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The impact of a sustained gender wage gap on the Australian economy

Report to the Office for Women, Department of Families, Community Services, Housing and Indigenous Affairs

PREPARED BY

Rebecca Cassells, Yogi Vidyattama, Riyana Miranti and Justine McNamara

NOVEMBER 2009

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It must be emphasised that NATSEM does not have views on policy. All opinions are the authors' own and are not necessarily shared by NATSEM.

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AUTHOR NOTE

Rebecca Cassells is a Senior Research Fellow at the National Centre for Social and Economic Modelling (NATSEM) at the University of Canberra. Yogi Vidyattama is an Acting Research Fellow, Riyana Miranti is a Research Fellow and Justine McNamara is an Acting Principal Research Fellow, all at NATSEM.

National Centre for Social and Economic Modelling University of Canberra ACT 2601 Australia 170 Haydon Drive Bruce ACT 2617

Phone + 61 2 6201 2780 Fax + 61 2 6201 2751
Email natsem@natsem.canberra.edu.au
Website www.natsem.canberra.edu.au

ACKNOWLEDGEMENTS

This research was initiated and funded by the Office for Women, Department of Families, Community Services, Housing and Indigenous Affairs (FaHCSIA).

This research report has been produced with the assistance of many people. The details of each contribution are provided briefly below.

Macroeconomics.com.au was consulted as a specialist adviser on the project, and we would like to acknowledge the director of Macroeconomics.com.au, Dr Stephen Anthony, and thank him for the expert advice he provided in relation to our macroeconomic model.

Associate Professor Anne Daly from the University of Canberra, and an Associate Researcher at NATSEM, was also consulted as a specialist adviser on the project in relation to gender wage gaps, decomposition methodologies and Australian labour markets. We would like to acknowledge Anne's contribution and guidance for our microeconomic model.

Previous work by Professor Stephan Klasen (Professor of Development Economics, University of Göttingen, Germany), has helped shape and inform the macroeconomic model used here. Stephan has also given helpful advice during the course of this project.

Dr Ian Watson (Senior Research Fellow, Macquarie University and Social Policy Research Centre, UNSW), provided useful assistance and advice in relation to technical aspects of wage gap decomposition methodologies.

This paper uses unit record data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey. The HILDA Project was initiated and is funded by the Australian Government Department of Families, Housing, Community Services and Indigenous Affairs (FaHCSIA) and is managed by the Melbourne Institute of Applied Economic and Social Research (MIAESR). The findings and views reported in this paper, however, are those of the authors and should not be attributed to either FaHCSIA or the MIAESR.

GENERAL CAVEAT

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These estimates may be different from the actual characteristics of the population because of sampling and nonsampling errors in the microdata and because of the assumptions underlying the modelling techniques.

The microdata do not contain any information that enables identification of the individuals or families to which they refer.

EXECUTIVE SUMMARY

The persistence of the gender wage gap in Australia and overseas has been the subject of much research. Debates about how best to measure the wage gap, how to calculate the relative contribution different factors make to the gap, and how the gap and its determinants differ across sectors and income levels abound. However, few if any studies, and none for Australia, provide a comprehensive and detailed account of the impact of the gender wage gap to economic growth. This paper seeks to provide such an account, with our research presented in the body of this paper, and our key findings summarised, as follows.

THE PERSISTENT NATURE OF AUSTRALIA'S GENDER WAGE GAP

Analysis of Australian Bureau of Statistics earnings data confirms that Australia has a persistent gender wage gap. Data from the Average Weekly Earnings Survey show that between 1990 and 2009, the gender wage gap remained within a narrow range of between 15 and 17 per cent. Indeed over the last four years the gap has steadily increased within this range from a low of 15.1 per cent in February 2005 to 17.0 per cent in February 2009.

KEY DETERMINANTS OF THE GENDER WAGE GAP IN AUSTRALIA

In estimating the impact of a sustained gender wage gap on the Australian economy, it was instructive to first identify and quantify the relative contributions of the key determinants of the gap.

Utilising robust microeconomic modelling techniques, based on a comprehensive and critical evaluation of several methodologies, we found that simply being a woman is the major contributing factor to the gap in Australia, accounting for 60 per cent of the difference between women's and men's earnings, a finding which reflects other Australian research in this area. Indeed, using wage gap analysis from the HILDA survey, the results showed that if the effects of being a woman were removed, the average wage of an Australian woman would increase by $1.87 per hour, equating to an additional $65 per week or $3,394 annually, based on a 35 hour week.

Other key determinants of the gap that were identified and quantified as part of the microeconomic modelling component of our research were industrial segregation (25 per cent), labour force history (seven per cent), under-representation of women with vocational qualifications (five per cent) and under representation of women in large firms (three per cent).

Overall, and as detailed in the body of this paper, our finding that simply being a woman is the major contributing factor to the wage gap in Australia is significant. Consistent with results from other Australian studies it highlights the considerable impact that discrimination and other differences between men and women, including differing motivations and preferences, can have on reducing the earnings of women relative to men, irrespective of similar labour force and work-related characteristics.

THE COSTS OF THE GENDER WAGE GAP TO THE MACRO ECONOMY

At the microeconomic level, the negative impacts of key drivers of the gender wage gap are significant. Yet what are its effects on the Australian economy as a whole? An increasing body of literature shows that in addition to fairness and equity there are also strong economic imperatives for addressing the gender wage gap.

Using rigorous macroeconomic modelling techniques, again selected on the basis of a critical evaluation of several methodologies, we found that the gender wage gap has a substantial effect on Australia's economic performance, measured in terms of GDP per capita, and that the value of reducing the gap is substantial. For example, we estimate that a decrease in the gender wage gap of 1 percentage point from 17 per cent to 16 per cent would increase GDP per capita by approximately $260. This equates to around $5,497 million (2007 dollars) or 0.5 per cent of total GDP, assuming that the Australian population is held constant. The results also indicate that eliminating the whole gender wage gap from 17 per cent to zero, could be worth around $93 billion or 8.5 per cent of GDP.

The impact of the wage gap on macroeconomic performance was measured both in terms of its direct impact on economic growth and through several indirect channels, including investment, fertility, hours of work and labour force participation. Diagnostic analysis of these results showed that while the relationship between the gender wage gap and economic growth was negative for each of these variables, except labour force participation, only the hours of work channel was statistically significant. This suggests that based on the assumptions of the model, the negative impact of the gender wage gap on Australia's macroeconomic performance stems primarily from the disincentives to work more hours associated with women's earnings being lower than men's.

Using our findings at a microeconomic level, we have also estimated the effect of each key determinant of the gender wage gap at the macro level. Disaggregating the estimated $93 billion cost to the economy of the gender wage gap, we estimate that removing the negative effects associated with the prime determinant of the gap, that is being a woman, could add around $56 billion or 5.1 per cent to total annual GDP.

A FEW WORDS OF CAUTION

We recognise that the findings presented in this paper are subject to the limitations and assumptions of the underpinning microeconomic and macroeconomic models. As detailed in the main body and appendices of this paper, we have sought to identify and minimise, to the greatest extent possible, these limitations. It should be noted, however, that both areas of modelling are the subject of vigorous debate about the strengths of a range of methodological techniques. While our work is firmly based on best practice and has been subjected to rigorous quality assurance procedures, the use of different data sets coupled with ongoing developments and improvements in methodological techniques may potentially produce different results. Details of our methodology and its potential limitations are provided in the appendices to this report.

1 INTRODUCTION

The gender wage gap in Australia and overseas has been the subject of much research. Debates about how best to measure the wage gap, how to calculate the relative contribution different factors make to the gap, and how the gap and its determinants differ across sectors and income levels abound. Little is known, however, about the costs to the economy of a sustained gender wage gap or indeed the value in terms of the macroeconomic benefits of reducing the gap. In June 2009, the Office for Women, Department of Families, Community Services, Housing and Indigenous Affairs (FaHCSIA), commissioned the National Centre for Social and Economic Modelling (NATSEM) to undertake research estimating the value to the economy of reducing the gender wage gap in Australia. This report presents the results of our research with the analysis structured as follows:

- **The gender wage gap in Australia 1990-2009**. This section presents the historical context to the report with a time series analysis of data from the Australian Bureau of Statistics' (ABS) Average Weekly Earnings survey. It shows that between 1990 and 2009, Australia experienced a persistent gender wage gap in the range of 15.5 to 17.5 per cent.

- **Potential drivers of the gender wage gap in Australia.** This section reviews recent international and Australian literature that examines the complex and inter-related causes of the gender wage gap. We identify the most widely accepted determinants of the wage gap, and the most robust method for decomposing the wage gap for our purposes in this project. This analysis is then used as the basis for selecting a methodology and variables for use in modelling the gender wage gap for this project.

- **Microeconomic modelling of the gender wage gap in Australia.** This section discusses the important considerations to take into account when measuring wage gaps, in particular the importance of feedback effects, and measuring direct discrimination. We find an hourly wage gap using HILDA data of $3.13 (approximately 11 per cent). We also find that the key factor associated with the wage gap is simply being a woman. We estimate that 60 per cent of the wage gap is due to either direct discrimination or other factors to do with being a woman.

- **Gender inequality and macroeconomic performance.** In this section, we discuss the importance of measuring the effect of wage gaps on economic growth and pathways through which wage gaps can impact upon economic growth, drawing on a range of international literature. We find that there are significant benefits to addressing the wage gap in terms of economic efficiency. Our modelling shows that the Australia economy would gain approximately 0.5 percent of GDP if the wage gap decreased by one per cent, from the current AWE calculation of 17 per cent to 16 per cent. This would mean a gain per capita of GDP of approximately

$260, equating to around $5,497 million (2007) dollars. We also use the findings from our microeconomic modelling of the key determinants of the wage gap to estimate the effect of each of these on the macro economy. Specifically, we estimate that removing the effects associated with being a woman (60 per cent of the wage gap), could see an improvement in GDP of around $56 billion per year.

Appendices. There are several appendices provided with this report, which provide greater detail and discussion of the literature, results and the extensive testing and modelling that has been undertaken.

2 THE GENDER WAGE GAP IN AUSTRALIA, 1990 – 2009

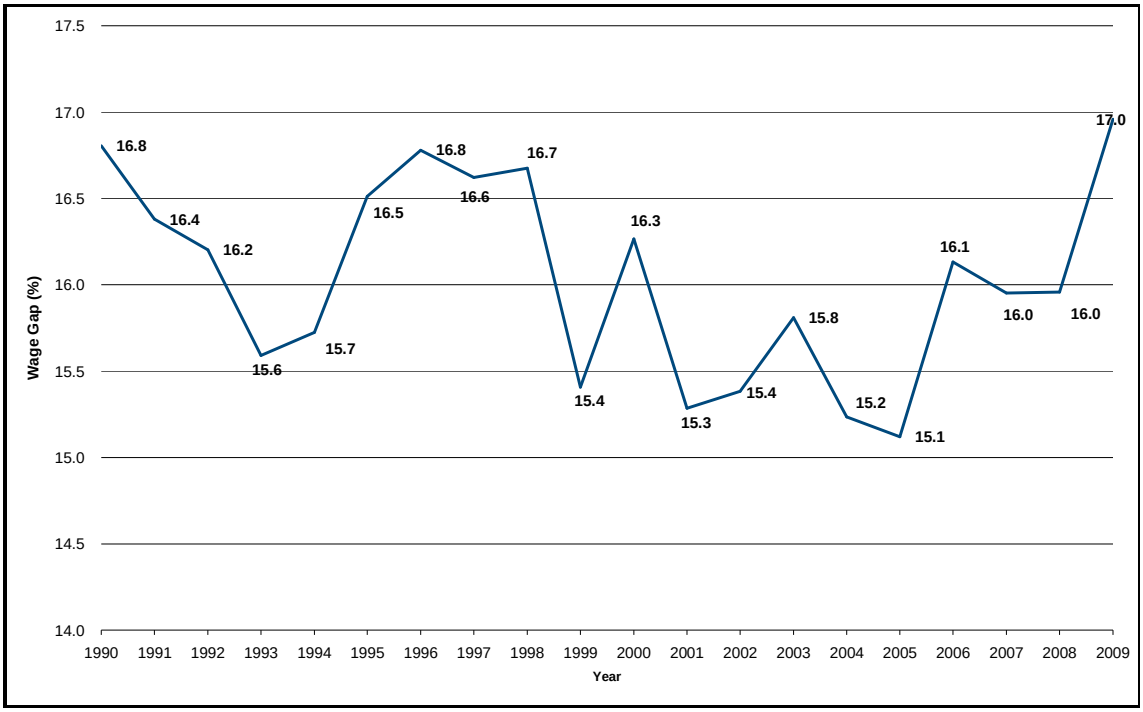
Over the past century, and more notably the past few decades, there have been many changes that shape the way in which Australian women participate in society and the economy. Today, women are now more likely than ever before to be participating in paid employment, are highly educated, and are delaying and having fewer children. Important legislative changes including the Matrimonial Causes Act (1961) and the Federal Sex Discrimination Act (1986), as well as social transformations, including the introduction of the contraceptive pill and the feminist movement, have all aided women's quest for equality. In relation to pay equity, the Commonwealth Conciliation and Arbitration Commission's 1969, 1972 and 1974 judgements in relation to the principle of equal pay for equal work and work of equal value were important milestones in relation to wage discrimination (see Pocock 1999 for a review of relevant policy, legislative and practice developments). Has equality been achieved though? In particular, are Australian women being rewarded for their efforts in the workplace fairly?

In this section we analyse the gender wage gap in Australia over the past two decades in order to see if the ground gained in terms of education, employment and social justice is reflected in women's incomes. This provides an historical context to the gender wage gap within Australia, by calculating its movements over time using data from the Australian Bureau of Statistics (ABS) Average Weekly Earnings series.

We have considered several data sources that could be used in order to gain an accurate, consistent, un-broken time series of the gender wage gap from the 1990s to the present., including the ABS Survey of Income and Housing (SIH), the ABS Employee Earnings and Hours Survey (EEH), the Employee Earnings, Benefits and Trade Union Membership (EEBTUM) and the ABS Average Weekly Earnings (AWE) Series. While each of these data sources has advantages and limitations, we have chosen to derive a time series of the gender wage gap using the ABS Average Weekly Earnings Series. The AWE has the advantage that, as an employer-based survey, the data on earnings are considered more reliable than household-based surveys such as EEBTUM and the SIH. In addition, unlike the EEH, which is also an employer based survey, the AWE is regular, consistent and has the advantage in that it provides a long uninterrupted time series.

In order to make the raw earnings data of men and women as comparable as possible over time, we limited our sample to full-time working adults working ordinary time[1]. It is important to note that a large proportion of women work part-time compared with men and including part-time employees in the wage gap estimate would increase the gap. Also, had we included overtime hours, the wage gap would also increase slightly, as men are more likely to have access to paid overtime hours than women[2]. Thus, limiting our sample in these ways increases the rigour of our wage gap estimates, as it reduces the labour market differences that exist between men and women, allowing us to focus more closely on wage differences only. However, there will nevertheless be some individual and organisational differences that cannot be accounted for in these wage gap estimates, such as level of education, or number of years work experience.

Figure 1 The Gender Wage Gap in Australia, 1990-2009



Note: The gender wage gap is calculated for full time, ordinary time adult employees, using original data.
The reference period for data used in this figure is February for each year.
Source: ABS Average Weekly Earnings, Data cube, 2009, Cat No. 6302.0

The persistence of the gender wage gap in Australia over the past two decades is illustrated in Figure 1. Whilst the wage gap has fluctuated slightly over this period, it has consistently remained between 15 and 17 percent, with women receiving around 83 to 85 per cent of the average man's wage. Between 1996 and 2005 the gender wage gap exhibits a downward trend falling from 16.8 per cent to 15.1 per cent but in the four years since then it has risen

[1] Full-time working adults are defined as those persons aged 21 years and above. Ordinary-time covers standard or agreed hours of work, thus excluding overtime, (ABS, 2009a).

2 The gender wage gap calculated based on AWE, using an alternative group of people - full time adults, total earnings, which includes overtime was 20.8 per cent in 1990 and 19.7 per cent in 2009.

quite sharply, wiping out the previous gains and in effect leaving the gap slightly above the level it was almost twenty years earlier. Currently (based on data from February 2009), women who work ordinary full-time hours earn on average $1,049.40 per week in comparison to full-time men who earn on average $1,263.70 per week.

3 POTENTIAL DRIVERS OF THE GENDER WAGE GAP IN AUSTRALIA

The causes of the gender wag gap while complex, inter-related and likely to vary over time can for analytical simplicity be grouped into two main factors, namely explained (human capital or labour market factors) and unexplained characteristics.

3.1 DISCRIMINATION OR CHARACTERISTICS

Many Australian and international studies on the gender wage gap have tended to focus on the question of whether it is discrimination that is the major driver of the gap in wages between men and women, or if the gap is driven primarily by differences in men's and women's human capital attainment and other characteristics. These differences have proved difficult to tease out, partly because of the ways in which discrimination may be intertwined with the attainment of other characteristics.

Discrimination can be defined as occurring 'when participants in the marketplace take into account such factors as race and sex when making economic exchanges' (Borjas 2010, p. 365). However, such effects may occur not just in the selection by employers of men over women into higher-paying jobs, but may also form a complex part of the decisions women and men make around study, career, family and labour market participation. These indirect effects of discrimination on men's and women's decisions and characteristics are also known as 'feedback effects' (see, for example, Grimshaw and Rubery 2002; Rummery 1992). The interplay between direct and indirect effects of discrimination means that it is very hard to isolate this from other drivers of the gap. Teasing out discrimination from other factors which drive wage differences is generally discussed in the literature in terms of endowments, and rewards for endowments.

Most studies decompose the wage gap using the Oaxaca-Blinder method or variations thereon (see Appendix A for further discussion), with the focus of this decomposition being to calculate the extent to which the difference between men's and women's wages can be explained by the *total* effect of all the variables included in the model, and what cannot be explained by these variables. The effect of the included variables is deemed to be that part of the gender wage gap which is explained by 'endowments' (that is, measureable differences between men and women in education, work experience, training and so on), while the portion of the wage gap that cannot be explained by these endowments is assumed to be explained by 'rewards' for these endowments[3]. These rewards represent the

[3] Other authors give these concepts different names. For example, Drolet (2001) refers to the explained portion of the wage gap (or endowments) as 'productivity-related characteristics' and the 'rewards for endowments' portion as compensations received for productivity-related characteristics (p. 13).

extent to which women are paid less than men once all other measurable characteristics are held constant, and may include discrimination as well as any other unobserved differences between men and women (which, as Olsen and Walby (2004) note, may include differing motivations and preferences). In these types of studies, therefore, the only determinants of the wage gap which are often actually quantified are the totality of 'endowments' and the remaining unexplained portion of the variation in wages. Attempts are not always made to separately quantify the role of the particular variables which fall within the broad category of 'endowments', and which will themselves be to a certain extent influenced by discrimination[4].

Findings about the determinants of the Australian gender wage gap generally show that rewards for endowments are more important than endowments themselves (see, for example, Borland 1999; Cassells *et al.* 2008; Daly *et al.* 2006; Eastough and Miller 2004; Kee 2006; Preston 2000; Wooden 1999). Miller (2005, p.405), summarising these findings, notes that in many studies only around one-fifth of the wage gap between men and women can be explained by productivity-related characteristics[5]. Kee (2006) additionally examined the extent to which the wage gap, and the extent it can be explained by endowments versus rewards, differs across the income distribution. She found that the difference in return to gender characteristics (rather than differences in endowments) was the most important determinant of the gender wage gap with the effect of rewards most profound at the highest end of the income distribution in the private sector.

Thus overall there is substantial evidence to suggest that a combination of discrimination or other unobserved characteristics play an important role in maintaining the wage gap in Australia. However, some Australian work goes on to examine in more detail the other drivers of the wage gap. A summary of these findings is provided below.

3.2 OTHER WAGE GAP DETERMINANTS

The findings summarised above suggest that human capital and labour market differences between men and women are less important in understanding the gender wage gap in Australia than variations in the way these differences are rewarded (or reflected in pay). However, the fact that discrimination in some form (as Olsen and Walby 2004 note) is likely to be closely intertwined with a range of the endowment and control variables used in wage gap models, suggests that further enquiry into the role which these factors play in maintaining the wage gap is vital. This is all the more so as current methodologies (discussed further in Appendix A) make it difficult to identify what proportion of the 'rewards for endowments' is in fact explained by discrimination, and what may simply be due to other unobserved differences between men and women (which in themselves may also be affected by discrimination).

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[4] Some studies additionally examine the differing contribution which rewards or endowments make in different sectors, or at different points of the income distribution (see, for example, Barón and Cobb-Clarke 2008; Kee 2006).

[5] Barón and Cobb-Clarke (2008) did find, however, that endowments, or wage-related characteristics, explained most of the wage gap at the very bottom end of the income distribution.

Australian work which provides some information about the key determinants of the gender wage gap includes studies which present detailed decomposition results, as well as those which discuss more broadly factors known to influence women's earnings. However, the contribution of various factors to the wage gap in Australia is very uncertain.

Studies of the gender wage gap have generally divided possible determinants of the wage gap into two groups: those related to human capital, and those related to labour market-related institutions and rigidities (see, for example, Walby and Olsen 2002). There is some consensus in the literature about a number of determinants of the wage gap in Australia within both these broad groups, but not for all variables. An additional body of literature examines the effects of personality characteristics which may affect occupation choice, hours of work, promotion and so on, and thus wages. Fortin (2008) and Cobb-Clark and Tan (2009) study the effects of noncognitive traits (e.g. self-efficacy and personality traits), on wages and the gender wage gap. Fortin (2008), focusing particularly on factors which are known to differ by gender (in particular the relative importance or value put on money/work and people/family) finds a modest but significant role of these variables. Using Australian data, Cobb-Clark and Tan (2009) further refine this methodology by examining the influence of noncognitive factors on occupational attainment first, and through occupation on wages. They do this by examining the effects of the noncognitive factors (along with other factors likely to influence wage gaps) for each occupation separately, and find that such factors have little effect on the wage gap.

Human capital variables

The recognition of human capital as a predictor of wage levels (and thus the wage gap) emerges from work by Becker (1975) and Mincer (1974). Walby and Olsen (2002) define human capital as:

> 'all the skills and experience that a person brings to employment that are relevant to that employment. It encompasses not only educational qualifications and training by employers, but also experience that people have as result of prior labour market experience' (Walby and Olsen 2002, p. 22).

In studies of the gender wage gap, human capital is usually measured through formal educational attainment and years of work experience (often proxied, as discussed below). In addition, some studies include further variables to capture human capital, including the use of employer-provided training. The literature usually takes as given the human capital developed at the point of entry to the labour market and focuses on the rewards to that human capital once in the labour market.

The education component of human capital is captured in virtually all gender wage gap studies, most often through the use of a set of dummy variables capturing the highest level of education completed – for example, completed high school, some post school training, bachelor degree and above (see, for example, Cassells *et al* . 2008; Preston 2003)[6]. Some

[6] Olsen and Walby (2004) and Walby and Olsen (2002) introduce an additional refinement to this method of measurement by using known educational attainment to develop a numeric index of education

work (e.g. Drolet 2001) also includes field of study as a variable within gender wage gap models, as wages differ by field of study, and there is considerable gender segregation in post-secondary fields of study.

Suggestive of discrimination and labour market rigidities, Australian studies have found that returns to education for women are generally lower than those for men, despite women's somewhat higher level of educational attainment (Miller 2005; Rummery 1992)[7]. As Miller (2005) notes: 'additional schooling opens up access to better paying positions more readily for males than for females' (Miller 2005, p. 413).

While previous literature is unanimous in acknowledging the importance of previous work experience in measuring the human capital contribution to the gender wage gap, there are considerable differences in the way in which this variable is measured. In the international literature, Walby and Olsen (2004), Grimshaw and Rubery (2002) and Drolet (2001) note that experience has generally been measured through a proxy variable designed to capture potential work experience, constructed by deducting years of schooling from age, less an approximate number of pre-school years, generally due to an absence of actual data about work experience (Australian examples of this approach include the work of Daly *et al.* 2006; Miller 2005; Preston 2003). However, the use of this type of proxy variable has serious flaws, especially for women, who are likely to have breaks in their labour market experience (Olsen and Walby 2004; Rummery 1992). As Drolet (2001) notes, a proxy variable for potential years of work experience based on age and years of schooling does not take into account withdrawal from the labour market or participation in part-time (rather than full-time) work.

A range of approaches to the measurement of years of work experience have been used in Australian studies[8]. Despite the use of different measures to proxy experience (Eastough

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level. While this method has the advantage of being able to attempt a precise quantification of the contribution of education levels to the gender wage gap (e.g. for every extra year of education, so many dollars are gained), it does involve having to make substantial assumptions about the additive value of extra educational qualifications

[7] Miller (2005) notes that at the very bottom end of the income distribution, only the returns to education for women are actually slightly higher than for men.

[8] There are various approaches in the literature to attempting to better capture work experience. Preston (2003) uses the additional controls of marital status and numbers of children in an attempt to overcome the limitations of her otherwise standard labour market experience proxy variable. Grimshaw and Rubery (2002) note, however, that one of the problems with the inclusion of both numbers of children and proxied experience is the likelihood of correlation between these two variables. Australian studies have sometimes used tenure with current employer to capture work experience (Kee 2006), along with age and number/ages of children, or both tenure with current employer and tenure in current occupation combined with age and number of children (Cassells *et al* . 2008). Drolet (2001) notes that tenure with current employer can be considered a measure of on-the-job training, as employers are more likely to invest in longer-tenured employees. Both Kee (2006) and Cassells *et al.* (2008) use a set of dummy variables that capture whether the individual is employed on a full-time, part-time, contract or casual basis. Rummery (1992), with access to data about labour market history, uses a measure of years worked. Olsen and Walby (2004), in the context of their argument about the long-term effects on human capital attainment and wages of life-time working patterns, include three measures of work

and Miller 2004; Miller 2005; Rummery 1992), results are consistent with findings generally confirming that returns to work are higher for men than women. Additional years of labour market experience translate into greater increases in wages for men than for women. Miller, using the potential experience variable from the 2001 Census data (which is equal to age minus school leaving age), finds that returns to labour market experience (evaluated at 10 years experience) is 1.8 per cent for men and 1.4 per cent for women. The contribution of years of experience to the gender wage gap is particularly substantial when variables which capture actual rather than potential experience are used. For example, Rummery (1992) using the 1984 National Social Science Survey, finds that the return to actual labour market experience (evaluated at ten years of work) for men is 1.45 per cent, yet for women it is only 1.32 per cent.

The effects on human capital attainment, earnings and the gender wage gap of interruptions and alterations to labour market experience (not working or working part-time) due to child bearing and rearing and other caring duties are widely acknowledged in the literature (for a detailed discussion see Baum 2002; Budig and England 2001; Walby and Olsen 2002). These issues are complex and multifaceted, and are by no means limited to the simple fact that not working, or working part-time, eliminates or reduces wages for a particular period.

The possible repercussions of interruptions to work on lifetime levels of pay follow several pathways. Drolet (2001, p. 7) summarises the effects of labour force withdrawals as follows. First, non-continuous work is associated with shorter periods of job tenure, which in turn is associated with lower pay. Second, the value of human capital may deteriorate while women are out of the workforce, and thus when they return these effects may result in a lower likelihood of promotion or lower wages. Third, women facing interruptions to their career may choose not to participate in training, or may decide to accept low-wage jobs. Finally, labour market withdrawals may often coincide with the beginning of women's careers, a time at which the acquisition of job skills (and therefore job advancement and wages growth) is particularly strong for non-withdrawers. Olsen and Walby (2004) also note that withdrawals from the labour force can have a negative impact on earnings through discrimination.

In Australian studies, labour force withdrawals have been captured through variables which show how many children women have (as the presence of children is likely to have resulted in a period of withdrawal), and is also captured by years of work experience when this is included in models. As noted above, the latter variable is generally shown to be an important determinant of the wage gap, and the presence of children also tends to contribute to the wage gap. The presence of children, particularly young children, causes

history in their gender wage gap models. They include a measure of years spent in part-time work and years spent in full-time work, and also capture additional information about women's labour force withdrawals by including a variable which measures years out of employment due to caring for children or other family members.

women to participate less in the labour market and work fewer hours than women without children or men (Lundberg and Rose 2000; Sigle-Rushton and Waldfogel 2006). This also contributes to women with children earning less wages than women without children or men (Lundberg and Rose 2000; Sigle-Rushton and Waldfogel 2006). Eastough and Miller (2004) note that in Australia, among full-time wage and salary earners, women with dependent children earn 7.5 per cent less than women without dependent children, whilst men with dependent children have slightly higher earnings than men who do not have dependent children. Further, the presence of children has been found to influence men's and women's lifetime earnings. Cassells *et al.* (2009) find that the lifetime earnings in Australia for a man with children is almost double those of his female counterpart ($2.5 million compared to $1.3 million), whereas in contrast the lifetime earnings for a man without children is hardly any different from a woman without children ($2 million compared to $1.9 million).

In contrast to international findings, in Australia current part-time work status has not been found to be a significant driver of the gender wage gap (see, for example, Booth and Wood 2006; Rodgers 2004). However, whilst current part-time work status in Australia does not appear to drive the wage gap, a prolonged history of part-time work may be associated with lower pay, due to factors associated with long-term part-time employment such as lower on-the-job training being offered and taken up. Olsen and Walby (2004), in a UK context, note some of the complexities associated with the effect of a history of part-time work on women's wages. They point out that part-time work in itself may be associated with lower rates of human capital attainment, that is, it cannot be assumed that years of experience in part-time work equates to the same level of skills acquisition (and therefore pay rate) as years of experience in full-time work.

Labour market factors

Not all possible determinants of the gender wage gap are related to individual characteristics such as education and work experience. Walby and Olsen (2002, p.22), in discussing the implications of the gender wage gap for productivity, note the role that 'failures in the market for labour' play in generating and maintaining the wage gap, and point particularly to labour market rigidities associated with occupation and industrial segregation, insufficient flexibility in the labour market to allow women to combine work with child-rearing, and discrimination. In addition, they note a series of other labour market factors which are broadly associated with wage determination including occupational segregation, unionisation, public versus private sector employment (which can reflect a centralised or decentralised bargaining system); industrial sector and firm size. Many of these appear to play some role in the persistence of the gender wage gap in Australia, but once again findings are mixed.

Occupational segregation

Occupational segregation can be defined as the extent to which 'women and men are differently distributed across occupations than is consistent with their overall shares of employment' (Watts 2003, p. 631). Occupational segregation is important to include in

analyses of gender wage gaps, as it can often be an indicator of the undervaluing of women's work. That is, traditionally 'female' jobs tend to be less well paid than traditionally 'male' jobs. Occupational segregation is a complex area of research, with debates about measurement of this concept driven by a range of theoretical and empirical approaches (Watts 2003). Occupation, and particularly the gender segregation of occupations, plays an important role in predicting wages, although the ways in which occupation and occupational segregation are included in models can mean varying results[9].

In an Australian context, the effects of occupational segregation on the gender wage gap are not clear. While some studies have found that occupational segregation contributes to the gender wage gap in Australia (see, for example, Miller, 1994, Preston and Whitehouse 2004; Robinson, 1998; Wooden 1999), other work suggests that in Australia occupational segregation has the opposite effect - that is, if occupations were desegregated and no longer had unequal representations of men and women, women's pay would be lower, not higher (Barón and Cobb-Clark 2008; Preston and Crockett 1999; Watts 2003). Cobb-Clark and Tan (2009), examining the gender wage gap separately for 18 different occupational classifications, conclude that, while this methodology leads to a greater portion of the gender wage gap being explained by men's and women's different characteristics, it is not occupational segregation that contributes to this, but rather women getting paid less than men within the same occupational groups.

Industrial segregation

Industrial segregation has been a less strong focus of gender wage gap literature. However the effect of segmentation of industries along gender lines is included in many wage gap models (see, for example, Cassells *et al.* 2008; Daly *et al.* 2006; Eastough and Miller 2004; Preston 2000; Preston and Crockett 1999; Wooden 1999), and Australian studies have generally shown that industrial segregation tends to widen the wage gap (see, for example, Cassells *et al.* 2008; Miller, 1994; Preston and Crocket 1999). These findings concur with those of a number of international studies which show that industrial segregation is associated with larger wage gaps (Grimshaw and Rubery 2002). Drolet (2001) found that industry of employment accounted for around eleven percent of the wage gap in Canada. Preston and Crockett (1999), who explicitly quantified the contribution that industry makes to the wage gap in Australia, found that this variable accounted for around 45 per cent of the explained portion of the gap. Their study decomposed the wage gap separately for each state, and they found that the effect of industry was particularly strong in Western Australia and Queensland.

Sector of Employment

Public-private sector effects on the gender wage gap in Australia have been examined and studies generally find that the wage gap is larger in the private than the public sector

[9] Grimshaw and Rubery (2002) note that the use of overly detailed occupational characteristics, while improving the explanatory power of models, can tend to obscure the role of discrimination in the wage gap (also noted by Drolet (2001), and thus relatively broad occupational categories are preferred.

(Barón and Cobb-Clarke 2008; Kee 2006; Preston 2000), although findings about the possibly differential effect of public sector employment on men's and women's wages differ somewhat across studies (Miller 2005; Wooden 1999).

Unionisation

Unionisation may have some effects on reducing the gender wage gap in Australia, particularly for lower wage workers (Barón and Cobb-Clarke 2008; Miller 2005) but findings about this relationship have been mixed. Wooden (1999), for example, found insignificant or weak negatively significant effects of union membership on wages, and Cai and Liu (2008) found that unions have a larger effect on men's wages than on women's.

Firm size

Firm size is also associated in the international literature with both income levels and income gaps – large firms pay more than small firms on average, and women are more likely to work in small firms than men (Drolet 2001). In Australia, Daly *et al.* (2006) use a set of six variables measuring firms with less than 30 employees, to firms with more than 1000 employees and found that for both men and women, hourly rates of pay were higher in larger firms. However, although larger firms may pay their employees on average higher wages, this may not necessarily be translated into a lower gender wage gap. Mitra (2003) finds that the gender wage gap between professional men and women in the US is the highest for firms with the smallest establishment size (1-25 employees), and interestingly second highest for firms with a very large establishment size (501 and more employees). Controlling for human capital variables and other characteristics, Mitra found that the gender wage gap for the 'very large' establishment size was 24 per cent, whereas for the 'large' establishment size (101-500 employees) it was 17 per cent. Further, recent findings from the 2008 EEH survey, show that as the firm size increases, the raw wage gap also increases (ABS 2008).

Income distribution

There have been several studies that have investigated the wage gap along the income distribution, rather than focusing on average values. Barón and Cobb-Clarke (2008), Kee (2006) and Miller (2005) note that the wage gap increases at the top end of the income distribution, although both Barón and Cobb-Clarke (2008) and Kee (2006) note that this effect is only evident in the private not the public sector. Authors also emphasise, however, that a substantial wage gap exists at all points of the income distribution, and that efforts to address the gap therefore need to be targeted at all income levels, not just high earners (Kee 2006; Miller 2005). In addition, Barón and Cobb-Clarke (2008) also find that for low-paid workers, the proportion of the wage gap explained by workers' characteristics (endowments) is much larger than for higher paid workers. Further, Austin *et al.* (2008), in their analysis of low-paid Australian workers, find that the minimum wage helped to reduce the gender wage gap by approximately 1.2 per cent between 1995 and 2005.

3.3 SUMMARY

Drawing on these Australian findings, as well as overseas studies, allows us to identify a set of variables to include in the decomposition of the gender wage gap being undertaken here. A large body of literature exists regarding theoretical and empirical considerations in selecting variables to predict the gender wage gap, and Grimshaw and Rubery (2002) note that as wage gap decomposition studies have developed, they have tended to include increasing numbers of variables (Grimshaw and Rubery 2002, p. 26). Drolet (2001, p. 11) notes that there is no 'universally accepted' set of variables that should be included in equations designed to assess gender earnings differentials. As noted above, Australian findings about many possible determinants have been mixed, and it is not possible from the literature to draw any definitive quantitative conclusions about the role of particular factors in maintaining the gender wage gap. In addition, many factors that influence wages and wage gaps overlap, and there is often the added difficulty of unmeasurable pre-labour market discrimination not being included in the model, and consequently under-estimating the overall effect of discrimination on gender wage gaps. Given this, it is important that the decomposition approach taken allows to some extent for these feedback effects to be included, and for direct discrimination to be measured.

4 MICROECONOMIC MODELLING OF THE GENDER WAGE GAP IN AUSTRALIA

4.1 HOW TO QUANTIFY THE WAGE GAP: DECOMPOSITION APPROACH[10]

As discussed in Section 3, feedback effects are an important factor to consider when attempting to estimate the impact of various factors on the gender wage gap. Pre-labour market discrimination is not taken into account when measuring wage gaps using traditional methodologies. These feedback effects result in differences in human capital levels, and can feed into the labour market through a variety of ways, including employer discriminatory practices resulting in lower human capital (for example, an employer may choose to invest less in training for particular people). Individual decisions to invest less in human capital due to lower returns, which are influenced by current discrimination practices, are also another form of feedback effects. These feedback effects can cause an under-estimation of labour market discrimination when using traditional decomposition methodologies.

In an effort to address these shortcomings, as well as to provide policy relevance, we have chosen to use the recent simulation approach pioneered by Olsen and Walby to identify and quantify the key determinants of the gender wage gap. Olsen and Walby's approach involves 'simulating the hypothetical changes needed to bring women's levels….into line with those of men' (Olsen and Walby 2004, p.24). In a hypothetical example, if the mean

[10] There are several issues to take into account, when measuring gender wage gaps, including the choice of decomposition methodology, and choice of an appropriate non-discriminatory wage structure for which to compare wages. These issues are discussed further in Appendix A.

years of formal education for women were eight years and for men this was ten years, an increase of two years would be required in order to bring women's years of education in line with the level of men. This extra two years of education is then multiplied by the corresponding coefficient (reward) for every extra year of education, which is, say 0.07 (seven per cent). This gives a simulated effect of 0.14 (0.07*2). This means that if women had the equivalent average level of formal education of men, their wage rate would increase by 0.14 (14 per cent). The Olsen-Walby technique is one of an 'integration' rather than 'separation' approach. To that effect, the simulation approach does not calculate separate 'reward' and 'endowment' components, but instead focuses on 'hypothetically moving the market in ways that equalise men's and women's experiences' (Olsen and Walby 2004, p.69). For a detailed description of this approach please refer to Appendix A.

The Olsen-Walby technique utilises the combined male and female prices for labour in their wage estimation in an effort to achieve a true non-discriminatory wage structure. Whilst there are limitations with this choice of wage structure, in that it may not be relevant in a 'real world' setting, and in that individual characteristics may be rewarded differently for men and women, (the effects of which may be neutralised within a combined labour market estimation), wage prices estimated for the entire pooled labour market offer a sensible middle ground[11]. One of the key advantages of the Olsen-Walby decomposition technique is that the gender component is illuminated and is not lost, or spread across factors, as is the case using other methodologies. This allows the direct discrimination component of being a woman to be measured or proxied. Limitations of the Olsen-Walby technique include those which are inherent in all regression estimation methodologies, including measurement error associated with chosen variables, and omitted variable bias.

Olsen and Walby also choose to exclude from their decomposition the effects of factors which are 'female-advantaging', (those that help to decrease the wage gap), factors that do not change (hold the same value for men and women), and those that they consider to be controls only and not relevant to gender wage gaps, however relevant in estimating wages – for example, geographical variables (Olsen and Walby, 2004, p.63). Whilst removal of these components could be considered to produce biased estimates, or in fact an over-estimation of the wage gap, their justification is based on the argument that the components of the wage gap considered are ones with practical policy relevance to reduce gender wage gaps. We concede that within the Australian context, and for the purposes of this analysis, removal of such variables is warranted and have also taken this path[12].

In summation, we see the advantages of the Olsen-Walby simulation technique, for our purposes in this study, being:

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[11] See Appendix A for further discussion on the choice of a non-discriminatory wage structure.

12 We have also estimated the effects of different components of the wage gap including all factors that influence or predict wages (both negative and positive) and find similar results as to the main drivers of the wage gap –these results are also shown in Appendix B.

- The gender component is visible, enabling the effect of direct discrimination, or other aspects related to being a woman to be clearly measured.
- There is the option to bring all of the 'policy relevant' variables into the forefront, and to treat all other variables as controls or irrelevant.
- Offsetting 'female advantaging' aspects are removed
- The tug-of-war about what component is due to 'rewards' and what is due to 'endowments' is removed.
- Feedback effects (pre-labour market discrimination) are to some extent addressed by giving women the 'best average situation among men' (Olsen and Walby 2004, p.8).

4.2 KEY DETERMINANTS OF THE WAGE GAP IN AUSTRALIA: OUR FINDINGS

Descriptive statistics[13]

The average characteristics of male and female wage earners in Australia, using data from HILDA, are shown in Table 1. The unadjusted wage gap shows men earning on average $3.13 more than women, with men receiving around $28 per hour on average and women around $25. This equates to an approximate 11 per cent hourly wage gap, which is different to the 17 per cent wage gap measured using AWE data[14]. Many of the characteristics of male and female wage earners are very similar, including whether they are partnered, whether they have a long term health condition, their work schedule, union membership status and areas of residence; however there are some notable differences. Men have on average around two years more time in paid work than women, and 1.21 years more time in their current occupation, giving them an advantage in the attainment of human capital in the form of work experience. Female wage earners are more likely to have a bachelor degree or higher, when compared with males – 33 per cent and 27 per cent respectively. However, women are under-represented in vocational qualifications and over-represented in having a qualification of year 12 or below, with 39 per cent of men with a vocational qualification compared to 29 per cent of women and 38 per cent of women with Yr 12 qualification level or below, compared with 34 per cent of men.

[13] Details about the data, sample and model specification used to produce the results in this section are provided in Appendix B, along with detailed decomposition results.

[14] The wage gap calculated from the HILDA survey is different to that calculated using AWE for several reasons. Firstly, the HILDA wage gap is calculated at an hourly wage rate, and the AWE gap at a weekly wage rate. There are also differences in the samples used in the AWE and HILDA wage gap calculations. The AWE sample includes only adult, full-time ordinary time workers. The HILDA sample excludes people still at school, self-employed, those aged below 21 years, and those aged 65 years and above. We also excluded people with unusually low or high hourly wages.

There are considerable differences in the hours worked per week for men and women, with higher proportions of women working part-time hours (41 per cent), and higher proportions of males working 41-49 and 50 or more hours per week (49 per cent of men compared with 21 per cent of women). Similar proportions of men and women work between 35-40 hours per week - 40 and 38 per cent respectively. Whilst these differences are quite large, our findings indicate that working long hours does not necessarily mean that there will be higher rewards compared with those working fewer hours, further, working part-time hours does not feature as a liability compared to those working more hours per week (see Table B2 in Appendix B).

Our occupational segregation variable is created by calculating the proportion of men within a particular occupation (using data from the ABS Labour Force Survey) and multiplying this by ten in order to produce an index, showing the extent to which individuals are employed in male dominated occupations. It shows that on average, men are working in occupations which are dominated by men (61 per cent male), and that on average women are working in occupations which are female-dominated (44 per cent male) The industry segregation variable is calculated in a similar fashion and has similar results, showing that on average men are employed in industries that are 60 per cent male, and on average women work within industries that are 44 per cent male.

Table 1 Characteristics of wage earners in Australia, HILDA, 2007[15]

Variable	Men (M)	Women (W)	Difference (M-W)
Hourly wage ($)	27.71	24.58	3.13
Time in paid work (years)	19.13	17.09	2.04
1-34 hours per week (%)	10	41	-0.31
35-40 hours per week (%)	40	38	2
41-49 hours per week (%)	21	11	10
50+ hours per week (%)	28	10	18
Partnered (%)	68	67	1
Children 0-4 (%)	16	11	5
Children 5-14 (%)	21	25	-4
Has long term health condition (%)	15	15	0
Bachelor or higher qualification (%)	27	33	-6
Vocational qualification (%)	39	29	10
Year 12 or lower qualification (%)	34	38	-4
Occupational segregation (male proportion x 10)	6.11	4.35	1.76
Industry segregation (male proportion x 10)	6.01	4.39	1.62
Tenure in current occupation (years)	9.91	8.7	1.21
Tenure with current employer (years)	7.25	6.41	0.84
Regular work schedule (%)	83	83	0
Firm size: Less than 20 employed (%)	37	34	3
Firm size: 20-100 employed (%)	28	33	-5
Firm size: 100-500 employed (%)	21	18	3
Firm size: 500+ employed (%)	15	14	0.01
In a union (%)	28	27	0.01
Private sector employee (%)	75	60	0.15
Public sector employee (%)	14	25	-11
Other sector employee (%)	10	15	-5
Lives in major urban area (%)	69	71	-2
Lives in other urban area (%)	2	18	2
Lives in rural area (%)	11	11	0

Source: Authors' calculations from HILDA, 2007, Wave 7 unit record data.

Wage gap determinants

Using HILDA data, (which, as noted earlier, includes part-time workers), Table 2 illustrates the simulation effect of moving Australian women to the average situation of Australian men. The largest effect is that of being a woman, followed by industry segregation and labour force experience. If the negative effects of being a woman, (which includes direct discrimination) were removed, the gender wage gap would decrease by 60 per cent, or an equivalent $1.87 per hour. For a woman who worked an average of 35 hours per week, this

[15] This table has been calculated using a sample of wage earners from HILDA, 2007. We excluded people who were self-employed people, people aged below 21 years, and those aged 65 years and above. We also excluded people with unusually low or high hourly wages.

would equate to an additional $65 per week, and in a full year, this would mean an extra $3,394 in earnings. These findings about the size of the effect of being a woman are consistent with those from other Australian studies which, as noted earlier, have generally found that discrimination or other unexplained differences between men and women dominate explanations of the wage gap in this country.

If women were represented equally (to men) within industries, we would see a 25 per cent reduction in the gender wage gap, which for a 35 hour week would mean around an extra $27 for the average Australian woman. The hourly wage for women would increase by 22 cents per hour (seven per cent of the wage gap) if their labour market history was equivalent to that of men – this includes increasing their average time in paid work, time with current employer and time in current occupation.

Smaller effects exist for vocational qualifications and firm size, however these effects do combine to make up eight per cent of the differences in wages between men and women. If the representation of women with vocational qualifications increased to the same proportion as men, we would see the wage gap decrease by five per cent, or 15 cents per hour. Representation of women in larger firms to similar proportions as those of men would also have a positive impact on women's wages, decreasing the wage gap by three per cent, which would mean an increase in hourly wages of 11 cents on average.

Table 2 Olsen-Walby decomposition of the gender wage gap in Australia

	Proportion of overall wage gap	Cents/hour equivalent	$/per 35 hour week	$/per year
	(%)	($)	($)	($)
Labour force history	7	22	7.78	404
Vocational qualification	5	15	5.26	273
Industry segregation	25	79	27.52	1,431
Firm size	3	11	3.73	194
Female	60	187	65.26	3,394
Total	**100**	**313**	**109.55**	**5,697**

Note: The proportion of the overall wage gap is measured as the simulated change in the characteristics of women to that of the average situation of men multiplied by the reward or coefficient for that particular characteristic. Figures may not add to total due to rounding. The total gap has been derived using selected variables only. The wage gap of $3.13 per hour has been derived from the difference between the average wage of men and women for all wage earners.

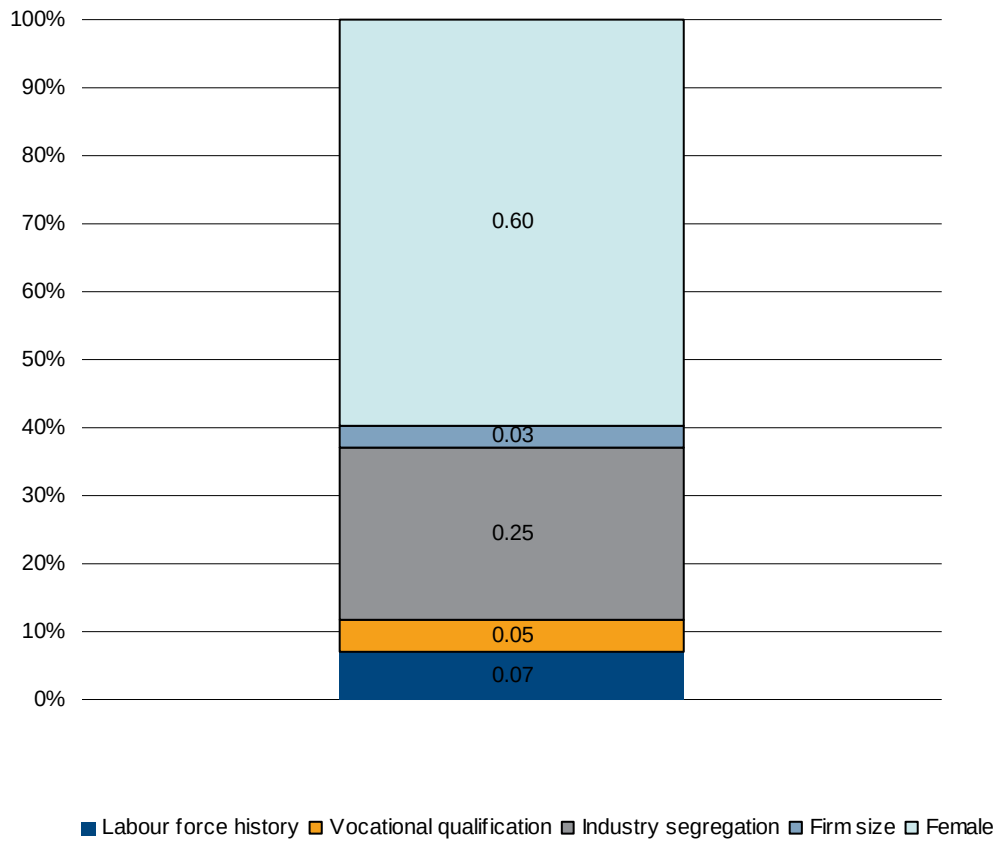
Source: Authors' calculations from HILDA, Wave 7 unit record data.

A graphical representation of the Olsen-Walby decomposition is provided below in Figure 2, where the effects of being a woman clearly dominate. If the negative effects associated with being a woman were removed, and equal representation of women within industries were to occur, this would see a decrease in the wage gap of 85 per cent. As mentioned earlier, these large negative effects associated with being a woman are likely to signify direct discrimination towards women, but can also include personal attributes that are unable to be observed with our dataset, such as motivation and drive. The effects of firm size are also evident in the chart, with larger firm sizes (measured by number of employees) having large associated returns (see Table B2 in Appendix B). Firm size may be acting as a proxy for a range of characteristics, and these are likely to include a number of

features of larger organisations, including economies of scale, the likelihood of being a government organisation, and greater rates of union membership and centralised bargaining systems.

Industry segregation (the predominance of men working with men and women with women) has been shown in a number of Australian studies to be a key driver of gender wage gaps (Miller, 1994; Preston and Crockett, 1999, Wooden, 1999). Work undertaken in female dominated industries is often undervalued within society compared to male dominated industries (Pocock 1999). Our findings here suggest that if there were equal proportions of men and women within industries in Australia, the gender wage gap would reduce by around a quarter. This finding (along with all others) is dependent upon everything else remaining unchanged. That is, our quantification assumes that if we were to see equal representation of men and women throughout all industries, the reward associated with this would not change. However, studies have shown that this may not be the case, and as women move into particular industries and occupations, the monetary value that society places on these sectors may decline (Kongar 2008).

Figure 2 Key determinants of the gender wage gap in Australia



Note: The proportion of the overall wage gap is measured as the simulated change in the characteristics of women to that of the average situation of men multiplied by the reward or coefficient for that particular characteristic. Figures may not add to total due to rounding. The total gap has been derived using selected variables only. The wage gap of $3.13 per hour has been derived from the difference between the average wage of men and women for all wage earners.

Source: Authors' calculations from HILDA, Wave 7 unit record data.

The policy implications of these findings are substantial but complex, and involve questions of equity and justice, as well as practical issues related to how, where and with what purpose policy interventions could take place. Using our findings about industrial segregation as an example, one question that would arise in addressing this issue at a policy level would be the extent to which improving women's wages by aiming towards a more equal distribution of men and women across industries would be an appropriate response to these findings. Should the focus be on re-distributing genders between industries, or targetting industrial relations policy towards fairer outcomes for sectors that are female-dominated? Issues such as these are beyond the scope of this paper, but our findings should be considered and interpreted in the light of such complexities.

5 GENDER INEQUALITY AND MACROECONOMIC PERFORMANCE

The gender wage gap does not just impose a cost on individuals in terms of loss of income, but it also inhibits economic performance. Earlier sections of this paper have focused on the existence of a gender wage gap, and the possible drivers of this gap. In this section, we move on to considering the impact of the gender wage gap on economic performance. There is an increasing body of international research which focuses on the potential impacts of the gender wage gap (and gender inequality generally) on economic growth. Such work extends arguments about wage equality beyond issues of gender equity, and instead considers the implications of gender wage gaps for a society's economic well-being.

5.1 BACKGROUND

Since the mid-1980s, feminist economists have been increasingly arguing for recognition of the importance of gender issues for the achievement of macroeconomic objectives (Cagatay *et al.* 1995). One key issue identified by such researchers has been the likelihood that gender differences in earnings (that is, the gender wage gap) can hinder an economy from achieving its macroeconomic objectives, and can be considered a cost to the economy (Cavalcanti and Tavares 2007).

Literature examining the impact of gender inequality on macroeconomic outcomes has more frequently focused on gender equality in education (e.g. Barro and Lee 1994; Barro and Sala-i-Martin 1995; Hill and King 1995; Klasen 1999; 2002; Dollar and Gatti 1999; Lagerlof 2003), and less often on the gender wage gap (see for example Seguino 2000; Cavalcanti and Tavares 2007; Caro 2008; Walby and Olsen 2002). The former body of literature contains important insights for developing methodology to measure macroeconomic impacts, and we have drawn on this in devising our modelling techniques for this study. The substantive findings from this work are also summarised in Appendix C.

Before presenting our results, we will discuss some issues related to concepts, measurement and definitions which are relevant to any study of gender inequality and its macroeconomic effects.

5.2 MEASURING ECONOMIC PERFORMANCE

While there are ongoing debates about how to measure economic performance, most research has used gross domestic product as the best measure of economic performance (Mankiw 1997). While GDP is widely accepted, it should nevertheless be noted that such a measure excludes the value of women's activities at home – that is, unpaid work such as looking after a household and family (Klasen 1999; 2002), as these activities are not included in national accounts data. The exclusion of this unpaid work means that we are undervaluing women's total economic contribution (Klasen 1999; 2002).

In this study we use GDP per capita as our primary measure of economic performance. GDP per capita is a better measure of the economic well-being of a country than total GDP, as it takes into account population size – very populous countries may have very large overall GDP, but when divided by population size the resultant GDP per capita figure will give a much clearer indication of the country's comparable wealth.

Conceptualising the pathways toward economic growth

Various theoretical frameworks exist for explaining the ways in which economic growth comes about. There are different channels or 'pathways' that explain economic growth. The Australian Treasury has divided these channels into three main components: population, participation and productivity, otherwise known as the 3Ps. Treasury has focused on labour as the main input; and therefore productivity within the framework of the Treasury 3Ps can be defined as similar to labour productivity. To some extent, this understanding of productivity can be incorporated in the type of growth model we are using for our estimation in this study. Our modelling also includes measures of participation (the size of the labour force – using total number employed, and the number of hours worked) and changes in population (measured by fertility).

Productivity

Walby and Olsen (2002) note the importance of the impact of the wage gap on productivity and hence on growth. Walby and Olsen (2002) used wages as a proxy measure of productivity in order to estimate the impact of gender discrimination on the wage gap (which, as wages were being used as a proxy for productivity, was equal to the productivity gap). Using a decomposition technique, they found that gender discrimination (being female woman) accounted for 29 per cent of the wage and productivity gap which in turn would affect the size of GDP and economic growth. However, Walby and Olsen (2002) did not quantify the impact of the productivity gap on the size of GDP or economic growth[16].

[16] Walby and Olsen (2002) also argued that additional feedback loops from reducing the gender wage gap would also indirectly act to aid economic growth i.e. the positive effects reducing the wage gap would have on reducing child poverty and domestic violence.

The relationship between gender inequality and economic performance will depend on the characteristics of the country or countries included in the sample; therefore it is important when comparing the literature and interpreting different results to also take into account differences in terms of a country's stage of development and the way in which its economy operates. In particular, differences in labour market structures are important to consider. For example, Seguino (2000), found that the gender wage gap was a stimulus (rather than a hindrance) to GDP growth in export-oriented economies, in her study of semi-industrialised countries. However, this finding may only be relevant for semi-industrialised or developing countries that rely on manufacturing exports as a significant component of output. For semi-industrialised economies, her findings emphasise the importance of investment, and the productivity of investment for growth. She argues that investment is a function of profitability as well as output. Profitability is signalled as the share of income going to employees. Thus, a lower share of income going to employees indicates a higher profit and stimulus for investment. In the economies studied by Seguino, distinguished by highly gender-segregated export sectors where price elasticity of demand and profitability effects are large, this translated into the stimulation of investment (and therefore economic growth) by a widening wage gap.

Participation

On the other hand, another stream of literature, including Cavalcanti and Tavares (2007) and Caro (2008) posits that a higher gender wage gap (measured as female to male earning ratios) leads to lower output per capita indirectly through two channels – female labour force participation and fertility. The female labour force participation channel shows that as the gender wage gap decreases, women work more, due to the added wage incentive, and thus GDP per capita increases, (assuming that the population remains constant – and other things *ceteris paribus*).

In general, literature related to developed countries shows a positive relationship between wages and female labour force participation. Birch (2005) presented a comprehensive literature review on the labour supply of women in Australia and found that among other factors, increases in women's wages would increase both female labour force participation and the number of hours worked. The positive association between lower wage gaps and female labour supply was also supported by the study of female labour participation for all OECD countries as discussed in Jaumotte (2003). Jaumotte (2003) found that the existence of a gender wage gap reduced female labour supply.

However, this positive relationship between higher wages and greater working hours may not always be the case. Interesting evidence about differences between single and married women's behavioural responses to changes in the gender wage gap may refute the generalisation that changes in the gender wage gap will always have a positive relationship with female labour force participation. Using data for the United States, Jones *et al.* (2003) examined the phenomenon of why hours of work of married women increased so much when the gender wage gap reduced. They found that married women were more sensitive to changes in the gender wage gap than single women. They found that changes in the

wage gap did not have large effects on single women, however for married women a small reduction in the gender wage gap generated a large labour supply response, which meant that their unpaid work at home was substituted for paid work. Recent evidence within the Australian context (Fitzpatrick and Lester 2009), has found the opposite effect for partnered women, where an increase in wages leads to a decrease in labour supply, however the authors do note that this effect is weak (Fitzpatrick and Lester 2009, p.43).

Population

In relation to the effect of the gender wage gap on fertility, Cavalcanti and Tavares (2007) and Caro (2008) found that as the gender wage gap decreased, the opportunity cost of having children increased, therefore fertility is reduced, and consequently women's hours of work are increased, which in turn increases GDP per capita. The size of this impact varies across studies. Cavalcanti and Tavares (2007) using a calibration cross-country analysis of both developed and developing countries, found that a 50 per cent increase in the gender wage gap caused a decrease of income per capita of a quarter of the original income per capita and an increase in hours worked at home by 65 per cent. It should be noted that this analysis did not take issues such as childcare availability and affordability into account. On the other hand, Caro (2008) in his Spanish study, also using calibration methodology, found that if the gender wage gap were completely eliminated, women's hours of work would increase by 20 percentage points and GDP per capita would increase by 17.6 per cent.

5.3 THE MACROECONOMIC COSTS OF THE GENDER WAGE GAP

5.3.1 The impact of the wage gap on economic growth

As noted above, we are measuring economic growth in this study as gross domestic product (GDP), focusing on GDP per capita. Detailed descriptions of a range of relevant modelling approaches, and their strengths and weaknesses, are provided in Appendix D. The model we have developed to estimate the effect of the gender wage gap on GDP per capita uses a type of regression analysis is described in detail in Appendix E, along with a discussion of our data sources, testing procedures and the model's limitations. This model allows us to estimate the impact of the gender wage gap on growth, both directly and indirectly through the channels of investment, participation and fertility[17].

Our estimations of the impact of the gender wage gap on GDP per capita are presented in Table 3 and show that, holding other variables constant (*ceteris paribus*), and including the effect of all the channels in our model, the average impact of the gender wage gap on GDP per capita is -0.507. This means that on average, a one percentage point increase in the gender wage gap would decrease economic growth by 0.507 per cent. This effect, however, should be treated as indicative only. It is an average figure, and is calculated (as shown in Table 3) by adding up all the effects of each of the modelled pathways. Not all these

[17] It is common practice to consider investment as a key determinant of productivity and fertility a key determinant of population.

modelled pathways had a statistically significant effect on economic growth in our model[18], which is likely due to data limitations inherent within the model[19].

However, an examination of the individual pathways through which the gender wage gap affects economic growth does provide us with additional evidence about the substantial negative effects of the wage gap on growth. In particular, the impact on growth of average hours of work (the only statistically significant pathway in our model) is negative and substantial. If the gender wage gap increased by one percentage point, average hours of work would decrease, and thus GDP per capita would fall by 0.318 per cent (Table 3). This finding makes intuitive sense, as an increased gender wage gap (thus lower female wages compared to male wages) is likely to act as a disincentive for women to work more hours. This effect is likely to be particularly noticeable as so many Australian women work part-time.[20]. Reduced working hours in turn lead to lower economic growth. Conversely, these findings suggest that a decrease in the gender wage gap would be significantly associated with an increase in women's hours of work. It should be noted, however, that women's ability to work more hours is likely to be affected by a range of factors, including unemployment rates, the availability of appropriate and affordable child care and access to flexible working hours. Given the importance in our model of hours of work, these factors may be critical to consider if a narrowing of the gender wage gap is to be translated into greater economic growth.

While the other pathways in our model do not have statistically significant effects, each of the factors except labour participation has an effect on economic growth which is in the same direction as the (significant) effect of average hours of work, providing further support for the hypothesis that the wage gap affects growth negatively. However, the non-significance of these relationships means that we cannot draw any conclusions about underlying processes. However, we do note that the direction of the relationship between the gender wage gap and investment is the opposite to that found by Seguino (2000) in relation to semi-industrialised countries, suggesting that wage gap effects may operate on investment in different ways in developed compared with developing countries.

18 The inclusion of non-significant pathways in the calculation of a total effect of gender inequality is supported in the literature (see Klasen 2002)

19 Confidence intervals around our total impact estimate range from -3.65836 to 2.128775 at a 95% confidence level. If a longer period of data was available, significant effects would be easier to see, and the degree of possible error around the estimate would be much smaller. A detailed discussion of model specifications and limitations is provided in Appendix E.

20 Fitzpatrick and Lester (2009, p. 43) found that there is an inverse relationship between wages and hours supplied for partnered women but not for single women. However, for men, because they mostly work full-time, an increase in hours to greater than full-time would be less likely, and consequently less likely to be associated with higher wages.

Table 3 The impact of the gender wage gap on economic growth (GDP per capita)

Channels	Coefficients
Wage gap → economic growth	-0.250
Wage gap → investment → economic growth	-0.021
Wage gap → fertility→ economic growth	-0.181
Wage gap → average hours of work→ economic growth **	-0.318
Wage gap → labour participation → economic growth	0.263
Total impacts	**-0.507**

N**ote:** ** significant at a confidence interval of 95 per cent. Economic growth refers to economic growth of GDP per capita. The results should be read as, for example, a one percentage point increase in the gender wage gap reduces economic growth of GDP per capita by -0.507 per cent.

Source: Authors' calculations, using a variety of data sources. Please refer to Appendix E for more detail about the data sources and variables used in the macro model.

5.3.2 Quantifying the cost of the gender wage gap to the Australian economy

After examining the impacts above, we can translate these effects[21] into dollar amounts to quantify how much the gender wage gap costs the Australian economy[22]. All dollar amounts are recorded in 2007 dollars.

Table 4 shows the estimated cost of the gender wage gap to the Australian economy if we simulate an increase in the gender wage gap from its current position of 17 per cent by one percentage point to 18 per cent. Two conditions are shown, before (1) and after the wage gap increase (2).

Table 4 Simulated cost of the gender wage gap to the Australian economy

	Current situation (1)	Increase in the wage gap from 17 to 18 per cent (2)	Cost to the economy (1) – (2)
Gender wage gap	17%	18%	Na
GDP per capita	$51,114	$50,854	$260 per capita
GDP (millions)	$1,084,146	$1,078,649	$5,497 million
Population (millions)	21.21	21.21	Na

Source: Authors' calculations, using a variety of data sources. Please refer to Appendix E for more detail about the data sources and variables used in the macro model.

Table 4 shows that an increase in the gender wage gap of one percentage point is estimated to decrease GDP per capita by around $260, which equates to around $5,497 million of GDP in total, assuming the population is held constant at 21.21 million. Conversely, if the gender wage gap were to decrease by one percentage point, this would translate into an

21 The effects described in the first section are basically the coefficients or the interactions between coefficients of the regression analysis.

22 It should be noted when interpreting the results in this section that they are based on an overall average total impact which (as explained above) can be treated as an estimate only – a longer period of data included in the model might produce effects which are bigger or smaller than the amount calculated.

increase in GDP per capita of $260. This also means that if the whole gender wage gap were to be eliminated (that is, reduced from 17 per cent to zero), such a change could be worth around $93 billion of GDP.

5.3.3 Quantifying the key determinants of the wage gap at a macro level

Our findings at a microeconomic level (shown in Section 4) estimated that the key determinants of the gender wage gap in Australia stem from being a woman, industry segregation, women having less labour force experience than men, women having less vocational qualifications than men, and the differences in the size of organisations where women work compared to men. In our final piece of analysis presented here, we apply these determinants to the findings from our macroeconomic model in order to estimate the approximate contribution of each of these determinants to the total amount of GDP per capita lost through the wage gap. It is important to note that the findings presented in this section do have limitations, particularly in regards to the differences in data sources and variables being used to capture the wage gap in our microeconomic and macroeconomic models, as well as time periods for each calculation[23]. However, bearing these limitations in mind, it is still possible to use our decomposition results as proxies for the key determinants of the gender wage gap in our macroeconomic model, and thus estimate the effect that each of these may have at a macroeconomic level.

Table 5 and Figure 3 show the disaggregation of the estimated $93.4 billion cost to the economy of the gender wag gap into the key determinants of the gender wage gap. We estimate that the effect of being a woman (direct discrimination and unobserved characteristics) is costing the economy over $55 billion per year in GDP. Industry segregation is contributing to around a quarter of the gender wage gap, which at an aggregate level, equates to over $23 billion of GDP. The labour force history component shows that if women had on average the same amount of time in paid work, tenure with their current employer and tenure in their current occupation that men do, we would see a reduction in the wage gap of seven per cent, which equates to a saving of $6.6 billion in GDP. If the representation of women with vocational qualifications increased to the same proportion as that of men, we would see a reduction in the wage gap of five per cent, which means an estimated gain of $4.5 billion of GDP. If women increased their representation in larger firm sizes to match that of the proportion of men, we would see a reduction in the gender wag gap of three per cent, which equates to around $3.2 billion in GDP.

[23] The gender wage gap at a micro level is measured using data from the 2007 HILDA survey, using many different variables to capture wages. The gender wage gap at the macro level is measured using data from the ABS survey of Average Weekly Earnings, and GDP figures are expressed in 2007 dollars. The gender wage gap measured using our decomposition approach and the HILDA survey (the adjusted wage gap – see Appendix Table B1) is very close to that measured using data from the Average Weekly Earnings Survey.

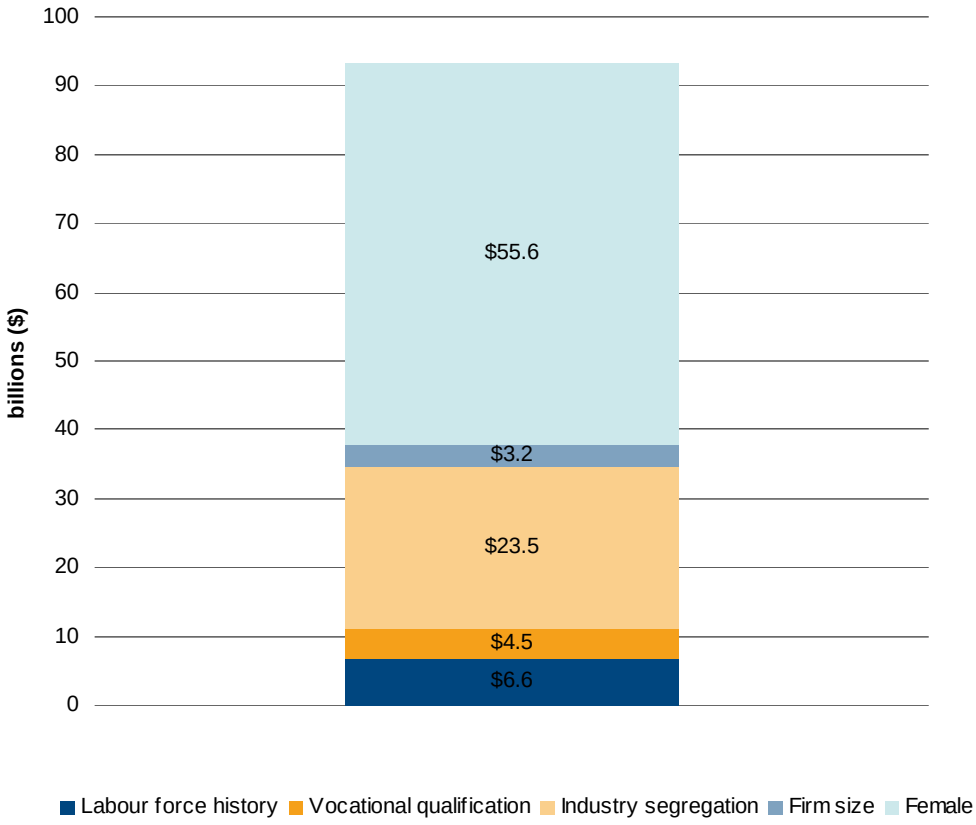
Table 5 Key determinants of the gender wage gap: estimated cost to the economy

Key Determinants of the wage gap	Proportion of the gender wage gap	Cost to the Economy (GDP)
	%	Billions ($)
Labour force history	7	6.6
Vocational qualification	5	4.5
Industry segregation	25	23.5
Firm size	3	3.2
Female	60	55.6
Total	100	93.4

Note: The results in this table are estimates only, and it is important to note that they are based upon assumptions about the economy and the way in which markets operate. Each result is dependent upon the common economic assumption that all other factors will remain constant (*ceteris paribus*). In particular, we assume that if women were to achieve the same average characteristics of men, the rewards for these characteristics would remain unaffected. In addition, the key determinants and their relative contributions to the wage gap were calculated using data from HILDA 2007, while the macroeconomic model to which these are applied relates to the latest available data.

Source: Authors' calculations, based on data from HILDA, 2007 and data sources used in the macroeconomic model. Please refer to Appendix E for more detail about the data sources and variables used in the macro model.

Figure 3 Key determinants of the gender wage gap: estimated cost to the economy



Note: The results in this table are estimates only, and it is important to note that they are based upon assumptions about the economy and the way in which markets operate. Each result is dependent upon the common economic assumption that all other factors will remain constant (ceteris paribus). In particular, we assume that if women were to achieve the same average characteristics of men, the rewards for these characteristics would remain unaffected. In addition, the key determinants and their relative contributions to the wage gap were calculated using data from HILDA 2007, while the macroeconomic model to which these are applied relates to the latest available data.

Source: Authors' calculations, using a variety of data sources. Please refer to Appendix E for more detail about the data sources and variables used.

6 SUMMARY AND CONCLUSION

This study has examined the gender wage gap in Australia from a number of perspectives, and one of its key contributions has been to estimate the dollar impact of the gender wage gap on Australia's economic performance.

The major findings of this report can be summarised as follows:

- The gender wage gap in Australia has persisted over the past twenty years. The size of the gap depends on the data being used to measure the ratio of female to male wages, but our analysis of the ABS Average Weekly Earnings Survey shows a wage gap of 17 per cent in 2009. Over the period 1989 to 2009 the size of the wage gap has remained fairly constant, fluctuating slightly between 15 and 17 percent.

- Previous research on the wage gap in Australia has been quite extensive, but drawing firm conclusions about the key determinants of the wage gap in Australia from the literature is difficult due to the range of findings, and the wide variation in samples, methods and focus in earlier studies.

- It is clear from previous studies that a large proportion of the wage gap in Australia cannot be explained simply by the differing characteristics or endowments of men and women. In most studies, a very large majority of the wage gap is due to differences between the wages of men and women that cannot be explained by the sorts of variables which are included in gender wage gap models. These unexplained differences in wages may be due to direct discrimination, or to other unmeasured differences between men and women

- In order to quantify the contribution of particular variables to the wage gap in Australia, as well as provide policy relevance, we use a simulation methodology developed by Olsen and Walby. This approach moves the average characteristics of women to those of men, and quantifies how much the wage gap would be reduced and how much women's wages would improve if this were to occur. This process is undertaken for variables considered to have relevance to policy and gender wage differentials, and all other variables are treated as controls.

- Using this simulation methodology we find that the key determinants of the gender wage gap in Australia include industrial segregation (25 per cent), labour force history (seven per cent), under-representation of women with vocational qualifications (five per cent) and under-representation of women in large firms (three per cent). However, being a woman accounts for a very large 60 per cent of the wage gap. This finding is in line with other literature and represents that part of the wage gap which is due to discrimination or other differences between men and women not captured by differences in their measured characteristics.

- We find that the gender wage gap has a substantial effect on Australia's economic performance. If the wage gap were closed entirely (that is, if women earned the same as men) we estimate that GDP would grow by around $93 billion. Much of

this effect on economic growth is brought about through the channel of hours of work, with a narrowing of the gender wage gap leading to significantly more hours of work, and thus to greater economic growth. As mentioned above, a woman's ability to work more hours is determined by a number of factors including the availability of appropriate and affordable child care. Further, increased hours of work for women has other implications, including the ever increasing struggle to balance work and 'life', and the division of household labour and care arrangements between men and women.

- Using our decomposition findings, we can also tentatively estimate the effect of each key determinant of the gender wage gap at a macro level. In particular, removing the negative effects associated with being a woman (direct discrimination and unobserved characteristics), might see an improvement in GDP of around $56 billion per year.

It is important to note that these findings do have limitations. Both the microeconomic and macroeconomic modelling included in this report incorporate a range of assumptions, and have various limitations in relation to data availability (discussed in the appendices). Both areas of modelling are the subject of vigorous debate about the strengths of a range of methodological approaches. While our work is strongly informed by best practice, and has been subjected to rigorous quality assurance procedures, it should be noted that the use of different data and alternative methodological approaches could potentially produce different results.

The findings in this research report are of particular relevance to policy makers. There are several areas highlighted where policy may contribute meaningfully in helping to reduce the gender wage gap in Australia, and in turn enhance economic performance and national well-being. Additional research that focuses on the contribution of each industry separately to the gender wage gap would also help inform and direct policy efficiently.

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