JOB POLARISATION

Economic restructuring affects the level and distribution of the skills of the working population. As early as the 1950s, the expansion of the higher education sector, changing composition of the workforce and the transition from manufacturing-based industry sectors to service oriented ones initiated the shift towards professionalisation of the workforce (Hamnett, 1996; McIntosh, 2013; Montresor, 2015). This shift resulted in a decline in demand for, and share of, intermediate skilled jobs. That is, an increasing share of the population with higher education qualifications contributed to the initial, substantial reallocation of employment from intermediate-skilled jobs to higher-skilled jobs, referred to as professionalisation. Based on the emergence of a knowledge intensive economic framework, the upskilling of the population was expected to lead to improving productivity, increasing competitiveness and demand for higher level skills, ultimately expanding employment opportunities, the availability of work and social cohesion (Gallie, 2017). However, this century the professionalisation of the workforce has shifted further to that of polarisation whereby the composition of the workforce shifts to an increase in the share of employment in both high and low skilled occupations offset by a decrease in the share of intermediate skilled occupations (Coelli and Borland, 2016; Goos and Manning, 2007). These changes are not necessarily equal in the redistribution of high and low skill jobs (Coelli and Borland, 2016), nor is the experience consistent across or within jurisdictions (Autor, 2015; Goos *et al.*, 2014; Montresor, 2018; Cirillo, 2018).

While most explanations as to the cause of job polarisation rest with either technological change or changes within the labour market institutional framework (Autor *et al.*, 2006; Goos and Manning, 2007; Goos *et al.*, 2009; Goos *et al.*, 2014; Holmes and Mayhew, 2010a), more

recent scholarship refutes these findings and suggests alternate causes (Barany and Siegal, 2015; Montresor, 2018; Rubæk Holm and Richter Østergaard, 2018). Fernández-Macías (2012) argues that the focus on technology as the determinant of structural change in employment leads to a narrow explanation of change over time. Cirillo (2018) found no single pattern of change in the employment structure across Europe and concluded that the emergence of polarised workforces is underpinned by sectoral and technological heterogeneity. Another perspective is that of the rise of the services sector (Gallie, 2017; Autor and Dorn, 2013) and, more specifically, the care economy resulting from changes to the social organisation of care (Dwyer, 2013), particularly in regions experiencing population ageing. Further, the historical industry structure of a region, the share of traditional industries and the process of economic diversification is increasingly associated with the extent of job polarisation (Autor and Dorn, 2013; Barany and Siegal, 2015; Rubæk Holm and Richter Østergaard, 2018). That said, advancements in technology are considered largely responsible for the restructuring of the employment market. This extends to globalisation and the pressures to improve productivity, increase competitiveness and the resultant ‘offshoring’. However, changes in household consumption and consumer preferences, the age structure of the respective populations, the level and type of immigration and the type of welfare state are also influencing factors (Baum, 1997; Goos and Manning, 2007; Hamnett, 1996; Murphy and Oesch, 2018; Oesch and Rodríguez Menés, 2010).

Since the Global Financial Crisis (GFC), a further defining characteristic of workforce polarisation is an increase in the share of lower skilled jobs, particularly in the services sector. More recently, as polarisation accelerated, an additional key feature of the composition of job polarisation is the increasing proportion of higher educated persons employed in lower-skilled jobs and a shift toward less than full-time employment, resulting in scenarios of over-qualification (Gallie, 2017; Goos *et al.*, 2014; Goos and Manning, 2007; Greve, 2017). Montresor (2018) suggests that this results from a decline in routinisation and increasing job competition due to rapid educational catch-up and, thus, an increasing supply of graduates. Together, these indicate an over-supply and/or lack of demand for higher educated workers (Autor, 2015; Greve, 2017; Salvatori, 2015). This is consistent with the declining trend of the relative supply of lower-skilled persons, even though overall employment growth is largely driven by high-skill occupations.

Technology can either substitute (replace) or complement workers based on the level of routinisation of an occupation and the cognitive requirements of the work (Autor, 2015; Goos *et al.*, 2014; Peng *et al.*, 2018). Where jobs, regardless of industry sector, have high levels of routine, repeatable and predictable processes requiring precision; automation or artificial intelligence (AI) has, and will, replace these jobs (referred to as routine-biased technological change (RBTC)). These jobs tend to fall in the intermediate-skill occupations requiring vocational qualifications. Technology complements jobs which require cognitive, yet non-routine, input. In these jobs, again regardless of industry sector, technology amplifies the human comparative advantages of problem-solving, creativity, adaptability, flexibility, physical dexterity, and interpersonal and communication skills, increasing the productivity of workers (referred to as skill-biased technological change (SBTC)). Growth in these non-routine, cognitive jobs may also increase the demand for higher educated workers, both within and across industry sectors (Autor, 2015).

Low skilled jobs are the least affected by technological advancements as they are generally non-routine and difficult to automate (Autor and Dorn, 2013; McIntosh, 2013; Peng *et al.*, 2018). These jobs usually require a response to a non-routine task more efficiently and effectively provided by human input and are less predictable. They usually rely on direct physical proximity and interpersonal skills. Lower skill jobs, particularly those in the services sector, tend to be non-storable nor tradeable and therefore suppliers and users of services must co-locate (Autor and Dorn, 2013). That is, these jobs are not ‘off-shoreable’ (yet). Increasingly, displaced intermediate-skilled and qualified workers are reallocating to lower skilled jobs.

It is growth in these non-routine jobs not substitutable by automation or artificial intelligence, which exist at opposite ends of the skill spectrum, associated with the polarisation of the workforce.

Job Polarisation in Australia

Storper (2018) argues that the magnitude of economic divergence between regions and the contribution of different causes vary according to the national context. For this reason, an overview of the Australian perspective is provided within the methods section. At the time of writing, no studies of job polarisation at a regional level in Australia had been identified.

In Australia there are a few disparate investigations into the changing composition of the labour market (see for example Baum (1997); Coelli and Borland (2016); Cully (1999); Esposto (2011); Healy (2016); Wilkins and Wooden (2014); Wooden (2000)). Each reports conflicting outcomes, largely explained by differing methodologies and periods of analysis. Most empirical approaches to identifying compositional change in the occupational distribution of the labour market use the aggregate number employed which Wooden (2000) suggests is misleading given the approach fails to account for those employed less than full-time and that the hours employed vary substantially across occupations. He suggests that recorded levels of employment are not a true indication of labour demand. In his analysis, Wooden (2000) concluded that workforce polarisation and the growth in the share of low skilled occupations was the result of an increase in the share of part-time and casualised jobs.

The most comprehensive analysis of changes in the composition of the Australian labour market was undertaken by Esposto (2011). Esposto (2011) investigated the presence of upskilling, down-skilling and polarisation of the workforce using both the number employed and hours of work by occupation groups and skill level as well as by the type of employment (full-time, part-time, permanent, casual) for both men and women. Incorporating the methodologies of Cully (1999) and Wooden (2000), Esposto (2011) concluded that the patterns of upskilling are mixed dependent on the combination of job type, terms of employment, hours worked and sex. Despite not actually analysing workers' skills nor educational attainment, only the occupations workers were employed in, Esposto (2011) further concluded that workers who do not possess high level skills will experience increasing levels of uncertainty in the labour market.

3. METHODS AND DATA

Consensus on the conceptualisation and measurement of job polarisation is yet to be reached given both the dearth of good data over time and methodological constraints as well as localised context (Autor, 2015; Coelli and Borland, 2016; Gallie, 2017). Initial scholarship of job polarisation used wages as a proxy for skill. However, the lack of polarisation in wages didn't reflect the changing labour market structure and indicated alternative approaches to identifying job polarisation were required (McIntosh, 2013; Salvatori, 2015). More recent investigations have used occupational classification systems, skill levels, educational

attainment, hours of work or labour force status by occupation. The greatest critique of these approaches is that the results are difficult to compare in different economic climates (Wooden, 2000). Given that economic disparities also exist within a nation (Storper, 2018), a regional perspective is undertaken using Tasmania, Australia, as a case study.

Using a cluster approach to polarisation rather than inequality measures (Esteban and Ray, 1994; Fernández-Macías, 2012), the unit of analysis for this research is shifted to jobs—labour demand—rather than the individual (labour supply). Esteban and Ray (1994) argue that polarisation and inequality measures have one fundamental difference; the use of population frequencies; “by effectively neglecting the population frequency in each category, inequality measurement [distribution] departs from the study of differentiation” (p.821). Further, rather than using occupation clusters, this approach groups jobs according to their skill level so that there is a high level of homogeneity within the skill group and a high degree of heterogeneity across groups (Esteban and Ray, 1994), not necessarily possible with occupation clusters.

For this research, ABS Census of Population and Housing (Census) data for 2006 and 2016 is analysed to explore the relationship between Tasmanians and the labour market and how this has changed over the ten-year period. The economic climate in Tasmania in 2006 was similar to that in 2016 with the state economy growing steadily from a relatively weak base. The detailed analysis of Census data across this 10-year period therefore provides an appropriate basis to examine the structural changes in nature of work for all Tasmanians prior to the GFC and post GFC.

The research uses the occupational classification systems approach which allocates jobs into a hierarchy according to skill level (highest level of educational attainment) and skill specialisation (areas of expertise or field of study). The focus of this research is on skill level only. In Australia, the Australia New Zealand Standard Classification of Occupations (ANZSCO) identifies the level of skill that is typically required to perform the tasks of a particular occupation and provides an indication of the minimum level of education and/or experience required by an individual to perform the tasks. The skill levels are ranked from one (highest) to five (lowest) (Table 1).

At the aggregated level, the hierarchy is not strictly reflective of the level of skill (educational attainment) required for a job. Within each occupational grouping, a number of skill levels exist, representing both the skill specialisation of the grouping and the required educational qualification. For this research, employment is therefore disaggregated by occupation to the ANZSCO 4-digit level which provides the required skill

level to undertake the job, and the corresponding workers' highest level of educational attainment by Australian Standard Classification of Education (ASCED) 3-digit level. Workers with a Certificate III are assumed to have 2 years' experience and therefore appropriately qualified for Skill Level 3 occupations.

Using a population level analysis approach the findings describe the evolution of the employment structure over the decade and the relative change in occupation and skill level demand to identify the existence of workforce polarisation. Within occupation and skill groups, changes are also explored for the entire workforce rather than separating those employed by terms of employment and/or sex as per Esposto (2011) to identify structural changes within the labour force.

Polarisation of the workforce is further analysed by change in the share of full-time and part-time employment to identify potential under-employment and spare capacity in the labour force. Analysis is extended to whether the workers educational attainment matches the skill level requirement of the job they are employed in; the existence of over- or under-qualification.

4. FINDINGS

In 2006, both Tasmania's and Australia's workforces were polarised, hollowed out in the middle skill occupations, yet skewed slightly to the higher skilled occupations, albeit, Tasmania's workforce was less professionalised than the Australian workforce (26.2 per cent compared with 29.3 per cent) and nearly half the occupational distribution was to skill level 4 or 5 jobs (46.7 per cent). By 2016, both workforces had professionalised further with an increasing proportion of the occupational distribution made up of skill level 1 jobs, 27.4 per cent for Tasmania and 31.6 per cent for Australia (Figure 1).

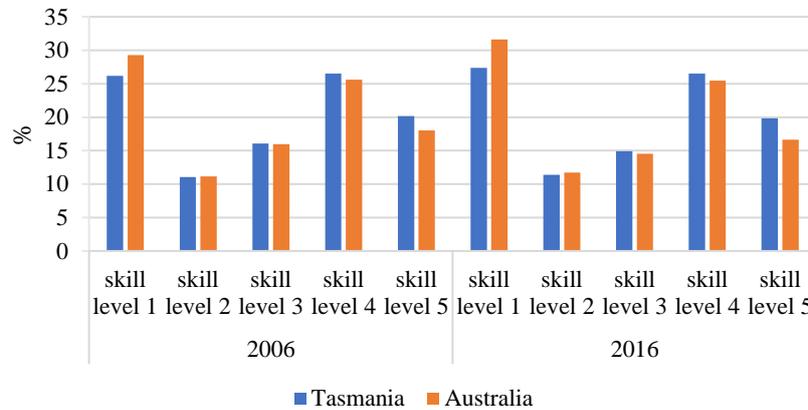


Figure 1. Occupational Distribution, by Skill Level, Tasmania and Australia, 2006 and 2016. Sources: ABS Census of Population and Housing (2006); (2016); author calculations.

However, the Australian workforce professionalised at a greater rate than Tasmania's; the share of skill level 1 jobs increasing by 2.4 percentage points compared with 1.2 percentage points. Australia's larger increase in share of skill level 1 jobs saw a corresponding decrease in the share of both skill level 3 and 5 jobs whereas Tasmania's gain in skill level 1 jobs was offset by a decline in skill level 3 jobs only, hollowing out the workforce structure further, supporting Storper's thesis of growing interregional economic divergence.

Over the ten-year period to 2016, Tasmania's workforce polarised further with a reduction in both the number and share of skill level 3 jobs. However, the polarisation was asymmetrical, showing a slightly greater increase in the professionalisation of the workforce. The greatest increase in both relative and absolute terms was experienced by increases in the number of skill level 1 occupations (10.3 per cent increase) and skill level 2 occupations (9.1 per cent increase). This is compared with a 5.4 per cent and 3.8 per cent increase in skill level 4 and 5 jobs respectively, effectively closing the gap between the proportion of higher and lower skill occupations by two percentage points. Intermediate skill jobs (level 3) experienced both a relative decline in the share of employment (-1.2 percentage points) and absolute decline (2.1 per cent) in the number of jobs (Figure 2).

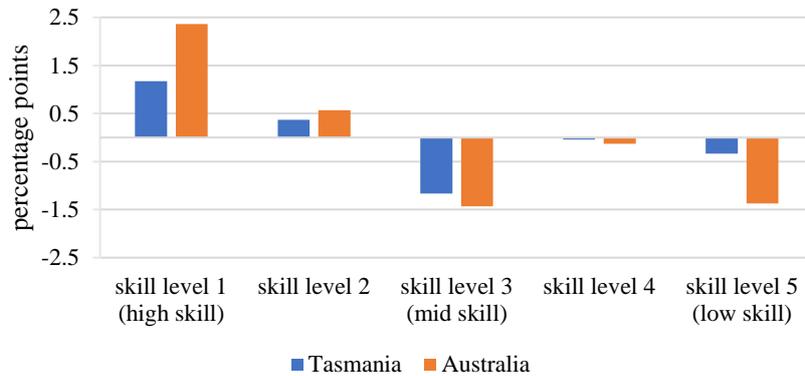


Figure 2. Change in Share of Occupations, Skill Level, 2006 to 2016, Tasmania and Australia. Sources: ABS Census of Population and Housing (2006); (2016); author calculations.

By 2016, the share of the workforce employed in skill level 1 and skill level 2 occupations increased by 1.2 and 0.4 percentage points respectively, offsetting the decline in skill level 3 and skill level 5 occupations; -1.2 and -0.3 percentage points respectively. The share employed in skill level 4 jobs was stable (Figure 3).

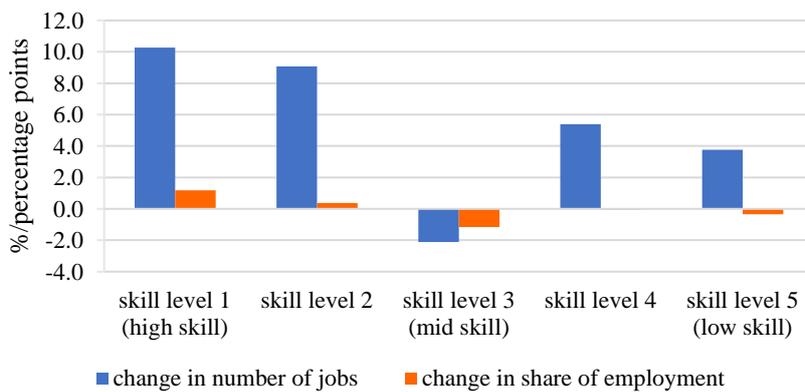


Figure 3. Change in the Workforce by Occupational Skill Level, Number and Share, Tasmania, 2006 to 2016. Sources: ABS Census of Population and Housing (2006); (2016); author calculations.

Over the same period from 2006 to 2016, the workforce experienced considerable upskilling, improving the potential for the professionalisation of the workforce and restructuring to a knowledge-based, more productive economy. The proportion of the workforce with their highest level of educational attainment equivalent to that required for skill level 1 occupations—bachelor degree or higher qualifications—increased from 18.6 per cent in 2006 to 24.0 per cent in 2016, providing evidence of educational catch-up; as suggested by Montresor (2018). The proportion of the workforce with the highest level of educational attainment equivalent to that required for skill level 5 occupations – certificate I or secondary schooling - declined considerably from nearly half of the workforce (49.6 per cent) to 39.1 per cent. The proportion of the workforce with certificate IV or III qualifications equivalent to the educational requirement for skill level 3 occupations increased by 3.3 percentage points to over a quarter of the workforce (25.5 per cent), despite both the relative and absolute decline in demand for skill level 3 occupations (Figure 4).

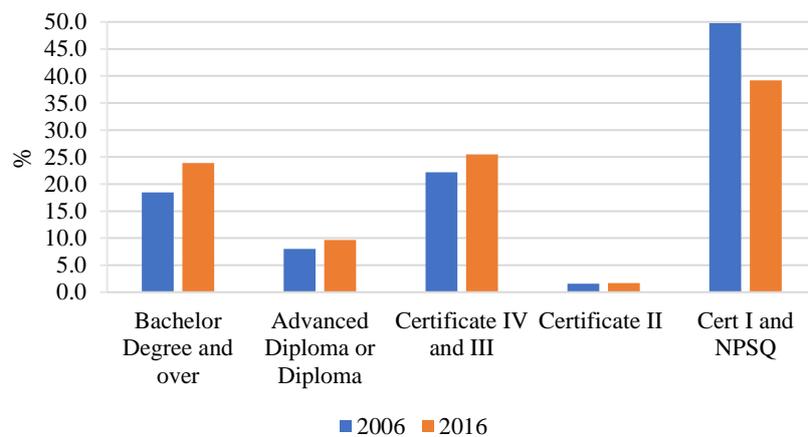


Figure 4. Highest Level of Educational Attainment of the Workforce, Tasmania, 2006 and 2016. Sources: ABS Census of Population and Housing (2006); (2016); author calculations.

The disparity in the change of supply of skills and demand for skills from 2006 to 2016 is evident in Figure 5. While the share of the workforce with bachelor's degree or higher qualifications (required for skill level 1 occupations) increased by 5.4 percentage points (skill supply), the share of skill level 1 jobs only increased by 1.2 percentage points (skill demand).

Similarly, for skill level 2 and skill level 3 jobs, the proportion of the workforce with equivalent qualifications increased by a greater rate than the share of jobs. That is, supply was greater than demand.

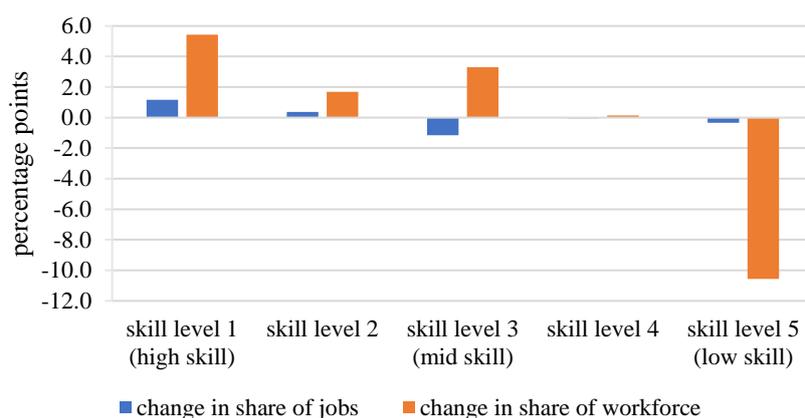


Figure 5. Change in the Share of Jobs and Workforce, by Skill Level, Tasmania, 2006 to 2016. Sources: ABS Census of Population and Housing (2006); (2016); author calculations.

While there has been an upskilling of the workforce, considerable levels of over-qualification and under-qualification are also evident. This does not necessarily mean there is a skill mismatch however, as over/under-qualification measures can hide skill heterogeneity or tacit knowledge and skills acquired through experience and on-the-job training (Quintini, 2011b), particularly in an ageing workforce, such as Tasmania’s (Author A).

Table 1 shows the proportion of workers in occupation skill levels by their educational attainment. The highlighted cells show the proportionate correct match of qualification level to occupation skill level. The cells to the left of the highlighted cell indicate the proportion which was over-qualified and the cells to the right show the proportion which was under-qualified. In 2016, three in five (63.0 per cent) workers employed in skill level 1 occupations were appropriately qualified for the job and held a bachelor’s degree or higher qualification, 14.4 per cent held either a certificate I or did not have a post-school qualification, indicating a high level of under-qualification. The majority of workers employed in skill level 2 jobs were under-qualified (58.4 per cent). Nearly half (47.3 per

cent) of workers in skill level 4 occupations held a certificate IV or III or higher, that is, they were over-qualified, providing evidence of crowding out of lower skilled workers resulting from polarisation. In addition, 4.9 per cent of workers in skill level 5 occupations held a bachelor's degree or higher qualification where no post school qualifications were required for the job they were employed in.

Table 1. Highest Level of Educational Attainment by Occupation Skill Level, Proportion, Tasmania, 2016.

		Education				
		Bachelor Degree and higher	Advanced Diploma or Diploma	Certificate IV and III	Certificate II	Certificate I and NPSQ
Occupation	Skill level 1	63.0	11.4	11.2	0.4	14.0
	Skill level 2	21.6	20.1	23.8	1.5	33.1
	Skill level 3	5.1	6.6	59.2	1.4	27.7
	Skill level 4	9.1	9.7	28.5	2.3	50.4
	skill level 5	4.9	3.8	15.8	3.2	72.3
	Total	24.0	9.7	25.5	1.7	39.1

Source: ABS Census of Population and Housing (2016).

Not only has there been a considerable shift in the share of the workforce across skill levels, there has been a substantial change in the share of labour force attachment within skill levels. The share of the workforce employed full-time dropped from 64.6 per cent in 2006 to 59.8 per cent in 2016 so that in 2016 two in five (40.2 per cent) of the workforce were employed part-time. For all skill levels, the share of the workforce employed full-time declined. The greatest change was experienced in the skill level 4 workforce, dropping 5.9 percentage points to 54.0 per cent followed by skill level 5 (5.6 percentage points less to 36.5 per cent) and the skill level 2 workforce (5.3 percentage points less to 71.5 per cent).

In terms of the share of the total workforce, all skill levels experienced a reduced share of full-time employees, with a marked shift to an increased share of part-time employees, particularly for the skill level 1 (1.4 percentage point increase) and skill level 2 (0.7 percentage point increase) workforces. Therefore, the professionalisation of the Tasmanian workforce

shown in Figure 6 has been in part-time employment. This may, or may not, be by choice.

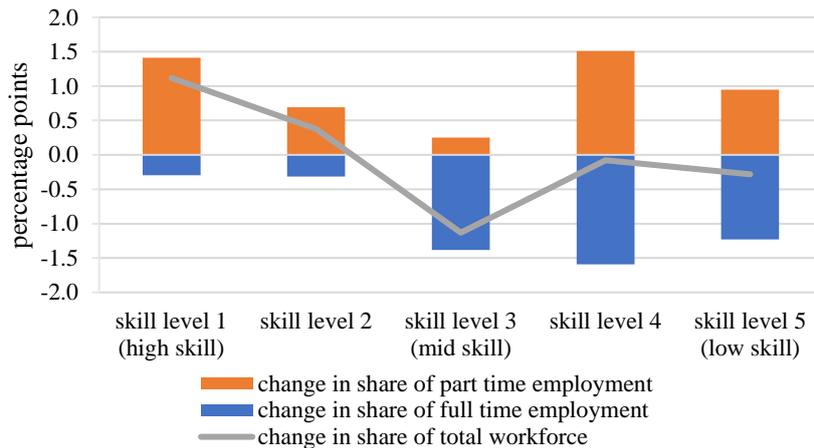


Figure 6. Change in Share of Employment by Labour Force Status, 2006 to 2016. Sources: ABS Census of Population and Housing (2006); (2016); author calculations.

When considered by occupation, the Tasmanian labour market has changed substantially since 2006 (Figure 7). Workers in professional occupations made up the largest share of the total workforce in both 2006 (17.6 per cent) and 2016 (19.0 per cent) followed by technicians and trade workers, and clerical and administrative workers. While these three occupational groups remained the top three in 2016, only professionals increased both the number and share of their workforce while the clerical and administrative workers reduced both the number and share of their workforce.

In the decade there was a large increase in both the number of community and personal service worker jobs (30.8 per cent) and as a share of the total workforce (2.4 percentage points), reflecting job creation in the services sector largely resulting from changes in the social organisation of care, including child and disability care, as well as an ageing population. The only other occupational category to experience both an increase in number of jobs and share of the workforce was professionals (13.6 per cent and 1.2 percentage points respectively), largely health professionals such as registered nurses and medical practitioners, again reflecting increasing demand for health services within the population. While the number of

managers, technicians and trade workers, and sales workers increased over the decade, their respective share of the total workforce decreased. In addition to clerical and administrative workers, the number of jobs and the share of the machinery operators and drivers and labourers' workforces also declined between 2006 and 2016.

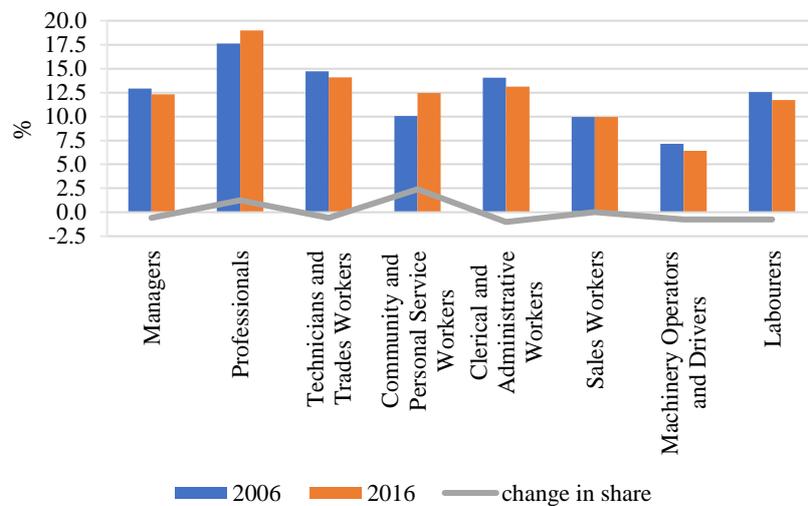


Figure 7. Employment Change by Occupation, 2006 to 2016. Sources: ABS Census of Population and Housing (2006); (2016); author calculations.

For all occupational categories, only the community and personal services workers increased their share of both full-time and part-time employment (0.4 percentage points and 2.0 percentage points of the total workforce respectively). Professionals employed full-time reduced their share of the workforce by 0.1 of a percentage point which was offset by a 1.3 percentage point increase for professionals employed part-time. While managers, technicians and trade workers, sales workers, machinery operators and drivers and labourers increased their respective share of the workforce employed part-time, the total share was offset by larger declines in the share employed full-time. Clerical and administrative workers experienced a decline in both the share of full-time and part-time workers (Figure 8).

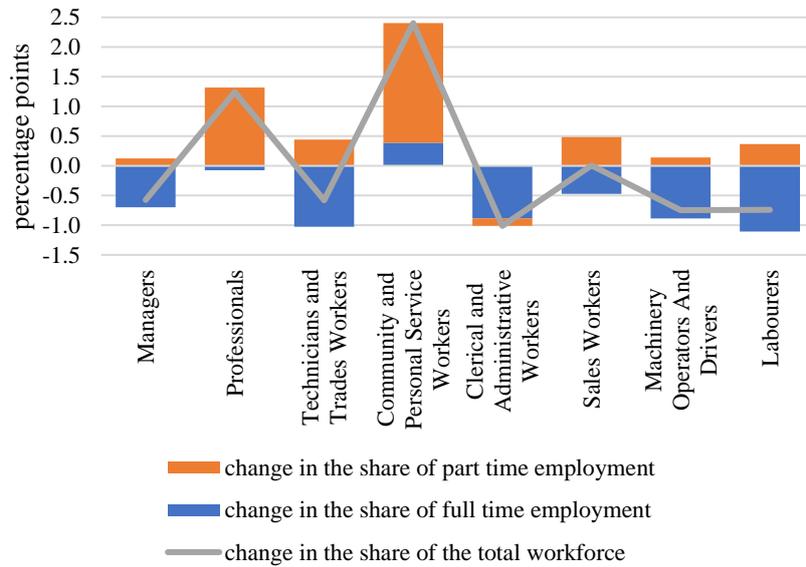


Figure 8. Change in Share of Employment by Labour Force Status, 2006 to 2016. Sources: ABS Census of Population and Housing (2006); (2016); author calculations.

5. DISCUSSION

Polarisation affects not only individuals but the broader economy as well. The number of jobs at each skill level is determined by the interaction between demand and supply (McIntosh, 2013) and, as evidenced in this research, employment growth in the low skill occupations has occurred in spite of the substantial increase in educational attainment. Polarisation presents considerable implications in inequality and opportunities for labour market mobility, particularly for young people (Holmes and Mayhew, 2015; Peat, 2016; Keep and Mayhew, 2010). Not only are the number and share of entry level jobs reducing, the opportunity for low to mid-qualified individuals to enter the workforce is contracting and the chance of progression or the ability to move from low skill level jobs to higher skill level jobs is increasingly difficult (Goos and Manning, 2007; Holmes and Mayhew, 2010b; McIntosh, 2013; Peat, 2016). Not only is over-qualification detrimental to society and the economy, so too is under-employment. Under-employment in Tasmania increased 2.3 percentage points to 9.5 per cent in the decade to 2016 and has since increased further

to 10.0 per cent in December 2018 (ABS, 2018). The structural changes in the labour market are resulting in a situation where having a job does not necessarily mean that an individual has a stable and reliable income. Under-employment indicates that there is spare capacity in the workforce coupled with people working below their level of educational attainment (Greve, 2017). Moreover, this scenario is extending into high skill areas of the labour market. The inability to secure quality work has flow on detrimental effects which accumulate disadvantage for individuals and society (Gallie, 2017).

Analysis of the change in the occupational distribution of the workforce between 2006 and 2016 provides evidence of increasing polarisation of the Tasmanian labour market and a shift to more precarious employment situations. As is evident in the change in occupations, and their skill levels, in Table 2 below, economic restructuring and diversification away from traditional industries such as forestry and manufacturing to the services industries, namely care, education and tourism, has contributed to the polarisation of the workforce in Tasmania.

It can therefore be interpreted that, routine biased technological change (RBTC) as well as globalisation and offshoring, have reduced the number and share of intermediate skilled jobs, those routine and non-cognitive jobs found in the manufacturing and administration sectors, such as machinery operators, process workers and administrative and clerical workers, in Tasmania. While jobs requiring human input and interpersonal skills, largely found in the care and services sector, however low-skilled, such as aged, disability and other care workers and hospitality workers, increased over the period. There is little evidence of skill biased technological change (SBTC) in the changing occupational distribution in Tasmania. That is, an increase in cognitive, yet non-routine jobs whereby technology amplifies human comparative advantages of problem-solving, creativity and interpersonal skills requiring higher levels of educational attainment, and professionalisation of the workforce, such as that in the professional, scientific and technical services sector, is not evident. The professionalisation of the workforce is more likely to be associated with the ageing population and the increasing demand for health and care professionals (Banks and Denny, 2018), further associated with the roll-out of the National Disability Insurance Scheme (NDIS) in Australia and the changed regulatory environment of the early childhood education and care (ECEC) sector.

Table 2. Occupational Changes, Top 20 Increases and Decreases, 2006 to 2016, Tasmania.

Increase			Decrease		
	No.	Skill level		No.	Skill level
Aged and Disabled Carers	1 841	4	Secretaries	-883	3
Sales Assistants (General)	1 421	5	Livestock Farmers	-754	1
Registered Nurses	726	1	Retail Managers	-686	2
Chefs	622	3	Metal Fitters and Machinists	-509	3
Education Aides	613	4	Forestry and Logging Workers	-387	4
Kitchenhands	496	5	Sales Assistants and Salespersons, nfd	-369	5
Checkout Operators and Office Cashiers	467	5	Timber and Wood Process Workers	-365	5
Enrolled and Mothercraft Nurses	456	2	Corporate Services Managers	-362	1
Construction Managers	444	1	Sales Representatives	-316	4
Nursing Support and Personal Care Workers	435	4	Textile and Footwear Production Machine Operators	-292	4
Domestic Cleaners	406	5	Bank Workers	-276	4
Child Carers	395	4	Food and Drink Factory Workers	-274	5
Cafe Workers	374	5	General Clerks	-273	4
Bar Attendants and Baristas	359	4	Other Cleaners	-258	5
Commercial Cleaners	345	5	Manufacturers	-249	1
Waiters	318	4	Paper and Wood Processing Machine Operators	-240	4
University Lecturers and Tutors	310	1	Mixed Crop and Livestock Farmers	-225	1
Generalist Medical Practitioners	291	1	Metal Engineering Process Workers	-203	5
Receptionists	289	4	Other Factory Process Workers	-198	5
Electricians	275	3	Engineering Production Systems Workers	-194	4

Sources: ABS Census of Population and Housing (2006) and (2016).

6. CONCLUSION

Social and economic restructuring have contributed to considerable industry diversification in Tasmania over the decade from 2006 to 2016, shifting from a traditional industrial base to one dominated by the care and services sectors. This has resulted in increasing workforce polarisation. Like other advanced economies and regions within nations, job polarisation has heightened in Tasmania since the GFC. Increasing job polarisation, under-employment and people working below their level of educational attainment indicates spare capacity in the labour market. Further, the current trends of workforce polarisation suggest that demand for labour and skills is a greater issue than the supply of skills. While there are more Tasmanians in employment in 2016 than in 2006, the extent of job polarisation and under-employment evident suggests that having a job does not necessarily mean that a person has a stable and reliable income nor that they are using their level of education effectively. This predicament has substantial economic and social implications for regional areas, particularly school leavers and graduates, as well as policy makers. Further analysis of the occupational distribution change by sex, industry sector and age would provide greater insight into the implications of workforce polarisation for the economy and society as well as better informed policy development.

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