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ABSTRACT

Occupational Segregation and the Gender Wage Gap in Private- and Public-Sector Employment: A Distributional Analysis*

We use HILDA data from 2001 - 2006 to analyse the source of the gender wage gap across public- and private-sector wage distributions in Australia. We are particularly interested in the role of gender segregation within sector-specific occupations in explaining relative wages. We find that, irrespective of labour market sector, the gender wage gap among low-paid, Australian workers is more than explained by differences in wage-related characteristics. The gender wage gap among high-wage workers, however, is largely unexplained in both sectors suggesting that glass ceilings (rather than sticky floors) may be prevalent. Gender differences in employment across occupations advantage (rather than disadvantage) all women except those in high-paid, private-sector jobs, while disparity in labour market experience plays a much more important role in explaining relative private-sector wages. Finally, disparity in educational qualifications and demographic characteristics are generally unimportant in explaining the gender wage gap.

JEL Classification: J31, J70, J24

Keywords: gender wage gap, occupational segregation, private and public sector employment

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I Introduction

After decades of research analysing the magnitude (and source) of the mean gender wage gap, economists have recently begun to consider the way in which relative wages differ for high- and low-wage workers. There are several reasons for this shift in focus. First, it is now becoming clear that the magnitude of the gender wage gap is generally not constant across the entire wage distribution and that the gap in mean wages obscures a great deal of the interesting variation in the data. Second, a much richer story about the role of gender in the labour market emerges once we move away from an exclusive focus on outcomes for "average" men and women. In particular, the presence of "glass ceilings" leads us to expect the gender wage gap to be larger amongst workers earning relatively high wages, while the existence of "sticky floors" might suggest the opposite (see Booth et al., 2003; Arulampalam et al., 2007; Kee, 2006). Finally, the extent to which disparity in men's and women's productivity-related characteristics accounts for the gender wage gap also appears to differ between high-and low-wage workers.[1] This implies that our theoretical models of labour market discrimination—and the public policies we adopt to deal with this phenomenon—need to be flexible enough to account for the full range of women's experiences both at the top and at the bottom of the wage distribution.

It is also important to consider the way in which the relative wages of men and women vary across labour market sectors. The mean gender wage gap is typically considerably smaller in public-sector jobs (Arulampalam et al., 2007; Gregory and Borland, 1999; Gunderson, 1989), while the distribution of relative wages varies dramatically across sectors (Arulampalam et al., 2007; Kee, 2006). Gregory and Borland (1999) argue that these differences in wage structure are not surprising given that wage setting in the public sector occurs in a political environment whereas private-sector decision making occurs in a market environment. Moreover, anti-discrimination legislation may be more aggressively enforced in the public sector and there is evidence that occupational integration has been

[1] García et al. (2001) argue that the unequal size of the discrimination effect across the distribution is related to the inability of traditional measures to fully capture discrimination. In particular, they point to the work of Kuhn (1987) (and others) suggesting that women's perceptions of discrimination do not correspond to traditional statistical measures of discrimination and that women at the top of the wage distribution are more likely to feel that they had been victims of discrimination.

more rapid in public-sector employment. Public sector jobs also tend to be concentrated in larger establishments, in a limited number of industries, and in specific occupations employing relatively educated workers. Finally, public-sector employment may attract more risk-averse workers (Pfeifer, 2008).

This paper contributes to our understanding of the distributional properties of gender wage gaps in Australia by analysing the source of the gender gap across public- and private-sector wage distributions. In particular, we address the following questions. What is the relative importance of gender differences in demographic characteristics, educational qualifications, experience, and labour market position in explaining the gender wage gap in public- and private-sector jobs? Does gender segregation within sector-specific occupations account for the pattern of relative wages in the two sectors? Finally, how do these effects differ across the wage distribution? We make three important contributions to the existing literature. First, we adopt the semi-parametric methodology proposed by DiNardo et al. (1996) which enables us to explicitly decompose public- and private-sector gender wage gaps into their various components at multiple points of the wage distribution. Second, we pool waves 1 - 6 of HILDA data allowing us to control for gender differences in employment across disaggregated (2-digit) occupations within sectors. Some researchers have controlled for the effects of aggregated industries and occupations (for example Kee, 2006; Lee and Miller, 2004), however, adopting a narrow definition of occupation helps us to avoid under-estimating the effect of occupational segregation on relative wages (Gunderson, 1989). Finally, our focus on the link between detailed occupational mix and relative wages across the wage distribution is important in light of the international evidence that the gender wage gap stems in large part from the differential return to job status and labour market position (for example, Amuedo-Dorantes and De la Rica, 2006; García et al., 2001; Breunig and Rospabe, 2005; Kunze, 2005). Ultimately, assessing the importance of phenomenon such as "sticky floors" and "glass ceilings" will rest upon our understanding of the way that labour market position affects men's and women's employment outcomes more generally.

We find that, irrespective of labour market sector, the gender wage gap among low-paid, Australian workers is more than explained by differences in wage-related characteristics.

The gender wage gap among high-wage workers, however, is largely unexplained in both sectors suggesting that glass ceilings (rather than sticky floors) may be prevalent. Gender differences in employment across occupations advantage (rather than disadvantage) all women except those in high-paid, private-sector jobs, while disparity in labour market experience plays a much more important role in explaining relative private-sector wages. Finally, disparity in educational qualifications and demographic characteristics are generally unimportant in explaining the gender wage gap.

II Gender Wage Gaps in Australia

Borland (1999) and Eastough and Miller (2004) review the history of wage setting and equal pay legislation in Australia. They note that for most of the twentieth century industrial tribunals in Australia enforced a policy of wage discrimination against female workers. When doing the same work as men, women were paid a wage equal to that of men so as to prevent men from being replaced by cheaper female labour. When employed along side other women, however, female workers were paid a wage between 54 and 60 per cent of the male rate (Short, 1986). In 1969, the Equal Pay Case for the first time introduced the concept of equal pay for equal work into the Australian labour market (see Borland, 1999; Eastough and Miller, 2004).

Perhaps as a result of this interesting legislative history, there have been a number of studies of the gender wage gap in Australia.[2] These studies show that the Equal Pay Case almost certainly contributed to an improvement in the relative pay of women (Borland, 1999) with the result that today the gender wage gap in Australia is less than half that in the United States and is amongst the lowest in the OECD (Eastough and Miller, 2004). At the same time, almost forty years on, there continues to be a substantial gender wage gap stemming primarily from the differential returns to productivity-related characteristics which is consistent with labour market discrimination. This gender wage gap is higher amongst the self-employed than it is amongst wage and salary workers (Eastough and Miller, 2004), is larger at the top of the wage distribution (Miller, 2005; Kee, 2006), and differs substantially

[2]See Rummery (1992) and Borland (1999) for extensive reviews.

across labour market sectors (Kee, 2006).

Researchers have also assessed the extent to which labour market segregation has declined over time. Although Blau and Kahn (2000) present evidence that occupational segregation in the US has fallen substantially, the integration of occupations in Australia appears to have been modest at best (Lee and Miller, 2004; Rimmer, 1991). Moreover, although the international literature suggests that a considerable portion of the gender wage gap is explained by gender segregation across occupations, industries, or jobs (see for example Blau and Kahn, 2000; Groshen, 1991), it is less obvious that segregation can account for the gender wage gap in Australia (Kidd, 1993; Lee and Miller, 2004; Miller, 1987; Rimmer, 1991). Rimmer (1991) and Lee and Miller (2004) conclude, for example, that women's relative earnings would fall rather than rise if they had the same occupational distribution as men. We know almost nothing, however, about the extent to which occupational segregation explains disparity in relative wages across labour market sectors or across the wage distribution.

Moreover, it is unclear what these patterns imply about labour market discrimination per se. The simple inclusion of occupation controls in wage regressions designed to measure labour market discrimination is appropriate only to the extent that gender segregation stems from individuals' unobserved human capital or job preferences rather than from discriminatory factors (see for example, Arulampalam et al., 2007; Miller, 1987). In particular, Arulampalam et al. (2007) argue that estimates of the gender pay gap with and without such controls provide lower and upper bounds on the extent of discrimination. Our results suggest, however, that this reasoning may be inappropriate in Australia where women appear to be advantaged rather than disadvantaged by their occupational distribution.

III Data

(i) The HILDA Survey

The data come from the Household, Income, and Labour Dynamics in Australia (HILDA) Survey. The annual survey collects information on income, labour market characteristics, and family dynamics for a nationally representative random sample of Australian households (see Watson, 2008 for more details).[3] Unlike Miller (2005) who analyses data from the 2001 Australian Census and Kee (2006) who analyses wave 1 HILDA data, we pool HILDA data from waves 1 - 6 spanning the period from 2001 to 2006.[4] The advantage of HILDA data for our purposes is that they provide more detailed information about individuals' demographic characteristics, occupational classification, and labour market experience than do Census data. Pooling data across waves makes our results more robust to particular events affecting the labour market in specific years, improves the precision of our estimates, and reduces concerns about sample selection.[5]

Our analysis sample includes private- and public-sector employees between the ages of 22 and 64 years old. We make this age restriction in order to exclude individuals in study-to-work and work-to-retirement transitions. We also exclude the self-employed and those drawing a salary from their own business. Individuals whose hourly wages are less than $4.00 or more than $90.00 (in 2001 AUD) are also dropped from the sample. Our estimation sample therefore represents individuals who are present—and satisfy all the selection criteria—in at least one wave of HILDA. The sample in wave 1, for example, consists of 624 men and 850 women in the public sector and 1896 men and 1439 women in the private sector. In the entire sample there are 4278 men and 4190 women with a total of 26,599 person-year observations.

The dependent variable in our analysis is the hourly wage rate in the main job. It is cal-

[3]Wave 1 included 13,969 respondents aged 15 and older distributed across 7682 households.

[4]We use the Stata add-on package PanelWhiz v2.0 (Nov 2007) for verifying the availability and consistency of coding for some variables in HILDA. PanelWhiz was written by Dr. John P. Haisken-DeNew (john@panelwhiz.eu) (see Haisken-DeNew and Hahn, 2006).

[5]Appendix Figure A1 shows the wave-specific distribution of relative male to female wages. Although the distribution of relative wages does not appear to vary much across waves, there are some differences between waves in the average gender wage gap particularly in the public sector in wave 1. Pooling data across waves reduces gender differences in the proportion of individuals included in the estimation sample in comparison to using only one cross section of data.

culated as the ratio of current weekly gross wages and the number of hours usually worked per week both measured in the individual's main job. We use the Consumer Price Index (CPI) available from the Australian Bureau of Statistics (2008) to deflate wages to 2001 levels.[6] Following Arulampalam et al. (2007) and Kee (2006), we analyse the determinants of the gender wage gap separately for public- and private-sector employment. People are classified as working in the public sector if they report that the best description of their employer (or business) is a government business enterprise or commercial statutory authority, or other governmental organisation (i.e. public service departments, local councils, schools, or universities). People classified as working in the private sector describe their employer as belonging to a private-sector, for-profit organisation. Those working for private not-for-profit, other commercial, and other non-commercial organisations are excluded from the analysis.

Our analysis includes controls for individuals' demographic characteristics (e.g., marital status, age, immigration status), human capital characteristics (e.g., education, employer tenure, occupation tenure, and labour market experience), state or territory of residence, and job characteristics (e.g., firm size, industry, part-time status, union membership, and occupation). One advantage of HILDA data relative to Census data is that they provide us with measures of actual labour market experience as well as both employer and occupation tenure. These measures are much more useful than potential experience measures in characterizing the labour market histories of women. HILDA also provides detailed occupational information. Our measure of occupation is based upon Sub-Major Groups in the Australian Standard Classification of Occupations (ASCO), second edition. At this ASCO level, there are 35 occupations ranging from several managerial occupations to cleaners and labourers (Australian Bureau of Statistics, 1997). Appendix Table A1 provides variable definitions, while descriptive statistics are presented by gender and sector in Appendix Table A2.

Not surprisingly, there are several differences in the relative characteristics of men and women both within and across sectors. Proportionately more men than women employed

[6]Specifically, we use the CPI at the end of the second quarter of each year, for all groups of goods, calculated as the weighted average of eight capital cities.

in the public sector are married, while there is no substantial gender difference in marriage rates in the private sector. In both sectors, divorced women represent a larger proportion of employees than divorced men. On average, there is a one-year difference in age between men and women in the public sector but there is virtually no age difference in the private sector. Women in the public sector are more likely than men to have a bachelor degree or above. In terms of experience, women have almost three fewer years tenure with their current employer in the public sector, but only one less year in the private sector. Our other measures of experience, tenure in current occupation and time in the labour force since full-time education, also exhibit similar gender differences. Finally, irrespective of labour market sector, women are more likely than men to work in jobs that are part-time, casual, or in organisations with less than 100 employees (see Appendix Table A2).

(ii) Gender Differences in Pay: Does the Level of Pay Matter?

Table 1 reports wage levels (in 2001 AUD) both at the mean and at the 10^{th}, 25^{th}, 50^{th}, 75^{th}, and 90^{th} percentiles of the wage distribution separately by gender and labour market sector. Standard errors have been bootstrapped (with 5000 repetitions) in order to account for the dependency among observations arising from the fact that we have multiple observations per individual. Specifically in Table 1—and in all of our subsequent results—we implement the bootstrap by sampling with replacement individuals rather than observations.[7] The results indicate that on average the women in our sample who are employed in the public sector earn more than $3.00 less per hour than men ($21.40 versus $24.50 per hour). The gender wage gap is somewhat larger in the private sector ($3.80) despite the fact that average hourly wages are lower for both men ($21.40) and women ($17.60). As expected, however, average wages tell us very little about the size of the gender wage gap among low- versus high-wage earners. Although there is a statistically significant difference in men and women's wages at all points of the wage distribution, we find that the gender wage gap is much larger among high-wage workers, particularly in the private sector. Moreover, the mean gender wage gap is also larger than that at the median which is consistent with the

[7]We thank Roger Koenker for this suggestion.

typical skewness in wage distributions.

[Table 1 here]

While Table 1 presents information about the gender wage gap in levels, it is also useful to consider relative wages. Figure 1 shows the natural logarithm of the ratio of male to female wages at each percentile of the wage distribution for both the public and private sectors. We have trimmed the bottom and top 5 per cent of the wage distribution where the number of observations is small. Figure 1 also shows normal confidence intervals at the 95 per cent level using the same bootstrapping method described above. We find that relative wages are roughly constant across the distribution of public-sector wages with minor variation at some percentiles (see Figure 1). Men employed in the public sector earn approximately 13 per cent more than women irrespective of whether they are high- or low-wage workers. In the private sector, however, the wage gap increases as one moves up the wage distribution. Women at the 10^{th} percentile face a wage gap of 6.8 per cent, while the wage gap at the 90^{th} percentile rises to 29 per cent. At the bottom of the wage distribution, the relative wage of women is significantly higher in the public sector than in the private sector, while at the top of the wage distribution the reverse is true. Relative wages do not differ significantly across sectors in the middle of the distribution (i.e., between approximately the $35^{th}$and 60^{th} quantiles). These results are consistent with Miller (2005) and Kee (2006).

[Figure 1 here]

(iii) Gender wage gaps and occupational segregation in Australia

Does gender segregation within sector-specific occupations account for the pattern of relative wages in the two sectors? We begin to address this issue by comparing the proportion of employed men and women in each ASCO major group in each sector (see Figures A2 and A3). Despite the aggregation into only 9 occupational categories, we observe a high degree of segregation in middle-skill jobs in Intermediate Production and Transport occupations; Intermediate Clerical, Sales and Services occupations; and Trade occupations.

This is not particularly surprising since these classifications include occupations such as plant operators and drivers; clerks, receptionists, and carers; and electricians, mechanics, and plumbers. More skilled occupations also show a high degree of gender segregation in the public sector: almost half of the women in our sample are categorised as Professionals compared to only 37.7 per cent of men. Professionals include nurses, teachers, and social welfare workers. On the other hand, women are under-represented in high-skilled Managerial and Administrative occupations. Fully, 8.6 per cent of men work in these occupations in comparison to 4.7 per cent of women. Segregation (as measured by the difference in proportion of men and women working in specific occupations) appears to be higher in the private sector. Men are almost three times as likely as women to be in a Managerial or Administrative occupation and equally as likely to be a Professional. Women are substantially over-represented in Clerical and Service jobs and under-represented in Production and Transport jobs in the private sector.

The differences across major occupational grouping (illustrated in Figures A2 and A3) are likely to provide a conservative estimate of the degree of gender segregation in the Australian labour market generally (see Gunderson, 1989). Moreover, they represent aggregate statistics across all workers and tell us nothing about how occupational segregation varies across wage levels. We investigate this issue by assessing the extent of gender segregation among high- and low-wage workers using an index of dissimilarity among detailed occupations at different levels of pay separately by sector (see Figure 2). Specifically, we classify men and women into six wage groups: 1) those in the bottom 10 per cent of their respective gender-specific wage distribution, 2) those earning wages between the 10^{th} and the 25^{th} percentile, 3) those between the 25^{th} percentile and the median, 4) those between the median and the 75^{th} percentile, 5) those between the 75^{th} and the 90^{th} percentile, and 6) those earning wages in the top 10^{th} percentile. For each of these sub-samples of individuals we then calculate an index of occupational segregation as

$$ID_i = \frac{1}{2} \sum_j |M_{ij} - F_{ij}| \,; \tag{1}$$

where $i = 1, 2, ..., 6$ indexes our segments of the wage distribution and M_{ij} and F_{ij} are

the proportions of total men and women working in occupation j. Here we use detailed occupation groups so $j = 1, 2, ..., 22$ in the public sector and $j = 1, 2, ..., 29$ in the private sector.[8] For each wage group i, this index tells us the proportion of male or female workers who would have to change jobs in order to make the gender allocation of jobs the same. ID_i equals zero if the distribution of jobs is exactly the same across genders, and equals one if men are employed in completely different jobs to the ones employing women (see Dolado et al., 2002 for example).

[Figure 2 here]

We find that occupational segregation in the public sector varies substantially across the distribution of wages (Figure 2). The index of segregation suggests that as many as 43 per cent of individuals would have to change occupations in order to make the gender distribution of low-wage jobs in the public sector identical across genders. At the top of the public-sector wage distribution, the segregation index is only 27 per cent. In the public sector there is a negative relationship between wage levels and the degree of occupational segregation. Interestingly, the degree of occupational segregation increases with wages in the private sector, particularly in the bottom half of the wage distribution.[9]

The question that remains is: how does occupational segregation affect the distribution of the gender wage gap across sectors? In what follows, we address this issue by accounting for detailed occupations groups in our decomposition of the distribution of the gender wage gap. Given the different evolution of wage gaps in the public and private sectors in both absolute and relative terms, we present our decomposition results for each sector separately.

[8]These occupations are based on Sub-Major group in the Australian Standard Classification of Occupations (ASCO), second edition (Australian Bureau of Statistics, 1997). At this level of ASCO aggregation there are 35 occupations. However, for each sector, we aggregate sub-groups that had fewer than 10 person-year observations for men or women. We also excluded from the analysis 100 person-year observations corresponding to the sub-group Farmers and Farmer Managers (13). See Appendix Table A3 for a detailed list of occupations in the analysis.

[9]The dissimilarity index calculated across all workers in the public and private sectors is 0.392 and 0.475 respectively.

IV Econometric Method

We adopt the semi-parametric methodology proposed by DiNardo et al. (1996) to decompose the distribution of the gender wage gap into its separate components.[10] We begin by assuming that each observation in the sample is drawn from the joint distribution $f(w, \mathbf{x}, g)$, where w represents the wage rate, $\mathbf{x}$ is a vector of wage covariates (e.g., education level, experience, etc.), and g is gender (0 for men and 1 for women). Conditional on gender g, we can write the joint distribution of wages and covariates as the conditional distribution $f(w, \mathbf{x}|g)$. This implies that the distribution of men's wages $f^0(w)$ is defined as the integral of the conditional density of wages over the domain of individuals' wage-related characteristics ($\Omega_{\mathbf{x}}$):

$$f^0(w) = \int_{\mathbf{x}\in\Omega_{\mathbf{x}}} f(w, \mathbf{x}|\, g = 0)\, d\mathbf{x}. \tag{2}$$

The definition of a conditional density implies that equation 2 can be rewritten as

$$f^0(w) = \int_{\mathbf{x}\in\Omega_{\mathbf{x}}} f(w|\, \mathbf{x}, g = 0)\, f_{\mathbf{x}}(\mathbf{x}|\, g = 0)\, d\mathbf{x}. \tag{3}$$

where $f(\cdot)$ is the distribution of wages conditional on both characteristics and being male and $f_{\mathbf{x}}(\cdot)$ is the distribution of wage covariates among men. The density of women's wages is defined analogously.

This representation of the (marginal) distribution of wages is useful in creating a series of counterfactual wage distributions which allow the effects of the various factors driving the gender wage gap to be isolated. Specifically, we partition the vector of wage covariates ($\mathbf{x}$) into the following four components: 1) labour market position (l); 2) experience (e); 3) educational attainment (h); and 4) demographic characteristics (d). We focus on these components specifically because previous research suggests that these are the main drivers of gender wage inequality. This partitioning, $\mathbf{x} = [l, e, h, d]$, allows us to write the wage

[10] Other studies using DiNardo et al.'s (1996) approach to analyse related issues are among others: Hyslop and Maré (2005), Daly and Valletta (2006), Cobb-Clark and Hildebrand (2006), Antecol et al. (2007), Bauer et al. (2007), and Altonji et al. (2008).

distribution for men as:[11]

$$f^0(w) = \int_l \int_e \int_h \int_d f(w, l, e, h, d \mid g = 0)\, dl \cdot de \cdot dh \cdot dd; \tag{4}$$

or

$$\begin{aligned} f^0(w) \;=\; & \int_l \int_e \int_h \int_d f(w \mid l, e, h, d, g = 0) \cdot f_l(l \mid e, h, d, g = 0) \cdot \\ & f_e(e \mid h, d, g = 0) \cdot f_h(h \mid d, g = 0) \cdot \\ & f_d(d \mid g = 0) \cdot dl \cdot de \cdot dh \cdot dd. \end{aligned} \tag{5}$$

Equation 5 is composed of five (conditional) probability densities. Note that f is the conditional wage density given *all* wage covariates ($\mathbf{x}$) and being male ($g = 0$), while f_l is the conditional density of labour market position given experience, educational qualifications, demographic characteristics, and gender. In the same way, f_e and f_h represent the conditional densities of experience and educational qualifications. Finally, f_d reflects the density of demographic characteristics conditional on gender. When the conditional expectations of these densities are linear in their arguments, we can think of $\mathbf{x}$ as reflecting a set of wage determinants, $[e, h, d]$ as capturing the determinants of labour market position, and so on (Butcher and DiNardo, 2002). In order to facilitate the interpretation of the decomposition, we partition $\mathbf{x} = [l, e, h, d]$ in such a way that more "endogenous" variables are conditional upon less "endogenous" variables (Cobb-Clark and Hildebrand, 2006).

The advantage of expressing the male wage distribution as in equation 5 is that counterfactual distributions arise intuitively. We can obtain, for example, the counterfactual wage distribution that would prevail if men retained their own conditional distributions of experience, educational qualifications, and demographic characteristics; but had the same

[11]Note that although some of the wage components contain only indicator variables, for simplicity we have used the notation for continuous random variables consistently throughout.

conditional distribution of labour market position as women. That is

$$\begin{aligned} f^A(w) &= \int_l \int_e \int_h \int_d f(w \mid l, e, h, d, g=0) \cdot f_l(l \mid e, h, d, g=1) \cdot \\ &\quad f_e(e \mid h, d, g=0) \cdot f_h(h \mid d, g=0) \cdot \\ &\quad f_d(d \mid g=0) \cdot dl \cdot de \cdot dh \cdot dd. \end{aligned} \tag{6}$$

We can then compare the counterfactual distribution given by f^A to another counterfactual distribution (f^B) in which men retain their own educational qualifications and demographic characteristics, but have the same labour market position and experience distributions as women. Similarly, f^C is the counterfactual wage distribution when men retain only their demographic characteristics, while f^D is the counterfactual wage density that results from assigning women's distributions for all four sets of wage covariates to men.

Using these counterfactual wage distributions and the observed wages for men and women, we can decompose the gender wage gap at any quantile of the age distribution, $q_i(\cdot)$, as follows:

$$\begin{aligned} q_i\left(f^0(w)\right) - q_i\left(f^1(w)\right) &= \left[q_i\left(f^0(w)\right) - q_i\left(f^A(w)\right)\right] + \left[q_i\left(f^A(w)\right) - q_i\left(f^B(w)\right)\right] + \\ &\quad \left[q_i\left(f^B(w)\right) - q_i\left(f^C(w)\right)\right] + \left[q_i\left(f^C(w)\right) - q_i\left(f^D(w)\right)\right] + \\ &\quad \left[q_i\left(f^D(w)\right) - q_i\left(f^1(w)\right)\right]. \end{aligned} \tag{7}$$

The first term on the right hand side of equation 7 captures the part of the gender wage gap, at quantile $q_i(\cdot)$, attributable to gender differences in labour market position. The second term represents the component attributable to differences in experience, while the third and fourth capture the components attributable to gender differences in educational qualifications and demographic characteristics respectively. The final term represents differences in the conditional (on $\mathbf{x}$) wage distributions of men and women. In particular, it is the portion of the gender wage gap that stems from the disparity in wages received by men and women with the same characteristics.[12]

[12]This decomposition is not unique. First, we have partitioned the wage covariates into four components implying that there are 4! permutations of the decomposition given by equation 7. To avoid our results being driven by one particular decomposition, we estimate all 24 relevant permutations and present results

Implementing the above decomposition requires estimating the counterfactual distributions f^A to f^D. The contribution of DiNardo et al. (1996) is to show that counterfactual distributions can be obtained by reweighting the observed wage distribution for either men or women. To see this, rewrite the counterfactual wage distribution f^A as

$$\begin{aligned} f^A(w) &= \int_l \int_e \int_h \int_d \psi_l f(w \mid l, e, h, d, g=0) \cdot f_l(l \mid e, h, d, g=0) \cdot \\ &\quad f_e(e \mid h, d, g=0) \cdot f_h(h \mid d, g=0) \cdot \\ &\quad f_d(d \mid g=0) \cdot dl \cdot de \cdot dh \cdot dd. \end{aligned} \tag{8}$$

where $\psi_l = f_l(l \mid e, h, d, g=0) / f_l(l \mid e, h, d, g=1)$. A comparison of equations 8 and 5 reveals that these equations differ only in the reweighting function ψ_l. Bayes theorem implies that ψ_l can be rewritten as:

$$\psi_l = P(g=1 \mid \mathbf{x}) P(g=0 \mid e, h, d) \left[P(g=0 \mid \mathbf{x}) P(g=1 \mid e, h, d)\right]^{-1}. \tag{9}$$

Note that the calculation of ψ_l involves only the probabilities of being of being male or female conditional on various sets of wage covariates. We can therefore estimate these probabilities using logit models in which the dependent variable is a gender indicator. These estimated probabilities can then be combined to generate an estimate of the reweighting factor ($\hat{\psi}_l$) which then multiplies the observed wage distribution for men to create f^A. Other counterfactual distributions are calculated in an analogous way.

The decomposition method proposed by DiNardo et al. (1996) is by no means the only way to calculate the effect of different factors on the wage gap at multiple points of the wage distribution. Alternative decomposition techniques can be found in, among others, Blau and Kahn (1996); Fortin and Lemieux (1998); and Donald et al. (2000). In particular, quantile regression is another relatively recent method that has been used to analyse

averaged across all decomposition (Cobb-Clark and Hildebrand, 2006). Second, this decomposition weights the difference in conditional wage distributions by women's characteristics. It effectively provides an estimate of what women would earn if they retained their own characteristics, but were paid like men. This is consistent with a model of discrimination against women rather than nepotism towards men and is the more interesting counterfactual for our purposes (see Arulampalam et al., 2007; Neumark, 1988). We also estimated the parallel decomposition which weights the differences in returns by male characteristics and found the results broadly consistent with those presented here. These additional results are available upon request.

wage gaps and wage inequality.[13] Whether the DiNardo et al. (1996) decomposition or decompositions based on quantile regressions produce more precise results is unknown and has not been addressed in the literature. More importantly, it seems that the selection of the decomposition method depends upon the aim of the study. In our case, we choose DiNardo et al.'s (1996) decomposition because it is easy to implement and because it provides an estimate if the total proportion of the wage gap that can be attributed to various sets of wage determinants. If interest lies in the specific contribution of single covariates (either continuous or discrete) to the gender wage gap, the decomposition approach proposed by Firpo et al. (2007) seems to be a natural extension of DiNardo et al.'s (1996) decomposition. Firpo et al. (2007) also present a brief comparison of decomposition methodologies and their characteristics.

V Results

We are interested in understanding the relative importance of gender differences in demographic characteristics, educational qualifications, experience and labour market position in explaining the distribution of gender wage gaps in both public- and private-sector employment. We investigate this issue using the method described in Section IV to decompose sector-specific gender wage gaps into their relevant components.[14] We begin by estimating a model that excludes occupation from the vector of labour market position variables. We then repeat the decomposition exercise adding controls for detailed (2-digit) occupations. In addition to shedding light on how gender segregation within sector-specific occupations affects relative wages in the two sectors, this procedure also gives us insight into the sensitivity of the unexplained component (i.e. estimated labour market discrimination) to alternative assumptions about the discriminatory nature of the occupational distribution

[13] For an introduction see Koenker and Hallock (2001) and Buchinsky (1998). Empirical research on wage gaps and wage inequality using this method can be found in Gardeazabal and Ugidos (2005); García et al. (2001); Albrecht et al. (2003); and Machado and Mata (2001, 2005). Finally, applications of this methodology to Australian data are available in Miller (2005) and Kee (2006).

[14] The decomposition is done using the Stata command decompose.ado written by Juan Barón and James Muller. The code is available upon request. The command computes all possible ways in which the wage gap can be calculated for any given number of factors. Many other statistics can also be decomposed with this command.

itself (see Arulampalam et al., 2007; Miller, 1987). In particular, Arulampalam et al. (2007) argue that estimates of the gender pay gap with and without such controls provide lower and upper bounds on the extent of discrimination.

Table 2 presents results for the decomposition of the logarithm of the ratio of male to female hourly wages in the public sector. Unconditional relative wage ratios are presented in the first column of Table 2, while subsequent columns show the estimated proportion of this gap that can be attributed to gender differences in each underlying component. Bootstrapped standard errors (with 2000 replications) are presented in parentheses.[15] Finally, the percentage of the gender wage gap attributable to each of the four factors is presented in square brackets.

[Table 2 here]

In the public sector, relative wages are roughly constant with a gender wage gap of approximately 13 per cent across the distribution (see Figure 1). Gender differences in wage-related characteristics fully account for the lower wages received by women at the bottom of the wage distribution. The proportion of the gender wage gap that cannot be explained by differences in wage-related characteristics (see column 6) is insignificantly different from zero in the bottom half of the distribution. Among high-wage workers, however, the portion of the wage gap not attributable to gender differences in endowments rises to over 90 per cent. Despite the fact that the magnitude of the public-sector gender wage gap is relatively constant, the extent to which it can be explained by the wage-related characteristics of men and women falls as we move up the wage distribution. Overall, it appears that high-wage public-sector employees in Australia may face more employer discrimination (i.e., glass ceilings) than low-wage workers (i.e., sticky floors). Arulampalam et al. (2007) also find no evidence of sticky floors in European public sector employment, while Kee (2006) reaches the same conclusion for Australia.

It is also useful to consider the relative importance of gender differences in specific wage-related characteristics in producing wage gaps. Our results indicate that at the

[15] As before, we implement the bootstrap by sampling individuals (rather than observations) with replacement to take into account the interdependency of observations. As a result, we obtain standard errors that are smaller than using only one wave of data (reflecting the efficiency of pooling wages), but which are larger than treating each observation as independent.

10^{th} percentile of the wage distribution, gender differences in labour market position (e.g. industry, casual status, part-time status, union membership) account for fully 91.2 per cent of the gender wage gap. Although the effect of labour market position falls (and becomes insignificant) as we move up the wage distribution, it is an important explanation for the gender wage gap in the bottom half of the wage distribution. On the other hand, gender differences in experience explain a relatively modest proportion of the gender wage gap (at most 9.9 per cent at the 25^{th} percentile) despite the detailed measures of actual experience included in the model. In fact, differences in labour market experience contribute to reducing (rather than increasing) the wage gap among high-wage workers though this effect is not statistically significant. Similarly, demographic characteristics and education have an insignificant effect on the gender wage gap throughout the distribution.[16] Taken together these results indicate that the distribution of relative wages in the public sector mainly reflects the relative labour market position of low-wage men and women and is completely unexplained by the wage-related characteristics of high-wage workers.

Introducing measures of occupation into the set of controls for labour market position has two effects (see the right panel of Table 2). First, the portion of the gender wage gap explained by relative labour market position falls substantially, particulary, at the bottom of the wage distribution. At the 10^{th} percentile, for example, the component due to labour market position falls from 91.2 to 30.6 per cent. Secondly, the fall in the component due to labour market position not surprisingly translates into an increase in the unexplained component of the gender wage gap. At the median, for example, the unexplain component increases from 75.0 to 91.8 per cent when we include occupation into the model. The percentage of the gender wage gap accounted for by the other three factors remains roughly unchanged. That the distribution of men and women across public-sector occupations appears to advantage, rather than disadvantage Australian women, is inconsistent with much of the international literature which suggests that labour market segregation contributes to the lower relative wages of women (see for example, Blau and Kahn, 2000; Dolado et al., 2002; Groshen, 1991). These results are, however, consistent with previous results based

[16] In the parallel decomposition that reweights differences in conditional wage distributions by the distribution of male wage-related characteristics, we found that gender differences in education contribute to a significant reduction in the public-sector gender wage gap. Results available upon request.

on Australian data (see Lee and Miller, 2004; Rimmer, 1991).

Table 3 presents our decomposition results for the private sector. Unlike the public sector, the unconditional gender wage gap rises as the wage level increases, from 6.8 per cent at the 10^{th} percentile to 29.0 per cent at the 90^{th} percentile. Differences in the conditional wage distribution serve to reduce (rather than increase) the pay gap faced by women at the very bottom of the wage distribution. Gender differences in wage-related characteristics, in particular, labour market position fully account for the pay gap facing low-wage women, but explain less than half of the gender wage gap among high-wage workers. Consistent with the results for the public-sector, we find no evidence that employer discrimination is more prevalent among low-wage, private-sector employers than among their high-wage counterparts. Thus, as before, the issue seems to be one of glass ceilings rather than sticky floors.

[Table 3 here]

In sharp contrast to the public sector, gender differences in labour market experience are an important explanation for the lower relative wages of women employed in the private sector. At the median, for example, experience accounts for roughly a third of the gender wage gap. Only among the highest paid private-sector workers (at the 90^{th} percentile) is there no significant experience component in the gender wage gap. At the same time, as in the public-sector, gender differences in education and demographic characteristics are not significant in explaining the lower relative wages of women employed in the private sector. Interestingly, the effects of education and demographics are often of opposite sign in the two sectors though given the imprecision of the estimates it is difficult to form firm conclusions about what this might imply. Finally, labour market position accounts for an economically important and statistically significant proportion of the gap across the wage distribution. The magnitude of the effect is roughly constant across the distribution and more than explains the gap at the bottom of the wage distribution where the relative wage gap is smaller. Still, at the 90^{th} percentile, labour market position accounts for almost 41 per cent of the gender wage gap.

Introducing occupation into the set of controls for labour position has no substantive

effect on the portion of the gender wage gap attributable to differences in experience, educational qualifications, and demographic characteristics (see the right panel of Table 3). However, as was the case in the public sector, the portion of the gender wage gap explained by gender differences in labour market position falls substantially at the bottom of the wage distribution where the unconditional wage gap is smaller. Although labour market position continues to completely explain the 6.8 per cent gender wage gap at the 10^{th} percentile, the relative importance of labour market position falls by approximately 10 percentage points at the 25^{th} and 50^{th} percentiles. There is a corresponding increase in the portion of the wage gap accounted for by differences in conditional wage distributions (i.e., estimated labour market discrimination) once occupational controls are added. At the median, for example, the unexplained component increases from 2.9 to 20.5 per cent. These effects are reversed in the top half of the wage distribution where gender differences in occupation contribute positively toward explaining the gender wage gap. At the 90^{th} percentile for example, the portion of the wage gap explained by labour market position increases (from 41.9 to 51.0 per cent) while the unexplained component falls (from 59.2 to 51.2 per cent) once occupational controls are included.

VI Conclusions

This paper analyses the source of the gender wage gap in public- and private-sector employment in Australia. Our results suggest that, irrespective of sector of employment, the gender wage gap among low-paid workers is fully explained by gender differences in productivity-related characteristics. Among high-wage workers, however, the wage gap faced by women is mostly (approximately 60 per cent) unexplained in the private sector and is completely unexplained in the public sector. Thus, our results are more consistent with the presence of glass ceilings than with sticky floors (Albrecht et al., 2003; Booth et al., 2003). Identification of the specific components of the gender wage gap reveals that disparity in educational qualifications and demographic characteristics are generally unimportant in explaining the wage gap, while differences in men's and women's labour market experience have a more important role in explaining relative private-sector than public-sector

wages particularly for workers in the bottom half of the wage distribution. Finally, gender differences in labour market position (e.g. industry, casual, part-time, union membership) provide an important explanation for the relatively low wages received by women. However, taking occupational segregation into account serves to increase (rather than decrease) the unexplained component further for all but the most highly paid private-sector employees. The suggestion by Arulampalam et al. (2007) that inclusion of occupational controls provides a lower-bound estimate of the extent of labour market discrimination seems to be inappropriate in the Australian context where in most cases the occupational distribution favors women with respect to wages.

The fact that the magnitude (and source) of the gender wage gap varies across labour market sectors is certainly supports the view that wage-setting mechanisms differ in public- and private-sector employment. Still, there are a number of puzzles yet to be resolved. In particular, the smaller wage gap in the public sector is consistent with more intensive anti-discrimination enforcement and faster occupational integration in public-sector employment (see Gregory and Borland, 1999). However, almost none of the gap in the relative wages of highly-paid, public-sector employees can be attributed to differences in their productivity-related characteristics. Why then do high-wage women employed in the Australian public sector continue to earn less than their male counterparts? To what extent is this evidence of employer discrimination? Moreover, it is not immediately obvious why gender differences in industry, casual status, part-time status, and union membership play such a large role in explaining the gender wage gap for low-wage workers. Booth and Wood (2008) find, for example, that, unlike in the US and the UK, part-time workers in Australia receive a wage premium rather than a wage penalty suggesting that it is not the concentration of women in part-time employment. Future research will be needed to carefully examine the role of labour market position in driving relative wages and to assess the extent to which labour market position itself might be the result of discriminatory factors. Finally, why does occupational segregation seem to improve rather than undermine the relative wages of women in Australia when then opposite appears to be the case in other countries? In their review of the literature, for example, Blau et al. (1998) conclude that "occupational segregation by sex has repeatedly been cited by scholars as a major deter-

minant of the gender pay gap" (pg. 1). Yet our results are consistent with Lee and Miller (2004) and Rimmer (1991) in finding a positive effect of women's occupational position on their relative wages despite a relatively high degree of persistent occupational segregation. This leaves open a number of questions about the particular role of Australian labour market institutions in producing this result.

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	Wages in Public Sector			*Wages in Private Sector*		
	Female	*Male*	*Wage Gap*	*Female*	*Male*	*Wage Gap*
Mean	21.36	24.45	3.10	17.56	21.39	3.82
	(0.18)	(0.26)	(0.32)	(0.14)	(0.19)	(0.24)
10^{th} percentile	13.20	14.98	1.77	11.09	11.85	0.76
	(0.16)	(0.18)	(0.24)	(0.11)	(0.09)	(0.14)
25^{th} percentile	16.02	18.37	2.35	13.15	14.44	1.29
	(0.15)	(0.22)	(0.26)	(0.06)	(0.09)	(0.11)
Median	20.23	23.04	2.81	15.69	18.23	2.54
	(0.21)	(0.25)	(0.32)	(0.09)	(0.17)	(0.19)
75^{th} percentile	25.36	28.50	3.14	19.62	24.90	5.29
	(0.26)	(0.33)	(0.41)	(0.20)	(0.28)	(0.34)
90^{th} percentile	30.44	35.11	4.67	26.03	34.93	8.89
	(0.35)	(0.52)	(0.62)	(0.45)	(0.60)	(0.75)

Table 1: **Unconditional Gender Wage Gap across the Wage Distribution by Sector (in 2001 dollars).**

Notes: The sample includes employees aged 22 to 64 receiving hourly wages between $4 and $90 per hour (in 2001 dollars) in each wave. We use data from HILDA's waves 1 to 6. We use the Consumer Price Index (CPI) to transform wages to 2001 dollars. Wages per hour are calculated as the ratio between current weekly gross wage and salary to hours per week usually worked both in the main job. The numbers in parenthesis are bootstrapped standard errors with 5000 replications. Standard errors are clustered at the individual level. All statistics in the table are statistically different from zero at the 1 per cent level. There are 4278 men and 4190 women in the sample, with 26599 person-year observations.

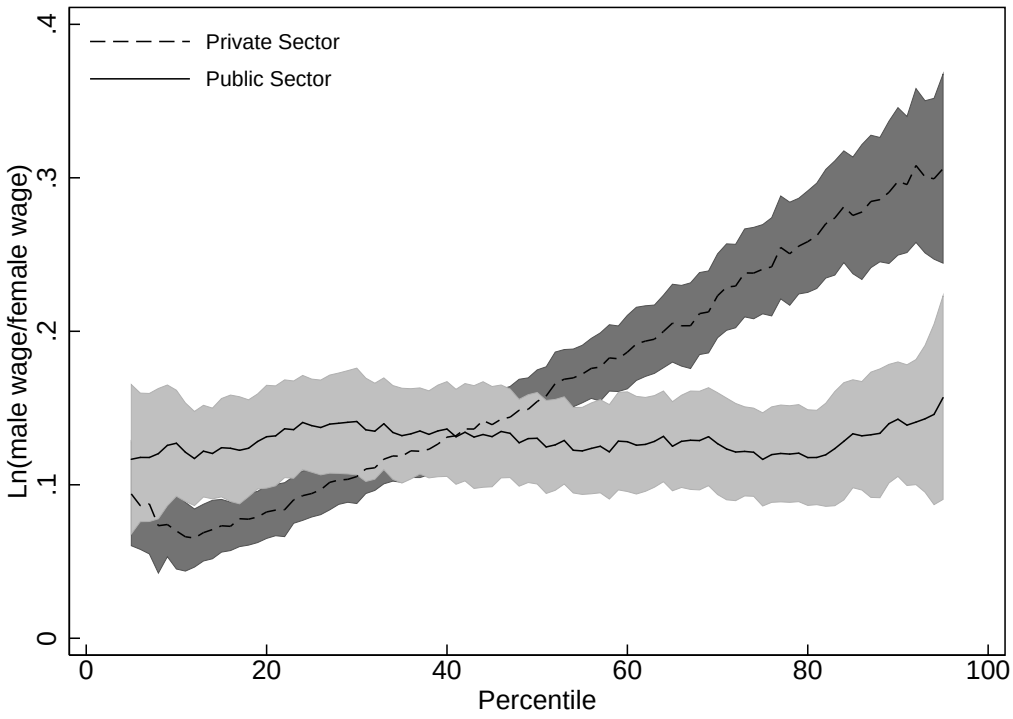

Figure 1: **Natural Logarithm of the Gender Wage Ratio by Sector.**
Notes: The sample includes employees aged 22 to 64 receiving hourly wages between $4 and $90 per hour (in 2001 dollars) in each wave. We use data from HILDA's waves 1 to 6. We use the Consumer Price Index (CPI) to transform wages to 2001 dollars. Wages per hour are calculated as the ratio between current weekly gross wage and salary to hours per week usually worked both in the main job. The bands represent bootstrapped-normal confidence intervals at the 95 per cent level with 5000 replications and clustered at the individual level. The graph excludes the top and bottom 5 percentiles. The dashed and solid lines represent the coefficient on a gender dummy (1 for male, 0 for female) from quantile regressions, at each percentile, of the logarithm of the wage per hour (in 2001 dollars) on the gender dummy. There are 4278 men and 4190 women in the sample, with 26599 person-year observations.

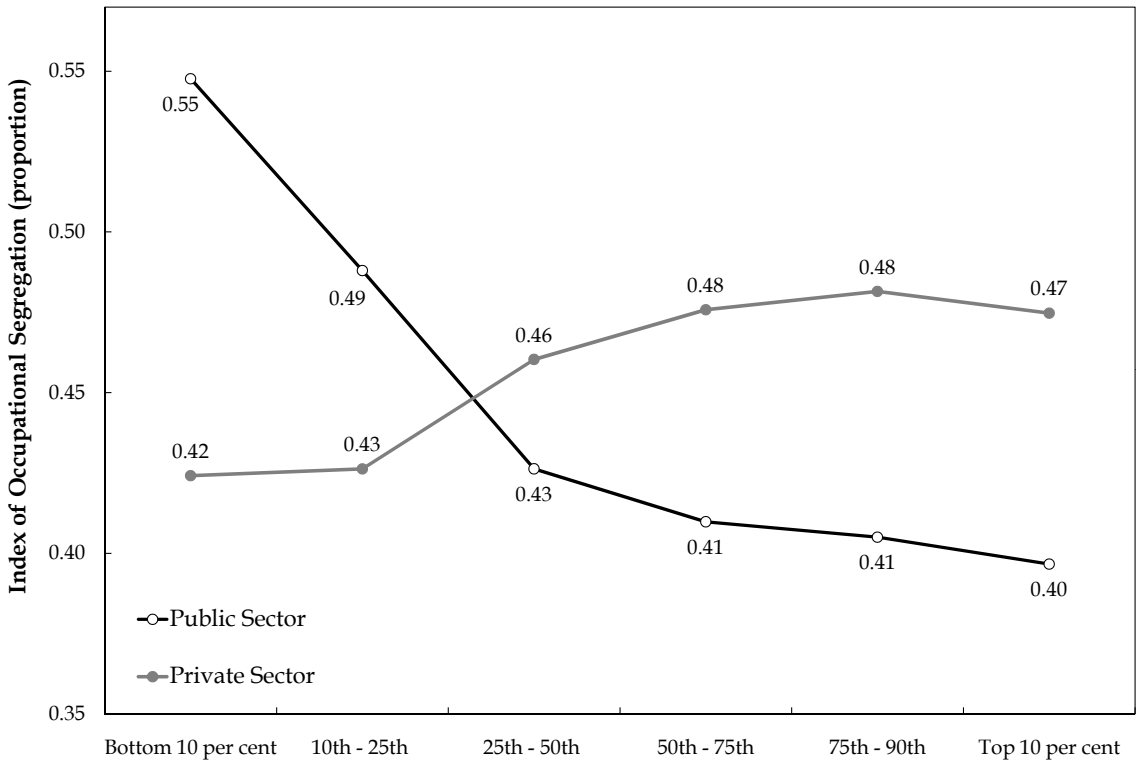

Figure 2: **Occupational Segregation across the Distribution of Wages, by Sector.**
The figures represented in this graph are calculated as follows: we calculate the proportion of total women and total men working in each occupation for individuals at different points of the wage distribution (e.g. in the bottom 10 per cent of their corresponding gender wage distribution). At each of these points of the distribution, and for each sector, we calculate an index of occupational segregation as $ID = 0.5 \times \sum_i |M_i - F_i|$ where i indexes occupations, and M_i and F_i are the proportions of total men and total women in occupation i. The resulting statistic tells us the proportion of women or men workers who would have to change jobs to make the distribution of occupations for each gender identical. The occupations used are based on the Australian Standard Classification of Occupations's (ASCO) Sub-Major Groups (22 categories in the public sector and 29 in the private sector). See Table A3 for a detailed description of occupations. There are 4278 men and 4190 women in the sample, with 26599 person-year observations.

		Occupation Excluded					*Occupation Included*				
	Raw wage gap	*Labour market charac.*	*Experience*	*Education*	*Demographics*	*Unexp.*	*Labour Market charac.*	*Experience*	*Education*	*Demographics*	*Unexp.*
10^{th} percentile	.124	.114	.004	.001	.009	−.004	.038	−.002	−.006	.021	.074
Std. Error	(.017)	(.040)	(.017)	(.012)	(.017)	(.058)	(.046)	(.024)	(.013)	(.024)	(.061)
%		[91.2]	[3.5]	[0.8]	[7.6]	[−3.1]	[30.6]	[−1.9]	[−4.6]	[16.5]	[59.4]
25^{th} percentile	.135	.081	.013	−.009	.009	.042	.028	.009	−.011	.008	.101
Std. Error	(.015)	(.028)	(.013)	(.010)	(.012)	(.040)	(.025)	(.015)	(.009)	(.014)	(.036)
%		[59.8]	[9.9]	[−7.0]	[6.5]	[30.7]	[20.6]	[6.8]	[−8.1]	[5.7]	[74.9]
50^{th} percentile	.126	.025	.004	−.012	.015	.095	.003	.001	−.010	.017	.116
Std. Error	(.015)	(.018)	(.012)	(.008)	(.010)	(.029)	(.018)	(.012)	(.008)	(.010)	(.028)
%		[19.6]	[3.0]	[−9.7]	[12.0]	[75.0]	[2.3]	[0.5]	[−7.6]	[13.1]	[91.8]
75^{th} percentile	.115	.011	−.007	−.009	.019	.101	.005	−.008	−.005	.019	.103
Std. Error	(.015)	(.015)	(.012)	(.007)	(.010)	(.024)	(.015)	(.012)	(.007)	(.009)	(.022)
%		[9.5]	[−6.5]	[−7.9]	[16.7]	[88.1]	[4.7]	[−6.8]	[−4.6]	[16.6]	[90.1]
90^{th} percentile	.141	.012	−.031	.003	.027	.130	.016	−.030	.004	.027	.124
Std. Error	(.018)	(.026)	(.025)	(.012)	(.016)	(.045)	(.026)	(.025)	(.011)	(.016)	(.048)
%		[8.5]	[−21.8]	[1.9]	[19.5]	[92.0]	[11.1]	[−21.5]	[3.1]	[19.3]	[88.1]

Table 2: **Decomposition of the Male to Female Wage Ratio, Public Sector.**

Notes: *Demographics* includes controls for marital status (the base group is single), state and territory dummies, and remoteness indicators (base group ACT and Major Cities), age, age^2, and indicators for immigrants, immigrants from non-English speaking countries and aboriginals. *Education* includes six indicator variables from Master and PhD to Year 12 and the base group is less than Year 12. *Experience* includes tenure with current employer (and squared), tenure in current occupation (and squared), time in labour force since full time education (and squared), and dummy variables for individuals with no children, children aged 0 to 4, and 5 to 14 (the reference group are individuals with children aged 15 and more.) *Labour Market Characteristics* includes 11 dummy variables for industry (the base group is people working in Accommodation, Cultural and Personal services), and indicator variables for people working part-time, in a casual basis, in workplaces with less than 100 employees, and union members. Depending on the panel of the table, this group also includes a set of occupational dummy variables (See Table A3 for details). These are based on Sub-Major Groups in the Australian Standard Classification of Occupations (ASCO).

Numbers in parentheses are bootstrapped standard errors with 2000 replications and clustered at the individual level. There are 4278 men and 4190 women in the sample, with 26599 person-year observations.

		Occupation Excluded					*Occupation Included*				
	Raw wage gap	*Labour market charac.*	*Experience*	*Education*	*Demographics*	*Unexp.*	*Labour Market charac.*	*Experience*	*Education*	*Demographics*	*Unexp.*
10^{th} percentile	.068	.136	.040	.006	−.003	−.112	.087	.036	.009	−.001	−.064
Std. Error	(.013)	(.030)	(.020)	(.009)	(.010)	(.041)	(.025)	(.016)	(.007)	(.008)	(.036)
%		[201.0]	[58.5]	[8.9]	[−3.7]	[−164.6]	[128.6]	[53.4]	[13.2]	[−1.4]	[−93.7]
25^{th} percentile	.094	.076	.040	.003	.000	−.025	.068	.036	.003	−.002	−.011
Std. Error	(.008)	(.018)	(.015)	(.006)	(.006)	(.020)	(.020)	(.015)	(.005)	(.006)	(.022)
%		[81.0]	[42.4]	[3.4]	[−0.2]	[−26.6]	[71.7]	[38.3]	[3.7]	[−1.9]	[−11.7]
50^{th} percentile	.152	.094	.053	.008	−.007	.004	.078	.043	.006	−.005	.031
Std. Error	(.011)	(.017)	(.015)	(.005)	(.007)	(.019)	(.018)	(.014)	(.005)	(.006)	(.020)
%		[61.6]	[34.6]	[5.2]	[−4.3]	[2.9]	[51.0]	[28.3]	[3.8]	[−3.5]	[20.5]
75^{th} percentile	.239	.108	.052	.003	−.005	.081	.120	.045	.005	−.001	.071
Std. Error	(.015)	(.025)	(.026)	(.010)	(.012)	(.036)	(.026)	(.022)	(.009)	(.010)	(.028)
%		[45.4]	[21.8]	[1.1]	[−2.1]	[33.7]	[50.1]	[18.7]	[2.0]	[−0.5]	[29.7]
90^{th} percentile	.290	.121	.006	−.007	−.002	.172	.148	−.005	−.003	.001	.149
Std. Error	(.025)	(.030)	(.043)	(.016)	(.016)	(.051)	(.034)	(.038)	(.014)	(.015)	(.045)
%		[41.9]	[1.9]	[−2.3]	[−0.8]	[59.2]	[51.0]	[−1.7]	[−1.1]	[0.4]	[51.5]

Table 3: **Decomposition of the Male to Female Wage Ratio, Private Sector.**

Notes: *Demographics* includes controls for marital status (the base group is single), state and territory dummies, and remoteness indicators (base group ACT and Major Cities), age, age^2, and indicators for immigrants, immigrants from non-English speaking countries and aboriginals. *Education* includes six indicator variables from Master and PhD to Year 12 and the base group is less than Year 12. *Experience* includes tenure with current employer (and squared), tenure in current occupation (and squared), time in labour force since full time education (and squared), and dummy variables for individuals with no children, children aged 0 to 4, and 5 to 14 (the reference group are individuals with children aged 15 and more.) *Labour Market Characteristics* includes 11 dummy variables for industry (the base group is people working in Accommodation, Cultural and Personal services), and indicator variables for people working part-time, in a casual basis, in workplaces with less than 100 employees, and union members. Depending on the panel of the table, this group also includes a set of occupational dummy variables (See Table A3 for details). These are based on Sub-Major Groups in the Australian Standard Classification of Occupations (ASCO).
Numbers in parentheses are bootstrapped standard errors with 2000 replications and clustered at the individual level. There are 4278 men and 4190 women in the sample, with 26599 person-year observations.

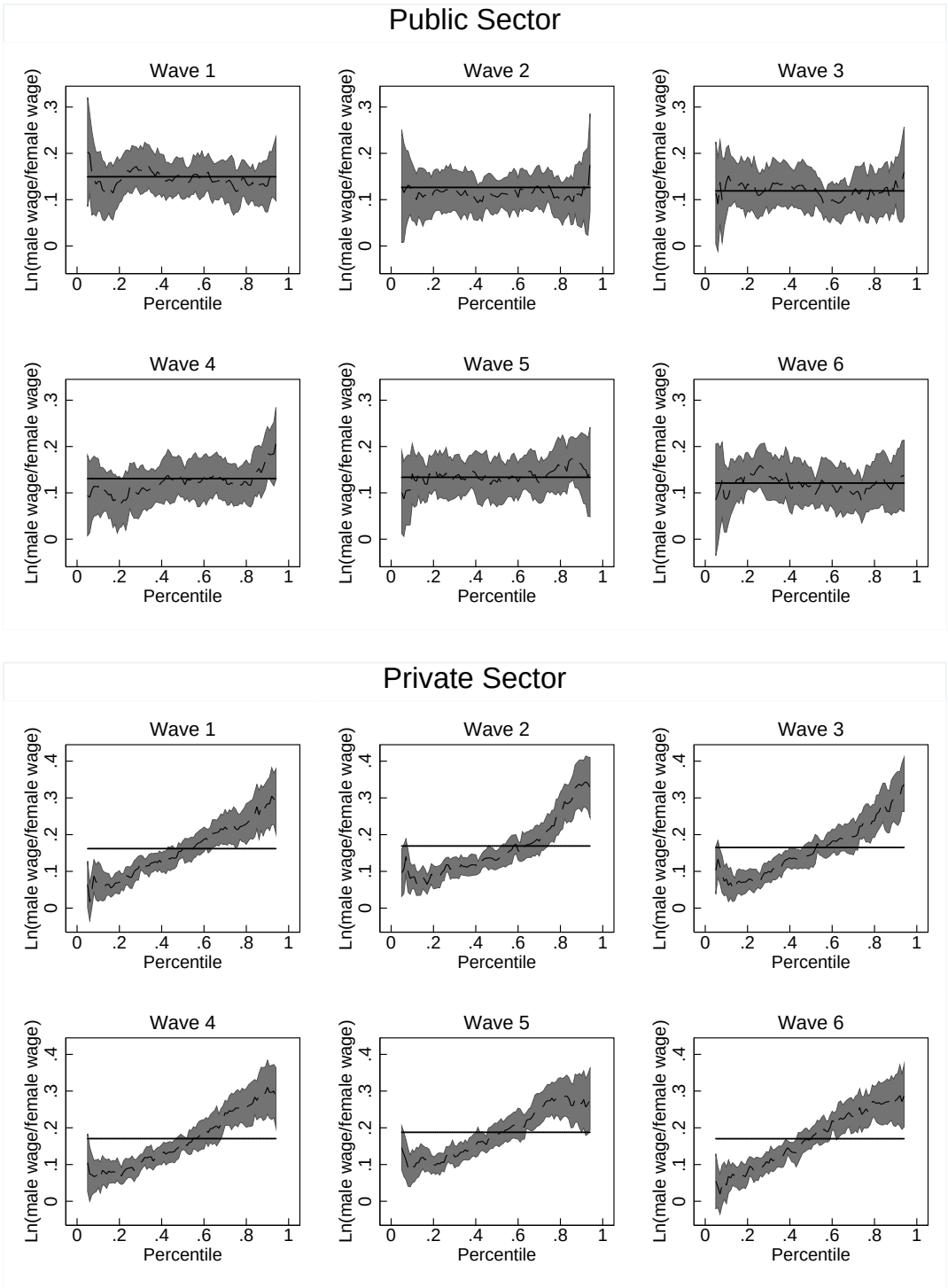

Figure A1: **Natural Logarithm of the Gender Wage Ratio by Sector and Wave**
Notes: The sample includes employees aged 22 to 64 receiving hourly wages between $4 and $90 per hour (in 2001 dollars) in each wave. We use data from HILDA's waves 1 to 6. We use the Consumer Price Index (CPI) to transform wages to 2001 dollars. Wages per hour are calculated as the ratio between current weekly gross wage and salary to hours per week usually worked both in the main job. The dashed line represents the coefficient on a gender dummy (1 for male, 0 for female) from quantile regressions, at each percentile, of the logarithm of the wage per hour (in 2001 dollars) on the gender dummy. The bands represent the corresponding normal-based confidence intervals at the 95 per cent level. From all graphs we exclude the first and last 5 percentiles since samples sizes are small. There are 4278 men and 4190 women in the sample, with 26599 person-year observations.

Variable	*Definition*
Wage per hour (dollars of 2001)	Current weekly gross wage and salary in main job divided by hours per week usually worked in the same job. We exclude the bottom and top 1% of wages. We use CPI to deflate wages in years 2002 to 2006.
Female	Equals 1 if respondent is female, 0 otherwise.
Public Sector	Equals 1 if person works for Government business enterprise, a commercial statutory authority or other governmental organisation, and 0 if person works for a for-profit private organisation. People working in non-for-profit organisations, other commercial, and other non-commercial organisations are excluded from the sample.
Private Sector	Equals 1 if public equals 0, and 0 if public equals 1.
Group: Demographics	
Marital Status	
Married	Equals 1 for married, 0 otherwise.
De-facto	Equals 1 for in a de-facto relationship, 0 otherwise.
Separated	Equals 1 for separated from partner, 0 otherwise.
Divorced	Equals 1 for divorced, 0 otherwise.
Widowed	Equals 1 for widowed, 0 otherwise.
Geographical variables	
New South Wales	Equals 1 for New South Wales, 0 otherwise.
Victoria	Equals 1 for Victoria, 0 otherwise.
Queensland	Equals 1 for Queensland, 0 otherwise.
South Australia	Equals 1 for South Australia, 0 otherwise.
Western Australia	Equals 1 for Western Australia, 0 otherwise.
Tasmania	Equals 1 for Tasmania, 0 otherwise.
Northern Territory	Equals 1 for the Northern Territory, 0 otherwise.
Inner region	Equals 1 for Inner Regional Australia, 0 otherwise.
Outer region	Equals 1 for Outer Regional Australia, 0 otherwise.
Remote Region	Equals 1 for Remote Australia, 0 otherwise.
Other characteristics	
Immigrant non-English background	Equals 1 for immigrant from non-English speaking country.
Immigrant	Equals 1 for an immigrant, 0 otherwise.
Aboriginal or TSI	Equals 1 for aboriginal or Torres Strait Islander, 0 otherwise.
Age	Age in years.
Group: Education	
Master or PhD	Equals 1 if person has a masters or PhD, 0 otherwise.
Graduate certificate	Equals 1 if person has a graduate certificate, 0 otherwise.
Bachelor degree	Equals 1 if person has a bachelor degree, 0 otherwise.
Diploma	Equals 1 if person has a diploma, 0 otherwise.
Certificate	Equals 1 if person has a certificate, 0 otherwise.
Year 12	Equals 1 if person has completed Year 12, 0 otherwise.
Group: Experience	
Tenure with current employer	Years of tenure with current employer.
Tenure in current occupation	Years of tenure in current occupation.
Children aged 0 to 4 in household	Equals 1 if person has children aged 0 to 4 years old.
Children aged 5 to 14 in household	Equals 1 if person has children aged 5 to 14 years old.
No children	Equals 1 if person has no children, 0 otherwise.
Time in labour force since FT education	Years of paid work since leaving school.
Group: Labour Market Characteristics	
Part-time	Equals 1 if person works part-time.
Casual	Equals 1 for employed in a casual basis.
Firm has less than a 100 employees	Equals 1 if person works in an organisation with less than 100 employees in all locations in Australia, 0 otherwise.
Union member	Equals 1 if persons is a union member, 0 otherwise.

Table A1: **Definition of Variables in the Analysis**

Notes: Boldface text indicate specific wage covariates considered in the decompositions. The base group in the *Demographics* group are individuals who are single, living in the ACT, in a Major City, who are not immigrants nor aboriginal. In the *Education* group the base group is people who have less than Year 12 of education. In the *Experience* group the base group is individuals with children aged 15 and more. The *Labour Market Characteristics* group includes 11 industry dummies; in every case the base group are people in Accommodation, Cultural, and Personal Services. See Table A3 for a detailed description of occupations included in some specifications in this group.

	Overall	*Public Sector*		*Private Sector*	
Variable	*Mean*	*Female*	*Male*	*Female*	*Male*
Wage per hour (dollars of 2001)	20.7	21.4	24.5	17.6	21.4
Group: Demographics					
Marital Status					
Married	.558	.564	.664	.524	.543
De-facto	.154	.141	.141	.161	.160
Separated	.033	.041	.025	.043	.025
Divorced	.065	.088	.035	.087	.047
Widowed	.010	.017	.007	.017	.001
Geographical variables					
New South Wales	.299	.304	.309	.297	.295
Victoria	.249	.229	.218	.267	.255
Queensland	.210	.204	.205	.215	.212
South Australia	.088	.086	.084	.088	.089
Western Australia	.093	.087	.084	.088	.103
Tasmania	.030	.041	.023	.027	.029
Northern Territory	.008	.014	.011	.005	.007
Inner region	.224	.244	.240	.215	.218
Outer region	.097	.108	.121	.090	.089
Remote Region	.020	.032	.017	.015	.020
Other characteristics					
Immigrant non-English background	.116	.087	.088	.137	.123
Immigrant	.219	.178	.196	.238	.231
Aboriginal or TSI	.014	.025	.018	.011	.011
Age	39.6	41.5	42.6	38.7	38.5
Group: Education					
Master or PhD	.041	.073	.102	.016	.025
Graduate certificate	.068	.149	.123	.041	.032
Bachelor degree	.173	.272	.201	.148	.138
Diploma	.100	.118	.130	.101	.082
Certificate	.239	.123	.228	.174	.343
Year 12	.138	.099	.091	.188	.135
Group: Experience					
Tenure with current employer	6.8	8.656	11.776	4.580	5.801
Tenure in current occupation	9.3	10.6	11.8	7.5	9.3
Children aged 0 to 4 in household	.160	.114	.165	.133	.199
Children aged 5 to 14 in household	.317	.329	.343	.303	.313
No children	.347	.311	.304	.340	.382
Time in labour force since FT education	19.7	19.6	23.6	17.2	20.2
Group: Labour Market Characteristics					
Part-time	.258	.398	.096	.471	.090
Casual	.205	.135	.073	.338	.183
Firm has less than a 100 employees	.373	.147	.120	.511	.461
Union member	.323	.530	.593	.177	.243
Observations (person-year)		4814	3585	7795	10517

Table A2: **Descriptive Statistics by Sector and Gender.**

Notes: Information is from the HILDA survey waves one to six. The sample includes employees aged 22 to 64 receiving hourly wages between $4 and $90 dollars per hour (in 2001 dollars) in each wave. Boldface text indicate specific wage covariates considered in the decompositions. The base group in the *Demographics* group are individuals who are single, living in the ACT, in a Major City, who are not immigrants nor aboriginal. In the *Education* group the base group is people who have less than year 12 of education. In the *Experience* group the base group is individuals with children aged 15 and more. In the *Labour Market Characteristics* the base group is people working in accommodation, cultural and Personal services and whose occupation is labourer or related worker. Occupations are Major Groups in the Australian Standard Classification of Occupations (ASCO). The Labour Market Characteristics group also includes 11 industry dummies; in every case the base group are people in Accommodation, Cultural, and Personal Services. There are in the sample 4193 women and 4298 men.

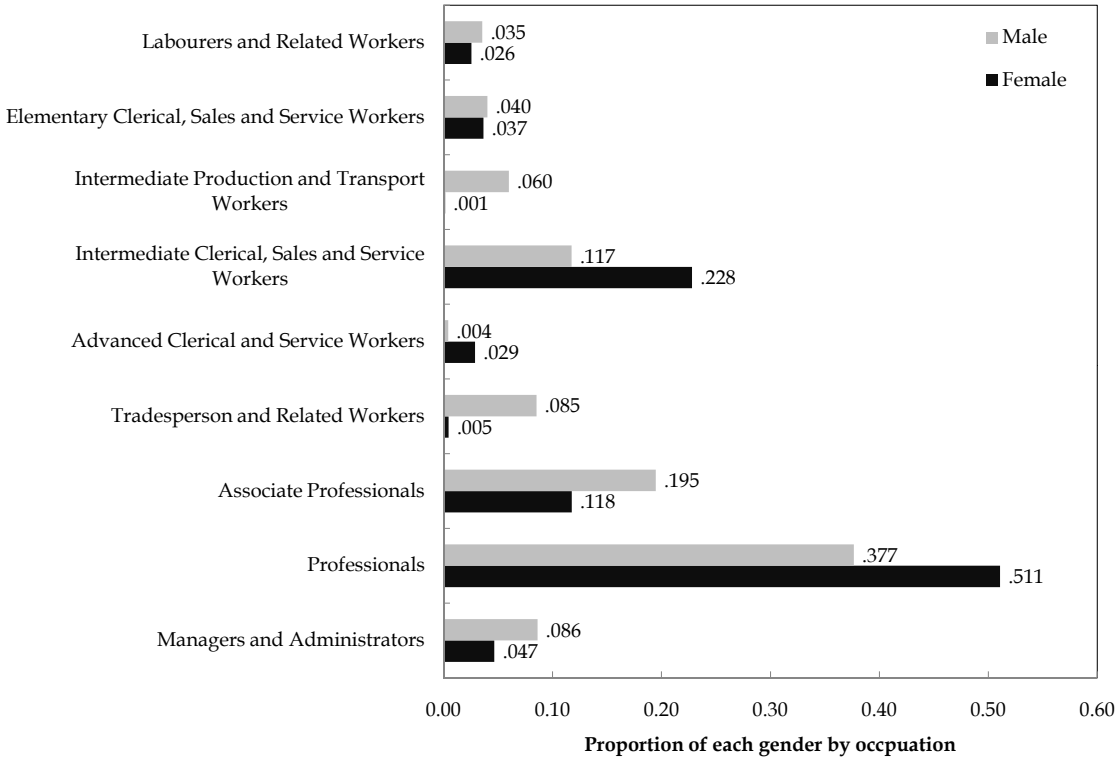

Figure A2: **Occupational Segregation by Gender in the Public Sector.**
Notes: Occupations are the Australian Standard Classification of Occupations's (ASCO) Major Groups (9 categories). There are 4278 men and 4190 women in the sample, with 26599 person-year observations.

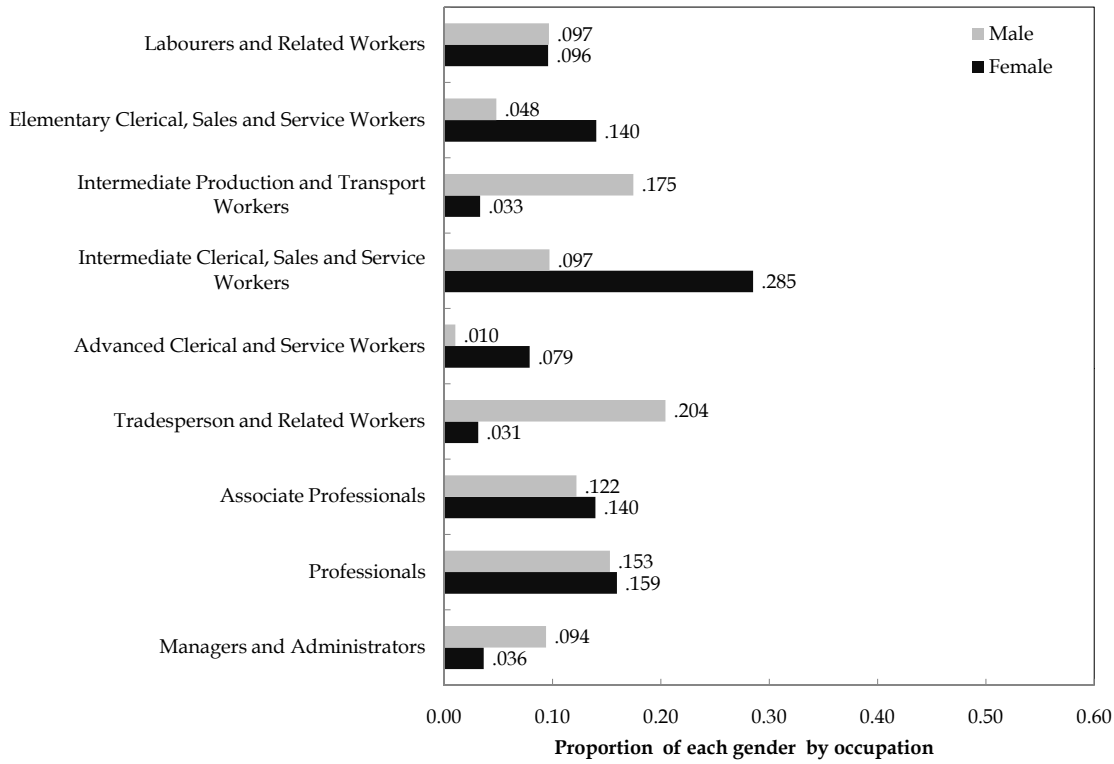

Figure A3: **Occupational Segregation by Gender in the Private Sector.**
Notes: Occupations are the Australian Standard Classification of Occupations's (ASCO) Major Groups (9 categories). There are 4278 men and 4190 women in the sample, with 26599 person-year observations.

Number	*Public Sector*	Private Sector
1	Generalist managers (11)	Generalist managers (11)
2	Specialist managers (12)	Specialist managers (12)
3	Science, building and engineering professionals (21)	Science, building and engineering professionals (21)
4	Business and information professionals (22)	Business and information professionals (22)
5	Health professionals (23)	Health professionals (23)
6	Education professionals (24)	Education professionals (24)
7	Social, arts and miscellaneous professionals (25)	Social, arts and miscellaneous professionals (25)
8	Science, engineering and related associate professionals (31)	Science, engineering and related associate professionals (31)
9	Business and administration associate professionals (32)	Business and administration associate professionals (32)
10	Managing supervisors (sales and service) (33)	Managing supervisors (sales and service) (33)
11	Health and welfare associate professionals (34)	Health and welfare associate professionals (34) and Other associate professionals (39)
12	Other associate professionals (39)	Mechanical and fabrication engineering (41), automotive (42), electrical and electronics (43), and construction tradespersons (44)
13	Tradesperon and related workers (41, 42, 43, 44, 45, 46, 49)	Food tradespersons (45)
14	Advanced clerical and service workers (51, 59)	Skilled agricultural and horticultural workers (46)
15	Intermediate clerical workers (61) and intermediate sales and related workers (62)	Other tradespersons and related workers (49)
16	Intermediate service workers (63)	Advanced clerical and service workers (51, 59)
17	Intermediate production and transport workers (71, 72, 73, 79)	Intermediate clerical workers (61)
18	Elementary clerks (81)	Intermediate sales and related workers (62)
19	Elementary sales workers (82)	Intermediate service workers (63)
20	Elementary service workers (83)	Intermediate plant operators (71)
21	Cleaners (91)	Intermediate machine operators (72)
22	Factory labourers (92) and Other labourers and related workers (99)	Road and rail transport drivers (73)
23		Other intermediate production and transport workers (79)
24		Elementary clerks (81)
25		Elementary sales workers (82)
26		Elementary service workers (83)
27		Cleaners (91)
28		Factory labourers (92)
29		Other labourers and related workers (99)

Table A3: **Occupations used in the analysis, based on ASCO Sub-Major Groups.**
Notes: Numbers in parentheses are Sub-Major group codes in the Australian Standard Classification of Occupations (ASCO), second edition (Australian Bureau of Statistics, 1997). At this level of aggregation there are in the ASCO classification 35 occupations. For each sector, we aggregate sub-groups that had less 10 person-year observations for men or women. We also excluded from the analysis 100 person-year observations corresponding to the sub-group Farmers and Farmer Managers (13).