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Attitudes to Gender and Personality in the Australian Gender Wage Gap

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Abstract

This paper estimates the effects of gender role attitudes and personality traits on the gender wage gap in Australia. Applying standard decomposition techniques and controlling for a wide range of variables, the paper finds that the overall gender wage gap in our estimates on average stood at 17.2% in 2019. Furthermore, the major portion of this wage gap remains unexplained, which accounts for at least 72.7% of the total gender wage gap. The results establish gender role attitudes as a key predictor of this pay gap both in the explained and unexplained part of the wage decomposition. It also shows that the impact of personality traits depends on whether the big five traits or the sub-traits are used in the analysis. Even some of the sub-traits belonging to the same category can influence the gender pay gap in opposite directions. Overall, the estimates establish the importance of psychological variables as more important than traditional human capital and other work-related characteristics in explaining the remaining gender wage gap in Australia.

JEL classification: J31, J71

Keywords: gender wage gap, wage decompositions, gender role attitudes, personality

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1 Introduction

In this paper, we evaluate the extent to which the Australian gender wage gap is attributable to gender role attitudes, personality traits and discrimination. The traditional approach to gender wage gap study mainly concentrates on human capital-based explanations in which the difference in human capital and labour market-related characteristics explains why men and women are rewarded differently in the labour market. The problem, however, appears that even after controlling for these variables, the unexplained portion of the gender wage gap continues to be substantial (Reshid 2019). Additionally, due to the convergence of male-female work-related characteristics, traditional variables like education and tenure are losing their ability to justify the remaining gender pay gap (Redmond and Mcguinness 2019). On the other hand, since the standard practice of labour economics is to measure discrimination as the residual part of wage regressions after controlling for productivity-related characteristics, there is also a growing concern if this unexplained part is representative of gender discrimination or whether it is the result of omitted variables (Nyhus and Pons 2012). The influence of gender role attitudes on wages, which is often overlooked in gender wage gap studies, goes beyond the traditional human capital channel. Narrowly defined personality traits are added to the existing set of regressors to reveal a complex mechanism through which personality traits and the gender wage gap is related to each other. Finally, together with gender role attitudes and a wide range of controls, personality traits help explain the remaining gender wage gap to provide a more precise measurement of gender discrimination.

Although the pay gap between men and women has significantly narrowed since the 1960s, especially in Australia and many other industrialised economies, the remaining pay gap has proved to be remarkably persistent (Cozzi et al. 2018, Olivetti and Petrongolo 2016). The Australian gender wage gap, for example, has fluctuated between 13.9 per cent and 19.0 per

cent in the past two decades (WGEA 2020). After the continuous improvement for several years, the pay gap stood at 14.0% in 2020 and weekly ordinary full-time earnings across all industries and occupations for women in Australia on average equalled 253.60 dollars less than male earnings in May 2020 (WGEA 2020). The comparable OECD figure, which measures the difference between median earnings of men and women relative to median earnings of men, was 13.01 per cent in 2018 (OECD 2020).

Economists have long been attempting to understand such movement or persistence of gender wage gap and it has developed many new explanations over time. Based on past developments, two distinct trends in literature deserve particular attention. The first approach focuses on measuring the impact of previously ignored variables in wage regressions (Redmond and Mcguinness 2019). New factors like labour mobility and preferences in the labour market have started to assume prominence in the economic literature (e.g., Redmond and Mcguinness 2019, Reshid 2019). The second approach examines the effect of psychological attributes or noncognitive skills tow create a new line of explanation (Blau and Kahn 2017). A large body of experimental and survey-based works has investigated the contribution of personality traits to the gender wage gap in the last decade (e.g., Nyhus and Pons 2012, Risse, Farrell, and Fry 2018, Cobb-Clark and Tan 2011, Gensowski 2018, Nordman, Sarr, and Sharma 2019, Reuben, Wiswall, and Zafar 2017).

Under these circumstances, the present paper makes three contributions. First, it evaluates the impact of gender role attitudes on male-female wage differences, which has mostly remained neglected in the empirical literature. Gender role attitudes may influence labour market outcomes in a number of ways and may require sustained and prolonged policy interventions. The only studies that have considered gender roles and earnings are Vella (1993) and Fortin (2008). However, both studies were limited in that they only study younger workers. Second,

this paper provides evidence of the effects of narrowly defined personality sub-traits, as opposed to previous studies that have predominantly focused on broad level big five traits of conscientiousness, openness to experience, extroversion, agreeableness, and neuroticism or emotional stability (e.g., Nyhus and Pons 2012, Gensowski 2018, Cobb-Clark and Tan 2011, Risse, Farrell, and Fry 2018, Cobb-Clark and Schurer 2013). However, as is found in previous works (e.g., Paunonen and Ashton 2001, Roberts et al. 2005), narrowly defined traits perform much better in capturing the effects of personality traits than any composite score from the big five domain. Moreover, it is possible for some sub-traits within a broad personality category to have a positive relationship with an outcome under study, while some others within the same category may show a negative relationship (Roberts et al. 2005). Finally, as the omission of any important control variables has the potential to introduce bias in the resulting discrimination measurement (Blau and Kahn 2000, Altonji and Blank 1999), a third contribution of the present paper is that it controls for a wider range of variables (e.g., occupational mobility and workplace entitlements along with more traditional variables like education and experience) to provide a more accurate estimate of the possible labour market discrimination in Australia.

In comparison to past years, our results attribute a greater portion of the gender wage gap to observable characteristics. This study also shows the influence of gender role attitudes on the gender wage gap to be significant and prominent in both the explained and the unexplained part of the decomposition analysis. Furthermore, the magnitude and the direction of influence of personality traits are shown to be dependent on the level of aggregation of the sub-traits. Finally, the paper reveals the greater ability of psychological characteristics to explain the remaining pay gap compared to traditional human capital variables like education, health and tenure.

The remainder of the paper is as follows. In Section 2, we provide the background literature. We discuss the methodology in Section 3 while describing the data and sample selection in Section 4. We present the results in Section 5 and conclude in Section 6.

2 Background Literature

2.1 Gender Role Attitudes

Stated simply, gender role attitudes refer to beliefs people hold concerning the obligations that men and women should fulfil within the family and in the workplace (Frieze et al. 2003, Fernández, Fogli, and Olivetti 2004). Gender or sex roles have entered the realm of sociological and psychological research long back (see e.g., Hochschil 1973). The effects of gender role attitudes as a potential source of women's employment-related outcomes also dates back in these other branches of research than in economics (e.g., Reskin 1988, Bielby and Bielby 1984, Eccles 1987). Placed within the human capital-based explanations, such attitudes can provide a powerful mechanism to explain the male-female wage gap in the labour market. However, the importance of gender role attitudes in explaining the gender wage gap goes beyond the traditional human capital model.

The theory of human capital argues that education and training are two major sources through which human beings become more productive. However, such productivity-enhancing activities involve direct and indirect costs in the form of monetary expenses for participation in those activities and income foregone for the time spent. Since the benefits derived from these involvements accrue mainly in the future, the associated costs can be considered an investment. (Mincer 1989). Therefore, the people who expect to devote more time in the labour market invest more in skill development than those whose labour market involvement tend to be shorter and intermittent, which in the present case is usually the women (Altonji and Blank 1999, Mincer and Polachek 1974). Women with less egalitarian gender role attitudes, therefore,

commit fewer resources in skill developments as they expect to spend more time in household labour.

A second explanation for the effects of gender role attitudes works through their influence on occupational choices. Women are more willing to enter careers that involve flatter earnings curves and relatively quicker returns due to the depreciation of human capital from their being away from the labour market for reasons such as pregnancy and child care (Vella 1994). However, a significant part of women's choice of career, and in turn occupational gender distribution, is also a product of the inherent gender role attitudes (Vella 1993). This happens because women's choices regarding work-life balance are shaped from birth by a variety of formal and informal institutions, such as families, churches and schools, and this entire socialisation process directs them towards a secondary and helping position of a mother and homemaker (Fuchs 1989).

The most important reason to include gender role attitudes in wage regressions, however, is to reflect individual commitment and motivation at the job, which goes beyond the traditional human capital channel. Women are more likely than men to fulfil family-related responsibilities, so they tend to show less commitment to the labour market (Vella 1993). Gender role attitudes thus influence women's labour hours in paid work. Women with less egalitarian views may also choose positions that require less effort and skills (Corrigall and Konrad 2007). However, even more importantly, women may put less effort compared to their male counterparts when employed and thus directly affect the earnings or wage equation, especially if they have access to family income. If the variables which can reflect such lack of commitment and motivation are not included in a study, the resulting estimates have the possibility to bias the true measurements.

Compared to sociological and psychological research, economic discussion on gender role attitudes, however, is mostly aimed at understanding female labour force participation and employment decisions (e.g., Fortin 2005) and intergenerational transmission of attitudes (e.g., Escriche, Olcina, and Sánchez 2004, Fernández, Fogli, and Olivetti 2004). There are only a few studies that have addressed how gender role attitudes affect the gender wage gap. In this regard, Vella (1993) and Fortin (2008) are exceptions. Vella (1993) investigated how traditional values affect occupational choice and the male-female wage differential using data of Australian youth. The paper concluded that the adaptation of less traditional values by women would have made only a marginal improvement in their occupational distribution and the resulting wage gap. Fortin (2008), on the other hand, studied the impact of gender roles on wages and the gender wage gap in the United States. However, as these papers considered only young respondents (i.e., those between 15 to 26 years of age or in their mid-twenties), they excluded the period in which women experience depreciation of human capital as a consequence of childbirth (Vella 1993). Moreover, as is demonstrated by Fan and Marini (2000), women experience a shift towards less egalitarian gender role attitudes after marriage as they come into regular interaction with men, since men are more likely to hold traditional values. Therefore, the effects of gender role attitudes on the gender wage gap are likely to be underestimated if the sample is limited to a young population.

2.2 Personality Traits

In comparison to studies on cognitive skills (see e.g., Griliches 1976), studies on personality traits are rare and economists have started to pick up interest in them as an important predictor of labour market outcomes fairly recently. The link between cognitive skills and problem-solving abilities are easier to understand and perform in standardised tests like the Scholastic Assessment Test (SAT), the Graduate Record Examination (GRE) and the Programme for International Student Assessment (PISA) have achieved widespread acceptance (Borghans et

al. 2008, Heckman and Kautz 2012). There is already ample evidence to suggest that cognitive skills are important for an individual's labour market outcomes (see e.g., Cawley, Heckman, and Vytlacil 2001, Murnane, Willett, and Levy 1995). In comparison, some of the serious empirical studies on non-cognitive skills or personality tests only started to originate in the last one and a half-decade or so (e.g., Mueller and Plug 2006, Heckman, Stixrud, and Urzua 2006).

However, despite not being studied for long, the relationship between personality traits and employment-related outcomes is also well-established in the economic literature. For example, Heckman, Stixrud, and Urzua (2006) has demonstrated that personality traits are equally effective like cognitive skills in explaining some of the labour market outcomes (e.g., wages) and even more effective in explaining some others (e.g., work experience). Mueller and Plug (2006) has shown that all the five basic personality traits of the five-factor model (i.e., extroversion, agreeableness, conscientiousness, neuroticism, and openness) can exert significant positive or negative effects on earnings of high school graduates and their combined impact can be similar to that of cognitive skills. Heckman and Kautz (2012) established that standardized achievement tests that measure cognitive ability may fail to properly represent an individual's personality traits and do not necessarily reflects the person's labour market outcomes (e.g., wage rates and earnings).

Previous works studying the relationship between non-cognitive skills or personality traits and the gender wage gap, however, have mainly examined the five-factor model (FFM, also known as the big five) of personality tests (e.g., Nyhus and Pons 2012, Gensowski 2018, Risse, Farrell, and Fry 2018, Cobb-Clark and Schurer 2013). The five factors of the model are openness, conscientiousness, extraversion, agreeableness, and neuroticism. Each of the five factors in turn is composed of several sub-traits. The type of influence the big five exerts on earnings and wages varies depending on the trait under consideration. For example, while greater openness

to experience led to higher earnings for men, more agreeableness and neuroticism caused the opposite effect on their income. For women, it was conscientiousness and openness that improved their earnings advantage (Mueller and Plug 2006).

The problem with any broad personality traits, such as the ones that make up the big five, is that although the broad categories consist of narrow sub-traits, they lack the diverse character that these narrower aspects possess. That is, although the narrow sub-traits are correlated, they conceptually represent distinct characteristics (Saucier and Ostendorf 1999). For example, the big-five trait of openness to experience covers such diverse subcomponents as imaginative, creative, intellectual, complex, philosophical and deep. When the broad trait openness to experience is used to examine or explain some variable of interest, it remains unclear which facet or facets of this broad measure are most relevant to the variable (Wood, Nye, and Saucier 2010). Similarly, it is difficult to predict how someone will perform in a specific situation if they have a high score in the openness to experience trait. Compared to that, the sub-trait imaginative can prove to be more helpful in career settings and intellectual in educational environments (Kajonius and Johnson 2018). Paunonen, Rothstein, and Jackson (1999) has already demonstrated that the use of multiple narrow personality measures instead of broad ones is not only considerably meaningful in explaining work-related behaviour but also is more accurate in predicting individual job performances. Finally, there also remains the possibility that the effects of some facets within a broad category may differ from the effects of some others within the same category, even in opposite directions (Roberts et al. 2005).

2.3 Discrimination

Discrimination is said to exist in the labour market when the decision about whom to hire and how much to pay is determined by non-productivity related beliefs and preferences. Theoretical works on discrimination predominantly assume a competitive environment. These works

mainly identify two types of discrimination: taste-based and statistical discrimination (Altonji and Blank 1999).

Becker (1971[1957]) developed the first theoretical model of labour market discrimination based on tastes or prejudice. It is the kind of discrimination that arises when economic agents believe that their encounter with people belonging to different groups (e.g., race, religion or gender) involves costs or disadvantages for them, and as a result, they want to avoid those groups. Although Becker (1971[1957]) identified three types of discriminatory agents – employers, employees and customers – it is the employer-based model of discrimination that has been interpreted extensively in empirical labour market research. If there are any kind of constraints on wages (e.g., minimum wage laws), the consequences of this kind of discrimination can be observed in the form of a lower rate of hiring of the group that is discriminated against. On the other hand, in the absence of any such constraints, taste-based discrimination can result in lower wage rates for disadvantaged groups (Neumark 2018).

The other kind of discrimination, which is called statistical discrimination, is observed when employers find certain groups (e.g., women or immigrants) to be on average less productive than others from previous engagements, and therefore, offer them a lower wage rate (Dickinson and Oaxaca 2014). When the information about an individual applicant's work-related skills is scarce or the cost of acquiring such information is excessive, even employers who hold no prejudice against any groups may engage in this kind of discrimination (Phelps 1972). Statistical discrimination may also arise from employers' tendency to appoint applicants who are similar to them as they find it easier to sort employees of their own type (Cornell and Welch 1996).

Regardless of the source, identifying whether the wage gaps between the two groups are the result of productivity differences or discriminatory practices remains a challenge. The standard

way to measure discrimination in economics is the Oaxaca-Blinder (OB) decomposition as it conveniently divides the gender pay gap into two components: differences in characteristics between two groups (or the "explained" part) and the differential returns to similar characteristics between the groups (or the "unexplained" part). It is this unexplained component that is considered reflective of labour market discrimination (Altonji and Blank 1999). However, the unexplained component is a statistical residual in the decomposition analysis and thus discrimination is dependent on the inclusion of all the relevant variables into the earnings equation. However, the number of variables identified as potential sources of the gender wage gap has expanded significantly over time to establish the importance of factors like occupational mobility and preferences for workplace entitlements (Redmond and Mcguinness 2019, Reshid 2019). Previous Australian literature on the gender wage gap does not include many of these variables (e.g., Risse, Farrell, and Fry 2018, Watson 2010, Coelli 2014, Cobb-Clark and Tan 2011, Barón and Cobb-Clark 2010), and therefore there is still ample room for improvements in our measurement of gender discrimination.

3 Methodology

3.1 Measuring Gender Role Attitudes

The Household, Income and Labour Dynamics in Australia (HILDA) Survey contains several questions about an individual's life opinions. Some of these are questions relate to gender roles in which the respondents are asked to indicate how strongly they agree or disagree with a particular statement. The options range between 1 (strongly disagree) and 7 (strongly agree). Eight survey questions[1] can be identified in HILDA that depicts a person's attitudes to gender roles:

[1] We follow Sjöberg (2004), Guiso and Rustichini (2018), Egmond et al. (2010) and Alesina, Giuliano, and Nunn (2013) to identify the relevant statements.

1. Children do just as well if the mother earns the money and the father cares for the home and the children.
2. It is not good for a relationship if the woman earns more than the man.
3. It is better for everyone involved if the man earns the money and the woman takes care of the home and children.
4. Mothers who do not really need the money should not work.
5. If both partners in a couple work, they should share equally in the housework and care of children.
6. A father should be as heavily involved in the care of his children as the mother.
7. A pre-school child is likely to suffer if his/her mother works full-time.
8. On the whole, men make better political leaders than women do.

Our composite scale of gender role attitudes is the sum of all eight items mentioned above (items 1, 5 and 6 are reverse coded) in which 1 indicates a more liberal or progressive viewpoint and 7 represents a more traditional or conservative position. To ensure that all the items measure the same underlying construct, we calculate Cronbach's alpha score of 0.78 for 2019 which indicates an acceptable level of internal consistency of our gender role attitudes scale (see Taber 2018 for further interpretation).

3.2 Decomposing the Gender Wage Gap

To study how the gender wage gap is influenced by gender role attitudes, personality traits and discrimination, we follow the standard decomposition procedure. We assume that the wage equations for females and males, respectively are given by

$$\ln w_{fi} = \beta_f X_i + u_{fi} \quad (1)$$

$$\ln w_{mi} = \beta_m X_i + u_{mi} \quad (2)$$

where $\ln w_{fi}$ and m_{fi} are the log of the hourly wage for females and males and X_i is a vector of explanatory variables for each individual i. The β's represent the contribution or return to wages of each variable in X_i and u_m and u_f are the errors terms where $E(u_{mi}|X_i) = 0$ and

$E(u_{fi}|X_i) = 0$. Therefore, the difference between the mean male and mean female wages can be expressed as

$$\overline{\ln w}_m - \overline{\ln w}_f = (\bar{X}_m - \bar{X}_f)\hat{\beta}_m + (\hat{\beta}_m - \hat{\beta}_f)\bar{X}_m \quad (3)$$

if the male wage structure is believed to be the non-discriminatory norm. If, on the other hand, the female wage structure is considered to prevail in the absence of discrimination, the decomposition equation becomes

$$\overline{\ln w}_m - \overline{\ln w}_f = (\bar{X}_m - \bar{X}_f)\hat{\beta}_f + (\hat{\beta}_m - \hat{\beta}_f)\bar{X}_f \quad (4)$$

In equations (3) and (4), the first term on the right-hand side of the equation is the "explained" component and the second term represents the "unexplained" or "discriminatory" component. The decomposition analysis in this form is referred to as overall decomposition. To identify the contribution of individual factors, both explained and unexplained components of the overall decomposition can be divided further according to the contributions of each covariate to produce detailed decomposition. However, since the non-discriminatory wage structure appears to lie somewhere between the male and the female structures, we use the pooled wage structure of the following form to represent it:

$$\overline{\ln w}_m - \overline{\ln w}_f = (\bar{X}_m - \bar{X}_f)\hat{\beta}^* + (\hat{\beta}_m - \hat{\beta}^*)\bar{X}_m + (\hat{\beta}^* - \hat{\beta}_f)\bar{X}_f \quad (5)$$

where $\hat{\beta}^*$ is the estimated returns to the characteristics on wages obtained from the pooled wage equation, and the second and the third terms are interpreted as the male wage advantage and the female wage disadvantage, respectively. The terms together represent the unexplained part of wage differences, that is often attributed to discrimination. We also include the gender dummy in the pooled equation to purge the effect of group membership from it (see Fortin, Lemieux, and Firpo 2011, Jann 2008).

Finally, we use the number of children between 0 and 4 and the presence of children between 5 and 9 as additional variables in the selection equation to account for self-selection into

employment. The selection equation also controls for age, marital status, the presence of children between 0 and 4 years of age, educational qualification, health status and geographic location.

3.3 Reverse Causality and Missing Data

Although gender role attitudes and personality traits are expected to affect earnings or wage rates, reverse causality might appear to be a concern (Cubel et al. 2016, Foster and Stratton 2018). Furthermore, solving the causality issue faces additional challenges in the case of the HILDA survey since personality and gender role attitudes data are not available for every survey year. Among the most recent years, for example, questions about personality traits were included in 2013 and 2017, while attitude related questions (including gender roles) are available for only 2015 and 2019.

Researchers mainly employ three different approaches to address the causality problem. The first approach uses limits the regressors to pre-labour market attitudes and personality traits that are not affected by current labour market experience (e.g., Fortin 2009). Given personality and attitude questions are not asked in every HILDA survey these methods cannot be applied for this study. Furthermore, values in the distant past may be a poor proxy of a characteristic at present and only current values may be relevant for some outcomes (Almlund et al. 2011). The second approach relies on the fact that psychological characteristics like personality are quite stable in adulthood and therefore exogenous. Despite the possibility of bias in the resulting estimates, the use of concurrent traits may still reveal important relationships (e.g., Mueller and Plug 2006, Nordman, Sarr, and Sharma 2019). However, ignoring the endogeneity issue completely can be costly as it may affect the significance level and the magnitude of estimates in standard regression models (Cobb-Clark and Schurer 2013).

A third approach that is often adopted by researchers and employed in this study is to use the lag values of the concerned variables (e.g., Green, Malpezzi, and Mayo 2005, Hayo, Kutan, and Neuenkirch 2010, Clemens et al. 2012, Curzi and Pacca 2015, Jetter and Parmeter 2018). Although this method is not ideal in certain situations (see Bellemare, Masaki, and Pepinsky 2017 for detail), the underlying logic is that lagged independent variables cannot be affected by the current values of the dependent variable as they are predetermined (Brock 2020, Kollmeyer and Peters 2019). In our study, we use the attitude related scale lagged by four years and personality scores lagged by two years to provide greater protection against reverse causality, than simply using one-year lag values. In addition, this results in any possible autocorrelation problem becoming less severe (Usmani 2018, Mennuni 2019).

4 Data and Sample Selection

The Household, Income and Labour Dynamics in Australia (HILDA) survey is a panel survey of the Department of Social Services and Melbourne Institute of Applied Economic and Social Research (2020) that collects socio-economic and demographic information about Australian households and individual household members every year starting from 2001. For this study, we have used data from the 19th wave of HILDA conducted in 2019. Additionally, we have obtained individuals' gender role attitudes from the 15th wave and their personality variables from the 17th wave of the same survey.

The dependent variable is the natural logarithm of the hourly wage earned in the main job. The independent variables include the gender role attitudes and the big five personality traits and sub-traits of the respondents (some reverse coded; see Appendix A for detail), and a range of demographic and labour market-related variables (e.g., age and occupation).

Our analysis focuses on working-age individuals in the 18–64 years age bracket. Employers, employees of their own businesses, the self-employed, family workers and students and

observations with zero hours per week worked are excluded from the sample. Observations for which data was unknown, refused or not provided on employment status or working hours are also excluded from the analysis. The final sample contains 7,838 individuals (3,490 males and 4,348 females). The definitions of the variables are provided in Appendix 1.

Table 1 shows descriptive statistics related to wages, geographic, demographic and labour market characteristics of Australian men and women in 2019. It is noticeable that there are significant differences between the male and female samples in many of the major labour market related (e.g., hourly wage, tenue, occupational status, industry, and occupational status) and demographic (e.g., education, the presence and number of children) characteristics.

Table 1 Wages, geographic, demographic and labour market characteristics by Gender

Variables	Men		Women		Male-Female
	Mean	Std. dev.	Mean	Std. dev.	Difference[†]
Hourly wage rate (log)	3.61	0.47	3.50	0.41	0.11***
Age (years)	41.68	13.04	42.59	12.85	-0.91***
Number of children 0–4 years	0.22	0.53	0.24	0.56	-0.02*
Tenure: occupation (years)	10.43	10.03	9.47	9.56	0.96***
Tenure: employer (years)	7.59	8.18	7.20	7.76	0.39*
Birth: Australia	0.82	0.39	0.82	0.39	0.00
Married	0.69	0.46	0.68	0.47	0.01
Children 0–4 years present	0.17	0.37	0.18	0.39	-0.02*
Children 5–9 years present	0.17	0.38	0.18	0.39	-0.01
Geographic remoteness	0.11	0.31	0.11	0.31	0.00
New South Wales	0.29	0.45	0.28	0.45	0.00
Victoria	0.25	0.43	0.25	0.43	0.00
Queensland	0.23	0.42	0.22	0.42	0.00
South Australia	0.08	0.28	0.09	0.29	-0.01
Western Australia	0.09	0.28	0.09	0.28	0.00
Tasmania	0.03	0.18	0.03	0.18	0.00
Northern Territory	0.01	0.10	0.01	0.10	0.00
Australian Capital Territory	0.02	0.15	0.02	0.14	0.00
University	0.29	0.45	0.37	0.48	-0.08***
Advanced diploma/diploma	0.09	0.29	0.12	0.32	-0.02***
Certificate III and IV	0.29	0.45	0.21	0.41	0.08***
Year 12	0.17	0.37	0.14	0.35	0.02***
Year 11 or below	0.16	0.37	0.15	0.36	0.01
Self-assessed health	0.03	0.16	0.03	0.18	-0.01*
Long term health condition	0.22	0.42	0.25	0.43	-0.03***
Employed	0.83	0.38	0.74	0.44	0.09***

Full-time employment	0.74	0.44	0.43	0.49	0.31***
Casual employment	0.14	0.35	0.18	0.38	-0.04***
Private sector employment	0.71	0.45	0.52	0.50	0.19***
Union member	0.24	0.43	0.28	0.45	-0.04***
Occupational Mobility	2.09	1.96	2.08	1.89	0.01
Firm size less than 5	0.08	0.27	0.07	0.25	0.01
Firm size 5-19	0.23	0.42	0.23	0.42	0.00
Firm size 20-99	0.30	0.46	0.31	0.46	-0.01
Firm size 100 or more	0.39	0.49	0.39	0.49	0.00
Employer: multiple location	0.74	0.44	0.76	0.43	-0.02**
Occupational status scale	50.70	24.61	56.77	22.83	-6.07***
Work-hour satisfaction	7.32	1.85	7.37	1.95	-0.05
Work-life balance satisfaction	7.33	2.17	7.39	2.16	-0.07
Paid maternity leave	0.75	0.43	0.76	0.43	-0.01
Flexible start/finish times	0.61	0.49	0.56	0.50	0.06***
Paid holiday leave	0.85	0.35	0.81	0.39	0.04***
Paid sick leave	0.86	0.35	0.82	0.38	0.04***
Multiple jobs	0.06	0.24	0.08	0.28	-0.02***
Manager	0.17	0.37	0.11	0.31	0.06***
Professional	0.23	0.42	0.34	0.47	-0.10***
Technician and trade worker	0.19	0.40	0.04	0.20	0.15***
Community and personal services worker	0.08	0.27	0.16	0.37	-0.08***
Clerical and administrative worker	0.07	0.25	0.21	0.41	-0.14***
Sales worker	0.05	0.21	0.08	0.27	-0.03***
Machinery operator and driver	0.11	0.32	0.01	0.11	0.10***
Labourer	0.09	0.29	0.05	0.22	0.05***
Agriculture, Forestry and Fishing	0.02	0.13	0.01	0.09	0.01***
Mining	0.04	0.20	0.01	0.08	0.03***
Manufacturing	0.12	0.33	0.03	0.18	0.09***
Electricity, Gas, Water and Waste Services	0.02	0.13	0.01	0.07	0.01***
Construction	0.11	0.31	0.02	0.12	0.10***
Wholesale Trade	0.05	0.22	0.02	0.14	0.03***
Retail Trade	0.07	0.26	0.10	0.30	-0.03***
Accommodation and Food Services	0.03	0.18	0.05	0.21	-0.01***
Transport, Postal and Warehousing	0.07	0.25	0.02	0.14	0.05***
Information Media and Telecommunications	0.01	0.12	0.01	0.11	0.00
Financial and Insurance Services	0.04	0.19	0.04	0.21	0.01
Rental, Hiring and Real Estate Services	0.01	0.11	0.01	0.12	0.00
Professional, Scientific and Technical Services	0.08	0.27	0.07	0.26	0.00
Administrative and Support Services	0.02	0.15	0.02	0.15	0.00
Public Administration and Safety	0.10	0.30	0.07	0.26	0.03***
Education and Training	0.07	0.26	0.18	0.38	-0.11***
Health Care and Social Assistance	0.08	0.27	0.30	0.46	-0.22***
Arts and Recreation Services	0.02	0.14	0.01	0.12	0.01**
Other Services	0.04	0.19	0.02	0.14	0.02***

Notes: ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively. † The significance level is based on a t-test performed to test the equality of mean values between the men and women in the sample. Source: Authors' calculation based on HILDA Survey data.

Table 2 presents the male-female difference in gender role attitudes and personality traits and sub-traits in 2019. Several gender differences appear to be noteworthy from it. First, women tend to be more progressive in our sample. Second, men and women significantly differ from each other in most of the traits and sub-traits. Finally, even when some big five traits show higher scores for men (e.g., openness to experience) and for women (conscientiousness), some of the sub-traits within them vary from the overall trait-level trend (e.g., creative and systematic).

Table 2 Gender role attitudes, personality traits and sub-traits by gender

Variables		Men		Women		Male-Female
		Mean	Std. dev.	Mean	Std. dev.	Difference†
Gender role attitudes		21.65	7.85	18.63	7.59	3.02***
	Conscientiousness	4.96	0.98	5.15	1.03	-0.19***
	Openness to experience	4.25	1.04	4.16	1.08	0.09***
Big 5 traits	Extroversion	4.25	1.04	4.5	1.16	-0.25***
	Agreeableness	5.10	0.93	5.63	0.87	-0.53***
	Emotional stability	5.12	1.04	5.09	1.07	0.02
	Efficient	4.91	1.28	5.16	1.33	-0.25***
	Disorganised	5.21	1.49	5.44	1.52	-0.24***
Conscientiousness	Inefficient	5.31	1.42	5.56	1.4	-0.25***
sub-traits	Sloppy	5.41	1.39	5.78	1.29	-0.37***
	Systematic	4.37	1.54	4.15	1.66	0.23***
	Orderly	4.58	1.42	4.85	1.48	-0.27***
	Imaginative	4.64	1.43	4.59	1.59	0.05
	Creative	4.44	1.53	4.48	1.72	-0.05
Openness	Intellectual	4.71	1.39	4.63	1.45	0.09***
sub-traits	Complex	3.69	1.62	3.44	1.72	0.25***
	Philosophical	3.97	1.63	3.63	1.69	0.35***
	Deep	4.06	1.53	4.21	1.58	-0.15***
	Talkative	4.09	1.62	4.64	1.63	-0.55***
	Bashful	5.00	1.49	5.19	1.51	-0.18***
Extroversion	Shy	4.65	1.68	4.76	1.75	-0.11***
sub-traits	Quiet	3.97	1.67	4.29	1.73	-0.32***
	Lively	4.47	1.31	4.62	1.41	-0.15***
	Extroverted	3.32	1.61	3.47	1.76	-0.15***
	Sympathetic	4.78	1.39	5.6	1.22	-0.83***
Agreeableness	Kind	5.41	1.09	5.88	0.98	-0.46***
sub-traits	Cooperative	5.41	1.09	5.63	1.1	-0.22***
	Warm	4.80	1.24	5.4	1.18	-0.60***
	Envious	5.17	1.38	5.27	1.42	-0.10***
	Moody	4.69	1.55	4.66	1.62	0.03
Emotional Stability	Touchy	4.86	1.53	4.7	1.61	0.16***
sub-traits	Jealous	5.59	1.38	5.52	1.47	0.08**
	Temperamental	5.06	1.47	5.16	1.51	-0.11***
	Fretful	5.34	1.4	5.26	1.56	0.07**

Notes: ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively. † The significance level is based on a standard performed to test the equality of mean values between the men and women in the sample. Source: Authors' calculation based on HILDA Survey data.

5 Results

Table 3 reports the overall gender wage gap in Australia in 2019. The results in the first model include all the big five personality traits, but no sub-traits. In the second model, the big-five trait of conscientiousness is replaced by its six sub-traits: imaginative, creative, intellectual, complex, philosophical and deep. The same procedure has been followed from column (3) to column (6) for the remaining big give traits, in which each of these traits has been replaced by the associated sub-traits.

Table 3 Decomposing the gender wage gap: overall results

Variables	(1)		(2)		(3)		(4)		(5)		(6)	
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	Overall	Adjusted	Overall	Adjusted	Overall	Adjusted	Overall	Adjusted	Overall	Adjusted	Overall	Adjusted
Male	3.686***	3.762***	3.690***	3.765***	3.688***	3.753***	3.689***	3.762***	3.687***	3.755***	3.689***	3.745***
	(0.016)	(0.062)	(0.016)	(0.062)	(0.016)	(0.062)	(0.016)	(0.063)	(0.016)	(0.062)	(0.016)	(0.062)
Female	3.548***	3.575***	3.548***	3.573***	3.551***	3.581***	3.550***	3.575***	3.548***	3.573***	3.549***	3.569***
	(0.011)	(0.046)	(0.011)	(0.046)	(0.011)	(0.044)	(0.011)	(0.046)	(0.011)	(0.046)	(0.011)	(0.046)
Difference	0.138***	0.187**	0.142***	0.192**	0.137***	0.172**	0.139***	0.187**	0.138***	0.182**	0.141***	0.176**
	(0.017)	(0.077)	(0.017)	(0.077)	(0.017)	(0.076)	(0.017)	(0.078)	(0.017)	(0.077)	(0.017)	(0.076)
Explained		0.038***		0.042***		0.047***		0.039***		0.034**		0.037**
		(0.014)		(0.015)		(0.015)		(0.015)		(0.015)		(0.015)
Unexplained		0.149*		0.150*		0.125*		0.149*		0.148*		0.139*
		(0.077)		(0.078)		(0.076)		(0.078)		(0.077)		(0.075)
R-squared	0.4599		0.4609		0.4678		0.4623		0.4612		0.4609	
Observations	7,756		7,756		7,756		7,756		7,756		7,756	

Note: *** p<0.01, ** p<0.05, * p<0.1. Linearised standard errors are in parentheses (corrected for clusters and strata). R-squared values are from the pooled models. While the 'Adjusted' gender wage gap is corrected for self-selection bias, the 'Overall' gender wage gap is estimated without such correction.

The results presented in Table 3 reveal two key aspects of the Australian gender wage gap. First, the uncorrected wage gap varies between 13.7% to 14.1% depending on the model, whereas the selectivity corrected wage gap is higher and ranges between 17.2% to 19.2%. This implies that relatively more qualified women than men are participating in employment activities in our sample. Second, at least 72.7% of this total wage gap remains unexplained and thus may be attributable to discriminatory practices (based on Model 3 which best fits the data). Our estimate of possible discrimination in Model 3, is somewhat smaller than the estimate of 78.4% in 2013 by Risse, Farrell, and Fry (2018) and 77.2% between 2001 and 2006 by Cobb-

Clark and Tan (2011). This is most likely attributable to the inclusion of the gender role, personality variables and other additional regressors in this study that were not included in the earlier studies.

Table 4 on the following page presents the impact of the control variables in our gender wage decompositions. The table shows that the higher occupational status of women is significant in reducing the explained part of the wage gap by approximately three percentage points. On the other hand, the concentration of women in certain occupations and industries increases the male-female wage difference. In the case of the unexplained components, age and marital status, and in most models the place of birth, are significant and positive and so contribute to the gender wage gap. In fact, our study shows, age is responsible for approximately 50% of the unexplained component of the 2019 gender wage gap in Australia. The remaining control variables, including education, health status, tenure, occupational mobility, and workplace entitlements, however, are found to have no effects on the gender wage gap in any of our estimates.

The effects of gender role attitudes and the big five personality traits and sub-traits on the gender wage gap are presented in Table 5 on the pages following Table 4. Our measure for gender role attitudes is statistically significant in all the specifications. The attitude variable has a negative sign in the explained part and a positive sign in the unexplained part. Since women, in general, hold more progressive gender views compared to men, this difference has contributed to their wages catching up with men by between half and one per cent. However, men are paid significantly higher than women even when both show the same level of progressiveness, exacerbating the gap by eight to ten per cent. Among the big five traits, agreeableness achieves significance in the explained part and extroversion in the unexplained part in some of the models.

Table 4 Decomposition Effects of geographic, demographic and labour market characteristics

Variables	(1) Model 1		(2) Model 2		(3) Model 3		(4) Model 4		(5) Model 5		(6) Model 6	
	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained
Age	0.001	0.528**	0.002	0.541**	0.002	0.436**	0.002	0.516**	0.002	0.503**	0.003	0.471**
	(0.004)	(0.208)	(0.004)	(0.211)	(0.004)	(0.210)	(0.004)	(0.208)	(0.004)	(0.207)	(0.003)	(0.199)
Tenure	0.003	0.014	0.003	0.013	0.003	0.011	0.003	0.019	0.003	0.024	0.003	0.017
	(0.002)	(0.028)	(0.002)	(0.029)	(0.002)	(0.028)	(0.002)	(0.028)	(0.002)	(0.029)	(0.002)	(0.029)
Birth: Australia	0.000	0.049*	0.000	0.042	0.000	0.059**	0.000	0.046*	0.000	0.051**	0.000	0.044*
	(0.000)	(0.026)	(0.001)	(0.026)	(0.001)	(0.024)	(0.001)	(0.026)	(0.001)	(0.026)	(0.000)	(0.026)
Married	0.001	0.055*	0.001	0.054*	0.001	0.053*	0.001	0.055*	0.001	0.056*	0.001	0.062**
	(0.002)	(0.031)	(0.002)	(0.032)	(0.002)	(0.031)	(0.002)	(0.032)	(0.002)	(0.031)	(0.002)	(0.031)
Children aged 0-4	0.001	-0.001	0.002	0.000	0.001	-0.001	0.001	0.001	0.001	-0.001	0.001	-0.002
	(0.001)	(0.011)	(0.001)	(0.011)	(0.001)	(0.011)	(0.001)	(0.011)	(0.001)	(0.011)	(0.001)	(0.011)
Geographic location	0.001	0.077	0.001	0.080	0.002	0.059	0.001	0.078	0.001	0.073	0.001	0.071
	(0.001)	(0.061)	(0.001)	(0.063)	(0.001)	(0.063)	(0.001)	(0.064)	(0.001)	(0.062)	(0.001)	(0.064)
Education	-0.004	0.007	-0.005	0.012	-0.004	0.018	-0.005*	0.020	-0.005*	0.021	-0.005*	0.015
	(0.003)	(0.065)	(0.003)	(0.067)	(0.003)	(0.065)	(0.003)	(0.065)	(0.003)	(0.065)	(0.003)	(0.065)
Health status	0.000	-0.001	0.000	0.000	0.000	-0.003	0.000	0.000	0.000	-0.001	0.000	-0.005
	(0.001)	(0.014)	(0.001)	(0.014)	(0.001)	(0.014)	(0.001)	(0.015)	(0.001)	(0.014)	(0.001)	(0.014)
Employee type	-0.009	-0.048	-0.010	-0.059	-0.006	-0.051	-0.007	-0.047	-0.008	-0.047	-0.007	-0.037
	(0.009)	(0.073)	(0.009)	(0.074)	(0.009)	(0.071)	(0.009)	(0.072)	(0.009)	(0.072)	(0.009)	(0.074)
Occupational mobility	0.000	-0.005	0.000	-0.004	0.000	-0.003	0.000	-0.004	0.000	-0.003	0.000	-0.001
	(0.000)	(0.015)	(0.000)	(0.015)	(0.000)	(0.016)	(0.000)	(0.016)	(0.000)	(0.015)	(0.000)	(0.015)
Firm size	0.002	0.038	0.002	0.051	0.002	0.032	0.002	0.037	0.002	0.045	0.002	0.038
	(0.002)	(0.061)	(0.002)	(0.061)	(0.002)	(0.061)	(0.002)	(0.062)	(0.002)	(0.061)	(0.002)	(0.062)
Employer: multiple locations	-0.001	0.011	-0.001	0.011	-0.001	0.005	-0.001	0.006	-0.001	0.007	-0.001	0.013
	(0.001)	(0.029)	(0.001)	(0.028)	(0.001)	(0.029)	(0.001)	(0.029)	(0.001)	(0.028)	(0.001)	(0.029)
Occupational status	-0.028***	-0.087	-0.027***	-0.097	-0.028***	-0.090	-0.028***	-0.093	-0.028***	-0.081	-0.030***	-0.083
	(0.007)	(0.084)	(0.007)	(0.085)	(0.007)	(0.085)	(0.007)	(0.087)	(0.007)	(0.084)	(0.008)	(0.085)
Employment related satisfaction	0.000	0.074	0.000	0.076	0.000	0.073	0.000	0.090	0.000	0.075	0.000	0.068
	(0.001)	(0.058)	(0.001)	(0.058)	(0.001)	(0.058)	(0.001)	(0.060)	(0.001)	(0.058)	(0.001)	(0.059)
Workplace entitlements	0.007	-0.251	0.006	-0.292	0.007	-0.231	0.006	-0.222	0.007	-0.270	0.005	-0.243
	(0.005)	(0.224)	(0.005)	(0.232)	(0.005)	(0.222)	(0.005)	(0.220)	(0.005)	(0.219)	(0.005)	(0.226)
Multiple jobs	0.000	-0.006	0.000	-0.005	0.000	-0.008*	0.000	-0.006	0.000	-0.005	0.000	-0.006
	(0.000)	(0.004)	(0.000)	(0.004)	(0.000)	(0.004)	(0.000)	(0.004)	(0.000)	(0.004)	(0.000)	(0.005)
Occupation	0.033***	0.141	0.033***	0.146	0.033***	0.129	0.034***	0.139	0.034***	0.147*	0.033***	0.132
	(0.008)	(0.086)	(0.008)	(0.089)	(0.008)	(0.087)	(0.008)	(0.088)	(0.008)	(0.088)	(0.008)	(0.088)
Industry	0.030***	-0.101	0.030***	-0.101	0.026***	-0.077	0.027***	-0.095	0.029***	-0.110	0.030***	-0.083
	(0.009)	(0.116)	(0.009)	(0.116)	(0.009)	(0.116)	(0.009)	(0.116)	(0.009)	(0.118)	(0.010)	(0.117)
Constant		-0.661*		-0.644		-0.603		-0.620		-0.612		-0.664*
		(0.383)		(0.391)		(0.382)		(0.386)		(0.381)		(0.392)

Note: *** p<0.01, ** p<0.05, * p<0.1. Linearised standard errors are in parentheses (corrected for clusters and strata). Population weights are used in the calculations. All the big five personality traits are included in model (1) while in the rest of the models, one of the big five traits are replaced by the respective sub-traits in the following order: conscientiousness, openness to experience, extroversion, agreeableness, and emotional stability. Age and tenure include squared terms.

Table 5 Decomposition Effects of gender role attitudes, personality traits and sub-traits

Variables	(1) Model 1		(2) Model 2		(3) Model 3		(4) Model 4		(5) Model 5		(6) Model 6	
	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained	Explained	Unexplained
Gender Role Attitudes	-0.007**	0.096***	-0.007**	0.091***	-0.006**	0.080***	-0.007**	0.092***	-0.006**	0.085**	-0.005*	0.094***
	(0.003)	(0.032)	(0.003)	(0.032)	(0.003)	(0.031)	(0.003)	(0.035)	(0.003)	(0.034)	(0.003)	(0.034)
Conscientiousness	-0.001	-0.001			-0.001	0.043	-0.002	-0.017	-0.002	0.016	-0.002	0.004
	(0.001)	(0.067)			(0.001)	(0.069)	(0.001)	(0.071)	(0.001)	(0.067)	(0.001)	(0.071)
Openness to experience	0.002	0.093	0.001	0.070			0.001	0.070	0.002	0.093	0.002	0.097
	(0.001)	(0.060)	(0.001)	(0.061)			(0.001)	(0.063)	(0.001)	(0.059)	(0.001)	(0.060)
Extroversion	0.000	0.084	0.000	0.099*	0.000	0.099*			0.000	0.079	0.000	0.094*
	(0.001)	(0.053)	(0.001)	(0.053)	(0.001)	(0.052)			(0.001)	(0.053)	(0.001)	(0.054)
Agreeableness	0.007*	0.109	0.008**	0.111	0.007*	0.139	0.006	0.069			0.006	0.093
	(0.004)	(0.086)	(0.004)	(0.085)	(0.004)	(0.087)	(0.004)	(0.090)			(0.004)	(0.085)
Emotional stability	0.000	-0.066	0.000	-0.041	0.000	-0.073	0.000	-0.035	0.000	-0.038		
	(0.000)	(0.068)	(0.000)	(0.076)	(0.000)	(0.069)	(0.000)	(0.074)	(0.000)	(0.070)		
Efficient			-0.003	-0.070								
			(0.002)	(0.090)								
Disorganised			0.001	-0.108*								
			(0.001)	(0.065)								
Inefficient			0.001	-0.006								
			(0.001)	(0.068)								
Sloppy			0.000	0.078								
			(0.002)	(0.066)								
Systematic			0.002*	0.049								
			(0.001)	(0.041)								
Orderly			0.000	0.055								
			(0.001)	(0.065)								
Imaginative					0.000	-0.005						
					(0.001)	(0.059)						
Creative					0.000	0.003						
					(0.000)	(0.049)						
Intellectual					0.001	-0.045						
					(0.001)	(0.059)						
Complex					-0.002	0.025						
					(0.001)	(0.033)						
Philosophical					0.006***	0.118***						
					(0.002)	(0.038)						
Deep					0.000	-0.066						
					(0.000)	(0.041)						
Talkative							0.003	0.077				
							(0.003)	(0.059)				
Bashful							0.001	-0.086*				
							(0.001)	(0.047)				
Shy							0.000	-0.016				
							(0.000)	(0.053)				

Quiet	0.000	0.072				
	(0.002)	(0.052)				
Lively	0.000	0.037				
	(0.001)	(0.062)				
Extroverted	-0.001	-0.036				
	(0.001)	(0.036)				
Sympathetic			-0.005	0.176**		
			(0.006)	(0.069)		
Kind			0.008**	0.116		
			(0.004)	(0.103)		
Cooperative			0.000	-0.177*		
			(0.002)	(0.103)		
Warm			0.000	-0.073		
			(0.004)	(0.085)		
Envious					0.000	0.056
					(0.000)	(0.068)
Moody					0.000	-0.057
					(0.001)	(0.055)
Touchy					0.000	0.019
					(0.001)	(0.046)
Jealous					-0.001	-0.024
					(0.001)	(0.068)
Temperamental					0.000	-0.021
					(0.001)	(0.068)
Fretful					0.000	-0.026
					(0.000)	(0.051)

Note: *** p<0.01, ** p<0.05, * p<0.1. Linearised standard errors are in parentheses (corrected for clusters and strata). Population weights are used in the calculations. All the big five personality traits are included in model (1) while in the rest of the models, one of the big five traits are replaced by the respective sub-traits in the following order: conscientiousness, openness to experience, extroversion, agreeableness, and emotional stability

Several points about the personality traits are noteworthy from Table 5. First, while some big five traits are insignificant, some of their sub-traits are found to exert significant influence on the male-female wage difference. For example, the trait 'Open to New Experiences' is not significant in explaining the gender wage gap in Model 1, but one of its sub-traits, 'Philosophical' is significant at the 1% level in Model 3, when 'Open to New Experiences' is replaced by its sub-traits. It indicates that males earn a wage premium of almost 12% from being just as philosophical as females. Similarly, men who categorise themselves as 'systematic' appear to enjoy slight wage premiums whereas men who are conscientious, to which systematic belongs to as a sub-trait, do not. Second, some of the sub-traits reveal an opposite influence on the wage gap in our analysis than the impact observed at the trait level. For example, the coefficient of 'cooperative' is negative and significant in the unexplained part of the wage decomposition in Model 5. However, 'agreeableness' which includes 'sympathetic' as a sub-trait, shows a positive significant effect in (Model 1). Finally, the impact of the sub-traits can be the opposite of each other, although they may belong to the same big five traits. For example, even though both 'sympathetic' and 'cooperative' are the sub-traits of the same trait 'agreeableness' their effects in the unexplained part of the wage gap are found to be significant yet the opposite of each other (Model 5).

The results of our models that include sub-traits are consistent with our main findings. First, they all reveal that gender role attitudes are a significant predictor of the gender wage gap in Australia. Second, male-female differences in the big five personality traits appear to be relatively unimportant due to the non-significance of many of these traits. Rather, differences at the sub-trait level are seen to be playing a more important role as these sub-traits show a greater impact on the gender wage gap. Furthermore, the kind of relationship (i.e., positive or negative) between the gender wage gap and personality depends on whether the trait or the sub-traits are considered. Finally, traditional variables like education and tenure are losing their

ability to justify the remaining gender wage gap as the contribution of these variables are not significant when controlling for gender attitudes and personality sub-traits.

6 Conclusion

In this paper, we investigated the effects of gender role attitudes and personality traits on the Australian gender wage gap. We used a sample of households in 2019 from the HILDA Survey and controlled for a wide range of variables such as occupational mobility and workplace entitlements. The results show that the unexplained portion of the gender wage gap that may be attributable to discrimination, accounted for approximately 72.7% of the male-female wage difference in 2019, slightly lower than the estimates from previous studies. We also observe that more progressive gender role attitudes have helped women to reduce the gender wage gap in the explained part of the decomposition analysis. However, a significant part of the wage gap in the unexplained part is still found to be originating from Australian men's receiving significantly higher wages than Australian women even with the same level of attitudes score.

Our results reveal that the majority of the big five personality traits play a comparatively less important role in determining the male-female wage gap compared to gender role attitudes as they were not significant in the decomposition analysis. More importantly, some of the sub-traits show an opposite relationship with the gender wage gap than what is found at the broader trait level. In addition, some of the sub-traits that belong to the same trait, display opposite signs in the same section of the decomposition analysis. Thus, our results suggest that although the big five traits are constructed from the sub-traits, the big five traits and their sub-traits affect the gender wage gap in different ways.

Overall, as is discernible from the magnitude and significance of the coefficients, psychological variables play a greater role in explaining the gender wage gap than traditional human capital. This role is likely to increase in the future as the male-female gap in human capital narrows.

Moreover, the fact that their influence is more active in the unexplained part of the wage decomposition should be a concern for employers and policymakers as it can be regarded as a sign of women being discriminated against for similar gender values. Future research should introduce further controls for the reverse causality problem and include additional variables to give greater scrutiny of the issues under consideration.

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Appendix A: Personality Traits List and Definition of Variables

Table A1 Big Five personality traits and sub-traits from the HILDA Survey

Big Five personality trait	Sub-Trait/Facet
Conscientiousness	Efficient, disorganised (R), inefficient (R), sloppy (R), systematic, orderly
Openness to experience	Imaginative, creative, intellectual, complex, philosophical, deep
Extroversion	Talkative, bashful (R), shy (R), quiet (R), lively, extroverted
Agreeableness	Sympathetic, kind, cooperative, warm
Neuroticism/Emotional stability	Envious (R), moody (R), touchy (R), jealous (R), temperamental (R), fretful (R)

Note: R = Reversed. Each sub-trait is measured on a scale of 1 to 7 in which 1 indicates the word does not describe the respondent at all while 7 means it describes the respondent very well. The big five scales are composed by taking the average of the sub-traits, some of which are reverse coded.

Table A2 Definition of variables

Variable	Definition
Hourly wage rate	Logarithm of the hourly wage earned in the main job
Gender role attitudes	See Section 3.1.
Age	Age in years
Female	1 = Yes; 0 = No
Birth: Australia	1 = Yes; 0 = No
Female	1 = Female; 0 = Male
Married	1 = Married or de facto; 0 = Never married and not de facto, Separated, Divorced or Widowed
Children aged 0–4 years present	1 = Yes; 0 = No
Children aged 5–9 years present	1 = Yes; 0 = No
Number of children aged 0–4 years	Number of own resident children and resident step/foster/grandchildren without a parent in the household, aged 0–4 years
Geographic remoteness	1 = Outer regional, remote, or very remote; 0 = Major city or inner regional
State[a]:	
New South Wales	1 = Yes; 0 = No
Victoria	1 = Yes; 0 = No
Queensland	1 = Yes; 0 = No
South Australia	1 = Yes; 0 = No
Western Australia	1 = Yes; 0 = No
Tasmania	1 = Yes; 0 = No
Norther Territory	1 = Yes; 0 = No
Australian Capital Territory	1 = Yes; 0 = No
Education[b]:	
University	1 = Yes; 0 = No
Advanced diploma/diploma	1 = Yes; 0 = No
Certificate III and IV	1 = Yes; 0 = No
Year 12	1 = Yes; 0 = No
Year 11 and below	1 = Yes; 0 = No
Health status:	
Self-assessed health	1 = Poor; 0 = Not poor
Long term health condition	1 = Yes; 0 = No
Employed	1 = Yes; 0 = No
Tenure: occupation	Tenure in current occupation in years

Tenure: current employer	Tenure with current employer in years
Multiple jobs	1 = Yes, 0 = No
Employee type:	
Full-time employment	1 = Yes; 0 = No
Casual employment	1 = Casual; 0 = Permanent
Private sector employment	1 = Private sector for-profit organisation; 0 = Not private sector for profit organisation
Union member	1 = Yes, 0 = No
Firm size[(c)]:	
Firm size 1-4	1 = Yes; 0 = No
Firm size 5-19	1 = Yes; 0 = No
Firm size 20-99	1 = Yes; 0 = No
Firm size 100 or more	1 = Yes; 0 = No
Employer: multiple locations	1 = has more than one workplace in Australia; 0 = has only one workplace in Australia
Occupational status scale	Occupational status scale of the current main job; range from zero to 100 (see McMillan, Beavis, and Jones 2009 for detail)
Occupational mobility	Number of times occupation changed during the survey years
Employment-related satisfaction:	
Work-hour satisfaction	10 = Totally satisfied; 0 = Totally dissatisfied
Work-life balance satisfaction	10 = Totally satisfied; 0 = Totally dissatisfied
Workplace entitlements:	
Paid maternity leave	1 = Yes, 0 = No
Flexible start/finish times	1 = Yes, 0 = No
Paid holiday leave	1 = Yes, 0 = No
Paid sick leave	1 = Yes, 0 = No
Occupation[(d)]:	
Manager	1 = Yes, 0 = No
Professional	1 = Yes, 0 = No
Technician and trades	1 = Yes, 0 = No
Community and personal	1 = Yes, 0 = No
Clerical and Administrative	1 = Yes, 0 = No
Sales	1 = Yes, 0 = No
Machinery operators and drivers	1 = Yes, 0 = No
Labourers	1 = Yes, 0 = No
Industry[(e):]	
Agriculture, Forestry and Fishing	1 = Yes, 0 = No
Mining	1 = Yes, 0 = No
Manufacturing	1 = Yes, 0 = No
Electricity, Gas, Water and Waste Services	1 = Yes, 0 = No
Construction	1 = Yes, 0 = No
Wholesale Trade	1 = Yes, 0 = No
Retail Trade	1 = Yes, 0 = No
Accommodation and Food	1 = Yes, 0 = No
Transport, Postal and Warehousing	1 = Yes, 0 = No
Information Media and Telecommunications	1 = Yes, 0 = No
Financial and Insurance	1 = Yes, 0 = No
Rental, Hiring and Real Estate	1 = Yes, 0 = No
Professional, Scientific and Technical	1 = Yes, 0 = No
Administrative and Support	1 = Yes, 0 = No
Public Administration and Safety	1 = Yes, 0 = No
Education and Training	1 = Yes, 0 = No
Health Care and Social Assistance	1 = Yes, 0 = No
Arts and Recreation	1 = Yes, 0 = No
Other Services	1 = Yes, 0 = No

Notes: Wage rate is calculated for people who have at least one hour of work history per week and earned at least $1 in that period. Base categories include [(a)]Tasmania, [(b)]year 11 and below, [(c)]firm size less than 5, [(d)]labourers, and [(e)]agriculture, forestry and fishing.

Appendix B: The Issue of Treating Ordinal Scales as Interval Scales

Some may question the application of statistical methods that are developed for interval data to Likert-type items (e.g., the narrower facets of personality traits) as assigning equally spaced integers to represent different levels or categories of an ordinal variable and then analysing it by methods suitable for interval scales may introduce large biases in parameter estimates (O'Brien 1981). However, one of the major reasons for treating ordinal variables as interval data is the fact that such treatment makes it possible to use parametric methods rather than nonparametric ones, which cannot sufficiently deal with problems that involve more than two ordinal variables (Kampen and Swyngedouw 2000). Most of the nonparametric methods also cannot tackle regressions with both categorical and continuous regressors (Tutz 2020). In addition, the treatment of ordinal variables as an interval in regression analysis makes interpretation of results easier (Long and Freese 2001). Many sociologists and psychologists, therefore, choose to use ordinal variables as interval data even when they do not strictly satisfy the requirements of the interval scale (Casacci and Pareto 2015). The same practice is also common in economics (e.g., Ifcher and Zarghamee 2011, Hetschko, Knabe, and Schöb 2014, Dynan and Ravina 2007). For the same reasons, we have considered personality sub-traits as interval variables in the decomposition equations.