Analysis of gender segregation within detailed occupations and industries in Australia

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Abstract

This study provides new and detailed estimates of gender segregation in the Australian labour market. Using ABS Labour Force Survey and Census data, we explore and decompose long-term trends of segregation and integration by employing a shift-share analysis and index measures across time, age and space. We find that over the last three decades, gender segregation has not significantly changed across either industries or occupations. Gender segregation across industries is, in general, more resistant to gender integration than across occupations and detailed classifications are profoundly more segregated than top-level classifications. Additionally, gender segregation increases as individuals get older and the farther they work from urbanised locations. We show that decades of gender equality policy have not had a major impact on minimising labour market segregation. Women continue to have more constrained labour supply choices than men, hindering labour market efficiency and flexibility.

JEL Codes: J16, J20, J21, J24, J30, J70
Keywords: employment, gender, occupational segregation, industrial segregation

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1. Introduction

Perhaps the biggest change to Australia's labour force in the past century is who does the work. Only 43 per cent of women participated in the labour market in 1989; 30 years later, this has risen to 61 per cent. In that time, the female share of total employment has gone from 36 per cent to 47 per cent.[1] Women now make up close to half of all workers in Australia.

These shifts have coincided with major reforms to the institutions, laws and incentives that shape the working lives of men and women. The federal Equal Pay cases of 1969–1975, *Sex Discrimination Act 1984*, *Affirmative Action (Equal Employment Opportunity for Women) Act 1986*, various child care payments, the *Paid Parental Leave Act 2010* and the introduction of flexible working provisions have all contributed to the higher rate of female participation. Despite this, analysis into the gender makeup of the labour market has found that gender segregation remains stubbornly persistent throughout the Australian labour market (Gregory and Duncan, 1981; Kidd and Meng, 1997; Lee and Miller, 2004).

Gender segregation exists when the mix of men and women in certain jobs does not match the gender balance of the overall labour force. It includes segregation across occupations and industries, working hours (with more women working part-time than men) and in the job hierarchy (with men occupying the lion's share of senior positions, also known as vertical segregation). This has been the subject of renewed policy attention, with a recent Australian Government *Strategy to Boost Women's Workforce Participation* (Department of the Prime Minister and Cabinet, 2017) and parliamentary inquiry (Finance and Public Administration References Committee, 2018).

Such segregation presents three key challenges to labour market and societal outcomes. Most fundamentally it constrains labour supply choices of individuals by limiting the range of jobs that are realistically available to them. Secondly, the constraint could limit women's earning potential and increase the gender wage gap (unlike the international literature, the Australia evidence is mixed on this point, Cassells *et al*. (2009) provides a summary). Thirdly, at the macro level, lesser mobility between 'male' and 'female' occupations hampers labour market efficiency and flexibility, with higher unemployment and skill gaps (Anker, 1997).

Renewed policy attention has not been met with renewed evidence. The most recent Australian sex segregation studies were conducted in the early 2000s, when signs of gender integration were minimal and slowing. Additionally, the existing literature often relies on high-level job breakdowns, understating the level of gender segregation and covers only short or discontinuous time series, which cannot show changes in segregation over time. This paper addresses these gaps using detailed occupation and industry data sourced from the Australian Bureau of Statistics (ABS) Labour Force Survey (LFS) time series, which were not available at the time of the previous studies. Our analysis uses a combination of indices and descriptive analysis to determine the extent of, and trends within, gender segregation in Australian over the last three decades.

1 Data sourced from ABS (2020) Labour Force, Australia, for persons aged 15 years and over.

The next section of this paper synthesises the literature on occupational and industrial gender segregation. The Methodology section outlines the study design, which data sets were used in analysis and the appropriate empirical methods chosen to quantify the current extent of gender segregation in Australia's workforce. The Descriptive Analysis sets out the data at broad occupation and industry classifications. The Measures of Segregation section employs a shift share analysis to decompose the increase in the female share of employment into growth and composition effects. It also measures gender segregation across time, age groups and locations using the index of dissimilarity (ID). The Conclusion summarises the findings, discusses policy implications and identifies future research directions.

2. Literature review

While the causes and consequences of gender segregation in the labour market are well documented – Anker (1998) provides the most thorough account – this paper is focussed on the measurement and change in the degree of segregation in labour markets. Segregation is often measured using various indices with Duncan and Duncan's (1955) ID being regularly used in the literature. Others include Karmel and Maclachlan's (1988) 'IP' index and the marginal matching index (MM) of Blackburn, Jarman and Siltanen (1993). We discuss the advantages and disadvantages of different indices in the Methodology section.

Australian studies provide mixed evidence on trends in segregation with most showing little or no change for over a century. Lewis (1985) conducted the longest study, with analysis back to 1891. Lewis showed the ID was largely unchanged from 1891 until the 1960s and 1970s, when segregation fell by around 8 per cent. Most of this occurred in the first half of the 1970s, with integration slowing up to 1981. Conversely, Karmel and MacLachlan (1988) found segregation actually increased slightly over 1960s and 1970s. In more recent decades, Rimmer (1991) and Lee and Miller (2004) found no change in segregation through the 1980s and early 1990s. On the other hand, Watts (2003) reports a 6 per cent reduction in segregation measures between 1986 and 2002 with the IP index.

International comparisons reveal current levels of segregation in Australia to be around average for developed economies (Blau and Khan, 1996; Jarman *et al*., 1999; OECD, 2002; Dolado, Felgueroso, and Jimeno, 2003). Segregation fell by around 20 per cent in the United States in the 1970s and 1980s, with little change since (Blau, Simpson and Anderson, 1998; Blau, Brummund and Liu, 2013). The United Kingdom also saw a rapid fall in the 1980s (Hakim, 1992). Anker (1998) and Anker, Helina and Ailsa (2003) report modest gender integration across a sample of developed countries, Latin American countries and Middle Eastern countries in the 1980s and 1990s. However, segregation was stable or increasing in some Asian countries and the transitional economies of Eastern Europe.

The OECD (2002) and Dolado, Felgueroso, and Jimeno (2003) find that the ID increases with age within several countries, including Australia. The authors suggest that segregation is falling overtime with more gender balance in successive cohorts. However, it could also suggest that segregation varies over the life course, irrespective

of cohort effects. Later life events are likely to increase segregation, like having children (OECD, 2002) or marrying (Lewis, 1985). Some Australian studies have found contrary evidence, with lower levels of segregation for older workers (Lewis, 1985; Lee and Miller, 2004).

The studies above have focused on gender segregation across occupations. Very few have also considered segregation across industries. Blau and Khan (1996) reported IDs for occupations and industries for 10 industrialised countries in 1985-88. In this study, industrial segregation was considerably lower than occupational segregation (around 5-10 percentage points), with Australia reporting below average occupational segregation and average segregation for industrial segregation.

In addition to the different jobs that men and women do, the workforce is also segregated in terms of *how* men and women work. Women are more likely to be employed part-time and use flexible work arrangements, this seems to be primarily due to their cultural role of needing to balance the responsibilities of work and care. Around 46 per cent of women worked part-time in 2019, compared with 19 per cent of men.[2] The limited availability of part-time work in selected occupations and industries can reinforce patterns of gender segregation (Department of Employment, 2017). However, part-time work is becoming more gender integrated, with increasing numbers of men working part-time, and a wider distribution of part-time working arrangements across the labour market (Watts, 2003).

One key weakness of segregation studies is that many are limited to very high-level occupational breakdowns in compiling their index measures (Hakim, 1992; Jarman *et al*., 1999). This is particularly true for cross-country studies where matching of detailed occupation categories is difficult. The broad categories ignore all of the variation and gender segregation between occupations within them, and their use therefore understates the degree of segregation. For example, Preston and Whitehouse (2004) showed that 37.3 per cent of women were working in female-dominated occupations (greater than 70 per cent female) in 2002 when counting the 1 digit occupations, but the number climbed to 55.8 per cent for 2-digit occupations and 62.6 per cent for 4-digit occupations. The 'true' level of segregation is an elusive concept to measure. At a micro level, even relatively well-integrated occupations often have workers segregated by gender across firms (Blau, Simpson and Anderson, 1998).

A second issue is that (the lack of) movements in the global measure of segregation given by an index does not give any information about underlying changes in the labour market. Despite the stagnant index measures in Australia, there are many counter-balancing shifts in individual occupations. Preston and Whitehouse (2004) showed that 46 per cent of women and 34 per cent of men in Australia worked in occupations that became more gender integrated between 1996 and 2002, while 34 per cent of women worked in female-dominated jobs that became more female-dominated and 18 per cent of men worked in male-dominated jobs that became more male-dominated.

2 Data sourced from the ABS (2020) Labour Force, Australia, for persons aged 15 years and over.

A third challenge is distinguishing between *horizontal* and *vertical* segregation. Horizontal segregation refers to work of different but equal types. Vertical segregation refers to work of different and unequal types that exist along a hierarchy in terms of pay, authority, status and other dimensions. Blackburn, Brooks and Jarman (2001) argue that vertical segregation is the primary concern because it relates specifically to the inequality of segregation. However, attempts to quantify vertical segregation are limited by the need to rank job types according to highly subjective vertical dimensions such as status. Watts (2003) argues that case study approaches will enable greater understanding, albeit limited in scope and generalisability.

In summary, the literature on occupational gender segregation shows that there has been little progress on gender integration of the Australian labour market over the last century, with the exception of a period through the 1960s and 1970s. This is despite the female employment rate and share of the labour force rising dramatically over the same period. Segregation exists horizontally and vertically, although the vertical component of segregation is difficult to measure. It also exists in the different ways of work, with more women working part-time and flexibly than men. There are some marked weaknesses in the literature: the most recent studies are now over 15 years old, many studies use broad occupational categorisations instead of detailed ones, few studies consider industrial segregation at all, and there is a limited understanding of counteracting movements beneath the headline index measure of segregation.

3. Methodology

The aim of this study is to provide new estimates of gender segregation in the Australian labour market. The methodology builds on the existing literature in several ways. We update old data; there are no estimates of segregation in Australia in this millennium. We look at occupational and industrial segregation; the latter has largely been ignored in the literature, despite also contributing to the gender pay gap. We use the 30-year LFS time series, which was not available at the time of previous studies. This series provides consistent and detailed industry and occupation categories across the series which allows us to measure change in segregation over an extended period. This is particularly useful given the economy has restructured considerably away from manufacturing and towards services. The 3- and 4-digit data in the series also allows greater accuracy than the often used high-level, 1-digit job categories.

Shift share analysis

We employ a shift share analysis to determine the source of changes in female share of employment. This analysis distinguishes between changes to a certain occupation's/industry's share of total employment and changes to the gender composition of those occupations/industries (Olivetti and Petrongolo, 2016).

To make this distinction, the equation below was applied to Australia's labour market:

$$\Delta l_{ft} = \sum_j \alpha_{fj} \Delta l_{jt} + \sum_j \alpha_j \Delta l_{fjt} \quad (1)$$

with l_{ft} denoting the change in female employment, l_{jt} representing the female share of labour in the occupation/industry j, l_{fjt} denoting the share of female employment in occupation/industry j while $\alpha_{fj} = (l_{fjt} + l_{fjy-t})/2$ and $\alpha_j = (l_{jt} + l_{jt-1})/2$ are decomposition weights.

Equation 1 can be divided into two components, with the first component signifying change in the female share of employment attributed to changes in the occupation's/industry's employment share within the total economy. For example, if there is strong growth in demand for midwives (the most 'female' occupation), there will likely be a shift toward female employment due to changes *between* occupations. This change is referred to as the 'between effect'.

The second component of the equation reflects variations in female employment due to alterations to the gender composition of occupations/industries. For example, if more women start working in mining (the most 'male' industry), there will be a shift toward female employment due to changes *within* industries. This is known as the 'within effect'.

Indices of segregation

Index calculation has characterised empirical investigations into segregation for some time, resulting in several suitable indices being available and appropriate for this study. These indexes of segregation represent the extent to which distinct groups, like men and women, are unevenly distributed across certain social constructs. Here, this refers to occupations and industries.

The ID can be written as;

$$ID = \frac{1}{2} \sum_{i=1}^{n} \left| \frac{F_i}{F_T} - \frac{M_i}{M_T} \right| \quad (2)$$

where n is the number of occupations, F_i is the number of females employed in a certain occupation/industry i, F_T is the total number of employed females and vice versa for M_i and M_T.

The ID signifies the proportion of a particular gender that would need to move occupations/ industries, without replacement, in order to create a uniform distribution of the population (Cortese, Frank, and Cohen, 1976). Its value is maximised at 1 when each occupation/industry contains only one gender, and minimised at zero when the proportion of each group in each occupation/industry is consistent with the proportion in the workforce as a whole.

There are some weaknesses of the ID. Watts (1992; 2003) outlines these in detail, including the failure of the ID to be independent of changes to the occupation structure of the labour force and the gender share of total employment.

Karmel and Maclachlan's (1988) IP index does meet Watts' criteria and is the main alternative index to the ID. The key difference is that the ID represents the share of either sex which must relocate, without replacement, to achieve zero segregation whereas the IP represents the share of either sex which must relocate, with replacement (Cortese *et al*., 1976; Watts, 1992).

Given the criticisms of the ID, both indices were tested in the analysis with negligible differences between them. While the values of each index differ (by construction), the overarching trends and insights are the same. We have not shown the IP analysis here, however, we can report that the two series have a correlation coefficient of 0.97 for 3-digit industries and 0.94 for 4-digit occupations. Given the ID is the most used index in the literature and there are few differences between the overarching trends in the indices, the ID was used for the analysis in this paper.

Data sources

Analysis in this paper focuses on gender distribution at a very detailed occupational and industrial classification level in Australia. In order to do this, ABS LFS data was primarily relied upon as it allows for analysis at the detailed level of both occupational (4-digit) and industrial (3-digit) classifications. The LFS is formed on a multi-stage area sample of approximately 26,000 private dwellings, covering roughly 0.32 per cent of the civilian population of Australia aged 15 years and over. The LFS survey first begun in 1985, making it a useful dataset for analysing segregation over time. LFS data from 1985-2019 was employed in this study.

The ABS's Census of Population and Housing is used where detailed breakdowns were not available in the LFS, including for the age group analysis and some locational analysis. This Census has been conducted every five years since 1911 and provides a comprehensive snapshot of the nation, counting respondents based on where they were located on the designated Census night. Data collected relates to a broad range of characterising fields, some of which include family size, marital status, occupations, languages spoken, country of birth and income.

Due to our reliance on LFS and Census data, an understanding of the occupational and industrial classification system employed by the ABS is necessary for making sense of the paper's findings. Industries and occupations are classified according to the Australian and New Zealand Standard Classification of Occupations (ANZSCO) and the Australian and New Zealand Standard Industrial Classification (ANZSIC), respectively.

ANZSCO is a skill-based classification for all occupations and jobs in the Australian and New Zealand labour markets. The framework has several hierarchical levels, which are grouped based on similarities in skill sets. The broadest classification level, denoted by a 1-digit code, is referred to as Major Group, followed by Sub-Major Group (2-digit), Minor Group (3-digit), Unit Group (4-digit) and then the most detailed classification of Occupations (6-digit).

For industries, individual businesses are assigned particular industry classifications, based on a businesses' predominant activity. The highest level within ANZSIC is denoted by one letter codes, named Divisions, followed by Subdivisions (2-digit), Groups (3-digit) and Classes (4-digit) being the most precise classification.

An example of the occupational and industrial classification structure is shown in Table 1.

Table 1. Example of classification levels

Source	*Digits*	*Level*	*Description*
ANZSCO	1-digit	Major Group	2 Professionals
	2-digit	Sub-major Group	23 Health Practitioners
	3-digit	Minor Group	231 Medical Practitioners
	4-digit	Unit Group	2312 Specialist Medical Practitioners
	6-digit	Occupation	231211 Anaesthetist
ANZSIC	1-digit	Division	E Construction
	2-digit	Subdivisions	30 Building Constructions
	3-digit	Groups	301 Residential Building Construction
	4-digit	Classes	3011 House Construction

Source: ABS (2006) ANZSCO; ABS (2006) ANZSIC.

4. Descriptive analysis

Analysing the female share of employment across top-level occupations and industries provides initial insight into the gender composition of the Australian workforce. The significant variance in female shares of employment across occupations discussed in the Literature Review section of this paper is clearly shown in Table 2. For example, in 2019, one in ten Australians employed as Machinery Operators and Drivers were female, compared to roughly three in four employed as Clerical Administrative Workers, representing a 65 percentage point difference.

Table 2 shows there has been minimal change in 30 years for three occupation groups; Clerical and Administration Workers, Sales Workers and Labourers. The female share increased substantially in four occupation groups, with two trending towards integration and two trending towards re-segregation, increasingly dominated by females (Community and Personal Service Workers and Professionals).

Table 2 highlights the large share of female employment in traditionally 'female' industries, such as Education and Training, and relatively low shares in traditionally 'male' industries, such as Construction. Similar to occupational segregation at the 1-digit level, a 66 percentage point difference can be seen between the industry with the highest female share of employment (Health Care and Social Assistance) and the industry with the lowest (Construction). Like occupations, there was a mixture of movements in the female share between 1989 and 2019. The female share has been steady in six of 19 industries, it is increasing in 11 industries and decreasing in two industries. Of those industries where the female share is increasing, nine are integrating and two are re-segregating.

Table 2. Female share of employment in industries and occupations, 1989-2019

Classification	*1989*	*1999*	*2009*	*2019*	*Change 1989-2019*
Occupations					
Managers	28.96	28.38	34.51	38.22	9.26
Professionals	43.80	47.86	51.46	54.53	10.72
Technicians and Trades Workers	11.05	12.69	13.83	15.78	4.73
Community and Personal Service Workers	63.61	66.58	69.57	70.55	7.24
Clerical and Administrative Workers	73.92	76.34	75.73	73.20	-0.73
Sales Workers	60.02	61.35	62.50	60.85	0.82
Machinery Operations and Drivers	16.64	11.83	8.48	10.46	-6.17
Labourers	35.97	35.52	35.54	34.18	-1.79
Industries					
Agriculture, Forestry and Fishing	28.79	31.03	31.38	31.69	2.90
Mining	10.74	10.13	13.31	16.49	5.75
Manufacturing	26.89	26.40	27.25	26.80	-0.09
Electricity, Gas, Water and Waste Services	12.19	18.63	20.61	24.89	12.69
Construction	13.15	12.68	12.04	11.89	-1.26
Wholesale Trade	31.86	33.02	32.05	32.33	0.47
Retail Trade	55.48	54.43	56.30	55.66	0.18
Accommodation and Food Services	56.32	54.60	55.95	54.79	-1.52
Transport, Postal and Warehousing	19.42	24.02	24.05	21.76	2.34
Information Media and Telecommunications	36.61	43.60	42.00	38.49	1.88
Financial and Insurance Services	52.80	55.02	52.63	50.20	-2.61
Rental, Hiring and Real Estate Services	39.81	44.10	52.27	48.74	8.93
Professional, Scientific and Technical Services	46.65	42.59	43.69	42.34	-4.31
Administrative and Support Services	48.84	51.13	52.28	53.53	4.69
Public Administration and Safety	38.23	41.91	46.49	50.80	12.57
Education and Training	62.10	66.43	69.35	71.16	9.06
Health Care and Social Assistance	74.90	77.57	79.11	78.00	3.10
Arts and Recreation Services	47.00	44.28	47.68	49.69	2.69
Other Services	40.92	37.69	43.28	46.31	5.39

Source: ABS, Labour Force, Australia, Detailed, Quarterly, Nov 2019.

The data above captures the average gender shares across broad 1-digit industry and occupation classifications. However, more detailed breakdowns reveal much greater variation in segregation. For example, the most female 4-digit occupations within the 1-digit Manager group is Child Care Centre Managers (91.4 per cent) and the least female is Construction Managers (9.7 per cent), while an average occupation is Advertising, Public Relations and Sales Manager (38.1 per cent). Taking segregation analysis beyond

the 1-digit classifications is relatively uncommon in this field. The index measures adopted later in this paper will show that detailed analysis indicates much higher levels of overall gender segregation in the labour market than broader classifications.

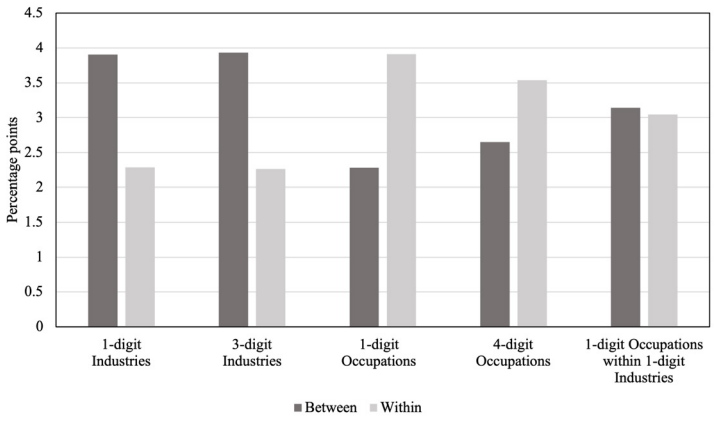
Overall, the descriptive analysis has highlighted persistently segregated occupations and industries. There were mixed trends over time, although it was most common for the female share to have increased in jobs over the last 30 years. This includes instances of both integration, where the gender balance is now more equal, and segregation, where already female jobs are becoming more female-dominated. The female share was steady in some jobs and actually decreased in a small sub-set of occupations and industries. The next section will explore the impact of these trends on the overall level of gender segregation in the Australian labour market.

5. Measures of segregation

Shift share analysis

The female share of total employment has increased from 39.9 per cent of the workforce in 1987 to 46.1 per cent in 2019, a rise of 6.2 percentage points in three decades.[3] As mentioned above, a shift-share analysis quantifies how much of this change in female share of employment is due to growth of specific occupations or industries, known as 'between effects', and how much is due to alterations in the gender composition of occupations or industries, known as 'within effects'. This analysis has been carried out for industries at the 1-digit and 3-digit level, for occupations at the 1-digit and 4-digit level, and for occupation by industry cross tabulations at the 1-digit level. The results of this decomposition can be seen in Figure 1.

Figure 1. Shift share analysis for industries and occupations



Source: ABS, Labour Force, Australia, Detailed, Quarterly, Nov 2019.

3 Data sourced from ABS (2020) Labour Force, Australia.

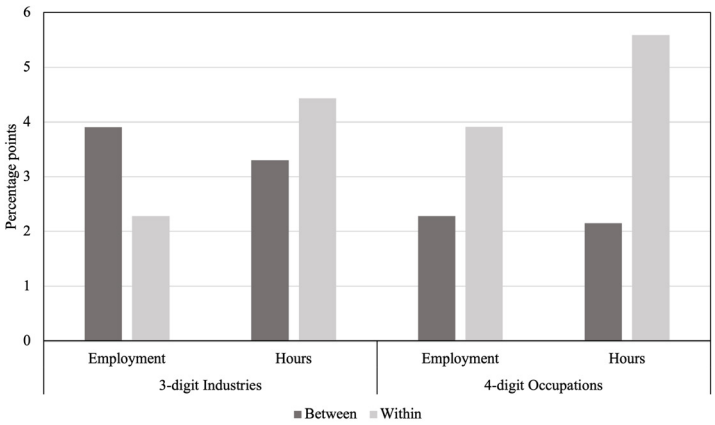
For industries, between effects account for a larger proportion of the rise in female employment share than within effects, with the opposite being true for occupations. Considering 1-digit industries, between effects accounted for 3.9 percentage points of the 6.1 percentage point rise in the female share of employment (63.5 per cent of the shift), and within effects accounted for 4.2 percentage points (36.5 per cent). This means that growth of industries that employ mostly women account for more of the change than a balancing of the gender mix within industries. For 1-digit occupations, between effects only account for 2.3 percentage points (36.8 per cent of the shift) while within effects account for 3.9 percentage points (63.2 per cent). This means that the occupation within effect has played a larger role than the between effect. These findings suggest that industries have been more resistant to gender integration than occupations.

The second key observation from Figure 1 is the difference between parent and detailed classifications of industries and occupations. There is a negligible difference between the results for 1-digit and 3-digit industries, however, there is a noticeable difference between 1-digit and 4 digit occupations. For the detailed 4-digit occupations, between effects are 0.4 percentage points higher than the 1-digit analysis, and within effects are lower by the same margin. Therefore, some changes within broad occupation groups reflect changes between more detailed occupations underneath the parent classifications.

Since the distribution of occupations varies across industries, a proportion of the between-occupation effects could be explained by the expansion of industries in which traditionally female roles are over-represented (Olivetti and Petrongolo, 2016). We see this in the final set of columns decomposing the change in gender share of employment for 1-digit occupations classed within 1-digit industries. The divergent results for industries and occupations converge, with between and within effects near evenly balanced at around 3 percentage points each. This indicates that some of the shift in female share that was caused by a changing industry composition (between effects) came from the changing gender mix within occupations that made up those industries (within effects). Conversely, some of the shifts within occupations came about because some industries were growing more than others (between effects).

Figure 2 presents the shift share analysis across 4-digit occupations and 3-digit industries, calculated across jobs and total hours worked. In presenting a comparison of integration trends by hours worked and the number of jobs, the analysis accounts for the inherent differences in instances of part-time employment between sexes. Within effects are stronger when decomposing the shift in hours worked compared to jobs worked (employment). This is most clear for industries, where the relative contribution of within and between effects is inverted for hours and employment. The smaller between effects when counting hours most likely reflects the higher rates of part-time work in the typically female industries that have seen strong growth, such as education and healthcare (there is only a small difference in between effects for occupations). The higher within effects suggests that the jobs that have seen gender integration have also seen more women working full-time than in previous decades.

Figure 2. Shift share analysis for jobs and hours



Source: ABS, Labour Force, Australia, Detailed, Quarterly, Nov 2019
Note: When comparing the shift share across hours and employment the difference in total increase in female's share of employment across this period (6.2 percentage points) and hours worked (7.7 percentage points).

The shift share analysis has measured the source of the rising female share of employment over the last three decades. The composition of the effects depends on whether jobs are categorised by industries, occupations or a combination of the two. The higher within effects suggests that there may have been a greater degree of gender integration for occupations than industries. However, this analysis captures both 'male' jobs that have become more integrated and 'female' jobs that have become more segregated, both of which contribute to a higher female share of employment. The next section measures the overall change in segregation via the ID, presenting which forces have contributed to the observed trends.

Index of dissimilarity

The ID measure of gender segregation within industries and occupations across the past 30 years is given in Table 3. We see that gender segregation across the detailed classifications is more profound. Around 33 per cent of workers across 3-digit industries would need to move industries in order to create a uniform distribution of genders across industries but around 40 per cent would need to move at the 3-digit level in 2019. For occupations, around 37 per cent would need to move between 1-digit occupations while 51 to 58 per cent would need to move between 4 digit occupations. In other words, there is a much more gender segregation when industries and occupations are broken down to a detailed level which more closely reflects real differences between jobs.

Table 3. Gender segregation in industries and occupations, 1989-2019

	Classification	*1989*	*1999*	*2009*	*2019*	*Change 1989-2019*
Industries	1-digit (n=19)	0.321	0.304	0.323	0.328	0.007
	3-digit (n=290)	0.381	0.363	0.406	0.402	0.021
Occupations	1-digit (n=8)	0.388	0.401	0.388	0.367	-0.020
	4-digit (n=468)	0.574	0.568	0.548	0.519	-0.055
	1-digit (n=152)	0.505	0.492	0.473	0.448	-0.057
Industries x occupations	1-digit (n=152)	0.505	0.492	0.473	0.448	-0.057

Source: ABS, Labour Force, Australia, Detailed, Quarterly, Nov 2019.

Gender segregation is more profound in occupations than industries. The ID for 1-digit occupations is around 7 percentage points higher than 1-digit industries, despite there being eight occupations and 19 industries defined at that classification level. Consistent with findings for other developed countries (Blau and Khan, 1996), this indicates that gender roles are more strongly aligned to the type of work we do, rather than the workplace (or industry) in which we do it. Still, segregation remains for both occupations and industries, and the final row of Table 3 shows that segregation is higher again at the intersection of the two.

The ID for 1-digit occupations within 1-digit industries ranges from 44 to 50 per cent, much higher than the 32 per cent and 38 per cent for 1-digit industries and occupations. Again, this indicates that there is a higher level of segregation when we consider finer breakdowns. The added implication here is that men and women who have the same occupation will tend to work in traditionally male or traditionally female industries.

Perhaps most importantly, we see that there have been only very modest reductions in gender segregation over the last three decades. The 4-digit occupation ID had a consistent (yet very slight) downward trajectory, finishing 5.5 percentage points lower in 2019 than 1989. Similarly, the ID for 1-digit industries by 1-digit occupations fell by 5.7 percentage points. The other series showed almost no change. This degree of change is greatly overshadowed by the rise in overall female labour force participation of 18 percentage points over the same period.

By these measures, there has been little change in the level of occupational and industrial segregation in the Australian labour market. At most, there is less than 5.7 per cent fewer workers who would need to change jobs to achieve gender integration across the workforce than 30 years ago. The result is similar to some previous Australian analysis of occupational segregation, which found declines in segregation of similar scale, particularly in the 1970s (Lewis, 1985) and 1990s (Watts, 2003). The slow pace of change aligns with the United States experience, where there was a distinct period of integration between 1970 and 1990 but little progress since then (Blau, Brummund and Liu, 2013).

This lack of movement in the ID is somewhat hard to reconcile with those of the previous section where we saw that between 38 per cent and 62 per cent of the rise in the female share of employment has come from changes within occupations and industries. One possible explanation is that some occupations have become more gender balanced, like managerial professions, while others have become less balanced and specifically more female, such as Health Professionals and Educational Professionals (Preston and Whitehouse, 2004).

Table 4, adapted from Preston and Whitehouse (2004), confirms these trends. It gives the share of employment in occupations and industries that were integrated, segregated or had a stable gender mix between 1988 and 2019. A job was classified as 'integrating' (or 'segregating') if the gender mix was closer (or further away) to the overall mix across the labour force in 2019 than 1989. A job was classified as 'stable' if the gender mix did not shift by more than 3 percentage points. Further, the table divides jobs into whether one gender was over-represented in 2019; this indicates the direction of integration or segregation, for example, whether a traditionally 'male' job now has a higher share of females.

Table 4. Employment shares of occupations and industries that became more gender integrated/segregated from 1989-2019, by gender representation

		Occupations		*Industries*	
		% of female employment	*% of male employment*	*% of female employment*	*% of male employment*
Integrating	Females over-represented*	27.0	14.1	9.5	8.0
	Males over-represented*	11.1	24.4	6.0	12.9
	Total**	**38.1**	**38.6**	**15.6**	**20.9**
Segregating	Females over-represented*	32.0	8.4	45.9	16.7
	Males over-represented*	3.4	12.1	5.0	16.4
	Total**	**35.5**	**20.5**	**51.0**	**33.1**
Stable***	Females over-represented*	21.8	6.9	21.3	12.2
	Males over-represented*	3.6	32.8	10.8	31.9
	Total**	**25.4**	**39.7**	**32.1**	**44.2**

* 'Over-represented' means a higher gender share in the industry or occupation than the gender share of total employment across all jobs in 2019

** Totals do not sum to 100% because some occupations were missing data in 1989

*** 'Stable' means the gender mix of the occupation or industry did not change by more than 3 percentage points

Source: ABS, Labour Force, Australia, Detailed, Quarterly, Nov 2019

We observe divergent patterns across occupations and industries. While many jobs are integrating, others are segregating, and others still are not changing much at all. In line with the ID measurements, occupations were more likely to be integrating

than industries. Around 38 per cent of men and women work in occupations that have been integrating in the last 30 years, but only 15-20 per cent work in industries than have been integrating. Likewise, industries are more likely to be stable or segregating than occupations.

A large number of female-dominated jobs are becoming more female-dominated (more segregated). Around one third of women work in occupations (32.0 per cent) where females are increasingly over-represented. For industries, it is nearly half of all women (45.9 per cent). This includes jobs like teachers, receptionists, clerks and bookkeepers. In contrast, only 11.1 per cent of women work in occupations and, 6.0 per cent work in industries, that are becoming more gender integrated, but where males are still over-represented. These are most commonly specialist manager roles, for example, finance managers. This suggests that significant barriers still need to be overcome for women to enter traditionally male fields.

Between a quarter and a half of men and women work in jobs where the gender mix has been relatively stable. Men were more likely than women to work in these unchanging jobs. They include construction, building, trade and manufacturing jobs for men. For women, they include care, nursing, administration and hospitality jobs.

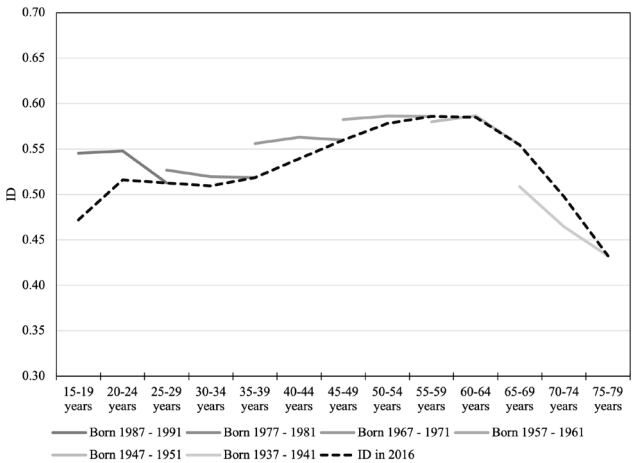
The ID analysis above has shown that more detailed classifications reveal a greater extent of segregation, occupations are more segregated than industries and that gender divides also occur at the intersection of occupations and industries. While occupations are more segregated overall, there has been more progress towards integration than in industries, albeit modest. This aligns with the within effects of the earlier shift-share analysis. Breaking down the trends reveals significant counter-balancing forces of integration and segregation underlying the aggregate ID measure.

Segregation and age

The gendered patterns of participation over the life course is a key feature of the Australian labour force. Women are more likely than men to stop or reduce labour participation around child rearing years and the participation rate does not fully recover in later years, at both the intensive and extensive margin. This section explores the implications for segregation over the life course.

Figures 3 and 4 present ID values for gender segregation across age groups for 4-digit occupations and 3-digit industries, respectively. The figures show the ID across age groups in 2016 as well as cohorts spaced 10 years apart, from those born in 1937-41 to those born in 1987-91. Comparing the two sets of data highlights how variation across ages groups reflect the different life courses of successive cohorts of workers (OECD, 2002).

Figure 3. Cross-cohort comparisons of ID by age, 4-digit occupations



Note: Cohorts are not constructed with longitudinal data, they are 'synthetic cohorts' constructed from cross-sectional data across ABS Census years
Source: ABS Census of Population and Housing, 2006, 2011 and 2016

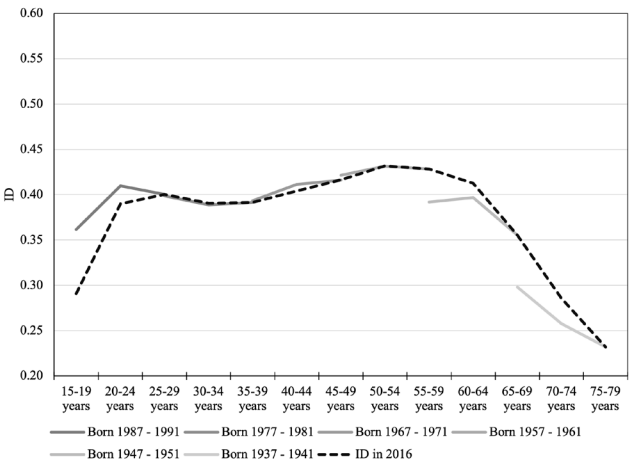
Firstly, considering the dotted line for the ID in 2016. There is a clear pattern of increasing segregation as Australians grow older, with segregation peaking around 50 to 64 years of age for both industries and occupations. These results are consistent with international studies from the OECD (2002) and Dolado, Felgueroso, and Jimeno (2003), but they are contrary to Australian studies from Lee and Miller (2004) and Lewis (1985), which both show occupational segregation falling consistently with age.

One likely explanation for the rising segregation over the life course is that over time many women move into more 'family friendly' jobs because they bear the overwhelming majority of caring responsibilities in most family units. This may also contribute to vertical segregation as women do not advance to higher status positions as often as men at later career stages.

Part of the pattern could also come from cohort effects, whereby the rates of segregation are lower for younger workers as new generations are entering non-traditional fields at higher rates. This appears evident for occupations (Figure 3), where the ID for each subsequent cohort is somewhat below the previous cohort (note later/younger cohorts are to the left of the chart).

The changes are less pronounced for industries than occupations, particularly between the ages of 20 and 60 years (Figure 4). This is true for both the overall variation across ages (dotted line) and the differences between cohorts (solid lines). As with earlier observations, this reflects the slower integration of industries and lower levels of segregation in industries overall. It could also reflect the different career paths over the life course, with workers more likely to move between occupations within the same industry than change industry altogether.

Figure 4. Cross-cohort comparisons of ID by age, 3-digit industries



Note: Cohorts are not constructed with longitudinal data, they are 'synthetic cohorts' constructed from cross-sectional data across ABS Census years
Source: ABS Census of Population and Housing, 2006, 2011 and 2016

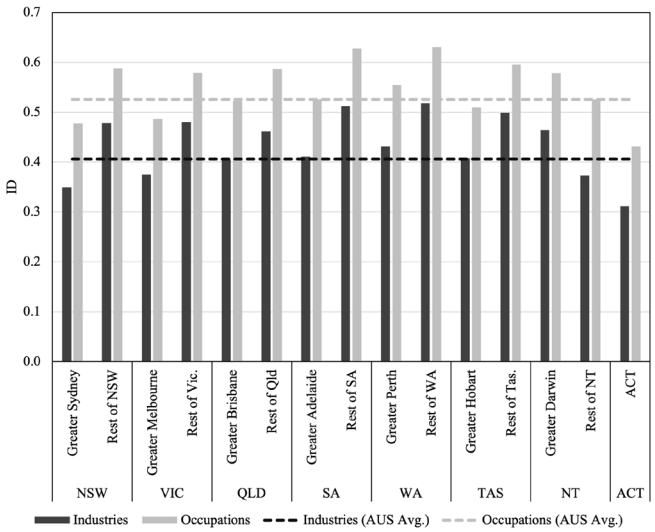
Finally, there is a marked fall in segregation in the later years for both occupations and industries. This may be driven by earlier exits from the labour force in traditionally gendered jobs, for example, a younger average retirement age in construction for men or nursing for women. Similarly, the patterns across cohorts indicate that segregation later in working life is increasing rather than decreasing for more recent cohorts. This could be due to workers in those aforementioned 'gendered' jobs' staying in the labour force for longer in more recent years.

Segregation and location

The data thus far has assessed segregation for Australia as a whole. However, there are large differences between locations, which are explored in this section by comparing capital cities with regions, and then across local areas of varying density.

Figure 5 shows the average ID for capital cities and the balance of state, using ABS Census data. Segregation is greater in the regional areas than the capital cities of all jurisdictions and like earlier data, the ID for industries is higher than the ID of occupations in each location.

Figure 5. Segregation for 4-digit industries and 4-digit occupations, capital cities and the balance of state, 2016

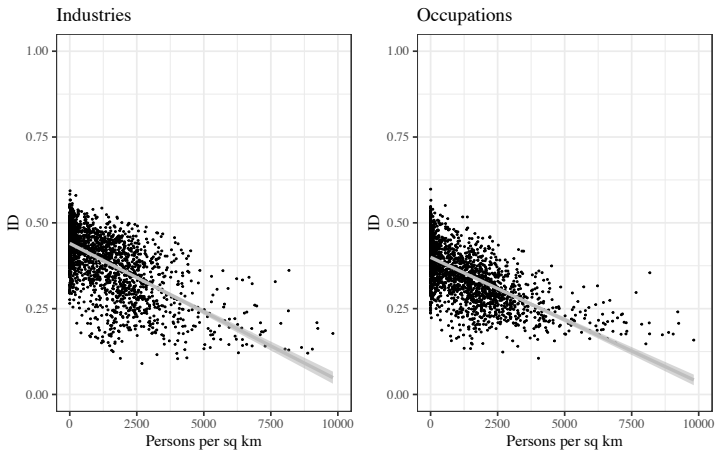


Source: ABS Census of Population and Housing, 2016

The overall levels of gender segregation are distinctly lower in Sydney, Melbourne and, in particular, Canberra (the ACT). A large proportion of the workforce in these jurisdictions is employed in service sectors that have a large share of female employment. By contrast, the level of segregation was much higher in regional Queensland, South Australia, Western Australia and Tasmania where male-dominated industries, such as agriculture, mining and manufacturing, play a much larger role in the economy.

Figure 6 takes this analysis further by considering segregation in local areas, as defined by the ABS Statistical Area Level 2 (SA2). There are 2310 SA2s in Australia and they typically correspond to an area the size of a suburb. The industry and occupation ID is plotted against population density for each location. The ID is based on the employment of the residents in each location (rather than the place of work).

Figure 6. Segregation and population density of local areas (SA2), 1-digit industries and 1-digit occupations, 2016



Note: SA2s with a population fewer than 1,000 persons were excluded in order to ensure meaningful ID estimates.
Source: ABS Census of Population and Housing, 2016; ABS, Population and Age by Sex, Regions of Australia, 2016

The scatterplots show a clear trend of declining ID for areas of greater density. An inner city location or inner ring suburb of more than 5,000 persons per sq km has an ID of around 0.25 for industries and 0.20 for occupations. This rises to 0.31 (industries) and 0.37 (occupations) in middle and outer ring suburbs with population densities around 1,500 persons per sq km, and further to around 0.40 (industries) and 0.45 (occupations) in regional areas. There is much more variability in low density locations, which is partly due to the low number of workers. To quantify the relationship with a simple OLS regression: an increase of 1000 persons per sq km is associated with a fall in ID of 1.8 percentage points for industries ($r2 = 0.15$, $p < 0.001$) and 3.6 percentage points for occupations ($r2 = 0.39$, $p < 0.001$).

The lower ID for more urbanised locations could be driven by 'between effects' in the underlying industrial and occupational structure (as noted with the interstate and intercity differences above). It could also be driven by differences within industries and occupations. That is, one industry in a regional labour market may be more segregated than the same industry in a city labour market, these are the 'within effects'.

Following the technique of Blau and Hendricks (1979), we decompose the variation between Australian capital cities and regions by comparing the ID to the national average. Table 5 details the within effects, between effects and a residual. The residual component is described by Blau and Hendricks (1979) as an interaction of the within and between components, however, this has been criticised by Anker (1998) as uninterpretable. Nevertheless, the residual is reported here for completeness.

Table 5. Decomposition of ID deviation from national average, 2016

		Decomposition (% pts)			*Share of deviation (%)**		
	Deviation	*Within*	*Between*	*Residual*	*Within*	*Between*	*Residual*
Industries (4-digit)							
Greater Sydney	-5.7	-3.5	-2.7	0.5	-52.7%	-39.6%	7.7%
Rest of NSW	7.2	5.6	2.0	-0.4	69.8%	25.0%	-5.2%
Greater Melbourne	-3.1	-2.3	-1.4	0.5	-54.4%	-32.9%	12.7%
Rest of Vic.	7.4	6.4	1.3	-0.3	80.1%	15.8%	-4.0%
Greater Brisbane	-0.1	-0.6	0.5	0.1	-55.2%	39.9%	4.9%
Rest of Qld	5.6	3.5	2.5	-0.4	54.6%	38.7%	-6.7%
Greater Adelaide	0.5	1.1	-0.5	-0.1	65.1%	-31.3%	-3.6%
Rest of SA	10.6	9.2	2.0	-0.6	78.5%	16.6%	-4.9%
Greater Perth	2.5	0.6	2.1	-0.1	19.8%	75.3%	-4.9%
Rest of WA	11.2	8.3	4.4	-1.4	58.9%	31.0%	-10.2%
Greater Hobart	0.1	4.5	-2.9	-1.5	50.8%	-32.5%	-16.7%
Rest of Tas.	9.3	8.6	1.0	-0.4	85.6%	10.2%	-4.2%
Greater Darwin	5.8	3.3	2.2	0.3	57.2%	37.7%	5.1%
Rest of NT	-3.3	3.1	-2.3	-4.1	32.7%	-24.4%	-42.9%
ACT	-9.5	0.9	-7.0	-3.4	7.9%	-61.6%	-30.5%
Occupations (4-digit)							
Greater Sydney	-4.8	-2.1	-2.9	0.2	-39.8%	-56.7%	3.5%
Rest of NSW	6.3	3.4	3.1	-0.2	51.1%	46.5%	-2.4%
Greater Melbourne	-3.9	-1.9	-2.2	0.2	-44.9%	-50.2%	4.9%
Rest of Vic.	5.3	3.3	2.2	-0.2	58.4%	38.4%	-3.2%
Greater Brisbane	-0.3	-0.2	-0.2	0.1	-45.3%	-31.1%	23.6%
Rest of Qld	6.2	3.2	3.4	-0.4	45.3%	48.8%	-6.0%
Greater Adelaide	0.0	0.6	-0.7	0.1	41.8%	-49.0%	9.2%
Rest of SA	10.2	6.2	3.4	0.6	60.6%	33.8%	5.6%
Greater Perth	2.9	1.3	1.6	0.0	43.7%	56.3%	0.0%
Rest of WA	10.5	5.4	6.9	-1.8	38.4%	49.1%	-12.5%
Greater Hobart	-1.5	1.2	-2.1	-0.6	30.3%	-53.2%	-16.5%
Rest of Tas.	7.0	4.5	2.7	-0.2	60.7%	36.0%	-3.3%
Greater Darwin	5.3	0.9	4.4	0.0	17.6%	82.2%	-0.2%
Rest of NT	0.0	2.0	1.2	-3.3	31.1%	19.0%	-49.9%
ACT	-9.4	-2.3	-6.2	-0.9	-24.1%	-65.9%	-10.0%

* This is the share of the absolute value of the components. This accounts for components with opposite signs, for example, the within and between component in Greater Adelaide.

Source: ABS Census of Population and Housing, 2016.

The table shows that both within and between effects are present. The two largest and most dense labour markets – Sydney and Melbourne – have lower IDs that the national average and between a third and half of the deviation is balanced across within and between components. The highest IDs are in regional Western Australia and South Australia where much of the deviation is due to within effects. The lowest ID is in the ACT and this is largely due to 'between effects', which owes to the dominant public sector.

The results point to a mix of between and within effects driving the lower segregation in more urbanised locations. This means that women have greater opportunities in bigger cities due to both the structure of the economy and the gender balance within industries and occupations. There are multiple possible drivers for this: higher wages in cities make the trade-off between work and care more attractive, shorter commute times and greater access to services make the work-care balance more manageable, higher housing costs require a greater household income (noting that women are most often the secondary earner) and there may be greater cultural acceptance of gender equality in cities.

6. Conclusion

There are five key findings of this research. First, detailed occupations and industries are profoundly more segregated than top-level occupations and industries. Second, little change has occurred in segregation across both industries and occupations in the past three decades. Third, industries are more resistant to integration than occupations. Fourth, segregation increases as workers get older. Vertical segregation, work-family dynamics and cohort effects are all likely contributors to this. And fifth, more urbanised locations have more gender integrated labour markets, which is due to both the structure of the local economies (between effects) and greater gender balance within industries and occupations.

The major implication of these findings is that decades of gender equality policy have not had a substantial impact on the gender balance across the jobs that men and women do. Women still have more constrained labour supply choices, hindering labour market efficiency and flexibility. Further work can be done on understanding and addressing the economic, social and cultural barriers to gender integration in the labour market, particularly on dimensions of vertical segregation and restructuring of the labour market post-COVID-19. Given progress is likely to be slow into the future, there is need for complementary work on how traditionally female jobs are valued (or undervalued). At least for wages, a reassessment of 'women's work' may be a faster route to gender equality.

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