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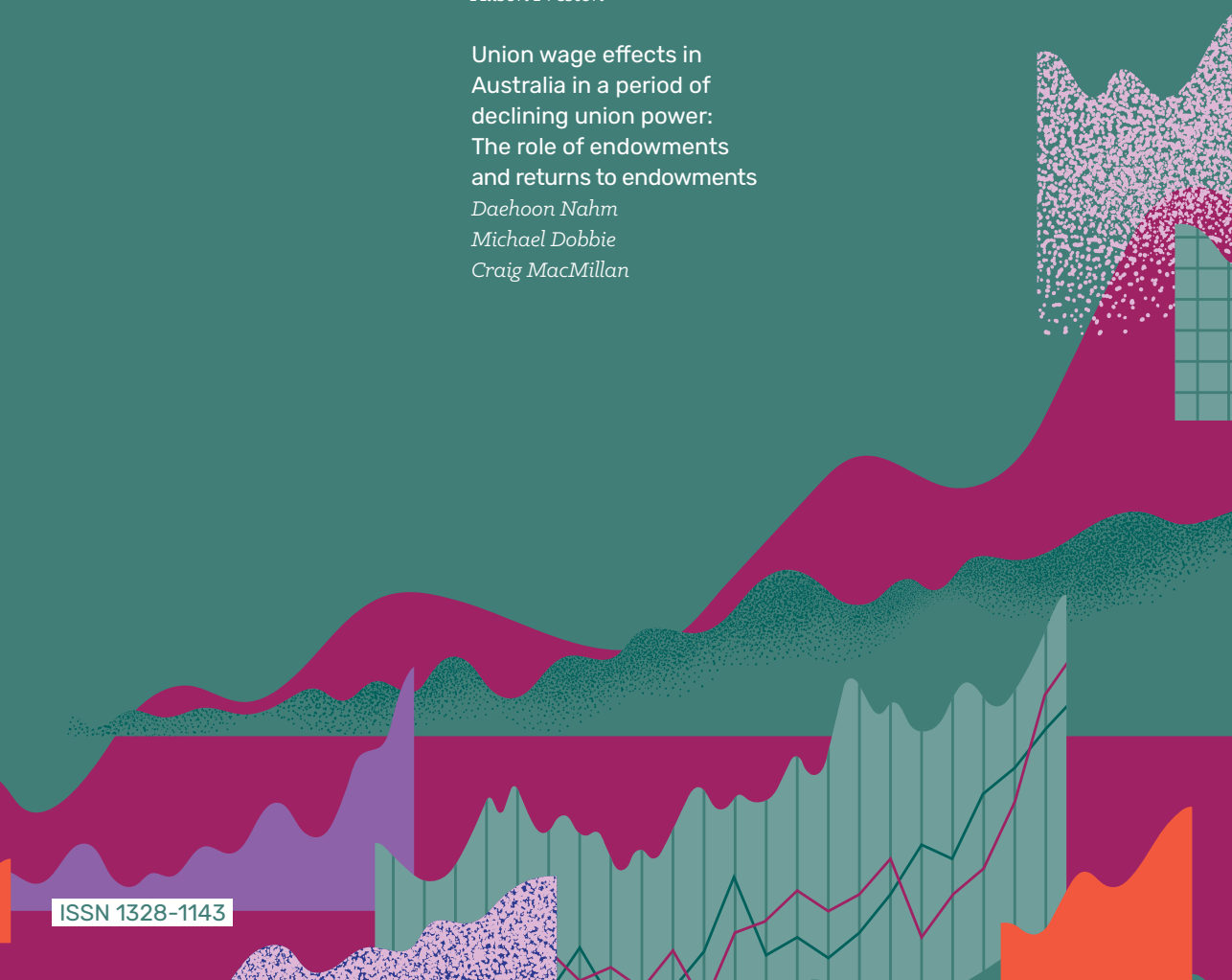

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# From the Managing Editor

Welcome to the second issue of the *Australian Journal of Labour Economics* (AJLE) for 2022. In this issue we have, as usual, a range of articles which will be of interest to our readers covering a range of labour market issues and using a variety of approaches to research. But first we have a paper in an occasional series covering a topic of general interest to readers. Jeff Borland of Melbourne University has written a paper providing a framework for thinking about labour supply policy in Australia. Several major future challenges for labour supply are identified and the main types of policies that can be used by government to deal with those challenges are described. Recent developments for groups likely to feature in discussions about increasing labour supply are briefly reviewed. I think this insightful paper will be of interest to academics and, particularly, practitioners and policymakers.

The second paper, by Alison Preston of The University of Western Australia, examines what happened as a result of the Commonwealth government allowing early access to superannuation savings during the COVID-19 pandemic. The research utilises the method of logistic regression analysis to HILDA data to examine the probability of a person reporting withdrawing money from any of their pension funds because of the coronavirus crisis. A range of factors were considered but the main focus is the relationship with financial fragility and financial literacy, The results demonstrate that those who are financially fragile, those with lower financial literacy, younger, less qualified, low income and precariously employed individuals were more likely to make a withdrawal under the scheme than their older, better educated and wealthier individuals. This suggests that financial need, associated with adverse events, such as job loss, is a particularly important driver. From a gender perspective, the gender gap, with respect to superannuation balances, widened during the scheme. This is likely to have exacerbated existing gender gaps in savings, thus increasing women's risk of economic insecurity in retirement.

The paper by Daehoon Nahm, Michael Dobbie and Craig MacMillan of Macquarie University examines the question of why union members on average receive greater wages than non-union members and why there is less dispersion in wages among union members. Research on this topic has a long history in labour economics but the authors concentrate here on the possibility that it might be differences in human capital endowments that explain these phenomena. They employ quantile regression and decomposition techniques to HILDA data. Their results suggest that the union-non-union wage differential tends to diminish the higher up the wage distribution and for males at the very top there may be no effect from union membership. They find that most of the observed union-non-union wage differential is due to the possession of superior human capital endowments by unionists. Also, the analysis shows that these endowments also tend to be more homogeneously distributed among unionists and this is the main reason that union wages are more compressed.

Linda Isherwood and Megan Moskos of the University of Adelaide and Zoei Sutton of Flinders University, seek to explain persistent gender patterns in employments, such as an overrepresentation of men in high status, highly paid and executive roles and overrepresentation of women in less (monetarily) valued care work. This gender-bias in employment has long been a concern for social policy. The authors employ data from a range of sources to examine whether and where gender bias is evident in the Australian healthcare and social assistance sector and whether it has changed over time. They refer to their techniques as 'mapping exercises'. They maintain that such mapping exercises are of value to scholars, policy makers and others seeking to address gender bias in employment. What these statistics show is that female domination in the healthcare and social assistance sector remains an issue and seems largely impenetrable by existing policy initiatives. The authors suggest that a major policy objective should be to improve male representation in the industry. They propose a multidimensional approach to the promotion of men's employment. This would include a collaborative effort from government, professional bodies, educational and industry organisations, guided by a gender-informed social policy specifically tailored around the improvement of men's recruitment and retention in the sector. Such a policy package could include the introduction of quotas for male employment, increased expenditure on mentor programs, retraining programs for employees from traditionally masculine industries in decline; and improvements to workplace conditions and remuneration.

Mabel Andalón and Matthew Jones of the Productivity Commission, in the final paper, present what they call a simple model of working from home. To the best of our (the Editors) knowledge, this is the first paper to develop a model, from microeconomic theory, of the decision of how many hours a worker should supply working from home vs. working in the office. From this perspective, we feel it is highly relevant and a significant contribution. The model was developed as part of a Productivity Commission research project to explore the possible economic effects of working from home in response to the forced experiment of working from home caused by the COVID-19 pandemic. Making certain assumptions about labour demand and supply the authors found that increased access to work from home increases labour supply. This increase is larger for individuals with longer relative commutes, as the time saved from commuting can be distributed between work and non-work activities. The labour supply increase is largest among those people who have a stronger preference for working from home. Commuting is a major cost which is borne entirely by the individual who supples labour and the removal of the constraint which prohibits working from home (i.e. allowing working from home) unambiguously increases individual utility — largely because of this commuting cost. The model predicts that paying a different wage to office vs. home-based labour yields an economically efficient outcome. However, when wages cannot vary by location, firms and workers will likely make adjustments over time to make the distribution of work more efficient, such as by investing in home-based work technologies, or by developing processes to make distributed work more productive.

**Phil Lewis**
Managing Editor

# Labour supply and policy

**JEFF BORLAND** *Department of Economics, University of Melbourne*

## Abstract

This article provides a framework for thinking about labour supply policy in Australia. Several major future challenges for labour supply are identified and the main types of policies that can be used by government to deal with those challenges are described. Recent developments for groups likely to feature in discussions about increasing labour supply are briefly reviewed.

JEL Codes: J21, J24
Keywords: Labour supply, policy

This article is an expanded version of a talk to the EY Pre-Summit Summit on Jobs and Skills on August 17 2022. It has been influenced by the opportunity to hear talks by my co-panellists Leonora Risse and Ian Yates, and by questions from Cherelle Murphy and the audience.

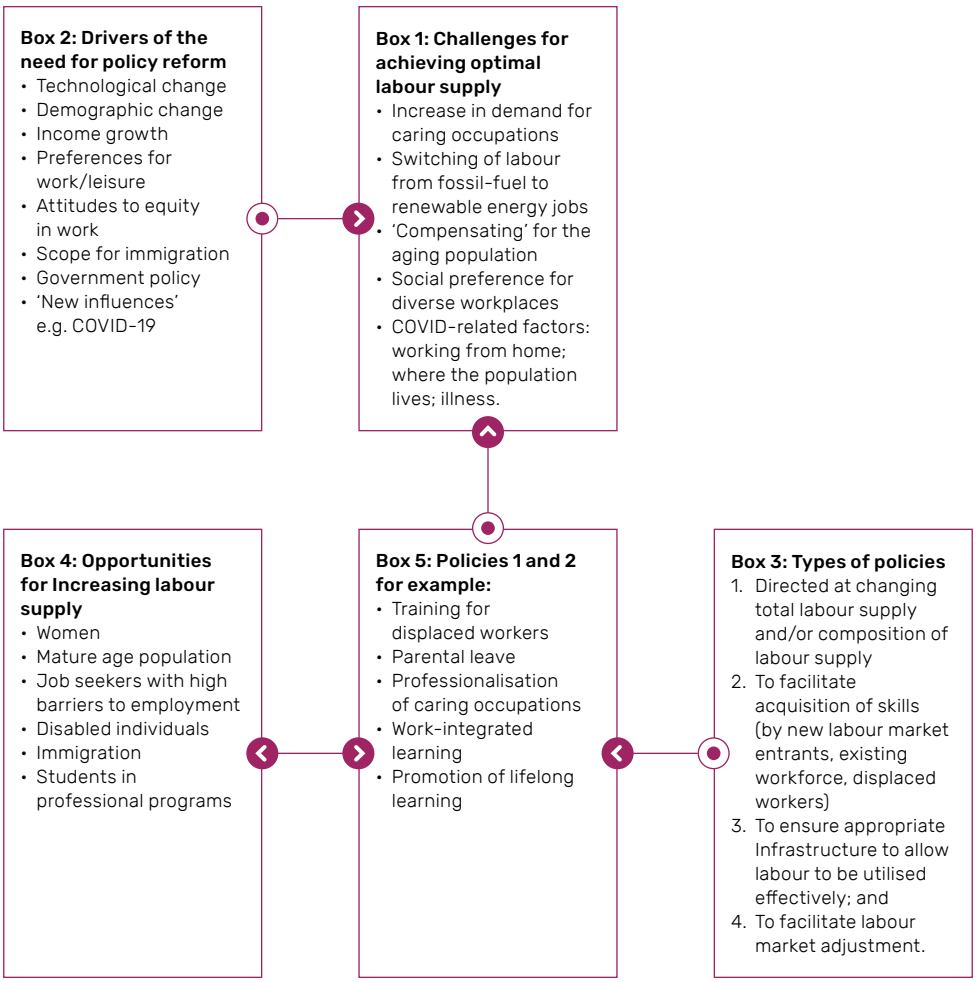
# Introduction

Labour supply is about the size, composition and skills of the available workforce. It constitutes 2 of the 3 P's, Participation and Productivity, that together with Population, determine national output. As an indicator of the opportunity to engage in and realise one's potential in paid work, and to achieve economic independence, labour supply is an important element of individual wellbeing. Having a sufficient supply of labour, with appropriate composition and skills, is therefore essential for a country to achieve its output and equity goals.

Achieving this target for labour supply necessarily involves a substantial role for government, since market outcomes cannot be relied on to be either efficient or equitable. A major difficulty for government in taking on this role is that the target for labour supply is always moving. The labour market is constantly beset by forces pushing it in new directions. As a result, the optimal skill set, composition and rate of growth of the workforce are constantly shifting.

This article provides a framework for thinking about labour supply policy in Australia. Figure 1 summarises the framework. Core to the framework is a set of challenges for labour supply policy that exist at any time (Box 1). Those challenges derive from various drivers – many long-term such as technology and demography, and some short-term such as (at present) COVID-19 (Box 2). Government can draw on a range of types of policies to seek to address the challenges (Box 3). As one example, how those types of policies might be used to achieve an objective of increasing the size and skills of the workforce is displayed (Boxes 4 and 5).

Figure 1. Framework for labour supply policy




The rest of this article develops the framework in more detail. Section 2 presents examples of some major current drivers of challenges for labour supply policy. Section 3 describes the types of policies available for influencing labour supply. In section 4 several general principles for policy-making are presented. Section 5 briefly discusses recent labour market outcomes for three groups likely to feature in thinking about how to increase labour supply.

The focus throughout is on government policy. Labour supply is determined both by economy-wide and workplace-specific factors, and hence potentially government

policy has a role across both dimensions. Examples of economy-wide factors that can be influenced by government policy are how incentives to acquire skills depend on the cost of university education; and how incentives to join the labour force depend on influences such as tax rates and availability of childcare. It is also the case that much of what happens to labour supply depends on employers. Workplace practices, pay/promotion policies and other job conditions are an important influence on individuals' willingness and capacity to supply labour. Training on-the-job is a critical element of the skills that workers develop. Government policy to achieve labour supply objectives therefore can also be directed at practices within workplaces.

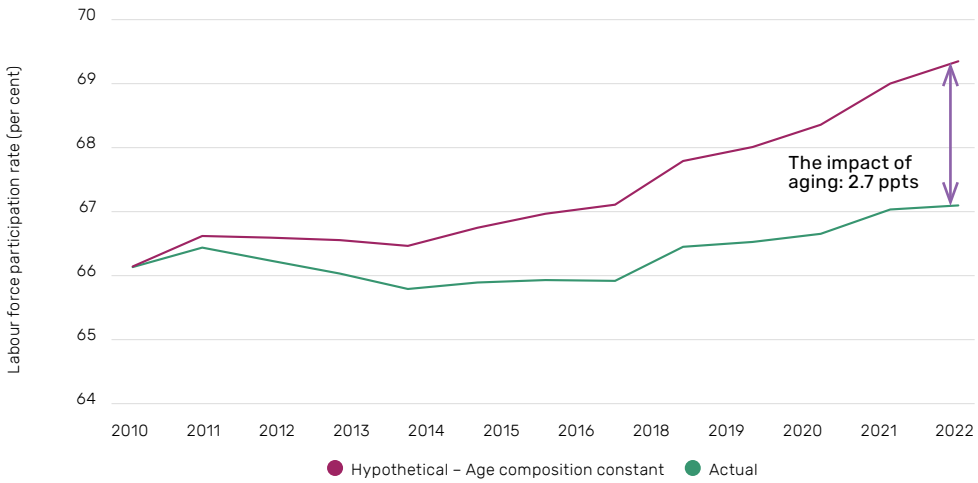
## Labour supply as a forever policy issue

Labour supply is a **'forever'** policy issue. Factors such as demographic change and income growth alter the composition of product demand, and consequently the types of jobs that need to be done and the skills workers require. Similar effects follow where government policy directs resources towards activities deemed social priorities. Technological change, by affecting the tasks where labour is best deployed, also changes the types of jobs available and skills needed by the workforce. New opportunities for profitable production, associated for example with an export boom, can increase the desirable size of the workforce. At the same time, shifts in preferences and norms about work, as well as demographic change, directly impact on the supply of labour.

### Example 1: Aging population

An aging population brings a challenge for maintaining the level of aggregate labour supply. Because the older population are less likely to want to be in paid work, as their share of the population increases, other things equal, Australia's aggregate labour force participation rate declines. Figure 2 illustrates this phenomenon. It shows the actual Labour Force Participation (LFP) rate and a hypothetical rate assuming that the age composition of the Australian population remained constant from 2010 to 2022. The difference between the series shows that an aging population over that period reduced Australia's LFP rate by 2.7 percentage points. An aging population means that labour supply policy has to run just to remain in the same place.

Figure 2: Labour force participation rate, Actual and hypothetical, 20210 to 2022 (March) (sa)

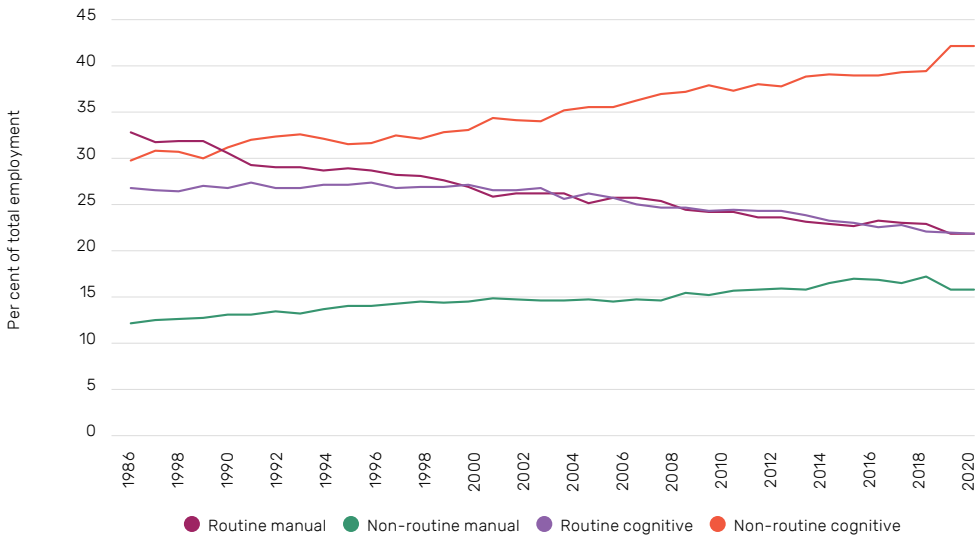



Source: ABS, Labour Force Australia – Detailed, Table 01.

## Example 2: Technological change

Technological change has brought – via automation – a steady long-run change in the composition of demand for labour: away from workers who perform jobs that involve 'routine' tasks, which can be precisely described and hence implemented via instructions to machines or computers, and towards labour to perform 'non-routine' tasks. Figure 3 shows how the composition of employment in Australia has shifted towards non-routine jobs and away from routine jobs, by about 0.45 percentage points per year since the mid-1980s. Supply-side adjustment to higher demand for workers to perform non-routine jobs has been through a massive increase in the proportion of the workforce with higher levels of education attainment. The proportion of the working-age population with a Bachelor's degree or higher qualification has grown from around 5 per cent in the early 1980s to over 30 per cent in 2021 (ABS, Education and Work, Table 19).

Figure 3: Share of employment by occupation type, Australia, 1986 to 2021 (August)




Sources: ABS, Labour Force Australia – Detailed, EQ08; and author's classification of occupations (Borland and Coelli, 2017, Appendix).

It is likely that this trend in the composition of employment will continue as new developments in IT-based technologies, such as robotics, increase the range of tasks that can be routinised. Autor (2022) also suggests that AI – through machine learning – is expanding the capacity of technology to undertake non-routine tasks, such as prediction. At the same time, however, technological change will continue to create new jobs: using those new technologies in production and producing new goods and services that embody new technologies. As a country that is primarily an importer of new technologies, what is most important in Australia is to have a workforce with skills that allow it to use those technologies (Productivity Commission, 2022, pp.47-48).

### Example 3: Demographics and the demand for caring

A combination of demographics and government policy is causing a major growth in labour demand for carers. At present, growth in demand appears to be outstripping supply growth. Table 1 summarises recent estimates of required growth in caring workforces and likely shortfalls based on current rates of growth in supply.

The challenge is therefore to increase labour supply of carers (and at the same time to up-skill the workforce). For this there seem only two options: immigration

or increased supply from the workforce already in Australia, which will require higher wages and professionalisation. The only other alternative is to accept a long-run labour shortage, with consequent low standards of care.

Table 1. Caring workforces: Supply and demand

| Type of workforce | Estimate of required increase/likely shortfall in workforce |
|---|---|
| Aged care | Require a net increase of 170,000 in the direct care workforce from 2020 to 2030 to meet a standard of 3-star staffing level. Estimated annual attrition from the direct care workforce is 45,000. |
| NDIS workforce: Community-based and home-based support workers | Workforce of 242,000 in 2020. Needs to expand to 313,000 in 2024. Estimated exits from 2020 to 2024 = 164,000. Hence net expansion needed is 235,000. |

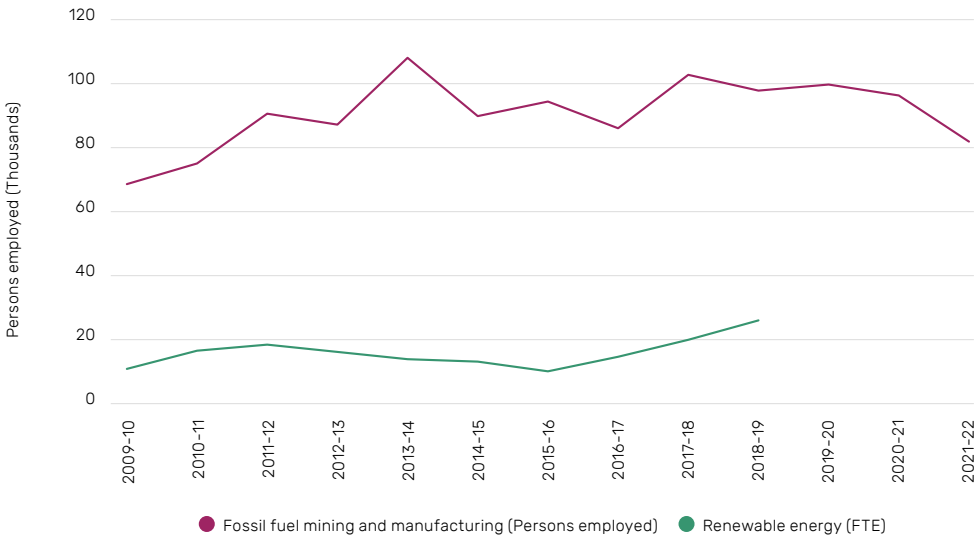
Sources:
1. Aged care: Committee for Economic Development for Australia (2021), Duty of Care: Meeting the Aged Care Workforce Challenge, https://cedakenticomedia.blob.core.windows.net/cedamediacontainer/kentico/media/researchcataloguedocuments/recent%20research/pdfs/aged-care-workforce-2021-final_1.pdf ;
2. NDIS: Commonwealth Department of Social Services (2021), NDIS National Workforce Plan 2021-25, https://www.dss.gov.au/sites/default/files/documents/06_2021/ndis-national-workforce-plan-2021-2025.pdf

## Example 4: Government climate change policy

A shift in employment towards production of renewable energy and away from old energy sources is being driven by new technologies and government policy. Figure 4 provides a perspective on the extent of adjustment that will need to occur. Over the past decade, on average about 90,000 persons have been employed in the mining of fossil fuels and production of fossil fuel energy.

The policy challenge presented by this type of structural change is twofold: first, to ensure that there is a workforce with skills needed for production in the expanding sector; and second, to enable workers displaced from the contracting sector to move into new jobs. Over the past several decades Australia has done well in the first task, much less well in the second task.

Figure 4: Employment, By type of energy production, Australia, 2009-10 to 2020-21




Notes:
a] Fossil fuel mining and manufacture = Coal mining; Oil and gas extraction; Petroleum and coal product manufacturing; Gas supply;
b] Renewable energy = activities principally motivated by the production of renewable energy, and/or by the design, construction and/or operation and maintenance of renewable energy infrastructure.
Sources: ABS, Employment in renewable energy activity, 4631.0, Table 1; ABS, Labour Force Australia – Detailed, EQ06.

## Example 5: COVID-19

COVID-19 is an example of a new driver than can emerge unexpectedly with potential implications for labour supply. It is possible to think of quite a lengthy list of potential implications of COVID-19.

First, COVID-19 may have affected preferences about labour supply in several ways. Most notably, it has been suggested that a fundamental change in relative preferences for work and leisure (the Great Resignation) is underway. Thus far, however, there is little evidence for this in Australia (Borland, 2022). Where change does seem to have occurred is in preferences for working from home, as the need to reduce social contact brought a forced experiment in that practice. Table 2 shows that at present there appears to be a difference of about a day per week in workers' and employers' expectations of the optimal amount of time to work from home (see also Petrie, 2022). Some adjustment will be needed to reconcile these differing preferences. A further short-term effect of COVID-19 has been to shift population in Australia away from Victoria and NSW and towards other states, especially Queensland; and within Victoria and NSW away from capital cities and towards regional areas. This population mobility

also necessitates adjustment – such as via an increase in working from home, extra travelling, or job mobility. In addition, a shift in home ownership in regional areas towards second (holiday) home ownership is affecting the capacity for workers to obtain rental housing in those areas.

Table 2. Preferences for working from home, Australia, 2022

| Question | Average response |
|---|---|
| After COVID-19, how often would you like to work from home? | 1.89 days |
| After COVID-19, how often is your employer planning for you to work full days at home? | 0.95 days |
| How would you respond if your employer announced that all employees must return to the worksite 5+ days a week (share of employees who would quit or look for a job with scope to work from home)? | 22.27% |
| How much of a pay rise [cut] (as a percentage of your current pay) would you value as much as the option to work from home 2 or 3 days a week? | 5.36% |

Source: Aksoy *et al*. (2022)

Second, COVID-19 has brought major disruption to immigration. Table 3 shows the impact on temporary migration. For the three categories included, the number of temporary migrants was 300,000 less in December 2021 than two years before. Whether migration will return to its previous levels, and the consequences for labour market tightness, are important issues for labour supply policy. For example, whereas it is usually thought that migration has close to a net zero effect on the rate of unemployment (see Boucher *et al*., 2022), in the case of COVID-19 it seems likely that the withdrawal of labour supply has been larger than the reduction in labour demand (due for example to the continuation of construction activity premised on previous migration levels), so that there is likely to be a slight upward effect on the rate of unemployment as levels of temporary migration increase.

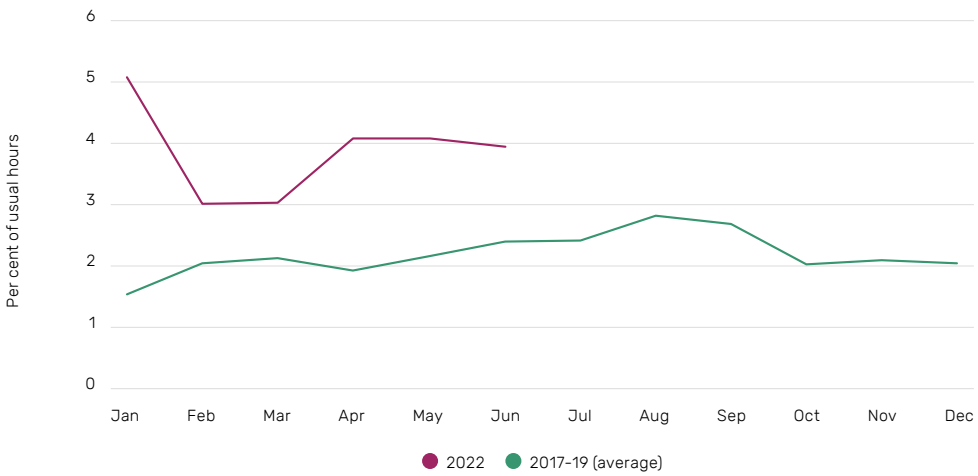
Table 3. Temporary migration (Stocks), Australia

| | Student and temporary graduate program | Working holiday maker program | Temporary resident (Skilled) | Total |
|---|---|---|---|---|
| December 2019 | 480,543 | 141,142 | 64,590 | 686,275 |
| June 2020 | 555,310 | 85,691 | 71,400 | 712,401 |
| December 2020 | 449,932 | 49,542 | 61,140 | 560,614 |
| June 2021 | 374,056 | 36,526 | 55,030 | 465,612 |
| December 2021 | 315,949 | 19,324 | 49,580 | 384,583 |

Source: Compiled from https://www.homeaffairs.gov.au/research-and-statistics/statistics/visa-statistics/overview

Third, COVID-19 is affecting labour supply via its health effects. Workers who contract COVID-19 need to spend time away from work, thereby reducing the effective labour supply. Figure 4 presents estimates of the percentage of usual hours lost due to 'own illness, injury or sick leave' in 2022 and on average in 2017-19. Hours lost due to illness in the first six months of 2022 were almost double in 2017-19 (3.8 per cent compared to 2.0 per cent). As time goes on, with an increasing proportion of the population having contracted COVID-19, long COVID may also affect labour supply, depending on its incidence.

Figure 5: Per cent of usual hours lost due to illness, injury & sick leave, by month, 2022 v. 2017-19 (average)




Source: Author's calculations from ABS, Labour Force Australia – Detailed, EM1a and EM2a.

# How policy can affect labour supply

A variety of approaches are available for government to seek to affect labour supply policy. In this section these approaches are briefly summarised.

### i] Change total labour supply and composition of labour supply.

The **size** of labour supply (both in total and in specific occupations) affects the extent to which it is possible to take advantage of available production opportunities that will provide a gain to society. The **composition** of labour supply is about the characteristics of the potential workforce, which matters because it is related to skills in the workforce and can be an indicator of the equity in participation. The output and equity benefits of increasing participation by females and the mature age population, for example, are well-established (see for example, Hsieh *et al.*, 2019).

A role for government in seeking to influence the size and/or composition of labour supply can derive from the need to address sources of market failure, such as where the market system does not provide sufficient incentives for working in specific jobs relative to socially optimal labour supply or where discriminatory workplace practices are adversely affecting labour supply by some groups. It can also be motivated by social equity objectives, such as ensuring that all groups in society have an equal opportunity to engage in paid work. In addition, government's role can come about as a by-product of other activities it undertakes. For example, once government assumes a role in regulating the volume of immigration, it automatically has a role in determining labour supply; or where government is a major source of funding for an activity such as aged care, and hence a major influence on wages paid to workers providing that service, it is also influencing labour supply.

### ii] Facilitate post-school acquisition of skills.

The skills of the workforce need to evolve according to changes in labour demand and new opportunities for education and training. Ideally, entrants to the workforce will be equipped with skills suitable for the jobs they will do early in their careers, and workers already in jobs or who are displaced from work will have the opportunity to update their skills as conditions require.

Government's role in post-school skill acquisition (via education and training) is mainly to correct for a variety of types of market failure. Some examples are where government funding is required due to workers and/or firms being unable or unwilling to finance training because of capital market imperfections or scope for poaching of workers with transferable skills; where setting minimum quality standards is necessary to address potential effects of information asymmetry between workers, firms and training providers; or to correct incentives for skill acquisition where social return is above private return.

### iii] Ensure appropriate infrastructure to allow labour to be utilised effectively.

Communication and transport infrastructure are critical for making the most of the available workforce and its skills. For example, workers need to be able to travel to their workplaces from home and need to be able to communicate with co-workers and with customers and suppliers. The public good dimension of infrastructure motivates a role for government in its provision.

### iv] Facilitate labour market adjustment to allow labour to be utilised effectively.

Realising potential output means that workers have to be matched to the jobs that generate the greatest output from their skills. Changes in labour market conditions necessitate continual rematching of workers and jobs/firms for that to happen. The extent to which that rematching can occur has important implications for output and productivity (Andrews and Hansell, 2021).

Government can assist to make the process of matching efficient in several ways. First, it can seek to remove sources of market failure that might otherwise exist. For example, mobility is easiest when workers' skills can be established by potential employers. Government may therefore have a role in establishing credentialling systems, that might otherwise not exist (due to a public good problem). Second, it should ensure that benefits of worker mobility are properly accounted for in the design of policies mainly intended for another purpose. For example, occupational licensing may be introduced to ensure minimum quality standards, but may have the cost of reducing worker mobility where different geographic regions adopt different standards. Third, it should ensure that worker mobility doesn't occur unnecessarily; for example, by providing an industrial relations framework that allows workplace issues to be resolved that might otherwise cause the end of an employment relation and loss of valuable firm-specific human capital.

## Principles for policy-making

1] The problem for policy is not just to increase labour supply, but to increase labour supply with the skills needed (for jobs available). Discussion of labour supply sometimes seems to narrow down to the question: 'How can we get more of group x into the labour force?' But just getting more of some group to be willing to supply labour is not enough by itself. It is also necessary that the extra workers from group x have skills that enable them to fill available jobs.

2] Policy works best when it is simultaneously case-based and holistic. The optimal policy to increase labour supply or to improve workers' skills is likely to differ between demographic groups and between occupations. Hence

policy must be tailored to what will work in each case. But at the same time, it is important for there to be a sense of the whole – of what the set of policies for different groups or workforces add up to. It is not much use, for example, having a policy to attract workers from aged care to address labour shortages in disability care, when that creates an equal shortage in aged care; or to increase labour supply of the mature age population at the cost of creating a gap in childcare for working families who had previously relied on that population for informal care. Instead, there needs to be a sense that the aggregate implications of labour supply policy are feasible.

3] Policy must be organised with a sense of priority. It is possible to put together a very long list of groups who could be targeted for increasing labour supply and occupations to which extra labour supply should be targeted. It's necessary therefore to have some sense of priority: What are the areas where labour shortages are having the most adverse effect on national wellbeing, and what are the groups from whom extra labour supply can be most readily and efficiently accessed to address those shortages?

4] Policy needs to be evidence-based. Labour supply policy needs to be based on what is, by now, a relatively extensive literature on what works for different groups, but also recognising the gaps in current knowledge.

## Background on labour supply of some key groups

This section provides a short background commentary on the evolution of labour market outcomes for each of three groups likely to feature in future attempts by policy-makers to increase labour supply:

### Women

In Australia the female share of total hours worked has increased across recent decades: for example rising from 32.5 to 42.0 per cent in the past 35 years (from 1986-87 to 2021-22). Over that same time, however, there has been little change in occupational segregation. The share of total hours worked by females in occupations where they account for at least 70 per cent of employment was 37 per cent in 1986-87 and 43.5 in 2021-22. As well, the top quartile of female-employing occupations (25 per cent of total hours worked) had an average female share of employment of 66.2 per cent in 1986-87 and 70 per cent in 2021-22.

## Mature age (55 plus years)

Declining labour force participation (LFP) rates for the mature age population exerted a major negative influence on labour supply in Australia from 1966 to 1993. But since then, the reverse has happened. Strong increases in the LFP rates of the mature age population up until 2019 explain the entire increase in the aggregate LFP rate during that time. These opposed patterns before and after 1993 are shown in Table 4. Focusing on the period after 1993, in recent times there has been some slowing in growth in the LFP rate for the 'younger' mature age population. For example, the annual rate of growth in the LFP rate for the population aged 55 to 59 years was 1.0 percentage point per year from 1993 to 2012, but then just 0.4 percentage point per year from 2012 to 2019; whereas the annual increase for the population aged 65 years plus remained steady at 0.4 percentage point per year across the whole period. The LFP rate of the mature age population has remained relatively steady since the onset of COVID-19 in 2020, but without displaying any evidence thus far of a 'Great Retirement' (Borland, 2022).

Table 4. LFP rates, Mature age population, 1966 to 2019 (August)

| | 1966 | 1993 | 2019 |
|---|---|---|---|
| 55 to 59 | 58.8 | 53.5 | 75.8 |
| 60 to 64 | 47.5 | 30.6 | 58.7 |
| 65 plus | 12.5 | 4.8 | 14.8 |
| Total (15 years plus) | 59.9 | 61.7 | 65.8 |
| Change in total LFP rate | | +1.8 | +3.9 |
| Contribution of change in LFP rate of population aged 55 plus years | | -2.2 | +4.2 |

Source: ABS, Labour Force Historical Timeseries Australia, Table 2; ABS, Labour Force Australia – Detailed, Table 01.

## Long-term unemployed

Prior to COVID-19 there had been commentary suggesting that the rate of long-term unemployment in the second half of the 2010's was above the level that would be expected given the overall rate of unemployment (Borland, 2019). That higher rate of long-term unemployment also appeared to be associated with a decrease in matching efficiency in the Australian labour market (reflected in an outward shift of the Beveridge curve). At present, the rate of long-term unemployment is even more elevated compared to its historical relation with the rate of unemployment. To what extent that is due to the

speed of labour market adjustment during COVID-19 causing an exaggerated adjustment path for long-term unemployment, or some further structural rise in the rate of long-term unemployment, is not yet clear. One hypothesis is that the elevated rate of long-term unemployment during the second half of 2010's may have reflected the increasing failure of the *jobactive* system to deal effectively with job seekers with high barriers to employment.

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# Financial fragility, financial literacy and the early withdrawal of retirement savings during COVID-19

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## Abstract

Using micro-data from the 2020 *Household, Income and Labour Dynamics in Australia (HILDA) Survey* for a large nationally representative sample of adults aged 18-64, this paper examines the factors associated with the early withdrawal of retirement savings as a result of the coronavirus. Logistic regressions show that early withdrawal behaviour was in response to financial needs with the likelihood of making a withdrawal higher amongst the young, those classified as financially fragile, precariously employed, the unemployed, lone parents with dependent children, persons experiencing poor health and those with poor financial literacy. The results raise questions about the design of early release schemes and the objectives of the Australian retirement income system, including equity outcomes in retirement. Policy suggestions are discussed, including a call for suitable data for monitoring purposes. The latter is important if the long-term equity effects of COVID-19 related to early withdrawals are to be properly understood.

JEL Codes: G51, G53, H55, J16, J32
Keywords: pension savings, superannuation, financial literacy, financial fragility, COVID-19

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# Introduction

In 1992, and in response to budgetary pressures associated with an aging population, Australia adopted a system of compulsory retirement savings in the form of mandated employer contributions into privately-managed defined contribution (DC) funds. Thirty years later coverage under the Australian system is high; around 90 per cent of adults aged 18-64 have some pension (superannuation) savings (Preston and Wright, 2022).[1] At March 2022, the total value of pension funds in Australia was around $3.4 trillion (ASFA, 2022), making it one of the largest pension fund markets in the world (Tang, 2021).

At the time of its establishment the vision for the Australian retirement income system was one of stable savings and preservation of contributions until retirement (Keating, 1991). Early withdrawal of retirement savings is provided for under certain conditions such as financial hardship, compassionate grounds and terminal illness. In 2020 these arrangements were significantly relaxed under the COVID-19 early release scheme (ERS). Via the latter, individuals, on meeting certain conditions, could withdraw up to A$10,000 before June 30, 2020 (i.e., within the 2019/20 financial year) and a further A$10,000 in the 2020/21 financial year. By the close of the scheme 3.5 million initial applications and 1.4 million repeat applications had been made (APRA, 2021).

The policy change was not without critique. Amongst other things, commentators noted that: some pension funds would be more exposed than others due to their nature and membership composition (e.g., Hostplus is a pension fund for employees in hospitality, tourism and recreation industry – an industry that was particularly hard-hit during COVID-19); that some individuals might face undue pressure to make an early withdrawal (renters, for example, may have been subject to pressure to withdraw within the context of legislative protections against evictions where rents could not be paid); and that the policy had the potential to 'exacerbate structural issues' within the retirement income system (CEDA, 2020; McKeown, 2020). Of particular concern was the question of gender equality and the likelihood that the ERS could exacerbate prevailing gender gaps in retirement savings (Birch and Preston, 2021a). During the early stages of the pandemic women were disproportionately affected in terms of jobs layoffs and cuts to hours worked (McKeown, 2020; Birch and Preston, 2021b).[2]

Globally, Australia was not alone in permitting early access to retirement savings during COVID-19. Kay and Borzotzky (2022) describe the case of Chile and the pressure within that country to permit access to pension funds during this time. The general consensus is that early access arrangements can be welfare enhancing by permitting consumption smoothing (Agarwal, Pan and Qian, 2020; Bateman *et al.*, 2022; Butrica,

1 In Australia the term superannuation savings is synonymous with the term pension.

2 Birch and Preston (2021b, Figure 1) show a 13 percentage point decline in the monthly hours worked by females between March 2020 and April 2020. Amongst men the corresponding fall was 7 percentage points.

Zedlewski and Issa, 2010; Wang-Ly and Newell, 2022). The danger, of course, is that early release schemes put at risk the financial well-being of some individuals in retirement. Additionally, the frequent relaxation of the rules governing early access to retirement savings also risks the integrity of the pension system and the principle of preservation. It also sends particular signals or messages that may undermine retirement planning and savings behaviour (Bateman *et al*., 2022). Concerningly, there appears to be no shortage of ideas for the use of retirement savings under early release provisions. Examples include permitting graduates to draw on their retirement savings to pay off government student loans (Iggulden, 2016) and a 'Super Home Buyer Scheme' whereby buyers could invest up to 40 per cent of their retirement savings in an existing or new property (Wu, 2022). The 'marketing message' given by these proposals is that "It's your money" (Murphy, 2022) and, as noted, that it does not need to be preserved. Recent evidence suggests that Australians are increasingly engaging in early withdrawal behaviour to pay for medical treatment such as dental work and IVF (Dalzell, 2022).

Since the 2007/8 global financial crisis (GFC) (also referred to as the 'Great Recession) there has been growing debate about the merits of early withdrawal pension arrangements and growing interest in understanding who makes such withdrawals, how withdrawn funds are used and how early withdrawal schemes might best be designed (Agarwal, Pan and Qian, 2020; Argento, Bryant and Sabelhaus, 2015; Beshears *et al*., 2015; Butrica, Zedlewski and Issa, 2010; Lee and Hanna, 2020). COVID-19 has fuelled interest in these debates, with recent Australian contributions including that of Warren (2021), Bateman *et al*. (2022) and Wang-Ly and Newell (2022).

In this paper data from the Household, Income and Labour Dynamics in Australia (HILDA) survey are used to also contribute to debate and inform policy development. HILDA is a large, rich, nationally representative, database. The paper extends Australian-based research by Warren (2021), Bateman *et al*. (2022) and Wang-Ly and Newell (2022). Bateman *et al*. (2022) employ administrative and online survey data in their analysis; their administrative data are from a large industry fund that predominantly covers men. Warren's analysis is based on a survey of Australian families while Wang-Ly and Newell tracked transactions in a large dataset provided by the Commonwealth Bank of Australia.

The specific focus in this paper is a study of the factors associated with early access under the COVID-19 ERS. In 2020 HILDA participants were asked, amongst other things, about their employment situation at March 2020 and after, their financial well-being, their financial literacy, whether they withdrew any of their retirement savings on account of the coronavirus and, if so, how much they withdrew. Such rich information enables a detailed analysis of the factors associated with making an early withdrawal of retirement savings during COVID-19, including the role played by financial literacy. A disaggregated analysis by gender highlights areas where the correlates differ. The analysis herein should be of interest to policy makers concerned with the design of early withdrawal provisions in pension systems, those concerned with income security and equality in old age and those concerned with the welfare of financially vulnerable individuals.

The remainder of the paper is organised as follows. Section 2 details the institutional context and offers some descriptive statistics on early withdrawals based on HILDA. Section 3 describes the research approach, data and sample. Section 4 presents the results and Section 5 concludes the paper.

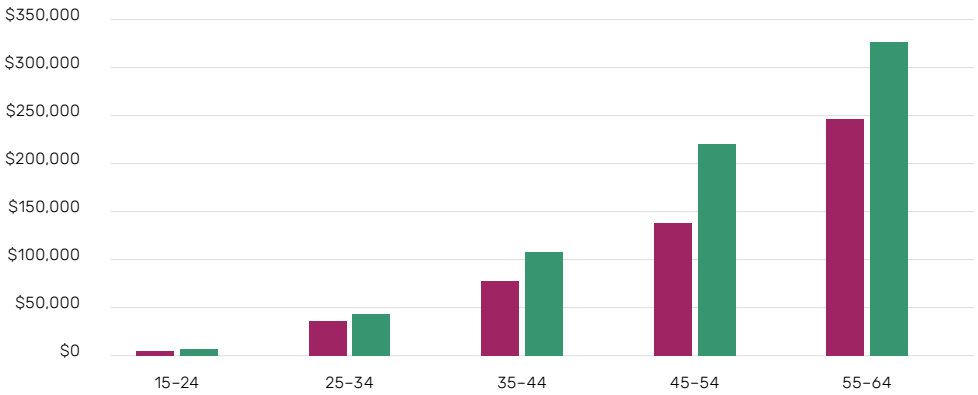
# Background

## Characteristics of Australia's retirement system

Australia's retirement income system is comprised of three pillars. The first is a means-tested universal Age Pension. This is a safety-net arrangement with the Age Pension rate set close to the poverty line (Birch and Preston, 2021a). The second is the savings accumulated under the mandated component of the retirement savings system (i.e., compulsory employer pension contributions, most of which are made into DC schemes). The third is comprised of voluntary contributions into pension funds or private savings made elsewhere. For most individuals the preservation age for savings under Pillars 2 and 3 is around 60 years of age. This contrasts with the Age Pension where the eligibility age is around 66-67 years. While coverage of Pillar 2 is high, retirement income savings in Pillars 2 and 3 are relatively low. For example, the median balance amongst men and women aged 45-54 years in 2019 was around A$150,000 for men and A$87,000 for women (ABS, 2022). Most retirees (around 70 per cent) currently receive the Age Pension (either in part or full) (Oguzoglu, Polidano and Vu, 2020) and it is likely that this will remain the case for many years to come. Generous tax concessions and government co-contributions have been used to incentivise voluntary savings into retirement funds. Indeed estimates suggest that by 2050 the cost of tax concessions as a share of GDP will exceed that of Age Pension expenditure (Treasury, 2020b, p.20). The system is described in more detail in Kingston and Thorp (2019) and Preston and Wright (2022).

The adoption of a mandated component has, as noted, significantly enhanced coverage of pension arrangements in Australia. Structural issues, nevertheless, plague the system. The occupational-based nature of the system, for example, disadvantages women who, on average work fewer hours in paid employment over their life-time and receive, on average, lower wages (Feng *et al*, 2019; Preston and Wright, 2022). Figure 1 shows the average (mean) balances of men and women in Australia by age. Focusing again on those aged 45-54 (a group that has mostly been covered by the mandatory component (Pillar 2) throughout their working life) the estimates show a gender gap in mean balances of 61 per cent (meaning that the average balances of females would need to increase by 61 per cent to equal that of males). At the median the corresponding gender gap is equal to 72 per cent.

Figure 1: Average (mean) pension (superannuation) savings of Australians aged 15-64 with positive balances, 2019-20.




Source: Australian Bureau of Statistics (ABS) (2022), Table 12.3.

## COVID-19 Early Release Scheme

In March 2020, just a few weeks after the World Health Organisation (WHO) declared the COVID-19 pandemic, Australia's Federal government announced a billion-dollar wage subsidy (JobKeeper) program and an increase in government income support payments for recipients of unemployment payments and other income support payments. Notably the 'JobKeeper' wage subsidy was not available for short-term casuals, employees in government agencies and employees in public universities.[3] Around the same time the government also announced a relaxation of arrangements governing early access to privately accumulated pension savings (i.e., contributions under Pillars 2 and 3 of the system). Up to A$10,000 could be withdrawn in financial year 2019/20 and a further A$10,000 in 2020/21 financial year. Unlike other early access arrangements such as the 'First Home Super Saver' (FHSS) scheme whereby first home buyers may withdraw up to A$15,000 per year (total A$30,000) of their voluntary contributions (Pillar 3) to help with the purchase of their first home, the early access arrangements under the COVID-19 ERS did permit a withdrawal of contributions made by employers. To be eligible to make a withdrawal individuals needed to satisfy one or more of the following requirements:

(a) Be unemployed
(b) Be eligible to receive a JobSeeker payment (e.g., youth allowance, parenting payment or special benefit)

3 Table A1 of Birch and Preston (2021b) provides a summary of the JobSeeker (support for those not in employment) and JobKeeper provisions.

(c) On or after 1 January 2020 had been made redundant, had their working hours reduced by 20 per cent or more or were a sole trader and their business was suspended or there was a reduction to their turnover of 20 per cent or more (Treasury, 2020a).

Applications were made online and required minimal supporting documentation (Bateman *et al*., 2022; Wang-Ly and Newell, 2022). Evidence suggests that most decisions were made in less than a week and without consideration of the long-term impact on incomes in retirement (Bateman *et al*., 2022). Additionally, the $10,000 limit appears to have served as a guide or anchor as to an appropriate withdrawal amount; if the limit had been higher it is likely more would have been withdrawn (*ibid*.).

In the 2020 HILDA survey (which went to the field around July of that year) the responding person questionnaire was re-engineered to ask questions related to COVID-19 and paid work. Specifically respondents were asked *"Now think back to the start of March of this year, before the introductions of restrictions by governments to limit the spread of the coronavirus. Can I just check: where you in paid employment then?"*. Those answering 'yes' were then asked a series of questions about their work including: *"As a result of the coronavirus, did you take a cut in your rate of pay? Were you temporarily stood down without pay or required to take unpaid leave? Was your employment terminated or were you made redundant? Did the income you normally receive from paid employment increase or decrease because of the coronavirus?"* Table 1 shows that, of those employed at March 2020, 7 per cent of men and 6 per cent of women experienced a pay cut and that 25 per cent reported a cut in hours. A sizeable share of both groups (7 per cent amongst men and 10 per cent amongst women) were temporarily stood down without pay or required to take unpaid leave.

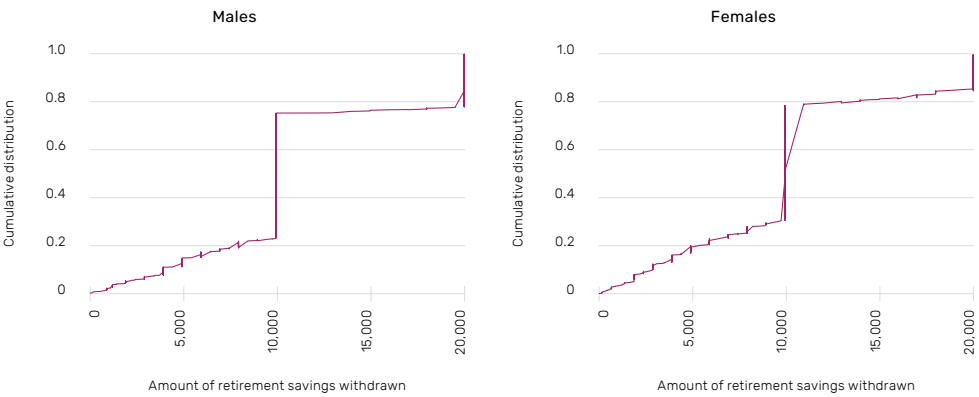
**Table 1: Share of persons who were employed at March 2020 and who, as a result of the coronavirus, experienced a cut in pay or hours or were temporarily stood down or made redundant**

| | As a result of the coronavirus you/your: | Male | Female |
|---|---|---|---|
| (1) | Rate of pay was cut | 7% | 6% |
| (2) | Hours were cut | 25% | 25% |
| (3) | Were temporarily stood down without pay or required to take unpaid leave | 8% | 10% |
| (4) | Employment was terminated or you were made redundant | 5% | 4% |

Notes:
1. Sample: aged 18-64.
2. N=4,217 (males); N=4,532 (females) for rows (1), (3) and (4); N=4,984 (males) and N=4,975 (females) for row (2).
3. Estimates weighted to reflect population totals.
4. Source: HILDA, wave 20.

HILDA respondents were also asked *"Did you withdraw money from any of your superannuation [pension] funds because of the coronavirus crisis?"* and, if yes, *"What was the amount withdrawn?"*. Weighted estimates for a sample of persons aged 18-64 finds that 13 per cent of men and 9.5 per cent of women reported withdrawing retirement savings because of coronavirus. The mean amount withdrawn was $11,135 amongst men and $10,143 amongst women. Figure 2 shows the cumulative distribution functions for men and women separately. There is a clear clustering of withdrawals at the A$10,000 amount (the maximum possible in each financial year). The estimates in Figure 2 support the conclusion of Bateman *et al*. (2022) that the A$10,000 limit served as an anchor point for individuals choosing how much to withdraw. Amongst men the share withdrawing less than this amount was around 20 per cent and for women it was around 30 per cent. Gender differences in withdrawal patterns may relate to gender differences in balances to begin with.

Figure 2: Distribution of Retirement Savings Withdrawn Amounts, Males and Females




Notes:
1. Sample: aged 18-64.
2. N=782 (males) and N=680 (females).
3. Estimates weighted to reflect population totals.
4. Source: HILDA, wave 20.

## Data, research approach and sample

The empirical analysis below is cross-sectional and employs data from Wave 20 (conducted in 2020) of the Household, Income and Labour Dynamics in Australia (HILDA) Survey. Logistic regressions are used, with the dependent variable a binary variable set equal to one if the respondent reported withdrawing money from any of their pension funds because of the coronavirus crisis and zero otherwise. The analysis is restricted to adults aged 18-64 and exploits information on the respondent's financial situation (e.g., their ability to pay bills on time), their financial literacy and their employment status at March 2020 and post March 2020. Information on household type (e.g., couple with dependents, lone parent etc.) is also employed, as is information on equivalised household income, number of dependent children and health status.

Financial fragility was measured using information from the HILDA self-completion questionnaire (SCQ) concerning household finances. Respondents were asked *"Since January 2020, did any of the following happen to you because of a shortage of money … could not pay electricity, gas or telephone bills on time; could not pay the mortgage or rent on time; pawned or sold something; went without meals; was unable to heat home; asked for financial help from friends or family; asked for help from welfare/ community organisations?".* A binary variable was created and set equal to one if any of these questions were answered in the affirmative. Around 12 per cent of the sample were missing information relevant to the construction of this variable. This was mostly as a result of individuals not completing the SCQ. While one could proceed by removing these missing observations, to do so would risk jeopardising the representative nature of the sample – a key advantage of the HILDA data. In the interest of retaining these observations a flag variable is employed. The latter is set equal to one (1) if information relevant for the construction of the financial fragility variable is observed and set equal to zero (0) otherwise. This is an established approach for dealing with missing observations (e.g., see Preston and Wright, 2019). Any significant difference in the groups with and without observable data will be picked up by this flag variable. The descriptive information in Table 2 below shows that around one in five adults aged 18-64 experience financial fragility in Australia in 2020. Women were significantly more likely than men ($p<0.001$) to be classified as financially fragile.

Financial literacy was measured using information on responses to three questions testing knowledge of basic financial concepts, namely interest rates, inflation and diversification. The wording of the three questions was as follows: Q1: Interest Rate: *"Suppose you put $100 into a no-fee savings account with a guaranteed interest rate of 2% per year. You don't make any further payments into this account and you don't withdraw any money. How much would be in the account at the end of the first year, once the interest payment is made?"*; Q2: Inflation: *"Imagine now that the interest rate on your savings account was 1% per year and inflation was 2% per year. After one year, would you be able to buy more than today, exactly the same as today, or less than today*

*with the money in this account?"*; Q3: Diversification: *"Buying shares in a single company usually provides a safer return than buying shares in a number of different companies."* [True, False].

These three questions are commonly referred to as the 'Big-3' and they are frequently employed global surveys measuring financial literacy (Clark, Lusardi and Mitchell, 2021; Lusardi and Mitchell, 2014). A binary measure was constructed from the responses. It was set equal to one if the respondent correctly answered all three questions and zero otherwise. Descriptive analysis shows that 60 per cent of men and 42 per cent of women in the sample (those aged 18-64) were financially literate in the sense that they could correctly answer all three questions (see Table 2).

A comparison of the financial literacy rates of those classified as financially fragile shows that, amongst men, 52 per cent of those who are financially fragile are financially literate; this compares to a 65 per cent financial literacy rate amongst those not financially fragile. Amongst women the corresponding financially literacy rate is 32 per cent amongst those who are financially fragile, compared to 46 per cent amongst those who are not financially fragile. A similar pattern is reported in Clark, Lusardi and Mitchell (2021) in the US with the suggestion "…that financial literacy could help people better prepare for unexpected expenses" (*ibid*., 294).

To examine the underlying factors associated with the withdrawal of pension savings as a result of the coronavirus, a logit regression is estimated. The marginal effects are reported in the next section. Table 2 details the variables included in the regression and presents associated summary statistics.

## Sample

The sample, as noted, is comprised of persons aged 18-64 and includes those who are employed, unemployed and not in the labour force (NILF). It was not possible to identify and exclude those who had retired. Wave 20 of HILDA contains 12,919 individuals aged 18-64. Nineteen observations were excluded on account of missing information on rental/mortgage status and a further seven observations excluded because of missing information on employment status at March 2020. This reduced the sample to 12,886 persons, of which 6,128 (48 per cent) were male and 6,758 (52 per cent) were female.

Table 2: Variables in the regression and associated descriptive statistics

| Variables | Persons | Male | Female |
|---|---|---|---|
| *Dependent variable* | | | |
| Made a withdrawal of pension (superannuation) savings because of coronavirus (=1 if made a withdrawal; = 0 otherwise) | 11.1% | 12.7% | 9.5% |
| *Gender* | | | |
| Male (=1 if male; =0 if female) | 48% | - | - |
| *Financial fragility* | | | |
| Financially fragile (=1 if respondent indicated that they had difficulty paying bills &/or rent, &/or went without meals, &/or unable to heat home, &/or sought financial help from family or friends, &/or sought assistance from a welfare organisation; =0 otherwise) | 19.6% | 17.0% | 22.2% |
| Flag_fragile: =1 if information required to compute financial fragility status observed; =0 if missing | 87.5% | 84.8% | 90.2% |
| *Financial Literacy* | | | |
| Financial literacy (=1 if respondent correctly answered three questions testing knowledge of interest rates, inflation and diversification; =0 otherwise) | 50.9% | 60.2% | 41.9% |
| *Age groups* | | | |
| 18-24 (base group) | 13.9% | 14.5% | 13.3% |
| 25-34 | 24.2% | 24.2% | 24.2% |
| 35-54 | 42.9% | 42.9% | 42.9% |
| 55-64 | 19.0% | 18.4% | 19.5% |
| *Highest Qualification* | | | |
| Less than Year 12 of high-school (base group) | 13.8% | 14.4% | 13.3% |
| Year 12 | 19.2% | 19.7% | 18.7% |
| Diploma | 33.0% | 35.4% | 30.7% |
| Degree | 33.9% | 30.5% | 37.3% |
| *Employment status at March 2020 and employment status after March 2020* | | | |
| Employed at March==> employed after (base group) | 72.4% | 76.1% | 68.7% |
| Employed at March=>unemployed | 2.0% | 2.4% | 1.6% |
| Employed at March=>NILF (not in the labour force) | 3.3% | 2.6% | 4.1% |
| Not-employed=>employed | 2.7% | 2.3% | 3.0% |
| Not-employed=>unemployed | 3.0% | 3.7% | 2.3% |
| Not-employed=>NILF | 16.6% | 12.9% | 20.3% |
| *Contract type after March 2020 if employed* | | | |
| Casual (=1 if reports being employed on a casual basis; =0 otherwise) | 11.7% | 10.4% | 13.0% |
| Self-employed (=1 if not employee) | 10.0% | 13.2% | 6.9% |
| *Household type* | | | |
| Couple with no child(ren) aged < 15 (base group) | 40.1% | 41.2% | 39.0% |
| Couple with child(ren) aged < 15 | 30.6% | 30.5% | 30.6% |
| Lone parent with child(ren) aged < 15 | 5.9% | 2.9% | 8.8% |
| Lone parent, no child(ren) aged < 15 | 5.6% | 5.4% | 5.9% |
| Other family type (including group households and multi- family households) | 7.2% | 7.1% | 7.2% |
| Lone person | 10.6% | 12.9% | 8.5% |
| Number of dependent children (children aged < 15) | 0.6 | 0.5 | 0.6 |
| | (0.97) | (0.95) | (0.99) |

Table 2: continued

| Variables | Persons | Male | Female |
|---|---|---|---|
| *Household equivalised income grouping* | | | |
| <25 percentile (base group) | 25% | 24% | 26% |
| 25-49 percentile | 25% | 25% | 25% |
| 50-74 percentile | 25% | 25% | 25% |
| 75+ percentile | 25% | 26% | 24% |
| *Mortgage status* | | | |
| Renting (base group) | 41.8% | 41.3% | 42.4% |
| Mortgaged | 44.3% | 44.7% | 43.9% |
| Home paid | 13.9% | 14.1% | 13.8% |
| *Health status* | | | |
| Self-assessed health (1 excellent; 5=poor) | 2.51 | 2.47 | 2.55 |
| | (0.89) | (0.87) | (0.90) |
| Flag_health (=1 if self-assessed health information observed; =0 otherwise) | 91.2% | 89.3% | 93.1% |
| *Regional controls* | | | |
| Resides major city (base group) | 65.0% | 65.2% | 64.9% |
| Resides other urban area | 18.1% | 18.0% | 18.1% |
| Resides rural area | 16.9% | 16.8% | 17.0% |
| *State dummies* | | | |
| New South Wales (base group) | 32.3% | 32.9% | 31.7% |
| Victoria | 26.7% | 26.6% | 26.8% |
| Queensland | 20.0% | 19.6% | 20.4% |
| South Australia | 6.7% | 6.7% | 6.7% |
| Western Australia | 9.6% | 9.6% | 9.7% |
| Tasmania | 2.2% | 2.2% | 2.1% |
| Northern Territories | 0.8% | 0.8% | 0.8% |
| Australian Capital Territories | 1.7% | 1.7% | 1.8% |
| Observations | 12,886 | 6,128 | 6,758 |

Notes:
1. Sample: aged 18-64.
2. Estimates weighted to reflect population totals.
3. Standard deviation in parenthesis for continuous variables only.
4. Source: HILDA, wave 20.

## Regression results

The results (marginal effects) from logistic regressions are presented in Table 4. There are six columns in total. Columns (1) and (2) present the results associated with a pooled regression with a male dummy variable employed to control for gender. Columns (3) and (4) show the results for men and columns (5) and (6) are for women. Within each of these three groups two different specifications are estimated. The first is the baseline regression with controls for financial fragility, demographic characteristics, employment status, household type (e.g., couple with children age less than 15, lone parents etc.), rental status, household income, self-assessed health and geographic controls. The second regression adds in a control for financial literacy (with the assumption that the latter is exogenous).

Focusing on column (2), the estimates show that men were 3.2 percentage points more likely than women to make an early withdrawal from their pension savings on account of the coronavirus. This estimate takes into account the fact that women are more likely to be out of the labour force and, therefore, not be eligible under the ERS. Descriptive data in Table 2 shows that 12.9 per cent of men and 20.3 per cent of women were not employed at March 2020 and NILF after March 2020.

Being financially literate reduced the likelihood of making a withdrawal. Interestingly, this relationship only holds for men (see columns (4) and (6)). Respondents who were financially fragile were significantly more likely (5.6 percentage points) to access their retirement savings, consistent with a financial needs-based explanation for access behaviour. The likelihood of making a withdrawal was lowest amongst those aged 18-24 (the base group) and highest amongst those aged 25-34 years. At a disaggregated level the results show that amongst men the likelihood of making a withdrawal was highest amongst 35-54 year-olds, while for women the likelihood was highest amongst 25-34 year-olds. Research elsewhere shows that breaks in contributions when young (which is similar to making a withdrawal) is an important factor contributing to gender gaps in pension savings in later life (Feng et al., 2019).

Consistent with studies elsewhere (e.g., Butrica, Zedlewski and Issa, 2010) the regression results also show that withdrawals are higher amongst the less qualified and those facing adverse life events such as becoming unemployed. Relative to respondents who were employed at March 2020 and who remained employed, those who were initially employed and subsequently unemployed ("Employed=>unemployed") were 19.1 percentage points more likely to access their pension savings. This likely also reflects the structure of the ERS and the fact that job loss was a specific eligibility criterion. Persons who transitioned from being employed to NILF were 11.4 percentage points more likely than those who remained employed to access their retirement savings. Persons not employed at March 2020 (presumably NILF) and NILF after March 2020 were significantly less likely to make a withdrawal. As noted, this result will be driven by the nature of the ERS and the fact that these individuals were not eligible to make a withdrawal.

The highly significant association between casual employment status and accessing retirement savings is noteworthy. It confirms the precarious nature of casual employment and the financial vulnerabilities that casuals faced during COVID-19, especially short-term casuals (those that had been with their employer for less than 12 months). Casual employment makes up a large share of employment in sectors such accommodation and food services (Gilfillan, 2020)[4] – i.e. sectors that were particularly hard-hit by the lockdown. Between February 2020 (before the start of COVID-19) and May 2020 employment amongst those without leave entitlements (the Australian Bureau of Statistics definition of casual employment) declined by 24 percentage points. The corresponding decline amongst those with leave entitlements was 3 percentage points (see Birch and Preston, 2021b, Figure A4 in their online supplementary appendix).

The controls for household type show that lone parents with dependent children (i.e., with children aged less than 15) were significantly more likely than the reference group (couples without dependent children) to access their pension savings, with the gendered analysis showing that this was purely driven by women. The income variables (household equivalised income) and rental status variables also show that access was higher amongst lower income groups and those who rented. Persons reporting poor health were also more likely to access their retirement savings. This health result, however, should be treated with caution given the significance of the associated flag variable. The latter suggests that there is a significant difference between those with observable health information and those who did not return the HILDA self-completion questionnaire or who refused to answer the question. Those with observable health information were significantly less likely to access their pension savings. When estimated across a restricted sample of those with observable health information the result (not reported) was marginally ($p<0.1$) significant for the health variable. It confirms an association between health status and withdrawal behaviour, consistent with recent evidence documenting a growth in early withdrawals to finance health related costs such as dental work and other procedures (Dalzell, 2022).

The various geographic controls show differential patterns in behaviour across Australia. Those residing in a major city or a rural area were significantly less likely than residents in other urban areas to make a withdrawal. Males in Victoria and South Australia were significantly less likely than their counterparts in New South Wales to make a withdrawal while women in Queensland were significantly more likely than their counterparts elsewhere to make a withdrawal. It is not clear why the patterns differ. If anything the expectation was that withdrawals may have been higher in Victoria given the extended lockdown experienced in that state. Differences may relate to occupational structures and/or to peer (socialisation) effects, although further research would be required to formally test this. The significantly lower incidence of withdrawal in the Australian Capital Territories likely reflects the fact that many public servants were able to work from home during the lockdowns and retain their jobs.

4 https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/rp/rp1920/StatisticalSnapshotCasualWorkersAustralia

Table 3: Logistic regression results:
Factors associated with the likelihood of withdrawing pension savings because of COVID-19

| Controls | (1) Persons; base | (2) Persons; base + FL | (3) Men; base | (4) Men; base + FL | (5) Women; base | (6) Women; base + FL |
|---|---|---|---|---|---|---|
| Male | 0.029*** (0.007) | 0.032*** (0.007) | - | - | - | - |
| *Financial Literacy (FL)* | | | | | | |
| Answered all questions in the 'Big 3' question set all correct | - | -0.017** (0.007) | - | -0.025** (0.012) | - | -0.009 (0.008) |
| *Financial Fragility Index* | | | | | | |
| Financial Fragility | 0.057*** (0.007) | 0.056*** (0.007) | 0.066*** (0.011) | 0.065*** (0.011) | 0.049*** (0.009) | 0.049*** (0.009) |
| Flag_FinFrag (=1 if information observed; =0 if missing) | -0.002 (0.015) | -0.001 (0.015) | -0.004 (0.021) | -0.002 (0.021) | 0.002 (0.022) | 0.002 (0.022) |
| *Age (base 18-24)* | | | | | | |
| 25-34 | 0.060*** | 0.060*** | 0.061*** | 0.060*** | 0.061*** | 0.061*** |
| | (0.009) | (0.009) | (0.013) | (0.013) | (0.012) | (0.012) |
| 35-54 | 0.055*** | 0.057*** | 0.071*** | 0.074*** | 0.040*** | 0.041*** |
| | (0.009) | (0.009) | (0.014) | (0.014) | (0.010) | (0.010) |
| 55-64 | 0.021** | 0.024*** | 0.027** | 0.030** | 0.016 | 0.018* |
| | (0.009) | (0.009) | (0.013) | (0.013) | (0.010) | (0.010) |
| *Highest Qualification (base less than Year 12)* | | | | | | |
| Year 12 (High School) | -0.050*** | -0.046*** | -0.045*** | -0.039** | -0.055*** | -0.054*** |
| | (0.011) | (0.011) | (0.016) | (0.015) | (0.017) | (0.016) |
| Diploma | -0.013 | -0.010 | -0.005 | 0.000 | -0.020 | -0.018 |
| | (0.011) | (0.011) | (0.015) | (0.014) | (0.016) | (0.016) |
| Degree | -0.051*** | -0.046*** | -0.045** | -0.035* | -0.059*** | -0.057*** |
| | (0.013) | (0.013) | (0.019) | (0.019) | (0.018) | (0.017) |
| *Employment status pre and post March 2020 (base employed before and after)* | | | | | | |
| Employed=>unemployed | 0.194*** (0.044) | 0.191*** (0.042) | 0.291*** (0.065) | 0.283*** (0.062) | 0.075* (0.040) | 0.075* (0.040) |
| Employed=>not-in-the-labour-force (NILF) | 0.112*** (0.038) | 0.114*** (0.038) | 0.162*** (0.046) | 0.164*** (0.047) | 0.084* (0.047) | 0.085* (0.047) |
| Not Employed=>employed | -0.012 (0.016) | -0.011 (0.015) | -0.004 (0.025) | -0.005 (0.025) | -0.017 (0.016) | -0.017 (0.016) |
| Not Employed=>unemployed | 0.009 (0.017) | 0.008 (0.017) | -0.007 (0.021) | -0.008 (0.021) | 0.027 (0.028) | 0.026 (0.028) |
| Not Employed =>NILF | -0.044*** (0.007) | -0.045*** (0.007) | -0.056*** (0.011) | -0.057*** (0.011) | -0.034*** (0.010) | -0.035*** (0.010) |
| *Employment arrangement if employed (base, employees who are not casual)* | | | | | | |
| Casual | 0.058*** (0.014) | 0.056*** (0.014) | 0.081*** (0.022) | 0.077*** (0.021) | 0.042** (0.017) | 0.041** (0.017) |

Table 3 continued

| Controls | (1) Persons; base | (2) Persons; base + FL | (3) Men; base | (4) Men; base + FL | (5) Women; base | (6) Women; base + FL |
|---|---|---|---|---|---|---|
| Self-Emp | 0.017 | 0.018 | 0.019 | 0.020 | 0.019 | 0.020 |
| | (0.012) | (0.012) | (0.017) | (0.017) | (0.015) | (0.015) |
| *Household type (base, couple with no dependent children)* | | | | | | |
| Couple+dependent children | -0.003 | -0.003 | 0.008 | 0.007 | -0.012 | -0.013 |
| | (0.009) | (0.009) | (0.013) | (0.013) | (0.013) | (0.013) |
| Lone parent+depependent children | 0.038*** | 0.038** | 0.050 | 0.049 | 0.033** | 0.033** |
| | (0.015) | (0.015) | (0.034) | (0.034) | (0.016) | (0.016) |
| Lone parent, no dependent children | -0.010 | -0.010 | 0.017 | 0.018 | -0.033** | -0.033** |
| | (0.014) | (0.014) | (0.024) | (0.025) | (0.016) | (0.016) |
| Other family type | 0.031* | 0.029 | 0.070** | 0.067** | -0.003 | -0.004 |
| | (0.018) | (0.018) | (0.029) | (0.028) | (0.022) | (0.022) |
| Lone person | -0.009 | -0.009 | 0.005 | 0.005 | -0.021 | -0.020 |
| | (0.010) | (0.010) | (0.015) | (0.015) | (0.014) | (0.014) |
| Number of dependent children | 0.008** | 0.008** | 0.016*** | 0.016*** | 0.000 | 0.000 |
| | (0.004) | (0.004) | (0.006) | (0.006) | (0.005) | (0.005) |
| *Household equivalised income grouping (base, bottom quartile)* | | | | | | |
| 2nd quartile | 0.003 | 0.004 | -0.012 | -0.010 | 0.016 | 0.016 |
| | (0.011) | (0.011) | (0.018) | (0.018) | (0.012) | (0.012) |
| 3rd quartile | -0.018 | -0.017 | -0.023 | -0.020 | -0.015 | -0.014 |
| | (0.011) | (0.011) | (0.018) | (0.018) | (0.013) | (0.012) |
| 4th quartile | -0.030** | -0.028** | -0.046** | -0.043** | -0.015 | -0.014 |
| | (0.012) | (0.012) | (0.019) | (0.019) | (0.015) | (0.015) |
| *Housing status (base, renters)* | | | | | | |
| Home mortgaged | -0.033*** | -0.033*** | -0.054*** | -0.054*** | -0.013 | -0.013 |
| | (0.008) | (0.008) | (0.013) | (0.013) | (0.010) | (0.010) |
| Home paid | -0.063*** | -0.062*** | -0.075*** | -0.072*** | -0.051*** | -0.051*** |
| | (0.009) | (0.009) | (0.015) | (0.015) | (0.010) | (0.010) |
| *Self-assessed health (scale of 1 (excellent) to 5 (poor)* | | | | | | |
| Self-assessed health | 0.009** | 0.008** | 0.008 | 0.007 | 0.008* | 0.008* |
| | (0.004) | (0.004) | (0.007) | (0.007) | (0.004) | (0.004) |
| Flag_health (=1 if health information observed; 0 if missing) | -0.037** | -0.036** | -0.037 | -0.037 | -0.039* | -0.040* |
| | (0.016) | (0.016) | (0.024) | (0.023) | (0.024) | (0.024) |
| *Regional controls (base, major city)* | | | | | | |
| Other Urban | 0.016** | 0.016** | 0.015 | 0.015 | 0.017** | 0.017** |
| | (0.006) | (0.006) | (0.010) | (0.010) | (0.008) | (0.008) |
| Non-Urban | -0.004 | -0.004 | -0.015 | -0.016 | 0.005 | 0.005 |
| | (0.010) | (0.010) | (0.016) | (0.015) | (0.011) | (0.011) |

**Table 3 continued**

| Controls | (1) Persons; base | (2) Persons; base + FL | (3) Men; base | (4) Men; base + FL | (5) Women; base | (6) Women; base + FL |
|---|---|---|---|---|---|---|
| *State controls (base, New South Wales)* | | | | | | |
| Victoria | -0.012 | -0.012 | -0.034** | -0.035** | 0.008 | 0.008 |
| | (0.009) | (0.009) | (0.014) | (0.014) | (0.010) | (0.010) |
| Queensland | 0.009 | 0.010 | -0.006 | -0.004 | 0.021* | 0.022** |
| | (0.009) | (0.009) | (0.013) | (0.013) | (0.011) | (0.011) |
| South Australia | -0.022* | -0.022* | -0.053*** | -0.053*** | 0.003 | 0.003 |
| | (0.013) | (0.013) | (0.019) | (0.019) | (0.017) | (0.017) |
| Western Australia | -0.004 | -0.003 | -0.007 | -0.005 | -0.001 | -0.000 |
| | (0.010) | (0.010) | (0.016) | (0.015) | (0.013) | (0.013) |
| Tasmania | -0.017 | -0.017 | -0.005 | -0.005 | -0.032* | -0.032* |
| | (0.017) | (0.017) | (0.028) | (0.028) | (0.019) | (0.019) |
| Northern Territories | -0.031 | -0.031 | -0.095* | -0.091* | 0.012 | 0.012 |
| | (0.037) | (0.037) | (0.052) | (0.053) | (0.048) | (0.047) |
| Australian Capital Territories | -0.112*** | -0.110*** | -0.144*** | -0.140*** | -0.084** | -0.083** |
| | (0.032) | (0.032) | (0.053) | (0.051) | (0.035) | (0.035) |
| Pseudo $R^2$(%) | 12.6% | 12.8% | 14.4% | 14.6% | 11.9% | 12.0% |
| Observations | 12,886 | 12,886 | 6,128 | 6,128 | 6,758 | 6,758 |

Notes:
1. Sample aged 18-64.
2. Estimates weighted to reflect population values.
3. Marginal effects reported.
4. Robust standard errors in parentheses.
5. Significance given by: *** p<0.01, ** p<0.05, * p<0.1.
6. Source: HILDA, wave 20.

# Conclusion

This paper examines the factors associated with making an early withdrawal of retirement savings under the Australian government's COVID-19 early release scheme (ERS). The analysis is based on a large, nationally representative, sample of adults aged 18-64 from wave 20 (2020) of the Household, Income and Labour Dynamics in Australia (HILDA) survey. The dependent variable is a binary variable set equal to one if the respondent made a withdrawal under the ERS. Logistic regressions are employed. The control set includes factors such as financial fragility, financial literacy, labour market status at March 2020 and post March 2020, casual and self-employment status, as well as demographic and household characteristics including age, qualifications, household type, equivalised household income and other wealth measures, health status and geographic controls. The aim of the paper is to contribute to ongoing debates regarding pension (superannuation) policy, including early release and preservation arrangements as well as debates concerning equity and the capacity of the retirement income system to deliver income security and income equality in old age.

The results demonstrate that those who are financially fragile, those with lower financial literacy, younger, less qualified, low income and precariously employed individuals were more likely to make a withdrawal under the COVID-19 ERS than their older, better educated and wealthier counterparts. It points to financial need as a key underlying motive with adverse events such as job loss a particularly important driver. Estimates for men show that those experiencing job loss were 28.3 percentage points more likely than their counterparts with ongoing employment to access their retirement savings. Amongst women the corresponding share was 7.5 percent.

It is not possible to infer from these data what the effect of these withdrawals will have on retirement savings over the longer term or on balances and equity outcomes at retirement. The opportunity cost of withdrawals when young (in terms of compound interest effects) is greater than withdrawals amongst older cohorts and, as the data consistently shows, it is younger individuals who had the greatest propensity to withdraw under the COVID-19 ERS. On-going monitoring of retirement savings of at risk groups will be important. This requires access to regular, disaggregated (e.g., by age, gender, marital and employment status) and accessible data. Additionally, policy makers may wish to explore means of rebuilding the retirement savings of those groups left at risk during the COVID-19 pandemic (e.g., short-term casuals). Measures might include government top-up contributions and/or co-contribution incentives.

Importantly, policy makers need to reflect on the goals of the Australian retirement income system. The latter, as noted, is comprised of three pillars; a means tested Age Pension; a compulsory component consisting of mandated employer contributions; and voluntary contributions into pension funds, incentivised by tax-concessions. The experience under the ERS raises questions about the role of these pillars, in particular Pillars 2 and 3. If the purpose of the system is to assist Australians achieve adequate incomes in retirement (Treasury, 2020b) then preservation needs to

be prioritised. Permitting early access to retirement savings should be discouraged and alternative measures used to support individuals and families in financial need. Funding for the latter might come from cancelling the tax-concessions that are used to incentivise voluntary saving within the retirement income system and which typically flow to high income earners.

Labour market reforms aimed at tackling rising casualisation and other precarious forms of employment provide another important way of reducing financial vulnerability and pressures / incentives to withdraw retirement savings during economic downturns. Financial education programs might also be embraced, particularly those targeted at financially vulnerable groups. Evidence shows that those more likely to make a withdrawal were generally less financially literate.

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# Union wage effects in Australia in a period of declining union power: The role of endowments and returns to endowments

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## Abstract

This study explores the union-non-union wage differentials in Australia, using a quantile regression model and simulation-based counterfactual decomposition. We find that wages for unionists are higher, and more equally distributed, compared to non-unionists. The decomposition analysis reveals that the main reason for a positive union-non-union wage differential is the possession of better labour market endowments by unionists compared with non-unionists. We find that union wages are more equally distributed because endowments of key employment characteristics are more homogenously distributed among unionists. A corollary of this is that differences in the returns to endowments, the 'pure' union-non-union wage differentials, are estimated to be small, approximately 0 to 4 per cent for males and 0 to 2 per cent for females.

JEL Codes: J3, J51, J590
Keywords: Union wage effects, unobserved heterogeneity, counterfactual decomposition, panel data, HILDA

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# Introduction

Despite a significant body of research on union-non-union wage differentials in Australia (see Cai and Waddoups 2011 and Nahm *et al*. 2017 for extensive recent literature reviews) two aspects of the union-non-union wage differential remain under-researched in Australia. The first relates to how the union-non-union wage differential varies along the wage distribution. The second relates to what factors drive union-non-union wage differentials. The only paper to tackle both aspects in the Australia context is Cai and Liu (2008). While not using a quantile regression approach, Cai and Waddoups (2011) do shed some light on the first aspect by estimating whether unions are better at raising wages for low skill, compared with high skill workers in Australia.

In terms of the first aspect, it has been well known since the work of Freeman and Medoff (1984) that unions tend to compress wages among union members. This could result from the pursuit by unions of standard rate policies that attach wages to jobs rather than to individuals. It could also result from union concerns to tackle wage discrimination (Bryson 2007). Wage bargaining models show that wage compression can also emerge from the preferences of risk averse workers who are motivated to seek insurance in the face of uncertainty. Cai and Liu (2008) find evidence to support wage compression among male union members, but not females.

Cai and Liu (2008) investigated the second aspect concerning what drives union-non-union wage differentials in Australia using the Blinder-Oaxaca technique to decompose the union-non-union wage differential into two parts. The first part is due to differences in endowments of personal and workplace characteristics, and the second part is due to differences in the returns to these endowments. They found that for males 70 per cent, and for females 30 per cent, of the observed differences between union and non-union wages could be explained by different returns to endowments, or to use the language of Freeman and Medoff, by the 'monopoly face' of unions.

The current study seeks to address both these underresearched aspects of the union-non-union wage differential. Specifically, the paper makes three contributions to the literature for Australia. First, by using panel data, fixed effects models and quantile regression techniques to analyse nine waves of HILDA data, we provide a more rigorous examination of union-non-union wage differentials along the wage distribution than those presented for Australia by Cai and Liu (2008) and Cai and Waddoups (2011). Second, the decomposition of the union-non-union wage differential in the current study controls for individual unobserved heterogeneity and also uses an econometrically superior estimation technique to Cai and Liu (2008) when simulating the marginal distribution of log wage. Third, the current study uses data covering the period 2009-17 and thus takes in a period when union density and associated bargaining power continued to decline. Specifically, Cai and Waddoups (2011) used data from 2001-2006. Cai and Liu (2008) used data up until 2004 when union density was 23 per cent whereas by 2017 it had fallen to 14 per cent, representing a decline of 40 per cent.

The paper has the following structure. The next section reviews the relevant literature and puts the study into its institutional context. Section 3 outlines the methodology employed. Section 4 discusses our data and Section 5 discusses our results. We find that unions raise the level of wages on average for union workers. They also tend to compress the spread of wages compared to non-union counterparts. We also find, in contrast to Cai and Lui (2008) that the differences in wage outcomes for union workers are overwhelmingly driven by differences in endowments, rather than by returns to endowments. In Section 6 we draw conclusions and outline some directions for future research.

## Literature review and institutional context

The international literature identifies structural change, and increasing product market competition as a result of globalisation, as having reduced both the ability of unions to act on the behalf of members, as well as the incentive for workers to become union members (Gilfillan and McGann 2018, Schnabel 2013). Indeed two key factors determining the ability of unions to raise wages are the strength of union membership, and the legislative framework that either supports or hinders their ability to exercise their strength when negotiating with employers. Both these factors have moved against unions in Australia in recent decades. Union density is an important measure of union strength and in advanced economies it has been typically falling since the 1980s, for example average union density among OECD countries has fallen from 30 per cent in 1985 to 17 per cent in 2017 (OECD 2017). However, the decline in union density in Australia has been even more dramatic over the same period, falling from 46 per cent to 15 per cent (OECD 2020).

In addition, from the early 1990s in Australia there have been a number of important legislative changes that have reduced the bargaining power of trade unions and their capacity to be an effective form of collective voice. Throughout most of the twentieth century, industrial relations in Australia was regulated by the *Commonwealth Conciliation and Arbitration Act 1904*. Wage increases won by unionists under this centralised system were expressed in awards that would flow-on to all workers covered by the award, including non-unionists, thereby making it less likely that a union-non-union wage differential would be observed. Nevertheless research from this period found union-non-union wage differentials of 9-15 per cent (Miller and Mulvey, 1993). The shift towards enterprise-based bargaining occurred first under the *Prices and Incomes Accord 1991*. Under this system wage increases won by unionists at one workplace would flow-on to non-unionists at the same workplace, but they would not necessarily flow-on to non-unionists at other workplaces, thereby increasing the likelihood that a union-

non-union wage differential might be observed (Wooden 2001).[1] While awards remained important in the decentralised system, they played a smaller 'safety net' role that reduced their ability to link wages and conditions between the union and non-union sectors. This change could be expected to increase the union-non-union wage differential (Cai and Waddoups, 2011). That said, the shift to enterprise bargaining was also accompanied by the creation of new methods for setting wages that did not involve unions. These included Australian Workplace Agreements (an individual contract), as well as non-union collective agreements. These would be expected to lower the bargaining power of unions and reduce the union-non-union wage differential.

In addition to these changes to wage setting institutions, the reforms that began in the early 1990s introduced a range of other changes that directly reduced union power. The *Industrial Relations Reform Act 1993* introduced a provision permitting unions to undertake legal or protected forms of strike action during collective bargaining to further their claims. However, from the *Workplace Relations Act 1996* through to the Fair Work Act 2009 the ability to undertake such protected industrial action has become increasingly circumscribed by technical procedures, third party damage protections and onerous fines. The impact of these changes on union power is revealed by the collapse in working days lost per year per 1,000 employees due to industrial action that fell from 94.9 days under the *Industrial Relations Reform Act 1993* to 14.9 under the *Fair Work Act 2009* (Bornstein 2018, Isaac 2018). Isaac (2018) has catalogued other damaging changes for unions over this period including, the *Workplace Relations Act 1996* that outlawed closed shop unionism and other forms of union preference, as well as imposing significant restrictions on the right of entry of unions to workplaces.

These changes have prompted new research on union-non-union wage differentials in Australia. Wooden (2001) was the first to examine the idea that the absence of automatic flow-on under enterprise bargaining might facilitate the identification of a union-non-union wage differential. Using matched employer-employee data from the Australian Workplace Industrial Relations Survey 1995, he found a union-non-union wage differential of 10 per cent between individuals from different workplaces with different degrees of union density and activity (Wooden, 2001). Waddoups (2005) also investigated how the changes in union density and the industrial relations environment impacted the union-non-union wage differential in Australia, using cross-section data from the Survey of Education and Training for 1993, 1997 and 2001. Waddoups found a widening of the union-non-union wage differential over time, particularly for workers in industries with high union density. This widening was interpreted as being due to the reduced likelihood of flow-on under decentralised wage setting. It should be noted that the union-non-union wage differential was small at around 5 per cent for males in 2001. Waddoups (2008), using cross-section data from the Survey of Education and Training, and Cai and

1 A 'threat effect' implies that a flow-on could arise even under enterprise bargaining. This may occur if non-union employers pass on wage increases to non-union employees in order to prevent the unionisation of their workforce.

Liu (2008) who pooled four waves from HILDA (2001-4), found union-non-union wage differential of around 11 per cent for males and 5 per cent for females.

None of these papers mentioned above controlled for unobserved individual heterogeneity and other forms of endogeneity, something that has been shown to overestimate union-non-union wage differentials for males in Australia (Cai and Waddoups, 2011), the US (Mellow, 1981; Freeman, 1984; Hirsch and Schumacher, 1998) and the UK (Hildreth, 1999; Swaffield, 2001). In the Australian context, Cai and Waddoups (2011) used HILDA for the period 2001-6 and found that, once they controlled for unobserved individual heterogeneity, male union-non-union wage differentials fell from 9 per cent to 5 per cent and female effects fell from 6 per cent to 2 per cent. A more recent study by Nahm *et al*. (2017), using the HILDA (2001-13) estimated small negative union-non-union wage differentials for males (-6.2 per cent) and females (-6.8 per cent).[2]

For Australia Cai and Waddoups (2011) found statistically significant union-non-union wage differentials for low skill workers, with no effect found for workers at the high skill end. Cai and Liu (2008) investigated how union-non-union wage differentials vary along the wage distribution using a quantile regression model. They found that for males union-non-union wage differentials are greatest at the 10th percentile and decline along the wage distribution until the 90th percentile when they become negative. By contrast, for females union-non-union wage differentials exhibit more stability across the wage distribution.

Using a Blinder-Oxacca decomposition Cai and Liu (2008) found that for males, most of the observed difference in wages between union and non-union workers, 70 per cent or more, was due to differences in returns, while for females the difference, 70 per cent or more, were driven by differences in endowments. Therefore, for males the overwhelming majority and for females a significant minority of the union-non-union wage differential reflects the power of unions to influence the price of labour. These results should be regarded with caution, because they did not control for unobserved individual heterogeneity.

2 Note that this result is not directly comparable with the result reported in the present paper because of the difference in the treatment of individual heterogeneity. In the present paper, the difference in average heterogeneity between unionised and non-unionised workers is treated as an endowment effect, while it is decomposed into an endowment effect and a coefficient effect based on the coefficient estimates for the group-mean averages (i.e. the Mundlak devices, Mundlak 1978) in Nahm et al. (2017). This difference in the approaches is mandated by restrictions imposed by the methodology.

# Methodology

Union effects on wages can vary considerably along the wage distribution. Existing studies typically analyse regression quantiles to examine varying union-non-union wage differentials (e.g. Cai and Liu, 2008, and O'Leary *et al.*, 2004). These studies, however, analyse cross-sectional or pooled data without properly controlling for heterogeneity of individual workers. It appears that union effect is typically inflated when heterogeneity is uncontrolled for; see for example Graham *et al.* (2018) and Nahm *et al.* (2017). The present paper estimates quantile regression coefficients, explicitly controlling for heterogeneity of individual workers. It then uses a counterfactual decomposition method to analyse the contribution of individual covariates towards union-non-union wage differentials, as well as their contributions as a group, at various points in the marginal (i.e., unconditional) wage distribution.

## Quantile regression

Consider the model given by:

$$w_{it} = X_{it}'\beta(u_{it}) + \alpha_i \tag{1}$$

where $w$ is log wage, $X_{it}$ is the vector of observable covariates for individual $i$ in time $t$, $\alpha_i$ represents unobservable individual heterogeneity for individual $i$, and $X_{it}'\beta(u_{it})$ is strictly increasing in $u_{it}$ where $\beta(u_{it})$ is the coefficient vector that depends on $u_{it} \in (0,1)$. In general, $\alpha_i$ and $u_{it}$ can be arbitrarily correlated, in which case identification of the model is problematic. To facilitate identification of the model, we draw on Canay (2011) and assume that $\alpha_i$ and $u_{it}$ are independent from each other so that $\alpha_i$ is a location shifter, implying that the $\tau^{th}$ quantile, $\beta(\tau)$, is not affected by $\alpha_i$:

$$P(w_{it} \leq X_{it}'\beta(\tau) + \alpha_i \,|\, X_{it}) = P(w_{it} - \alpha_i \leq X_{it}'\beta(\tau) \,|\, X_{it}) = \tau \in (0,1). \tag{2}$$

As Canay explains, this allows us to obtain consistent estimates of $\beta(\tau)$ using a simple two-step method under some regularity conditions. In the first step, the fixed-effects model is estimated and a new variable $w^*$ is generated as $w_{it}^* = w_{it} - \hat{\alpha}_i$ where $\hat{\alpha}_i$ are the fixed-effects estimates. In the second step, the regression quantiles, $\hat{\beta}(\tau)$, are obtained by solving the following minimisation problem:

$$\min_{\beta} \sum_i \sum_t \rho_\tau(w_{it}^* - X_{it}'\beta) \tag{3}$$

where $\rho_\tau(v) = v \times \tau - v \times I(v<0)$ with $I(.)$ denoting the indicator function.[3]

3 Mahuteu *et al.* (2017) recently used the same method to examine public-private sector wage differentials.

The set of the covariates for our model consists of conventional determinants of wage, including: work experience and its square, occupation tenure and its square, job tenure and its square, a public-sector dummy, a dummy for marital status, a dummy for having one or more children aged between 0 and 4, a dummy for children aged between 5 and 9, two dummies for country of birth, four dummies for education level, three dummies for employment contract type, seven dummies for occupation, nine dummies for industry, five dummies for organisation size, twelve dummies for regions, eight dummies for waves, and a constant term. These are standard explanatory variables that are widely used for the analysis of wage determination; see for example Cai and Liu (2008), Cai and Waddoups (2011), Dobbie *et al*. (2014), Nahm *et al*. (2017) and Wooden (2001). The models for unionised workers and non-unionised workers are simultaneously estimated by adding the interactions of these variables with a union dummy variable. The issue of self-selection into union membership is not explicitly considered in our analysis, and it is assumed that selection into union membership is exogenous to the wage equations.[4] However, even if the selection process is endogenous, controlling for individual heterogeneity must have mitigated potential problems of this omission to the extent that the self-selection is a function of time-invariant characteristics of individual workers.

## Counterfactual decomposition

Regression quantiles provide valuable information about how the covariates affect log wage across its conditional distribution and how these effects are different between union and non-union. However, the regression quantiles themselves do not show how the wage differential between the two groups can be decomposed into the part that is due to the difference in the characteristics (*endowment effect* hereafter) and the part due to the difference in the returns to these characteristics (*coefficient effect* hereafter). Furthermore, regression quantiles represent the effects of covariates along the *conditional* distribution of log wage, and not along the *marginal* distribution. For instance, if the 90th regression

4 This is a practical decision we made in order to focus on the issue of varying wage differentials over different wage levels without making the analysis too complicated. The issue of self-selection into union membership is explicitly considered in Nahm *et al*. (2017) where they analyse mean wage differentials, as opposed to quantiles, by estimating a simultaneous-equations model that consists of two wage equations and an equation representing self-selection into union membership. In the context of this model, the present decision not to explicitly model the self-selection process could be justified if the random error term of the selection model were uncorrelated with the random errors of the wage equations, in which case the selection process is exogenous. If the selection process were exogenous, inclusion of an explanatory variable that is endogenously correlated with self-selection in the wage equations would not cause inconsistency in the estimates. For example, inclusion of occupation dummies in the present study would not be problematic even if union membership were a necessary condition for some occupations.

quantile for education is 0.05 (assuming that the variable is measured in years), it is implied that an additional year of education leads to a 5 per cent increase in wage for a worker whose wage is at the 90th percentile in the distribution of wages for workers with the same levels of the characteristics, including education. One would be more interested in these effects along a wage distribution that is not conditional on a specific set of covariates so that the effects can be analysed for workers with all levels of the characteristics. This would be achieved if the conditional distribution, which is conditional on a specific set of covariates, could be integrated over the whole domains of the covariates. Machado and Mata (2005) introduce a method of empirical integration through resampling. We draw on their method to decompose the overall wage differentials between union and non-union and to measure the endowment effects of individual covariates. We then extend their idea and attempt to measure the coefficient effects of individual covariates as well as their endowment effects. Machado and Mata's (2005) method and our extension to the methodology is explained in the appendix.

## Data

The data used for this study are extracted from the Household, Income and Labour Dynamics in Australia (HILDA) database. The HILDA is a household-based longitudinal study that has been collecting data annually from year 2001. The present paper analyses waves 9 (2009) through 17 (2017). Each wave includes a panel of six to eight thousand employees who were directly interviewed and aged between 15 and 65 in the year of interview, with a total of 67,572 wave-person observations. The number is evenly divided between males (33,744) and females (33,828), out of which 21.6 per cent and 24.0 per cent are union members, respectively; see Table 1.

It is worth noting that since the first wave of HILDA data in 2001 the estimates of trade union membership are typically 4-6 percentage points higher than those obtained from the Australian Bureau of Statistics (ABS). Wooden (2009) has argued that there are two reasons for this (i) HILDA includes membership of professional associations in its trade union membership question and (ii) HILDA only includes responses from people interviewed and excludes proxy responses from interviewees about other members of the household which the ABS includes. In terms of (i) from 2009 onwards a separate question has been included in the survey that asks only about trade union membership and that is the question used in this study. Furthermore, in terms of (ii) Wooden (2009) pointed out that this is expected to reduce the ABS estimate by at most 0.5 percentage points. Despite the change in question HILDA estimates continue to be 6 percentage points above the ABS estimates for any given year. Importantly, however, the HILDA estimate of trade union density has undergone the same dramatic decline since the period covered by Cai and Liu (2008). Specifically, the HILDA estimate fell from 30.5 per cent in 2004 to 21.5 per cent in 2017 a decline of 30 per cent.

Table 1 indicates that on average, union members are paid higher wages than those who are not union members ($33.23 vs. $30.08 per hour), where the gap is slightly higher for female workers ($31.41 vs. $27.68) than male workers ($35.26 vs. $32.40). The standard deviations and the Gini indices in Table 1 show that wages are more equally distributed among union members than non-unionised workers. Wages are more equally distributed among female workers than male workers, and the gap in inequality between union and non-union is larger for men than for women. The ratios of 25th percentile to 10th percentile imply that, for those who are paid relatively low wages, there is little difference in the degree of inequality between the gender-based groups or the union membership-based groups. For higher wage earners, however, the wage compression effect of unions is evident as the ratio of 90th percentile to 75th percentile for unionised workers remains largely unchanged while the ratio increases significantly for non-unionised workers.

Table 1: Summary statistics of wage rate by gender and union membership

| | Male | | | Female | | | All | | |
|---|---|---|---|---|---|---|---|---|---|
| | Union | Non-union | All Male | Union | Non-union | All Female | Union | Non-union | All |
| Average Wage | 35.26 | 32.40 | 33.02 | 31.41 | 27.68 | 28.58 | 33.23 | 30.08 | 30.80 |
| S.D. | 16.42 | 18.99 | 18.51 | 13.14 | 14.70 | 14.43 | 14.91 | 17.18 | 16.74 |
| Gini Index | 0.223 | 0.278 | 0.268 | 0.207 | 0.240 | 0.235 | 0.217 | 0.264 | 0.255 |
| P25/P10 | 1.224 | 1.237 | 1.238 | 1.225 | 1.212 | 1.204 | 1.241 | 1.221 | 1.218 |
| P90/P75 | 1.240 | 1.412 | 1.360 | 1.209 | 1.348 | 1.306 | 1.224 | 1.390 | 1.334 |
| Number of Obs. | 7,299 (21.6%) | 26,445 (78.4%) | 33,744 | 8,126 (24%) | 25,702 (76%) | 33,828 | 15,425 (22.8%) | 52,147 (77.2%) | 67,572 |

Notes: Wages are real hourly wages in 2011/12 Australian dollars.

Table 2: Sample means of the covariates by union membership and gender

| | Male | | Female | | | Male | | Female | |
|---|---|---|---|---|---|---|---|---|---|
| Variable | Union | Non-union | Union | Non-union | Variable | Union | Non-union | Union | Non-union |
| Work experience | 24.8** | 18.9 | 22.1** | 17.2 | *Industry* | | | | |
| Occupation tenure | 13.3** | 8.5 | 13.1** | 7.5 | Primary | 0.00 | 0.03** | 0.00 | 0.01** |
| Job tenure | 11.6** | 5.7 | 10.9** | 5.3 | Blue collar | 0.34** | 0.30 | 0.03 | 0.08** |
| Public sector | 0.45** | 0.15 | 0.61** | 0.23 | Wholesale/trans. | 0.14** | 0.12 | 0.02 | 0.05** |
| Married/de facto | 0.77** | 0.70 | 0.72** | 0.67 | Retail | 0.05 | 0.08** | 0.08 | 0.11** |
| Children 0–4 | 0.15 | 0.19** | 0.11 | 0.14** | Hospitality | 0.01 | 0.04** | 0.01 | 0.07** |
| Children 5–9 | 0.15 | 0.15 | 0.14 | 0.15 | Business services | 0.05 | 0.10** | 0.05 | 0.13** |
| *Country of birth* | | | | | Government | 0.16** | 0.08 | 0.08** | 0.07 |
| Australia | 0.82** | 0.80 | 0.83** | 0.80 | Education | 0.12** | 0.04 | 0.33** | 0.12 |
| Other English | 0.08 | 0.10** | 0.08 | 0.08 | Health/community | 0.08** | 0.05 | 0.37** | 0.23 |
| Non-English | 0.09 | 0.10** | 0.09 | 0.12** | Recreation/other | 0.05 | 0.15** | 0.03 | 0.13** |
| *Education* | | | | | *Firm size* | | | | |
| Tertiary | 0.26 | 0.28** | 0.50** | 0.33 | < 20 | 0.05 | 0.25** | 0.03 | 0.23** |
| Adv. Dip. & Dip. | 0.10** | 0.09 | 0.11 | 0.11 | 20–99 | 0.08 | 0.18** | 0.08 | 0.17** |
| Cert. III or IV | 0.36** | 0.28 | 0.16 | 0.21** | 100–499 | 0.16 | 0.17** | 0.14 | 0.17** |
| Year 12 | 0.13 | 0.17** | 0.10 | 0.17** | 500–999 | 0.09** | 0.07 | 0.07 | 0.08* |
| Year 11 or below | 0.15 | 0.17** | 0.12 | 0.18** | 1,000–4,999 | 0.19** | 0.12 | 0.11 | 0.12 |
| *Employment contract* | | | | | ≥ 5,000 | 0.43** | 0.20 | 0.57** | 0.23 |
| Fixed-term | 0.07 | 0.10** | 0.11 | 0.11 | *Region* | | | | |
| Casual | 0.06 | 0.16** | 0.07 | 0.22** | Sydney | 0.14 | 0.19** | 0.16 | 0.17* |
| Permanent/ongoing | 0.87** | 0.74 | 0.82** | 0.67 | Other NSW | 0.16** | 0.10 | 0.15** | 0.11 |
| Other | 0.00 | 0.00* | 0.00 | 0.00 | Melbourne | 0.19 | 0.18 | 0.18 | 0.20** |
| *Occupation* | | | | | Other VIC | 0.08** | 0.06 | 0.08** | 0.07 |
| Manager | 0.07 | 0.18** | 0.06 | 0.10** | Brisbane | 0.09 | 0.10** | 0.11* | 0.10 |
| Professional | 0.22* | 0.21 | 0.50** | 0.24 | Other QLD | 0.12 | 0.11 | 0.10 | 0.11* |
| Technician/Trades | 0.22 | 0.21 | 0.02 | 0.05** | Adelaide | 0.07** | 0.06 | 0.06 | 0.07 |
| Com. & pers. Service | 0.11** | 0.06 | 0.17 | 0.16 | Other SA | 0.02 | 0.03** | 0.02 | 0.02** |
| Clerical & admin. | 0.07 | 0.08** | 0.13 | 0.27** | Perth | 0.05 | 0.07** | 0.06 | 0.07** |
| Sales | 0.02 | 0.06** | 0.07 | 0.11** | Other WA | 0.03** | 0.02 | 0.01 | 0.02** |
| Machinery operator | 0.17** | 0.10 | 0.01 | 0.01** | TAS | 0.04** | 0.03 | 0.05** | 0.03 |
| Labourer | 0.11* | 0.10 | 0.05 | 0.06* | NT | 0.01 | 0.01** | 0.01 | 0.01** |
| | | | | | ACT | 0.02 | 0.03 | 0.02 | 0.02** |

Notes: Work experience, occupational tenure and job tenure measured in years. * and ** implies significantly larger than the other at 5 % and 1 %, respectively, in the comparison between union and non-union.

Table 2 reports the sample means of the variables used in the model. As normally observed in the literature, unionised workers in the sample are more experienced and have longer occupation and job tenures. Further, compared with non-unionised workers, unionised workers are more likely to be born in Australia; have post-school education; be a permanent employee; work for a large company; and be employed in a blue-collar industry, or government, education, or health and community sector. These observations reveal very little beyond what is already well known in the literature. What is less known, however, is detailed information about the drivers of the wage differentials, especially at different points in the wage distribution. The empirical analysis in the next section addresses this issue.

# Empirical Results

This analysis has generated a large amount of output. For brevity we report and discuss only the results of the decomposition analysis. In addition, when we further decompose the overall results reported in Table 3 into the individual cofactors we report only a small subset of these that are especially relevant to our core analysis. The results from our quantile regression analysis and decomposition are generally sensible and consistent with expectation and previous literature. A full set of results, with a written report, are available on request.

## Results from overall decomposition

In Table 3 the combined difference (as defined by equation A2 in the appendix) from the overall decomposition for males indicates that wages for unionised workers differ from those for non-unionised at the 10th, 25th, 50th, 75th and 90th percentiles by 17.5 per cent, 19.6 per cent, 18.3 per cent, 9.7 per cent and -5.4 per cent. The negative differential at the 90th percentile is not statistically significant.[5] The corresponding numbers for females are 14.5 per cent, 15.1 per cent, 18.8 per cent, 15.7 per cent and 6.4 per cent.[6] These findings are consistent with the idea that unions tend to raise wages, and to do so more for workers at the lower end of the wage distribution than at the top, and by so doing help to compress union wages.

5 Fransden (2012) also finds evidence for a significant increase in wage effect at the low end, and a negative wage effect at the very top, of the distribution for workers in the USA estimating quantile treatment effects within a regression discontinuity design.

6 These results are numerically similar those in Schmitt (2008) who finds (for pooled males and females) 20.6 per cent at the 10th percentile and 6.1 per cent at the 90th percentile, using USA data for 2003-7.

Table 3: Decomposition of log-wage difference between union and non-union

| | P10 | P25 | P50 | P75 | P90 | P25/P10 | P90/P75 | SD | Gini |
|---|---|---|---|---|---|---|---|---|---|
| *Males* | | | | | | | | | |
| Combined difference | **0.175** | **0.196** | **0.183** | **0.097** | -0.054 | 0.002 | **-0.043** | **-0.093** | **-0.018** |
| Endowment effect | **0.179** | **0.165** | **0.150** | **0.062** | **-0.102** | **-0.010** | **-0.045** | **-0.105** | **-0.019** |
| Coefficient effect | -0.004 | **0.031** | **0.033** | **0.035** | **0.048** | 0.013 | 0.003 | **0.012** | **0.001** |
| *Females* | | | | | | | | | |
| Combined difference | **0.145** | **0.151** | **0.188** | **0.157** | **0.064** | -0.002 | **-0.029** | **-0.039** | **-0.009** |
| Endowment effect | **0.126** | **0.136** | **0.167** | **0.140** | **0.071** | 0.000 | **-0.022** | **-0.031** | **-0.007** |
| Coefficient effect | **0.019** | **0.014** | **0.021** | 0.016 | -0.007 | -0.002 | -0.007 | **-0.008** | **-0.002** |

Notes:
For each characteristic function, g(.), the differences are g(union) minus g(non-union).
Bold figures are significant at 5 %, implying that 95 % confidence interval does not include zero. The confidence intervals are estimated using the bootstrap method with 200 repeated samples.

The closest study to the current paper for Australia is Cai and Liu (2008). The estimates reported as the "total wage gap in simulated data" and the "gap due to difference in returns", in Table 2 of their paper are comparable with our estimates for the combined difference and the coefficient effect, respectively. They found that for males the total wage gap in simulated data between union and non-union wages decrease from 20 per cent, 16.7 per cent, 13.9 per cent, 7.1 per cent to -2 per cent across the 10th, 25th, 50th, 75th, and 90th percentiles. For females, the corresponding union-non-union wage differential was estimated to be 17 per cent, 14.2 per cent, 18.5 per cent, 17.7 per cent and 10 per cent. Despite differences in methodology and data period employed, these results are numerically similar to those in this paper, and the qualitative picture they paint about the effect of unions on inequality across the distribution is the same. The fact that Cai and Liu's results are systematically larger than ours is possibly explained by their not controlling for unobserved heterogeneity. It might also reflect the fact that their sample data came from a period where union power was greater for the reasons discussed previously.

Cai and Waddoups (2011) also explored whether unions are more effective at raising wages at the top or bottom of the wage distribution using HILDA from the years 2001-6. While they did not estimate quantile regressions, part of their analysis involved estimating separate fixed effects regressions for high and low skill workers, where skill was defined by education and predicted wages. They found statistically significant union-non-union wage differentials only for low skill workers. For low skill males, wages were 8 per cent higher using predicted wages, and 5 per cent higher using education levels, than for non-unionists. For females they found a statistically significant union effect of 4 per cent at the second quartile using predicted wages. No statistically significant union effects were found at the higher skill end for male or female unionists.

Table 3 contains other evidence for wage compression. The numbers in the columns headed P25/P10 (ratio of 25th to 10th percentile), P90/P75 (ratio of 90th to 75th percentile),

SD (Standard Deviation) and Gini (Gini Index) are the differences between the union and non-union values of these statistics. As such they are measures of 'relative inequality' between the two groups, with a negative sign suggesting less inequality among union compared to non-union workers. The negative sign in front of the P90/P75 ratios in Table 3, in the combined difference rows for both males and females, indicates lower inequality at the top of the wage distribution for unionists compared to non-unionists. The same comments apply to the numbers recorded under the headings, SD and Gini, in the same row for both genders.

Comparing union effects on wages across countries is challenging as the nature of unions and the institutional environments in which they operate are quite different (Bryson, 2014). Moreover, most of the results with which ours might be compared are from regressions on the conditional distribution which often do not control for unobserved heterogeneity. That said, a significant international literature finds support for the idea that unions both raise and compress wages. See for example: Schultz and Mwabu (1998) using 1993 data for South African workers; Fritzenberger, Kohn and Lembcke (2013) for German workers using matched employer-employee data for 2001; Blunch and Verner (2001) for manufacturing workers in Ghana; O'Leary, Murphy and Blackaby (2004), Marquilef- Bachler *et al*. (2009) and Hildreth (1999) for the UK (Marquilef-Bachelor *et al*. only find evidence for this for public sector males, and only once the decision to join a union is endogenised); Falaris (2004) for Panama; Fransden (2012) and Schmitt (2008) for the USA.

Very few of these studies attempt to decompose the total differences between union and non-union workers into a part that is due to differences in endowments, and a part due to different returns to those endowments. As noted in the introduction to this paper, Cai and Liu (2008) conducted such a decomposition and found that 70 per cent of the observable difference in wages between male union and non-union workers could be explained by different returns, with the rest due to differences in endowments. The corresponding figures for females were 30 per cent for returns and 70 per cent due to different endowments. A clear point of difference in our results, reported in Table 3 is that for both genders the differences in earnings between union and non-union workers is driven overwhelmingly by endowment effects, as can be seen from the endowment effect rows for males and females. These effects are statistically significant at all the reported quantiles. Table 3 indicates that the coefficient effects are also mostly statistically significant and positive, implying that unionised workers receive higher returns than non-unionised workers for their characteristics. However, the size of these effects is much smaller than the size of the endowment effects, indeed the endowment effects tend to be about six times the size of the coefficient effects on average. This finding is consistent with a previous Australian study by Nahm *et al*. (2017). In that study the decomposition of the estimates, at the mean values of the covariates, suggested that around 80 per cent of the difference between the wages of union and non-union workers was due to different endowments.

The SD and Gini measures of relative inequality in Table 3 for the combined difference for both genders are negative. This implies that wages among unionised workers are more equally distributed than those among non-unionised workers. An examination of the endowment effect and coefficient effect for both genders in Table 3 indicates that the reason for this is that union workers have endowments that are more homogeneously

distributed. For male workers, the coefficient effects on these measures are positive, meaning that the reward system for unionised workers increases wage inequality relative to non-unionised workers. However, this effect is dominated by the inequality-reducing effect of more homogeneous distribution of characteristics among unionised workers than non-unionised workers, resulting in the negative values of relative inequality measures. For female workers, both endowment effect and coefficient effect are negative, but the size of the endowment effect is many multiples that of the coefficient effect.

## The 'pure' union wage effects

The coefficient effects in Table 3 indicate that the top three quarters of unionised male workers enjoy an overall wage premium of 3.1 per cent to 4.8 per cent, with the size steadily increasing as one moves up through the wage distribution. This is consistent with the positive signs of the coefficient effects for SD and Gini index for male workers. In contrast the coefficient effects in Table 3 for females indicates that only the bottom half of these workers enjoy a significant wage premium, which ranges between 1.9 per cent and 2.1 per cent. These are the 'pure' union-non-union wage differentials in the sense that they do not result from differences in endowments. They result from differences in the way the market rewards those endowments between union and non-union workers. Note that they are small by comparison to the role played by different endowments in explaining the combined wage differences that we observe for both males and females in Table 3. It is again relevant to compare our results to those of Cai and Liu (2008) which for males ranged from 16 per cent at the 10th percentile to 1 per cent at the 90th percentile. For females the figure was a relatively constant 5 per cent for the bottom 75 per cent of the wage distribution, and a statistically insignificant negative 0.6 per cent at the 90th percentile. There are a number of reasons for the differences in magnitude between Cai and Liu and our paper. First, we control for unobserved heterogeneity. Second, we use a somewhat different methodology to do the decomposition. Third, we use a different, arguably more appropriate measure of individual union membership available from wave 9 onwards. Fourth, they may reflect reduced union power in our sample period.

## Differences in endowments and what do unions do?

The analysis of pure union-non-union wage differentials suggests that the ability of unions to raise wages and thus earnings is quite limited in Australia. However, some of the endowment differences between unionists and non-unionists may also be the result of union activity. Specifically, Freeman and Medoff (1984) discuss how the 'collective voice' face of unions often involves unions pushing for procedurally fair arrangements for workers around such things as retrenchment, redeployment and redundancy, as well as grievance and performance matters. These arrangements are typically designed to limit the power of employers to dismiss employees at will and function to increase the employment security of

unionists which generates better employment stability. Consequently, unionists compared to non-unionists will have superior amounts of three important forms of human capital: general labour market experience, occupational tenure and job tenure that have been shown to be drivers of higher lifetime earnings for workers in Australia (Dobbie *et al.* 2014), the US (Kambourov and Manovskii 2009) and the UK (Zangelidis 2008). In the current study unionists do in fact have more of these three forms of human capital compared to non-unionists. This is evident in Table 4, which reports a decomposition analysis in which the overall differentials are further decomposed into the effects of three individual experience cofactors (as defined by equation A3 in the appendix).

Table 4: Decomposition of log-wage difference between union and non-union, labour market experience cofactors

| | P10 | P25 | P50 | P75 | P90 | P25/P10 | P90/P75 | SD | Gini |
|---|---|---|---|---|---|---|---|---|---|
| *Males* | | | | | | | | | |
| *Work experience* | | | | | | | | | |
| Combined difference | **0.079** | **0.090** | **0.080** | **0.062** | **0.042** | 0.001 | -0.006 | **-0.020** | **-0.005** |
| Endowment effect | **0.074** | **0.079** | **0.071** | **0.044** | **0.029** | -0.000 | -0.005 | **-0.016** | **-0.004** |
| Coefficient effect | **0.006** | **0.012** | **0.009** | **0.018** | 0.013 | 0.002 | -0.002 | **-0.004** | **-0.001** |
| *Occupation Tenure* | | | | | | | | | |
| Combined difference | **0.033** | **0.031** | **0.029** | **0.028** | -0.001 | -0.002 | -0.008 | -0.019 | **-0.003** |
| Endowment effect | **0.038** | **0.044** | **0.034** | **0.038** | **0.010** | 0.001 | -0.008 | -0.016 | **-0.003** |
| Coefficient effect | -0.005 | **-0.013** | **-0.005** | **-0.011** | **-0.011** | -0.002 | 0.000 | **-0.003** | **-0.000** |
| *Job Tenure* | | | | | | | | | |
| Combined difference | **0.039** | **0.063** | **0.054** | **0.059** | 0.016 | 0.007 | -0.013 | **-0.012** | **-0.003** |
| Endowment effect | **0.038** | **0.066** | **0.055** | **0.059** | 0.019 | 0.008 | -0.012 | **-0.012** | **-0.003** |
| Coefficient effect | 0.000 | -0.003 | -0.001 | 0.000 | -0.003 | -0.001 | -0.001 | 0.000 | 0.000 |
| *Females* | | | | | | | | | |
| *Work experience* | | | | | | | | | |
| Combined difference | -0.006 | -0.003 | -0.018 | -0.012 | **-0.028** | 0.001 | -0.004 | **-0.012** | **-0.001** |
| Endowment effect | **0.025** | **0.034** | **0.028** | **0.045** | **0.043** | 0.002 | -0.001 | 0.003 | 0.000 |
| Coefficient effect | **-0.032** | **-0.037** | **-0.046** | **-0.057** | **-0.070** | -0.001 | -0.003 | **-0.015** | **-0.001** |
| *Occupation Tenure* | | | | | | | | | |
| Combined difference | 0.009 | **0.025** | **0.034** | **0.047** | **0.037** | 0.005 | -0.003 | 0.014 | 0.002 |
| Endowment effect | **0.023** | **0.039** | **0.041** | **0.051** | **0.041** | 0.005 | -0.004 | 0.007 | 0.000 |
| Coefficient effect | **-0.014** | **-0.013** | **-0.007** | **-0.004** | -0.004 | 0.000 | 0.000 | **0.008** | **0.001** |
| *Job Tenure* | | | | | | | | | |
| Combined difference | **0.028** | **0.052** | **0.048** | **0.047** | **0.030** | 0.008 | -0.005 | -0.002 | -0.001 |
| Endowment effect | **0.032** | **0.060** | **0.056** | **0.053** | **0.035** | 0.009 | -0.006 | -0.002 | -0.001 |
| Coefficient effect | **-0.005** | **-0.008** | **-0.008** | **-0.006** | **-0.004** | -0.001 | 0.001 | 0.000 | **0.000** |

Notes:
1. For each characteristic function, g(.), the differences are g(union) minus g(non-union).
2. Bold figures are significant at 5 %, implying that 95 % confidence interval does not include zero. The confidence intervals are estimated using the bootstrap method with 200 repeated samples.

Table 4 shows that both male and female unionists have better endowments of work experience, occupational and job tenure, than their non-union counterparts, across the entire wage distribution. The coefficient effects of work experience are positive for men, but they are negative for women, at all wage levels. By contrast, Cai and Liu (2008) report negative coefficient effects for experience for unionised males, with the opposite being the case for unionised females. O'Leary *et al*. (2004) report negative union effects for experience for both males and females in the UK. Our results imply that male unionised workers are rewarded better for longer work experience than non-unionised workers, but that the opposite is true for female unionists. The penalty experienced by female unionists increases steadily as wage rate increases.

In addition, our analysis shows that work experience is a factor that reduces inequality in the distribution of wages among unionised workers in comparison with non-unionised workers for both men and women. This is evident from the fact that the SD and Gini in the combined difference row in Table 4 are significant and negatively signed. However, our analysis shows that the main drivers for this are different between men and women. For men, work experience lowers inequality among unionised workers mainly because they have a more homogenous distribution of work experience, the SD and Gini on endowment effects are -0.016 and -0.004 respectively. For women, however, inequality in wages is lower among unionised workers because they are penalised more for being unionised at higher wages, with the coefficient effects going from -0.032 to -0.07 as we move up the female wage distribution.

For the other two experience-related characteristics, the endowment effects are significantly positive throughout the wage distribution for both men and women, except for the 90th percentile of job tenure for men where the effect is positive but insignificant. This is consistent with what was reported earlier in the paper, that unionised workers have significantly longer occupation and job tenures on average than non-unionised workers. The coefficient effects are significantly negative except for the case of job tenure for men. Both tenure variables contribute toward lowering inequality in the wage distribution among unionised males in comparison with non-unionised males, but their effects on inequality are insignificant for female workers. As was the case for work experience, the main reason for this, in the case of males, is the more homogeneous distribution of these characteristics among male unionised workers. This analysis suggests that unions can increase the earnings of their members directly by raising wages and indirectly by increasing experience related forms of human capital. It also adds additional insight into how union associated wage compression occurs.[7]

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7 One objection to this line of argument is that unionists have greater amounts of experience related human capital, not because of the activity of unions, but because unionists are on average older than non-unionists. To test this we split the sample into a younger workers, aged 18-40 years and older workers aged 41-65 years. Even among younger workers unionists have significantly greater amounts of the three forms of human capital than do non-unionists. The reader may be concerned about potentially bi-directional causality between union membership and human capital. However,

One final piece of evidence to support this comes from Dobbie *et al*. (2017). That paper found that unions in Australia trade-off wages in return for better workplace training options for union members. These better workplace training options should correlate with better work experience, job and occupational tenure outcomes.

## Conclusion

Our analysis indicates that unionists earn significantly more than equivalent non-unionists across the wage distribution. Our results suggest that the union-non-union wage differential tends to diminish as we move up the wage distribution and for males at the very top there may be no effect at all from union membership. These results are consistent with various approaches which suggest unions tend to compress wages. We decompose this differential into a part that relates to different endowments and a part that relates to different returns to those endowments. The latter are the pure union effects. We find them to be small and indeed smaller than typically found in the previous Australian literature. This may be partly due to our methodology which allows us to control for factors which have been shown to otherwise inflate union effects. It may also reflect the more challenging environment in which unions operate in Australia these days. The bulk of the observed union-non-union wage differential, what we call the combined difference, is due to the possession of superior endowments by unionists. Moreover, our analysis reveals that these endowments also tend to be more homogeneously distributed among unionists and this is the main reason that union wages are more compressed.

While not strictly part of the analytical core of this paper we speculate that these better endowments may result, at least in part, from the actions that unions undertake in respect to the 'collective voice'. These actions aim to create greater employment stability for unionists and hence result in them possessing more of the various forms of labour market experience that have been shown to add to lifetime earnings. Future research on union-non-union wage differentials may be better focused on exploring in more detail the role played by collective voice, as opposed to the monopoly face of unions.

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under the same assumption of exogenous selection into union membership, such reverse causality in the selection model would not be problematic to obtaining consistent estimates of the coefficients of the wage equations.

# Appendix: Counterfactual decomposition

This appendix describes the method by Machado and Mata (2005) and our extension to the methodology. For convenience of the description of the methodology, let $X^1$ be the $(n_1 \times K)$ matrix of $n_1$ observations on the $K$ covariates for union members in the sample, and $X^0$ be the $(n_0 \times K)$ matrix of the covariates for non-unionised workers. The quantile regression coefficient vectors corresponding to these design matrices are denoted by $\beta^1(\tau)$ and $\beta^0(\tau)$, respectively, where $\tau$ has a uniform distribution between 0 and 1. The marginal distributions of log wage that are consistent with the estimated quantile coefficients are simulated as follows.

(a1) Randomly draw a large number of observations (say, $m$ observations) from the uniform distribution between 0 and 1. Denote these $m$ observations as $\{\tau_i\}_{i=1}^{m}$.

(a2) Estimate the quantile regression model (2)-(3) for each $\tau_i$ using the $n_1$ observations of unionised workers and then using the $n_0$ observations of non-unionised workers. Denote these $2m$ sets of quantile coefficient estimates as $\left\{\hat{\beta}^1(\tau_i)\right\}_{i=1}^{m}$ for union and $\left\{\hat{\beta}^0(\tau_i)\right\}_{i=1}^{m}$ for non-union.

(a3) Generate a random sample of m observations on the covariates by drawing with replacement from the rows of each of $X^1$ and $X^0$. Denote these two random samples by $\left\{X_i^1\right\}_{i=1}^{m}$ for union and $\left\{X_i^0\right\}_{i=1}^{m}$ for non-union.

(a4) The marginal distributions of $w^*$ are then obtained by $\left\{w_i^*\left(X^j;\beta^h\right) \equiv X_i^j\hat{\beta}^h(\tau_i)\right\}_{i=1}^{m}$ where $j$ = 0, 1 and $h$ = 0, 1.

(a5) Individual heterogeneity ($\hat{\alpha}_i$) is a significant part of predicted log wages. Hence, it is sampled together with the other cofactors in step (a3), and it is added to $w_i^*$ to construct the marginal distributions of log wage:

$$\left\{w_i\left(X^j,\hat{\alpha}^j;\hat{\beta}^h\right) = w_i^*\left(X^j;\hat{\beta}^h\right) + \hat{\alpha}_i^j \equiv X_i^j\hat{\beta}^h(\tau_i) + \hat{\alpha}_i^j\right\}_{i=1}^{m}. \quad \text{(A1)}$$

This allows us to simulate not only the factual union and non-union marginal distributions that are consistent with the regression quantiles, but also counterfactual distributions. For instance, the marginal distribution of log wage that would prevail in the counterfactual situation where the covariates are distributed as for non-unionised workers while the returns to those covariates are the same as those applied to unionised workers is given by $\left\{w_i\left(X^0,\hat{\alpha}^0;\hat{\beta}^1\right)\right\}_{i=1}^{m}$.

Let $g(w)$ be a characteristic function, such as a quantile or the standard deviation, of the marginal distribution of $w$. Further, let $w^1$ and $w^0$ denote log wages for

union and non-union, respectively. Then, the differential in $g(w)$ between union and non-union is obtained as follows:

$$\begin{aligned}
&g(w^1) - g(w^0) \\
&= g\left[w\left(X^1, \hat{\alpha}^1; \hat{\beta}^1\right)\right] - g\left[w\left(X^0, \hat{\alpha}^0; \hat{\beta}^0\right)\right] + \text{residual} \\
&= \left\{g\left[w\left(X^1, \hat{\alpha}^1; \hat{\beta}^1\right)\right] - g\left[w\left(X^0, \hat{\alpha}^0; \hat{\beta}^1\right)\right]\right\} \\
&+ \left\{g\left[w\left(X^0, \hat{\alpha}^0; \hat{\beta}^1\right)\right] - g\left[w\left(X^0, \hat{\alpha}^0; \hat{\beta}^0\right)\right]\right\} + \text{residual}
\end{aligned} \tag{A2}$$

The first row represents the difference in the characteristic function between the distributions of $w^1$ and $w^0$ in the sample, which is referred to as the *total difference*. The difference between the first two terms in the second row represents the difference in the characteristic function between the simulated distributions of $w^1$ and $w^0$, which we refer to as the *combined difference*. The third row is the difference between the simulated distribution of wage for union workers and the counterfactually simulated distribution of wage for non-unionised workers that would prevail if the returns to their characteristics were the same as those for unionised workers. Thus, this represents the *endowment effect*. Finally, the difference between the first two terms in the fourth row represents the *coefficient effect* because it is the difference between the two distributions with the same covariate distributions but different coefficients. Note that the coefficient for heterogeneity is unity, and hence it is treated as an endowment. As such, for the ease of exposition, heterogeneity is no longer denoted separately, and it is treated like any other cofactor hereafter.

In addition to the above decomposition of overall difference, the difference pertaining to each cofactor is also decomposed into the endowment effect and the coefficient effect. Let $z$ be the cofactor of interest and $x$ be the vector of the other cofactors, where the coefficient vector is accordingly divided into $\delta(\tau)$ for $z$ and $\theta(\tau)$ for $x$. The combined difference in the characteristic function pertaining to covariate $z$ is decomposed as follows:

$$\begin{aligned}
&g\left[w\left(x^1, z^1; \hat{\theta}^1, \hat{\delta}^1\right)\right] - g\left[w\left(x^1, z^0; \hat{\theta}^1, \hat{\delta}^0\right)\right] \\
&= \left\{g\left[w\left(x^1, z^1; \hat{\theta}^1, \hat{\delta}^1\right)\right] - g\left[w\left(x^1, z^0; \hat{\theta}^1, \hat{\delta}^1\right)\right]\right\} \\
&+ \left\{g\left[w\left(x^1, z^0; \hat{\theta}^1, \hat{\delta}^1\right)\right] - g\left[w\left(x^1, z^0; \hat{\theta}^1, \hat{\delta}^0\right)\right]\right\}
\end{aligned} \tag{A3}$$

The rows above represent the combined difference, endowment effect, and coefficient effect of $z$, respectively. The distribution of $w\left(x^1, z^1; \hat{\theta}^1, \hat{\delta}^1\right)$ is simulated by

(A1). The counterfactual distribution of $w\left(x^1, z^0; \hat{\theta}^1, \hat{\delta}^1\right)$, which represents the distribution of wage that would prevail if only the distribution of $z$ were like non-unionised workers while all the other cofactors and all the coefficients, including those for $z$, are the same as unionised workers. We draw on Machado and Mata (2005) to simulate this distribution as follows.

(b1) Classify the $n_0$ observations for non-unionised workers in the sample into subgroups according to the size of $z$, and calculate the relative frequency $(f_k)$ for each subgroup. (For discrete variables, the subsets are naturally given and hence classification is not necessary.)

(b2) Consider the distribution $\left\{w_i\left(x^1, z^1; \hat{\theta}^1, \hat{\delta}^1\right)\right\}_{i=1}^{m}$ that was obtained for the decomposition of overall difference. Randomly draw $m \times f_k$ observations with replacement from the subgroup of this distribution for which $z$ belongs to subgroup $k$. Repeating this for all subgroups provides the desired distribution of $w\left(x^1, z^0; \hat{\theta}^1, \hat{\delta}^1\right)$.

Machado and Mata (2005) only consider the endowment effects and hence they did not construct the distribution $\left\{w_i\left(x^1, z^0; \hat{\theta}^1, \hat{\delta}^0\right)\right\}_{i=1}^{m}$. We obtain this distribution as follows.

(b3) Identify the coefficients, $\hat{\beta}^0(\tau_i)$, that correspond to $X_i^1$ in constructing $X_i^1\hat{\beta}^0(\tau_i)$ for each $\tau_i$ in steps (a4)-(a5).

(b4) For the $m$ observations generated in step (b2), $w\left(x^1, z^0; \hat{\theta}^1, \hat{\delta}^1\right)$, replace $\left\{\hat{\delta}^1(\tau_i)\right\}_{i=1}^{m}$ with $\left\{\hat{\delta}^0(\tau_i)\right\}_{i=1}^{m}$ to produce $\left\{w_i\left(x^1, z^0; \hat{\theta}^1, \hat{\delta}^0\right)\right\}_{i=1}^{m}$.

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# Mapping gender-bias in the Australian health and care industry: A case study

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## Abstract

Gender-bias in employment has long been a site of concern for social policy. Enduring gender patterns have seen an overrepresentation of men in high status, highly paid and executive roles, while women dominate less (monetarily) valued care work sectors internationally. While existing research has highlighted the negative impacts of this gender bias for women, as well as demonstrating the positive experiences of care work roles for men, it is unclear whether any significant change in male representation is occurring. This article contributes to contemporary understandings of gender-bias in employment by mapping gender patterns in the Australian healthcare and social assistance industry from 2006 to 2020. Drawing on Australian census and workforce statistical data we highlight the significant patterns over time and explore how these might inform developments in social policy to address gender bias in health and care occupations. We conclude by arguing that a broad collaboration of government, professional bodies, educational and industry organisations is needed to mount a sustained challenge to pervasive gender bias in health and care industries.

JEL Codes: I11, J21, J24
Keywords: Gender, care work, healthcare, employment, Australia

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# Introduction

The healthcare and social assistance industry is the largest employing industry in Australia, accounting for 14.26 per cent of the country's working population in 2020 (ABS 2020). The industry includes health services (such as hospitals and primary healthcare) and various care sectors including aged and disability care. With the rollout of a National Disability Insurance Scheme coupled with an ageing population, strong growth is expected to continue through to 2050 (Deloitte Access Economics 2020). However, there is one area in which the sector has stagnated despite otherwise steady growth: the Australian healthcare and social assistance industry remains highly segregated by sex (Foley and Cooper 2021). Census data consistently shows a pattern of gender bias that classifies the industry as 'female dominated', a categorisation that requires the overrepresented gender to make up at least 70 per cent of the workforce (Pocock 1998; and Preston and Whitehouse 2004). This pattern speaks to complex social, economic and policy relations that perpetuate traditional gender roles and require nuanced social policy solutions to address them. This article seeks to inform such solutions by presenting a thorough examination of the literature and initiatives focused on men's employment in health and care occupations and mapping gender bias in the Australian sector through nationally representative data. Based on our analysis, we argue for a multi-dimensional approach to addressing gender bias in the industry, in order to improve labour market outcomes for all genders.

The female dominance of employment in this industry has been noted across Australia, Canada, the UK and Western Europe, with decades of scholarship dedicated to researching the gendered experiences of those in the sector (see, for instance, Adams 2010; Cottingham *et al*. 2015; Davies 1995; England 2010; Floge and Merril 1986; Hay *et al*. 2019; Lindsay 2005; Pascall and Lewis 2004; and Shannon *et al*. 2019).[1] Gendered segregation in health and care work has been attributed to social norms that frame certain roles as 'suitable' for particular gender identities, as well as policy shaped around the male breadwinner/female carer model in which men are presumed to be the main provider for a family and compensated accordingly (Gottfried and Reese 2008; Hay *et al*. 2019; Orloff 2002; and Pascall and Lewis 2004). Pervasive gender norms include the designation of empathy, nurturing and care-taking as feminine traits, assumed to be held by women, while rationality, leadership and decision making are framed as masculine and assumed to be aspired to and held by men (Connell 1987; Daly 2002; and Hay *et al*. 2019). In the context of the healthcare and social assistance industry, these ideals have encouraged

1 Although the authors are informed by a sociological understanding of sex and gender as both separate (though often linked) and socially constructed, the datasets drawn on in this project collect statistics based on 'sex' encouraging a problematic conflation of the two. Thus the reader will see reference to sex segregation/dominance patterns in the sector, as well as gender bias/construction in discussions of the social norms shaping employment.

men to gravitate towards managerial and 'cure' roles – such as socially and financially rewarding positions in medicine and upper management – while women are consistently overrepresented in 'care' roles, such as nursing, childcare and aged care (Hay *et al*. 2019).

Efforts to address gender bias in employment have typically focused on encouraging increased employment and improved conditions for women in traditionally masculine occupations (England 2010). However, a growing body of research investigating men's employment in traditionally feminised occupations is slowly emerging (e.g. Hardie 2015; Clow *et al*. 2014; and Moskos 2019). This expansion of the field can be seen as vital for all genders, with many scholars stating that after significant advancements for women in the last few decades the gender revolution is stalled due to men's lack of change (Friedman 2015; Hochschild 1989; and Williams 2015). We contend that a key aspect of this change is evidence-based, gender-focused social policy (Gottfried and Reese 2008) and this article is intended as a tool to facilitate the development of this with regards to the Australian healthcare and social assistance sector.

## Literature Review

Literature around men's involvement in health and care work both within Australia and internationally focus on three key themes: (1) barriers and facilitators to men's employment in health and care work, (2) men's experiences of working in these sectors, and (3) the initiatives designed to promote greater male representation. Below we briefly review the key findings pertaining to each of these three themes to provide context for the data analysis and discussion to follow.

### Barriers and facilitators to men's employment in health and care work

Existing research demonstrates that men face multiple barriers to employment in the healthcare and social assistance sector, often seeking these roles only after other opportunities have been unsuccessful (Isherwood *et al*. 2018; and Moskos and Isherwood 2019). There are several factors contributing to this, largely attributed to the perceptions associated with female-dominated occupations. Many roles in the sector have, and continue to be, associated with 'women's work' (Dill *et al*. 2016; King *et al*. 2013; and Litosseliti and Leadbeater 2013), requiring 'feminine' skills and attributes such as caring, listening and communication skills and a nurturing disposition (England 2005; and Pease 2011). These expectations promote scepticism around men's suitability for these roles from employers (King *et al*. 2013), prospective male workers (Bagihole and Cross 2006; Hussein *et al*. 2016; Khunou *et al*. 2012; and Loughrey 2008) and their friends and family who may question male workers' motivation, masculinity and sexuality (Khunou *et al*. 2012; Peeters 2007; Pirard *et al*. 2015; and Segev and Lander 2019). The pre-existing lack of male representation may prevent men from considering roles in the sector as options for them (Litosseliti and Leadbeater 2013; McLaughlin *et al*. 2010; and Vector Research

2009), with some existing research highlighting that men may not be aware of the types of roles available in the sector or, alternately, may be deterred by the prospect of entering a work environment in which they will be a minority (Boyd and Hewlett 2001; Chen *et al*. 2017; Hussein and Christensen 2017; Moskos 2019; and Simpson 2004).

The devaluation of female dominated occupations within the healthcare and social assistance industry, and resulting perceptions of low pay and status for these roles, is a further barrier for men's employment in the sector (Chen *et al*. 2017; Daly 2002; Dill *et al*. 2016; Hussein *et al*. 2016; Khunou *et al*. 2012; and Peeters 2007). This can serve as a deterrent for prospective male workers with familial and financial responsibilities (Cheng *et al*. 2018; and Moskos and Isherwood 2019), as well as those who seek advancement and recognition in their career trajectories (Bagilhole and Cross 2006; Hussein and Christensen 2017; and Litosseliti and Leadbeater 2013). Research demonstrates that when men do occupy care worker roles, this is often as a 'last resort' (King *et al*. 2013) with an overrepresentation of men from minority backgrounds who tend to be disadvantaged in the broader labour market (Dill *et al*. 2016; Hussein and Christensen 2017; and Wingfield 2009).

Despite these barriers, some men do choose to work within the healthcare and social assistance industry, citing several key reasons. Firstly, the sector has seen increased work opportunities (Hussein *et al*. 2016; and Moskos and Isherwood 2019). This is a noteworthy attribute particularly in the context of declining opportunities in typically male-dominated industries such as manufacturing (Bagilhole and Cross 2006; Dill *et al*. 2016; and Isherwood *et al*. 2018). Awareness of the healthcare and social assistance sector – particularly through contact with men working in the industry – positively influences prospective male workers to enter the sector (Blackley *et al*. 2019; Boyd and Hewlett 2001; Brody 2015; and Litosseliti and Leadbeater 2013). Health and care work is also appealing to male workers who seek employment that is people-focused, socially important and provides an opportunity to have a positive impact on people's lives (Blackley *et al*. 2019; Boyd and Hewlett 2001; Cameron 2001; Chen *et al*. 2017; Fiore and Facchini 2013; Moskos and Isherwood 2019; Pirard *et al*. 2015; and Simpson 2004). Flexible work facilitating work-life balance is a further factor encouraging men to seek employment in the industry (Asakura and Watanabe 2011; Chen *et al*. 2017; and Isherwood *et al*. 2018). Finally, for some men the female dominance of the sector was considered to be advantageous as their minority status was perceived to be a facilitator of career development and advancement (Bagilhole and Cross 2006; and Blackley *et al*. 2019).

## Men's experiences of working in health and care work

Once men have elected to work in the healthcare and social assistance sector, they report both positive and negative experiences which are often shaped along gendered lines. For instance, men are more likely to gravitate to typically masculine roles, such as technical, scientific and managerial positions (Hussein *et al*. 2016; McLean 2003; and Murray 1996) and are also more likely to be offered opportunities for development and

training (Pirard *et al*. 2015; and Simpson 2004) and advance more rapidly in their career (Litosseliti and Leadbeater 2013). This pattern has seen an overrepresentation of male nurses in emergency departments, intensive care, surgery and psychiatry (Cheng *et al*. 2018; Evans 1997; Simpson 2004; and Snyder and Green 2008), while the social care sector sees men more likely to gravitate towards mental health, drug and alcohol, HIV and intellectual disability services (Baines *et al*. 2014; and McLean 2003). These specialties are considered to require more autonomy, control, technical skills and decision-making from workers, and are likely to be higher-status and more highly paid than other roles in the industry (Evans 1997; and Snyder and Green 2008). Such traits position the work as being more in line with traditional gendered expectations of appropriate roles for male workers (Brown 1998; Cheng *et al*. 2018; and Snyder and Green 2008). Male workers also describe experiencing more relaxed expectations in the workplace than their female co-workers (Cottingham *et al*. 2015; Moskos and Isherwood 2019; Pirard *et al*. 2015; and Simpson 2004), as well as feeling that they were valued, welcomed and more overtly appreciated by clients and colleagues (Cheng *et al*. 2018; Evans 1997; Moskos 2019; Simpson 2004; and Tunte 2007). Finally, men working in health and care roles describe job satisfaction from working with clients as a key highlight of working in the industry (Blackley *et al*. 2019; Boyd and Hewlett 2001; Pirard *et al*. 2015; and Simpson 2004).

Conversely, men working in the health and social assistance industry also describe negative experiences of working in female-dominated environments. As mentioned in the previous section, male care workers often experience negative reactions to their choice of occupation from clients, co-workers, friends and family (Isherwood *et al*. 2018; King *et al*. 2013; and Moskos and Isherwood 2019). Men working in child-centric roles (such as childcare, speech and language therapy) reported negative stereotypes around their sexuality, motivations for doing the work and the potential risk of sexual abuse for clients (Boyd and Hewlett 2001; Brody 2015; Cameron 2001; Cameron 2006; Isherwood *et al*. 2018; King *et al*. 2013; Moskos 2019; Moskos and Isherwood 2019; Murray 1996; Pease 2011; and Tunte 2007). Indeed this latter issue has led to some workplaces introducing formal or informal practices to prevent male workers from providing personal care or being alone with female and child clients (Blackley *et al*. 2019; Cameron 2001; Isherwood *et al*. 2018; and Moskos and Isherwood 2019), a measure that was welcomed by some men but seen to further increase negative stigma by others (Holyoake 2002; and Murray 1996). Some male workers find it challenging to feel a sense of belonging in female-dominated workplaces, and isolation and exclusion were cited as common issues (Blackley *et al*. 2019; Boyd and Hewlett 2001; Chen *et al*. 2017; Cheng *et al*. 2018; Moskos 2019; Pirard *et al*. 2015; and Segev and Lander 2019). Finally, although male workers may experience career advancement or higher pay in the industry, this is still often less lucrative than that which is available in alternative male-dominated industries (Bagihole and Cross 2006; and Dill *et al*. 2016). These benefits were also less likely to be experienced by men from minority backgrounds or those who were working in areas with flatter organisation structures and a proclivity for part time working hours such as childcare and aged care (Cameron 2001; Hussein *et al*. 2016; Isherwood *et al*. 2018; McLean 2003; Moskos and Isherwood 2019; Pease 2011; and Tunte 2007).

Male workers in the sector manage some of these challenges by gravitating towards the jobs and tasks in the sector that are most aligned with traditionally masculine traits (Baines *et al*. 2014; Cheng *et al*. 2018; Evans 1997; McDonald 2013; and McLean 2003), reframing their job or using deflective humour when describing it to others (Baines *et al*. 2014; Blackley *et al*. 2019, Hrzenjak 2013; Moskos and Isherwood 2019; Pease 2011; and Simpson 2004), or adjusting their gender identity to reflect a 'softer' masculinity (Baines *et al*. 2014; Hrzenjak 2013; and Loughrey 2008).

## Policies and initiatives to promote male representation

In order to encourage greater male representation in female-dominated industries within the healthcare and social assistance sector, research from Australia and overseas has recommended the adoption of specific policies and initiatives. These recommendations have focused on four main areas: promotion of occupations in the sector (including the benefits of such employment), stigma reduction, increased support provision for potential male workers in training and improved workplace conditions (Blackley *et al*. 2019; Boyd and Hewlett 2001; Isherwood *et al*. 2018; Litosseliti and Leadbeater 2013; and Moskos 2019).

Recommendations for promotional activities have emphasised the need to highlight the roles, activities and specialisations within the sector that may appeal to male workers (Moskos and Isherwood 2019; Snyder and Green 2008; and Vector Research 2009), as well as demonstrating the importance of male representation to employers (Moskos 2019; Peeters 2007; and Vector Research 2009). The need to actively challenge the assumption that roles in the sector are 'women's work' has been highlighted in several studies (King *et al*. 2013; Moskos and Isherwood 2019; and Peeters *et al*. 2015), with suggested strategies including ensuring that direct and indirect gender discrimination is effectively addressed and men are purposefully included in recruitment, training, orientation and workplace activities (Carte and Williams 2017; McLaughlin *et al*. 2010; Peeters 2007; and Segev and Lander 2019). High attrition rates of male students and workers in the sector have led to recommendations for more support for these cohorts (Brody 2015; Peeters 2007; and Peeters *et al*. 2015), including peer support, mentoring opportunities with male workers, stress management strategies and financial assistance for educational opportunities (Blackley *et al*. 2019; Boyd and Hewlett 2001; Khunou *et al*. 2012; and Segev and Lander 2019). Finally the improvement of working conditions such as pay rates, hours, job stability and career opportunities may encourage more men to enter and stay in the sector (Cheng *et al*. 2018; King *et al*. 2013; Moskos and Isherwood 2019; and Peeters 2007), with the use of quotas and targets for male representation also suggested as a way to ensure workplaces are actively trying to address gender bias (Moskos 2019).

Based upon these recommendations, various initiatives have been employed to address the under-representation of men in the healthcare and social assistance industry worldwide. Some success has been seen in the attraction and retention of male students in nursing and care training courses in Europe and the UK. For instance,

European promotional campaigns, provision of student bursaries and incorporation of introductory or training modules that are designed to appeal to masculine interests and/or offer men-only classes were found to increase male uptake of childcare courses and reduce attrition (Peeters 2007, and Peeters *et al*. 2015). In addition, UK school programs developed to promote job opportunities and challenge gendered assumptions of nursing and allied health professions can positively impact the perceptions of male students (Research Works Limited 2020). Finally, open day and recruitment campaigns that use male student and professional role models have been shown to increase the proportion of men enrolling in Scottish nurse training programs (Whitford *et al*. 2018). Whilst some inroads have been made, there is little definitive evidence to suggest that these implemented approaches have had a significant impact on gender bias in the healthcare and social assistance workforce overseas. For example, in Europe targets to increase male representation to 20 per cent of the childcare sector have not been met. Despite active promotion, recruitment and workplace support, there has been limited impact with recent data showing male representation sits around 2 per cent in the UK (Department for Education 2017) and 9 per cent in Norway (Wright and Brownhill 2019).

Within Australia, there has been very limited attention paid to strategies to increase male representation and retention in female-dominated occupations in the healthcare and social assistance industry. Strategies to date have included a mentoring program for men who study and work in early childcare education to promote the building of social and professional networks (Mills-Bayne 2013). Also within the nursing field, the Australian College of Nursing has developed promotional material aiming to encourage more males to enter the nursing profession (ACN 2022).

The Workforce Gender Equality Agency (WGEA) has advocated for industries and organisations to develop gender equality strategies with targeted initiatives to improve workforce diversity (WGEA 2022). However, within Australia the focus of strategies to improve gender equality has typically been on the attraction of female workers to male-dominated industries (Australian Government 2022, WGEA 2022). Thus the existing literature considering ways in which male representation in female-dominated occupations can be enhanced is limited, highlighting a significant gap in understandings of efforts to address gender bias in the Australian healthcare and social assistance workforce. This paper moves towards addressing this gap by mapping gender bias in the sector using nationally representative data, offering a foundation for future efforts to better promote men's representation in the industry.

## Methods

In order to address the question of whether and where gender bias is evident in the Australian healthcare and social assistance sector, this project utilised statistical data from a selection of nationally representative datasets to map the sex-segregation of the sector. These Australian Bureau of Statistics (ABS) datasets included:

- the Australian Census (2006, 2011, 2016),
- Characteristics of Employment Survey (2014-2020), and
- Barriers and Incentives to Labour Force Participation, Retirement and Retirement Intentions (2018-19).

All datasets are uniform in their classification of the variables of interest to this paper (e.g. occupation and industry). Our initial exploration focused on the variables of sex and industry (healthcare and social assistance). Cross-sectional data was obtained using the Australian Bureau of Statistics' TableBuilder and CensusTableBuilder to generate descriptive statistics on the gendered dimensions of employment (including by occupation, full time status, income, age and job satisfaction) for each year of available data. Data was then compared across years to highlight trends and key changes over time. We consider this descriptive mapping of the sector to be a key aspect of identifying the sites and magnitude of gender segregation in the sector in order to inform future policy and practice initiatives.

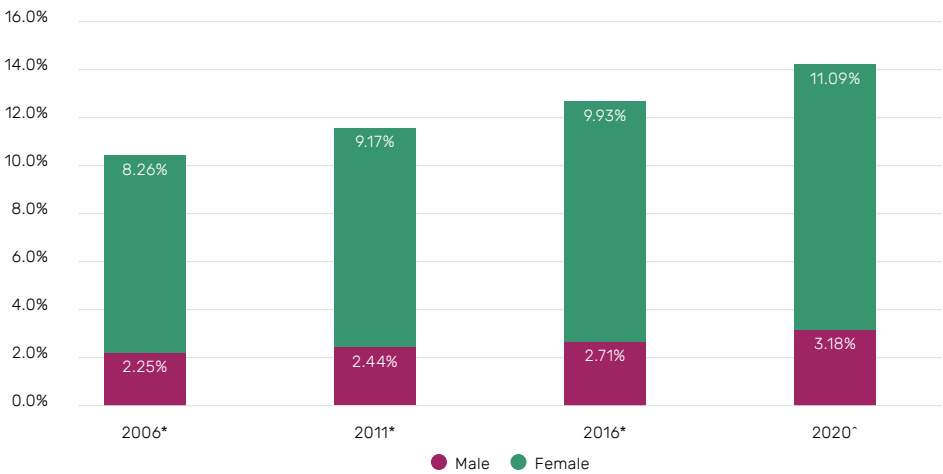
This approach, however, has some limitations. One of these is that due to the use of multiple datasets, which differ in scope and sample size, it is difficult to definitively track trends across the full 2006-2020 period. Despite this, we have included these datasets to provide the most up-to-date snapshot of the healthcare and social assistance sector in lieu of more recent census data, and indicate the source of presented figures in the tables and figures so that this is clear to the reader. A further limitation of using ABS data in TableBuilder is that the ABS uses a random data adjustment technique to ensure the protection of confidential data. This process of perturbation is unlikely to have a significant impact on the underlying pattern of statistics, but may result in slight discrepancies in figures presented. The results of this analysis are presented below.

# Results

## The Australian healthcare and social assistance sector

ABS data shows that the healthcare and social assistance industry has consistently been the largest Australian industry category for the last fifteen years. As Figure 1 demonstrates, the sector has seen steady growth over time, now accounting for an estimated 14.27 per cent of the Australian workforce.

Figure 1: Proportion of the Australian workforce employed in the health care and social assistance sector (2006, 2011, 2016 and 2020, per cent)




Data sources:
*ABS Census TableBuilder, 2016,
^ABS Characteristics of Employment 2014 to 2020 Dataset, 2020

Throughout this period of growth the gender split in the sector remains steady, with census data showing that men made up 21.38 per cent of the healthcare and social assistance workforce in 2006, increasing only slightly to 21.46 per cent by 2016.

## Key sites of overrepresentation

A closer examination of sex segregation in the sector (see Table 1 below) highlights areas where this bias is more pronounced.

Table 1: Industry comparison of male and female workers (2016, per cent)

| Health Care/ Social Assistance Industry | (Tier 4 detail) | Male (%) | Female (%) |
|---|---|---|---|
| Overall | | 21.46 | 78.54 |
| Hospitals | | 22.04 | 77.96 |
| Medical and Other Health Care Services | **Medical Services** | | |
| | • Medical Services, nfd* | 22.63 | 77.21 |
| | • General Practice Medical Services | 27.16 | 72.84 |
| | • Specialist Medical Services | 27.24 | 72.84 |
| | • Medical and Other Healthcare Services, nfd* | 23.01 | 77.01 |
| | **Pathology and Diagnostic Imaging Services** | 24.23 | 75.76 |
| | **Allied Health** | | |
| | • Allied Health Services, nfd* | 19.85 | 80.01 |
| | • Dental Services | 20.45 | 79.55 |
| | • Optometry and Optical Dispensing | 29.68 | 70.31 |
| | • Physiotherapy Services | 29.92 | 70.08 |
| | • Chiropractic and Osteopathic Services | 32.04 | 67.95 |
| | • Other Allied Health Services | 20.55 | 79.45 |
| | **Other Health Care Services** | | |
| | • Other Healthcare Services, nfd* | 27.27 | 72.73 |
| | • Ambulance Services | 56.42 | 43.56 |
| | • Other Healthcare Services, necˆ | 20.15 | 79.89 |
| Residential Care Services | | 17.06 | 82.94 |
| Social Assistance Services | • Social Assistance Services, nfd* | 24.41 | 75.60 |
| | • Child Care Services | 6.39 | 93.62 |
| | • Other Social Assistance Services | 26.10 | 73.90 |
| Health Care and Social Assistance, nfd* | | 20.37 | 79.64 |

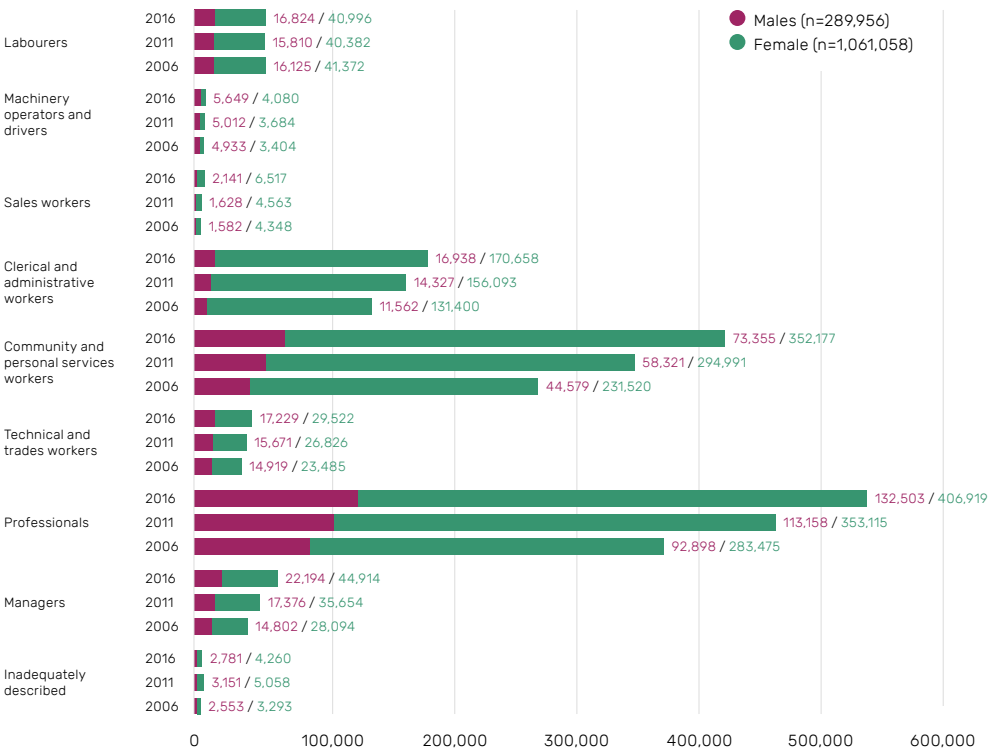
Notes: *Not further defined, ˆNot elsewhere classified.
Data source: ABS Census TableBuilder, 2016

In 2016 most areas of employment in the healthcare and social assistance sector conformed to a gender split that favoured female employment, with only two of the twenty employment areas in Table 1 not being female-dominated (i.e. with female representation of less than 70 per cent). Only one of these areas, Ambulance Services, had a higher representation of male than female employees in 2016 (56.42 per cent male), though this has decreased from the 2006 figure of 65.99 per cent. Findings indicate that female dominance in the healthcare and social assistance industry has increased since 2006 when seven of the employment areas – general practice medical services, specialist medical services, allied health services nfd, optometry and optical dispensing, chiropractic and osteopathic services, ambulance services, and social assistance services nfd – reported higher male representation.

Childcare services consistently sees the most significant sex-segregation, with males making up only 6.39 per cent of the workforce in 2016 – a slight increase from 5.23 per cent in 2006. In lieu of more recent census data, the characteristics of employment dataset shows male employment in childcare peaking at 8.80 per cent in 2019, before falling to 5.63 per cent in 2020. Residential care had the second largest divide in sex representation, however male employment has increased over time (from 13.92 per cent in 2006 to 17.06 per cent in 2016). The characteristics of employment dataset shows that male employment in residential care peaked in 2018 at 19.22 per cent, subsequently declining to 14.87 per cent in 2020.

Examination of the gender bias in particular occupations offers further detail around the segregation of employment in the healthcare and social assistance industry. As can be seen in Figure 2, female employees have consistently outnumbered males in every occupational category except machinery operators and drivers since 2006.

**Figure 2: Occupational comparison of male and female workers in the healthcare and social assistance industry (2006, 2011, 2016)**




Data source: ABS Census TableBuilder, 2006, 2011, 2016

Proportionally, the male workforce is more likely to gravitate towards professional roles (45.70 per cent in 2016 vs 38.35 per cent of women), managerial positions (7.65 per cent vs 4.23 per cent), technicians and trades (5.94 per cent vs 2.78 per cent), labouring (5.81 per cent vs 3.86 per cent), and machinery operation (1.95 per cent vs .38 per cent). In contrast, women are more likely to be employed in community and personal service roles (33.19 per cent vs 25.30 per cent of men), and clerical and administrative occupations (16.08 per cent vs 5.84 per cent).

A closer examination of the two largest occupational categories in the healthcare and social assistance industry – 'professionals' and 'community and personal service workers' – further shows the extent of sex bias at a more granulated level. As can be seen in Table 2, across both occupational categories there are only ten occupations in which males make up the majority of the workforce, and only one of these (surgeon) is classified as male-dominated. The remaining nine male sub-occupations have significantly lower rates of male representation when compared to the top sub-occupations for females. In comparison, female employees make up the majority in 39 sub-occupations, and 32 of these are considered female-dominated. Table 2 highlights the top sub-occupations for females which are predominantly comprised of allied health, nursing and care worker roles. This analysis clearly shows that (with the exception of surgeon) gender bias in sub-occupations in which females make up the majority is significantly more pronounced than in male-majority sub-occupations.

**Table 2: Top sub-occupations for male and female representation in professional and community and personal service occupations (2016, per cent)**

| Top sub-occupations for male representation | Top sub-occupations for female representation |
|---|---|
| Surgeons (82.00% male)* | Dental Assistants (98.24% female)* |
| Anaesthetists (67.22%) | Midwives (98.24%)* |
| Ambulance Officers and Paramedics (62.75%) | Early Childhood Teachers (97.72%)* |
| Dental Practitioners (58.07%) | Child Carers (95.28%)* |
| Medical Practitioners nfd^ (57.43) | Nutrition Professionals (94.57%)* |
| Specialist Physicians (57.36%) | Audiologists & Speech Pathologists/Therapists (92.34%)* |
| Chiropractors and Osteopaths (56.24%) | Occupational Therapists (92.19%)* |
| Psychiatrists (55.83%) | Diversional Therapists (91.86%)* |
| Other Medical Practitioners (54.47%) | Midwifery & Nursing Professionals nfd^ (90.91%)* |
| General Practitioners and Resident Medial Officers (53.90%) | Nurse Educators & Researchers (90.83%)* |
| | Education Aides (90.60%)* |
| | Enrolled and Mothercraft Nurses (90.54%)* |
| | Registered Nurses (89.31%)* |
| | Nurse Managers (86.84%)* |
| | Social Workers (84.69%)* |
| | Heath Diagnostic and Promotion Professionals (82.46%)* |
| | Social and Welfare Professionals nfd^ (81.20%)* |
| | Aged and Disabled Carers (80.54%)* |

Notes: *Denotes a sub-occupation considered to be gender-dominated (i.e. if >70% of workers are from one particular gender), ^ Not further defined.
Data source: ABS Census TableBuilder, 2016

## Worker demographics and experiences

An exploration of the demographics of workers in the healthcare and social assistance sector highlight some key points of difference between male and female workers. As can be seen in Table 3, while the median age for both male and female workers in the industry sits around 44 years of age, differences in age distribution see more females in the youngest age group (below 25 years), and more males in the oldest age group (over 64 years) (ABS 2016). Male workers reported higher levels of education than females, and were more likely to have completed a postgraduate degree (15.00 per cent men to 7.59 per cent of women) or bachelor degree (34.94 per cent men to 30.02 per cent women), while women were more likely to report diploma and certificate level qualifications (36.66 per cent women to 27.48 per cent of men) (ABS 2016).

Table 3: Socio-demographic comparison of male and female workers (2016, per cent)

| | Males (n=289,956) | Females (n=1,061,058) |
|---|---|---|
| *Age (years)* | | |
| <25 | 7.17 | 9.20 |
| 25-34 | 22.22 | 22.52 |
| 35-44 | 22.90 | 21.39 |
| 45-54 | 22.46 | 24.19 |
| 55-64 | 18.98 | 18.98 |
| >64 | 6.46 | 3.73 |
| Median age | 44 | 43 |
| *Post-school qualifications* | | |
| Postgraduate Degree level | 15.00 | 7.59 |
| Graduate Diploma/Certificate level | 4.15 | 4.79 |
| Bachelor Degree level | 34.94 | 30.02 |
| Advanced Diploma and Diploma level | 11.66 | 16.69 |
| Certificate level | 15.82 | 19.97 |
| Inadequately described | 1.07 | 0.89 |
| Level of education not stated | 1.55 | 2.08 |
| Not applicable | 15.81 | 17.97 |
| *Form of employment* | | |
| Full time | 67.81 | 44.32 |
| Part time | 28.09 | 49.58 |
| Employed, away from work | 4.10 | 6.09 |
| *Preferred number of extra weekly hours* | | |
| 0 hours | 85.88 | 85.35 |
| Less than 10 | 6.40 | 6.62 |
| 10-19 hours | 5.45 | 6.15 |
| 20-29 hours | 2.06 | 1.12 |
| 30 hours or more | 0.00 | 0.40 |

Table 3 continued

| | Males (n=289,956) | Females (n=1,061,058) |
|---|---|---|
| *Weekly Income* | | |
| Less than $150 | 1.19 | 1.42 |
| $150-299 | 2.06 | 3.23 |
| $300-$399 | 2.43 | 4.38 |
| $400-$499 | 3.43 | 6.34 |
| $500-$649 | 5.70 | 11.71 |
| $650-$799 | 7.73 | 13.96 |
| $800-$999 | 10.85 | 14.76 |
| $1,000-$1,249 | 12.97 | 14.65 |
| $1,250-$1,499 | 9.72 | 9.48 |
| $1,500-$1,749 | 9.17 | 7.46 |
| $1,750-$1,999 | 6.92 | 4.24 |
| $2,000-$2,999 | 11.85 | 4.64 |
| $3,000 or more | 14.60 | 2.18 |
| Not stated | 1.09 | 1.24 |
| Median income | $1,250-$1,499 | $800-$999 |

Data source: ABS Census TableBuilder, 2016

The data also shows pertinent differences in the working experiences of male and female employees in the sector. Male workers in the healthcare and social assistance industry were much more likely to be employed full time (67.81 per cent to 44.32 per cent of women) and had a higher median weekly income ($1,250-$1,499 compared with $800-$999 for female workers) (ABS 2016). They were also more likely to earn over $1,500 per week, with 42.54 per cent of male workers reporting this level of income compared with 18.52 per cent of female workers (ABS 2016). Tables 3 and 4 highlight some points of similarity, for instance, male and female workers reported similarly high levels of job satisfaction (with 87.50 per cent of men and 91.13 per cent of women being satisfied or very satisfied with their job) (ABS 2019). In terms of continuity, male workers were more likely to have been employed for 10 or more years by their current employer (30.94 per cent vs 24.83 per cent) but both sexes were highly likely to report an expectation that they would remain with the same employer in the next year (>90 per cent for both) (ABS 2020). A similar proportion (~14 per cent) of male and female workers reported a desire to increase their hours of employment (ABS 2020).

Table 4: Recruitment and retention - comparison of male and female workers (2019, per cent)

| | Males^ (n=384) | Females^ (n=1,345) |
|---|---|---|
| *Continuous duration with current employer* | | |
| < 12 months | 17.98 | 19.23 |
| 1-2 years | 7.47 | 10.62 |
| 2-3 years | 11.22 | 9.90 |
| 3-5 years | 13.69 | 14.98 |
| 5-10 years | 18.42 | 20.19 |
| 10-20 years | 17.80 | 16.54 |
| > 20 years | 13.14 | 8.29 |
| Median | 3-5 years | 3-5 years |
| *Expected future duration with current employer* | | |
| With current employer in 12 months | 91.67 | 92.50 |
| Not with current employer in 12 months | 8.33 | 7.68 |
| | Males# (n=219) | Females# (n=895) |
| *Job satisfaction* | | |
| Very satisfied | 51.98 | 48.14 |
| Satisfied | 35.52 | 42.99 |
| Neither satisfied or dissatisfied | 7.09 | 5.50 |
| Dissatisfied | 4.37 | 3.01 |
| Very dissatisfied | 0.77* | 0.94* |

Notes:
*Denotes figures with a relative standard error that is high enough to render them unreliable by ABS standards.
Data sources:
^Characteristics of Employment Survey, 2014-2019 (Figures from August 2019),
#Barriers and Incentives to Labour Force Participation and Retirement and Retirement Intentions, 2018-19

# Discussion

The data presented above largely supports long-held understandings of gendered employment – namely that men are most likely to be highly paid, working full time and found in traditionally masculine 'cure' and professional roles. Progress in challenging gender segregation in the Australian healthcare and social assistance industry has been negligible, with little change in proportional representation in the last fifteen years. The magnitude of bias is also noteworthy, with female employees not only dominating in more occupations than males, but also more significantly. Despite men's dominance in surgery and overrepresentation in some masculine roles only one of these occupations was classified as male-dominated. This indicates that while women are increasingly occupying traditionally masculine roles, men are unlikely to occupy traditionally feminine

roles. In short, men are not making any significant inroads into female-dominated occupations in the healthcare and social assistance industry.

We contend that such mapping exercises as we have undertaken are of value to scholars, policy makers and others seeking to address gender bias in employment. What these statistics show is that female domination in the healthcare and social assistance sector remains an issue and seem largely impenetrable by existing policy initiatives. Efforts undertaken in Australia to date to improve male representation in the industry have been limited with little long-term effect. For policy makers, this data serves as a starting point – from here, initiatives may be developed and measured against the baseline data presented above to discern whether any significant changes have been wrought.

This, then, begs the question of how social policy efforts might seek to address gender bias in the Australian healthcare and social assistance sector. Given the significant and long-standing nature of sex-segregation in the industry, we propose a multidimensional approach to the promotion of men's employment. This would include a collaborative effort from government, professional bodies, educational and industry organisations, guided by a gender-informed social policy specifically tailored around the improvement of men's recruitment and retention in the sector. Key initiatives might include the introduction of quotas for male employment, increased expenditure on mentor programs, retraining programs for employees from traditionally masculine industries in decline and improvements to workplace conditions such as funding for additional staff and improved leave and remuneration. In addition, a promotional effort to highlight the possibilities of working in the sector for men might be useful, although we would caution that these should resist reinscribing gender norms through portraying these occupations as amenable to traditionally masculine ideals and instead normalise new forms of masculinity in which care, empathy and nurturing are not traits restricted to women. This is an endeavour that requires socio-cultural changes on multiple levels, however we contend that gender-informed social policy that meaningfully addresses the issue of men's underrepresentation in the sector is an important step towards this much needed social transformation.

A small but noteworthy finding we uncovered is the significant dip in male representation in the most segregated occupations – childcare and residential care – in the 2019-2020 period. Recent research has suggested that the COVID-19 pandemic has led to a worsening of gender equalities in the labour market both within Australia and internationally (Foley and Cooper 2021). In Australia, the pandemic has had a greater adverse effect on the employment of females than males including factors such as job loss, working hours and pay (Hill and Cooper 2021). Furthermore, workers in frontline roles in feminised occupations such as nursing and care work have commonly experienced an intensification of their workload, increased hours, burnout and psychological distress due to the pressures of responding to the pandemic (ABS 2021; Dobson *et al*. 2021; and Lee *et al*. 2022). The healthcare and social assistance industry has experienced strong employment growth but also greater job mobility - the movement of workers both within and from a sector - since the start of the pandemic (ABS 2021; Black and Chow 2022; and

Rapeport and Ravindran 2021); however the particular impacts of the pandemic on the employment of male and female workers in the industry has not been identified. Future research efforts might examine whether broader contextual factors (such as COVID-19) play a role in the increased sex segregation our study observed within some occupations in the healthcare and social assistance industry, or if there are other influential factors driving this regression.

## Conclusion

As the findings discussed in this paper indicate, the Australian healthcare and social assistance sector is a key site in which gender bias in employment is stark. The industry is overwhelmingly female-dominated, with enduring patterns of sex-segregation indicating that this is unlikely to change without intentional social policy initiatives directed at improving men's representation. Here we are mindful of Christine Williams' (2015, p.393) sentiment that 'retaining men should not come at the cost of losing women', nor should efforts to pursue equity in conditions and opportunities be sidelined to foreground men's employment. However, the healthcare and social assistance sector in Australia, with its current and (predicted) growth represents a key opportunity to increase men's representation in a feminised industry without such gains impeding the employment opportunities of women. We argue that challenging gender bias in female-dominated industries is a much needed step towards the gender revolution, and one that requires the development of supportive social policy to sustain it. To this end our exploration has demonstrated that further research is needed to evaluate the effectiveness of current initiatives operating in Australia and abroad in attracting and retaining male representation in the sector, and also more resources dedicated to the pursuit of effective initiatives for gendered change.

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# A simple model of working from home

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## Abstract

The paper describes a simple model of working from home. The model extends the standard consumption vs unpaid hours decision faced by individuals to make labour a location-specific good. We drew three main insights from the model: (1) increased access to working from home increases labour supply as some time saved from commuting is diverted to working hours; (2) the commute is a major cost which is borne entirely by the individual who supplies labour — this cost drives much of the welfare improvements that occur when working from home is permitted and; (3) paying a different wage to office vs home-based labour yields an efficient outcome. However, when wages cannot vary by location, firms and workers will likely make adjustments over time to make the distribution of work more efficient; such as by investing in home-based work technologies, or by developing processes to make distributed work more productive.

JEL Codes: D11, D21, J2
Keywords: Consumer Economics: Theory, Firm Behaviour: Theory Labour Demand and Supply

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# Introduction

The COVID-19 pandemic forced many workers and firms to experiment with working from home. While stay-at-home orders have eased across the developed world, the level of working from home is likely to remain much higher than pre-pandemic, as around 35-40 per cent of Australian jobs can be done remotely (Productivity Commission 2021, p.9). This research aims to shed light on how increased levels of working from home are likely to affect labour markets. It incorporates the concept that the productivity of individuals working in different locations may vary (Bloom *et al*. 2014), which could be related to management (Groen *et al*. 2018) and monitoring (Jensen *et al*. 2020) issues when workers are remote. It also takes into account varying preferences for working from home across employees (Barrero *et al*. 2021).

In response to the forced experiment of working from home caused by the COVID-19 pandemic, the Productivity Commission undertook a self-initiated research project to explore the possible economic effects of working from home. The paper considers how firms and workers will make decisions about the location of work when working from home is common. It also assesses the role of regulation in transitioning to working from home, including work place health and safety and workplace relations. The report also considers the likely effects on how cities are organised and the possible reallocation of economic activity. It concludes by discussing the potential effects of working from home on wellbeing and equity.

As part of the Productivity Commission's working from home report, we developed an illustrative working from home model that provides insights into how access to work from home might change agents' labour supply and demand decisions and what factors will influence the extent of those changes. The individual's (who supplies labour) preference for location is captured by entering the location of work directly into the utility function, which requires additional assumptions to ensure the utility function is realistic. We construct a simple hedonic labour model where labour units are broken into labour supplied/demanded from the home and labour supplied/demanded from the office. We assume that the firm values labour from each location based on its relative productivity, which can vary, while the individual has different preferences for each location and must also incur a time cost to work from the office (i.e. the commute). We consider equilibrium conditions when working from home is and is not permitted. A simulation exercise allows us to explore the implications of working from home on different groups for a range of parameter values.

We find that increased access to work from home would be expected to increase labour supply. The increase is likely to be larger for individuals with longer relative commutes, as the time saved from commuting can be distributed between work and non-work activities. The labour supply increase would also be expected to be largest among those people who have a stronger preference for working from home (for example, people with caring responsibilities, secondary earners in family households, and people with disabilities).

We find that the removal of the constraint which prohibits working from home (i.e. allowing working from home) unambiguously increases individual utility. This is primarily due to avoiding the cost of the commute, however preferences for the location of work also imply a gain for individuals with zero commute.

Finally, we find that if wages can adjust to reflect the location of work – that is, wages are allowed to differ according to whether work is done at home or in a central office location — then this allows for an optimal outcome for a wider range of individuals and firms. We discuss caveats to this finding, such as what parameter assumptions are required for this outcome and how these assumptions may, or may not, hold in the long run. We also discuss how working from home may develop over time if wages are not allowed to vary by location for a given individual.

## The model

This illustrative working from home model provides insights into how access to work from home might change agents' labour supply and demand decisions and what factors will influence the extent of those changes. The model is necessarily an imperfect representation of a complex interaction between employers and employees, but yields useful insights. This paper briefly outlines the model, the model is then used as the basis of a simulation exercise which explores its implications.

These implications are summarised into three key insights which are addressed in the discussion section.

1. Increased access to work from home would be expected to increase labour supply. The increase is likely to be larger for individuals with longer relative commutes, as the time saved from commuting can be distributed between work and non work activities, based on the preferences of the individual. The labour supply increase would be expected to be largest among those people who have a stronger preference for work from home (for example, people with caring responsibilities, secondary earners in family households, and people with disabilities). If the productivity of home based work increases (relative to office based work), proportion of hours worked at home would also likely increase.
2. The commute is a time cost that could be better allocated to other activities like extra work, time with family, and caring or domestic tasks (Dockery and Bawa 2014; NSW IPC 2020). Because working from home allows individuals to avoid the commute it constitutes a weak Pareto improvement. Time otherwise spent commuting can be distributed between paid and unpaid activities, meaning that access to work from home unambiguously increases individual utility.

Because some of the reclaimed commuting time is devoted to work, the firm is at least as well off than before. This makes working from home beneficial for employers (assuming constant productivity across locations) and employees.

3. Flexible wages yield an efficient allocation of labour. If wages can adjust to reflect the location of work — that is, wages are allowed to differ according to whether work is done at home or in a common location — then this allows for an optimal outcome for a wider range of individuals and firms. However, when wages cannot adjust to reflect the location of work, parameters will likely evolve over time to improve the allocation of labour to the office and the home.

The model is a single period, two sided (individual and firm) problem that assumes the location of work is an important component of decisions made by individuals and firms. Work can be done in one of two locations: in the 'office', which represents typical centralised workplaces, or at 'home'. There are two agents in the model representing typical decision makers in the economy:

1. the individual (employee), who is assumed to maximise utility and supply labour
2. the firm (employer), who is assumed to maximise profit and demand labour.

The agents are a stylised representation of the aggregation of heterogenous employers and employees in the market. The model extends the standard consumption vs unpaid hours decision faced by individuals to include individual preferences for working from home ('flexibility') or in the office ('social interaction').

When individuals work from home they save the time that would otherwise be spent commuting. It is assumed that employers only have preferences for one work location over another if the location of work affects productivity.

Both agents are price takers, accepting the market wage for labour. As a starting point, it is assumed that different wages can be paid for each type of labour. However, the discussion section addresses what happens when wages for work performed at home and in the office are constrained to be equal.

## The firm's problem

The employer is assumed to maximise profit (total revenue minus total cost). Output is a function of two kinds of productive hours of work, work supplied from the home and work supplied from the office. This makes the profit function of the firm:

$$\pi = p \cdot f(L_h, L_o) - w^h L_h - w^o L_o$$

Where:

1. $\pi$ is profit
2. $p$ is the unit price of the output good
3. $L_h$ is hours worked at home per week
4. $L_o$ is hours worked at the office per week
5. $w^h$ is the wage paid to labour supplied from the home
6. $w^o$ is the wage paid to labour supplied from the office.

If we specify a constant elasticity of substitution production function we get the following maximisation problem:

$$\max_{L_h,L_o} \pi = p\left(\beta_{L_h}{L_h}^{\rho} + \beta_{L_o}{L_o}^{\rho}\right)^{\frac{1}{\rho}} - w^h L_h - w^o L_o \; s.t. \;\; L_h \geq 0, \; L_o \geq 0$$

Where:

1. $\beta_{L_h} \in (0,1)$ is the output parameter for hours worked at home
2. $\beta_{L_o} \in (0,1)$ is the output parameter for hours worked at the office
3. $\beta_{L_h} + \beta_{L_0} = 1$
4. $\rho \in (-\infty, 1)$ is the substitution parameter, where $\sigma = \frac{1}{1-\rho}$ is the elasticity of substitution (that is, $\rho = \frac{\sigma-1}{\sigma}$)
5. The production function exhibits constant returns to scale.

Which yields the Lagrangian:

$$\mathcal{L} = p\left(\beta_{L_h}{L_h}^{\rho} + \beta_{L_o}{L_o}^{\rho}\right)^{\frac{1}{\rho}} - w^h L_h - w^o L_o + \lambda_{L_h} L_h + \lambda_{L_o} L_o$$

With the following first order conditions:

$$\frac{\partial \mathcal{L}}{\partial L_h} = p\beta_{L_h}{L_h}^{\rho-1}\left(\beta_{L_h}{L_h}^{\rho} + \beta_{L_o}{L_o}^{\rho}\right)^{\frac{1}{\rho}-1} - w^h + \lambda_{L_h} = 0 \tag{1}$$

$$\frac{\partial \mathcal{L}}{\partial L_o} = p\beta_{L_o}{L_o}^{\rho-1}\left(\beta_{L_h}{L_h}^{\rho} + \beta_{L_o}{L_o}^{\rho}\right)^{\frac{1}{\rho}-1} - w^o + \lambda_{L_o} = 0 \tag{2}$$

$$\lambda_{L_h} L_h = 0$$

$$\lambda_{L_o} L_o = 0$$

If we assume that the firm is using labour from both the home and the office, and combine equations (1) and (2):

$$\frac{\beta_{L_h}{L_h}^{\rho-1}}{\beta_{L_o}{L_o}^{\rho-1}} = \frac{w^h}{w^o}$$

$$\frac{L_h}{L_o} = \left(\frac{\beta_{L_o} w^h}{\beta_{L_h} w^o}\right)^{\frac{1}{\rho-1}} \tag{a}$$

This implies that the firm's labour demand will be determined by the wage ratio, the relative productivity of home labour to office labour, and the substitutability of home and office labour.

If wages are fixed to be equal regardless of where work is performed, then the wage ratio will be 1. In this case, the distribution of labour across the two locations will be determined only by the relative marginal profit from using employees in the two locations (as determined by $\beta_{L_o}$ and $\beta_{L_h}$) and how readily the firm can substitute between them.

## The individual's problem

The individual enjoys consumption, unpaid activities, and has a preference affecting where they want to work. The preference for the location of work simply means that hours worked in the home are valued differently to hours worked in the office. Preferences for a particular location of work reflects the value of social interaction when working at the office and the value of flexibility when working at home. The individual then faces the following utility function:

$$U(C, H, L_h, L_o)$$

Where:

1. $C$ is consumption of the individual, which includes the benefits of savings
2. $H$ is the unpaid hours of the individual — these hours can be used for leisure, house work, extra sleep etc.
3. $L_h$ is the hours worked at home, here it reflects a direct preference for the location of work to be the home. We assume that $\frac{\partial U}{\partial L_h} > 0$, $\frac{\partial^2 U}{\partial L_h^2} < 0$
4. $L_o$ is the hours worked in the office, here it reflects a direct preference for the location of work to be the office. We assume that $\frac{\partial U}{\partial L_o} > 0$, $\frac{\partial^2 U}{\partial L_o^2} < 0$.

The individual's constraints are time and budget. The individual's time is strictly bounded, with time divided up between paid activities (work) and unpaid activities. The individual's consumption is bounded by their earnings from labour (i.e. their budget).

This set up breaks from convention as labour hours enter directly into the utility function instead of only through consumption and unpaid time. This implies that there is a positive marginal utility of labour in this model. The aim of this feature is to capture the benefits of the location of work separate to the typical trade off between consumption and unpaid time.

Wanting more work in the office (captured by the fourth term in the utility function) is intended to represent people who get satisfaction from socialising with colleagues. Wanting more work at home (captured by the third term in the utility function) represents people who enjoy working in familiar surroundings, comfortable clothes, and being able to do home activities in between work tasks.

We impose the restriction that $\frac{\partial U}{\partial H} > \frac{\partial U}{\partial L_o}$ and $\frac{\partial U}{\partial H} > \frac{\partial U}{\partial L_h}$ for all values of $L_o$ and $L_h$ below $\bar{T}$, so that the preference for a certain type of work is not so strong that the worker would agree to work for free (or a negative wage).

The unpaid hours constraint is:

$$H = \bar{T} - L_h - (1+t)L_o$$

Where:

1. $\bar{T}$ is the total work week time endowment
2. $t$ is the fixed length of commute expressed as a fraction of hours spent at the office.

For the individual income constraint, we assume no savings, so income $(Y)$ is equal to consumption $(C)$:

$$Y = C = w^h L_h + w^o L_o$$

This gives the following maximisation problem:

$$\max_{C,H,L_h,L_o} U(C,H,L_h,L_o)$$

$$s.t. \quad H + L_h + L_o + \mathrm{t}L_o \leq \bar{T}$$

$$\mathrm{C} \leq w^h L_h + w^o L_o$$

$$L_h \geq 0,\ L_o \geq 0$$

Substituting the constraints into the utility function yields:

$$\mathcal{L} = U(w^h L_h + w^o L_o\ , \bar{T} - L_h - (1+t)L_o,\ L_h,\ L_o) + \lambda_{L_h} L_h + \lambda_{L_o} L_o$$

We assume that an interior solution exists in which the individual wants to work a positive number of hours, and have some positive number of unpaid hours, which holds if $\lim_{C\to 0} \frac{\partial U}{\partial C} = \infty$ and $\lim_{H\to 0} \frac{\partial U}{\partial H} = \infty$.

This formulation allows for the possibility that the employee could choose to work almost all of their hours at the office, or almost all of their hours at home. If a positive number of hours are worked at home, then the parameter $\lambda_{L_h} = 0$, and if a positive number of hours are worked at the office, then the parameter $\lambda_{L_o} = 0$.

Taking first order conditions (assuming an interior solution) with respect to $L_h$ and $L_o$ yields:

$$\frac{\partial \mathcal{L}}{\partial L_h} = \frac{\partial U}{\partial C} w^h - \frac{\partial U}{\partial H} + \frac{\partial U}{\partial L_h} + \lambda_{L_h} = 0 \tag{3}$$

$$\frac{\partial \mathcal{L}}{\partial L_o} = \frac{\partial U}{\partial C} w^o - \frac{\partial U}{\partial H} \cdot (1+t) + \frac{\partial U}{\partial L_o} + \lambda_{L_o} = 0 \tag{4}$$

$$\lambda_{L_h} L_h = 0, \qquad L_h \geq 0$$

$$\lambda_{L_o} L_o = 0, \qquad L_o \geq 0$$

Equations (3) and (4) imply that as the marginal utility of consumption $\left(\frac{\partial U}{\partial C}\right)$ increases, the labour supplied from both home and office will increase, assuming $L_o$>0

and $L_h$>0. Conversely, as the marginal utility of unpaid hours $\left(\frac{\partial U}{\partial H}\right)$ increases, labour supplied from the home and office will decrease.

Equations (3) and (4) also show that the longer it takes for employees to commute to and from the office — that is, as t increases — the larger is $\frac{\partial U}{\partial L_o}$ (holding other things constant) and the smaller is $\frac{\partial U}{\partial L_h}$, meaning more time will be spent at home.[1] Even if the wages for home and office work are identical, there could be an interior solution, depending on the values of social interaction and avoiding the commute.

If we specify a constant elasticity of substitution utility function (without substituting the constraints into the utility function), the maximisation problem becomes:

$$\mathcal{L} = \left(\alpha_C C^r + \alpha_H H^r + \alpha_{L_h} {L_h}^r + \alpha_{L_o} {L_o}^r\right)^{\frac{1}{r}} + \lambda_H(-H - L_h - L_o - \mathrm{t}L_o + \bar{T}) + \lambda_C(w^h L_h + w^o L_o - \mathrm{C}) + \lambda_{L_h} L_h + \lambda_{L_o} L_o$$

Where:

1. $\alpha_C \in (0,1)$ is the preference parameter for consumption
2. $\alpha_H \in (0,1)$ is the preference parameter for unpaid hours
3. $\alpha_{L_h} \in (0,1$ is the preference parameter for hours worked at home
4. $\alpha_{L_o} \in (0,1)$ is the preference parameter for hours worked at the office
5. $\alpha_C + \alpha_H + \alpha_{L_h} + \alpha_{L_o} = 1$
6. $r \in (-\infty, 1)$ is the substitution parameter, where $s = \frac{1}{1-r}$ is the elasticity of substitution
7. The utility function exhibits constant returns to scale.

Which yields the following first order conditions:

$$\frac{\partial \mathcal{L}}{\partial C} = \alpha_C C^{r-1}\left(\alpha_C C^r + \alpha_H H^r + \alpha_{L_h} {L_h}^r + \alpha_{L_o} {L_o}^r\right)^{\frac{1}{r}-1} - \lambda_C = 0 \quad (5)$$

$$\frac{\partial \mathcal{L}}{\partial H} = \alpha_H H^{r-1}\left(\alpha_C C^r + \alpha_H H^r + \alpha_{L_h} {L_h}^r + \alpha_{L_o} {L_o}^r\right)^{\frac{1}{r}-1} - \lambda_H = 0 \quad (6)$$

$$\frac{\partial \mathcal{L}}{\partial L_h} = \alpha_{L_h} L_h^{r-1}\left(\alpha_C C^r + \alpha_H H^r + \alpha_{L_h} {L_h}^r + \alpha_{L_o} {L_o}^r\right)^{\frac{1}{r}-1} - \lambda_H + \lambda_C w^h + \lambda_{L_h} = 0 \quad (7)$$

$$\frac{\partial \mathcal{L}}{\partial L_o} = \alpha_{L_o} L_o^{r-1}\left(\alpha_C C^r + \alpha_H H^r + \alpha_{L_h} {L_h}^r + \alpha_{L_o} {L_o}^r\right)^{\frac{1}{r}-1} - \lambda_H(1+t) + \lambda_C w^o + \lambda_{L_o} = 0 \quad (8)$$

$$\frac{\partial \mathcal{L}}{\partial \lambda_H} = H + L_h + L_o + \mathrm{t}L_o - \bar{T} = 0$$

$$\frac{\partial \mathcal{L}}{\partial \lambda_C} = w^h L_h + w^o L_o - \mathrm{C} = 0$$

$$\lambda_H \geq 0, \quad \lambda_C \geq 0, \quad \lambda_{L_h} \geq 0, \quad \lambda_{L_o} \geq 0$$

$$\lambda_H(H + L_h + L_o + \mathrm{t}L_o - \bar{T}) = 0, \quad \lambda_C(w^h L_h + w^o L_o - \mathrm{C}) = 0,$$

$$\lambda_{L_h} L_h = 0, \quad \lambda_{L_o} L_o = 0$$

1 Remembering that a low marginal utility of labour reflects a high level of labour.

The section below considers these first order conditions when the individual can and cannot work from home. When the individual does not have the option to work from home, the maximisation problem for the firm and individual would need to be modified so that the firm and individual do not have the option to choose $L_h$. These maximisation problems have not been written out for the sake of brevity.

## Equilibrium conditions when working from home is permitted ('work from home')

The first order conditions of the individual's maximisation problem help us understand how parameters of the model affect equilibrium levels of paid and unpaid hours when individuals can and cannot work from home. Focusing on the range of values for which workers want to work a positive amount from home and from the office ($\lambda_{L_h} = 0,\ \lambda_{L_o} = 0$), we use (5) and (6) to substitute $\lambda_H$ and $\lambda_C$ out of equations (7) and (8):

$$\alpha_{L_h} L_h^{r-1} - \alpha_H H^{r-1} + w^h \alpha_C C^{r-1} = 0 \tag{7'}$$

$$\alpha_{L_o} L_o^{r-1} - (1+t)\alpha_H H^{r-1} + w^o \alpha_C C^{r-1} = 0 \tag{8'}$$

Combining (7') and (8') to eliminate $H$ yields:

$$\alpha_{L_o} L_o^{r-1} - (1+t)\alpha_{L_h} L_h^{r-1} + w^o \alpha_C C^{r-1} - (1+t) w^h \alpha_C C^{r-1} = 0$$
$$\alpha_{L_o} L_o^{r-1} - (1+t)\alpha_{L_h} L_h^{r-1} = \left((1+t)w^h - w^o\right)\alpha_C C^{r-1}$$

Replacing $C$ with its value in terms of $L_o$ and $L_h$ from the income equation yields:

$$\alpha_{L_o} L_o^{r-1} - (1+t)\alpha_{L_h} L_h^{r-1} = \left((1+t)w^h - w^o\right)\alpha_C (w^h L_h + w^o L_o)^{r-1}$$
$$\alpha_{L_o} - (1+t)\alpha_{L_h} \left(\frac{L_h}{L_o}\right)^{r-1} = \left((1+t)w^h - w^o\right)\alpha_C \left(w^h \frac{L_h}{L_o} + w^o\right)^{r-1} \tag{b}$$

This (b) function implicitly defines the $\frac{L_h}{L_o}$ ratio. In particular:

- if $w^o = (1+t)w^h$ (i.e. the office wage and the home wage are identical, after adjusting for the cost of travel), then $L_h = L_o \left(\frac{(1+t)\alpha_{L_h}}{\alpha_{L_o}}\right)^{\frac{1}{1-r}}$ and the utility of consumption $\alpha_C$ does not affect the relative proportions of home and office work. Increasing the fixed commute length will shift work towards the home.
- $w^o = (1+t)w^h$ (i.e. the office wage is higher), then $L_h < L_o \left(\frac{(1+t)\alpha_{L_h}}{\alpha_{L_o}}\right)^{\frac{1}{1-r}}$ and $L_h$ is a smaller share as the utility of consumption $\alpha_C$ is larger. $L_h$ becomes a smaller share of labour as the utility of consumption increases because $L_o$ will grow faster than $L_h$ (because of the relatively higher returns to $L_o$).
- $w^o = (1+t)w^h$ (i.e. the office wage is lower), then $L_h > L_o \left(\frac{(1+t)\alpha_{L_h}}{\alpha_{L_o}}\right)^{\frac{1}{1-r}}$ and $L_h$ is larger as the utility of consumption $\alpha_C$ is larger.
- Intuitively, $\frac{L_h}{L_o}$ increases with $\alpha_{L_h}$ and decreases with $\alpha_{L_o}$.

## Equilibrium conditions when working from home is not permitted ('no work from home')

Before 2020, most offices did not allow many workers the option of regularly working from home. In that state of the world, which we will describe as 'no work from home', if $L_h=0$ and $L_o>0$, the optimisation conditions are:

$$\frac{\partial \mathcal{L}}{\partial C} = \alpha_C C^{r-1}\left(\alpha_C C^r + \alpha_H H^r + \alpha_{L_o} {L_o}^r\right)^{\frac{1}{r}-1} - \lambda_C = 0 \tag{9}$$

$$\frac{\partial \mathcal{L}}{\partial H} = \alpha_H H^{r-1}\left(\alpha_C C^r + \alpha_H H^r + \alpha_{L_o} {L_o}^r\right)^{\frac{1}{r}-1} - \lambda_H = 0 \tag{10}$$

$$\frac{\partial \mathcal{L}}{\partial L_o} = \alpha_{L_o} L_o^{r-1}\left(\alpha_C C^r + \alpha_H H^r + \alpha_{L_o} {L_o}^r\right)^{\frac{1}{r}-1} - \lambda_H(1+t) + \lambda_C w^o = 0 \tag{11}$$

$$\frac{\partial \mathcal{L}}{\partial \lambda_H} = H + L_o + \mathrm{t}L_o - \bar{T} = 0 \tag{12}$$

$$\frac{\partial \mathcal{L}}{\partial \lambda_C} = w^o L_o - \mathrm{C} = 0 \tag{13}$$

Using (9) and (10) to substitute $\lambda_H$ and $\lambda_C$ out of equation (11) yields:

$$\alpha_{L_o} L_o^{r-1} - (1+t)\alpha_H H^{r-1} + w^o \alpha_C C^{r-1} = 0$$

Using (12) and (13) to substitute out $H$ and $C$ and solve for $L_o$ yields:

$$\alpha_{L_o} L_o^{r-1} - (1+t)\alpha_H (\bar{T} - (1+t)L_o)^{r-1} + {w^o}^r \alpha_C {L_o}^{r-1} = 0$$

Re arranging:

$$\left(\frac{(1+t)\alpha_H}{\alpha_{L_o} + {w^o}^r \alpha_C}\right)^{\frac{1}{1-r}} + (1+t) = \frac{\bar{T}}{L_o}$$

Solving for $L_o$ yields:

$$L_o = \frac{\bar{T}}{\left(\frac{(1+t)\alpha_H}{\alpha_{L_o} + {w^o}^r \alpha_C}\right)^{\frac{1}{1-r}} + (1+t)}$$

Intuitively, labour supply to the office is high when $\alpha_C$ is high, when $\alpha_{L_o}$ is high, when the wage is high, when $\alpha_H$ is low, or $t$ is low.

## Simulation setup

To explore the implications of a range of equilibrium outcomes given specific parameter values of the model, simulations were run using the General Algebraic Modelling System (GAMS) software. GAMS was used to program and solve the optimisation problem for a range of parameter values.

The simulations were done using the first order conditions in equations (1), (2), (5), (6), (7), (8) and their respective constraints (unless otherwise stated).

The default set of parameters used in simulations are described in table 1. A slightly higher preference for unpaid hours than consumption is chosen because of the specification of the utility function. The direct entry of labour into the utility function will otherwise skew preferences towards more work creating unintuitive patterns of substitution.

The fixed commute length of $t = 0.125$ was chosen as it represents a 1 hour total commute for an 8 hour work day, which approximates the average commute of full-time workers in Australian major cities in 2019 (67 minutes) (Productivity Commission 2021, p.3).

Labour was set to be equally productive in both locations by default as evidence on this is mixed. Survey data has found that 75 per cent of Australians believe they are as or more productive at home than in the office (Beck and Hensher 2021). Some evidence has shown that workers can be more productive at home if they are allowed to sort to their preferred location (Bloom *et al*. 2015), while other evidence collected during the pandemic found working from home decreased productivity (Gibbs, Mengel and Siemroth 2021).

Substitution parameters were chosen so that the degree of substitutability between inputs is higher than the degree of complementarity. Total time endowment was set to $\bar{T} = 80$ as this represents the total number of hours in the 5 work week days (assuming individuals sleep for 8 hours per night).

Table 1: Default parameter settings for simulations

| | |
|---|---|
| $\alpha_C$ | 0.47 |
| $\alpha_H$ | 0.49 |
| $\alpha_{L_h}$ | 0.02 |
| $\alpha_{L_o}$ | 0.02 |
| $t$ | 0.125 |
| $\beta_{L_h}$ | 0.5 |
| $\beta_{L_o}$ | 0.5 |
| $s\ (individual)$ | 2 |
| $\sigma\ (firm)$ | 2 |
| $\bar{T}$ | 80 |

# Discussion

### Working from home leads to increased labour supply

A number of factors influence how much people would choose to work at home or in the office if the choice was entirely theirs. Broadly, these can be summarised as:

- the trade-off between the time people have for themselves, family and friends
- the consumption they get from the income earned through work
- any additional wellbeing benefits (such as social interaction) or costs (such as stress or effort) associated with that work.

Ultimately, individuals must decide how to allocate their finite weekly hours between different activities.

When work is constrained to the office, people's labour supply decisions are more straightforward but less flexible. For those who would work, travel time is a necessary cost of getting to the workplace and an unavoidable ingredient to obtaining income for consumption. But the commute is time spent neither working nor on leisure/home production, and is lost.

Figure 1 shows a simulation where only the individual's maximisation problem was considered. It shows the number of hours the individual is willing to work for a given wage and set of preference parameters when the commute length is varied. The parameters are set as shown in table 1 and both wages set to 1 – that is, $w^o = w^h = 1$. Then the value for $t$ is varied, indicating how a change in the individual's fixed commute length will, holding all other variables constant, affect their labour supply.

The dark blue line shows the outcome when working from home is not available. This is imposed using an additional constraint (not included in the first order conditions and formulation above, for simplicity). That additional constraint will have its own Lagrange multiplier. The individual would like to choose to work from home, but the additional constraint prevents it. The light blue line shows when this constraint is removed and working from home is made possible.

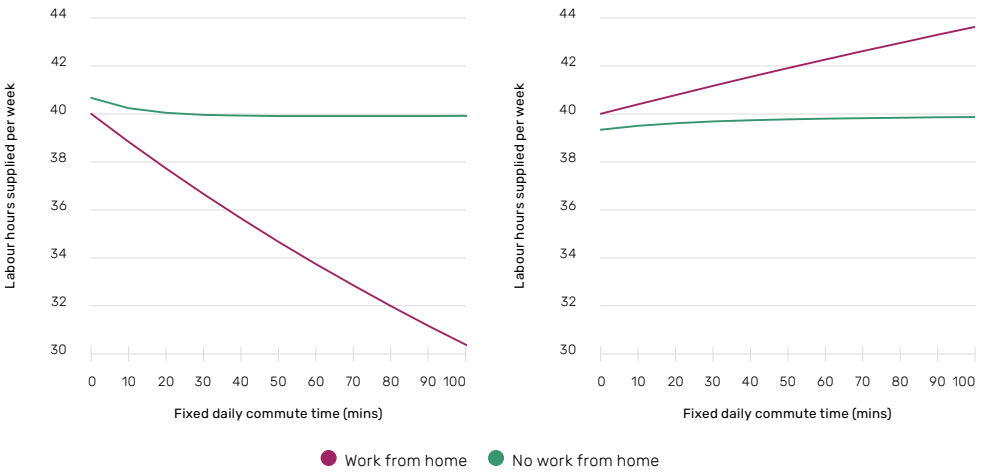
The small difference between the two curves at zero commute is due to the small degree of complementarity between home and office work in the utility function. Intuitively, the complementarity between home and office labour implies that an individual would get a higher payoff from devoting 15 hours to home labour and 15 hours to office labour than they would get from devoting all 30 hours to either one. This complementarity could be thought of as reflecting a preference for hybrid working arrangements.

As the fixed length of the commute increases, it becomes more costly to go into the office. Individuals who can work from home substitute more labour hours into home based work and their overall labour supply changes very little. Due to the fact that this is a single agent model, this fixed length of the commute is best represented as the distance lived from the office. However, in a dynamic multi-agent system it could also

represent a variable that is dependent on the actions of others, such as the level of traffic congestion. Increased working from home is unlikely to decrease congestion without the support of other policies such as road pricing (Productivity Commission 2021, p.55). Even with more people working from home, congestion may worsen if people who used public transport prior to the pandemic begin driving.

However, individuals without the option to work from home substitute work hours for unpaid hours and overall labour supply decreases. Because wages are fixed in this scenario, the utility of the individual who cannot work from home decreases as the commute gets longer, whereas the utility for the home based worker does not change.

Figure 1. Allowing home-based work increases the supply of labour — especially with longer commute times[a]




a. The values on the horizontal axis represent $t=\{0,0.02,0.04,...,0.18\}$, noting that t is the fixed length of the commute per hour worked, but is only incurred when the person works in the office. So if we assume that a person who works in the office does so for 8 hours, then a commute length of $t=0.02$ represents a fixed commute length of 9.6 minutes (rounded to 10).

## Labour supply increases are largest for those with the strongest attachment to the home

People's preferences are an important factor influencing their attitude toward work. In this model the individual trades off between consumption and unpaid hours as well as between office based and home based work.

In determining labour supply, people consider the importance of time spent not working compared to consumption and paid work. These preferences are reflected in their utiltiy weights on unpaid hours and consumption, $\alpha_H$ and $\alpha_C$, respectively. For

example, people with a relative preference for more non work time ($\alpha_H > \alpha_C$), even if it means lower income, might have carer responsibilities.

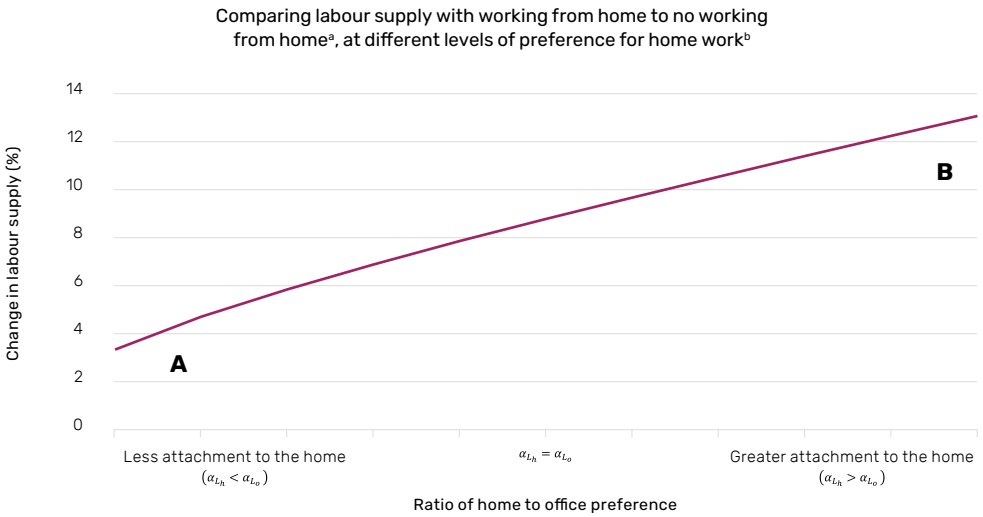
At the same time, the individual will consider how much they want to work at home relative to the office. People with a higher utility weight for home labour than office labour ($\alpha_{L_h} > \alpha_{L_o}$), are people who would prefer more of their work time to be at home. This could include people with disabilities that make workplace attendance challenging, or people who appreciate the flexibility to substitute between unpaid home production and paid work. The distribution of which people will have these different preferences will be determined by those who are in jobs that can be done form home. Working from home is particularly suited to office based workers such as managers, professionals and clerical and administrative workers, where workers use computers, interact less with the public, do not perform outdoor work or physical activity, and do not work with immovable structures, materials or equipment. This potential to work from home is associated with higher levels of education and higher incomes, and full time jobs.

Figure 2 is similar to figure 1 in that it shows only the individual's optimal conditions without considering the demand for labour (wages are once again fixed to be equal to 1). It shows how much an individual's labour supply increases when work from home is made available for people with varying relative preferences for home labour vs office labour.

People who prefer office based work (or actively dislike work from home) will not substantially change their work location decision when home based work is made available (point A on figure 2). This means that the option to work from home will not increase their labour supply by very much for a given wage. This also limits their welfare gain as they do not save much time from avoiding the commute.

However, as people's relative preference for home based work increases, the effect of being able to work from home increases their labour supply response. They increase their number of hours worked by a greater percentage (as shown in figure 2 comparing the curve at point A to point B). This also means people with these preferences receive the greatest increase in their welfare.

Figure 2. Those with the strongest attachment to the home will have the biggest labour supply response




a. This measures the difference in total labour supply when there is no working from home to when there is working from home.

b. This measures the relative direct preference of home to office work, i.e. $\alpha_{L_h}/\alpha_{L_o}$. Specifically, the horizontal axis shows the relative preference for location of labour, where 'less attachment to the home' indicates $\alpha_{L_h} < \alpha_{L_o}$ and strong attachment to the home indicates $\alpha_{L_h} < \alpha_{L_o}$.

This higher level of labour supply for people with a larger $\frac{\alpha_{L_h}}{\alpha_{L_o}}$ is the result of a greater desire to work at home, rather than a desire to work more to get more consumption.

## Improved productivity of home based work will increase demand for home based labour

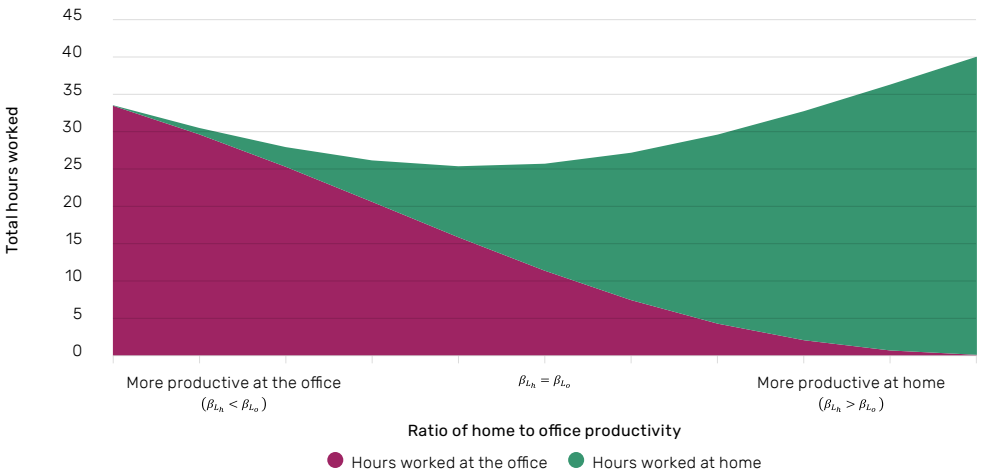
If we consider the firm and the individual together, then the total amount of labour traded in the market will also be determined by the marginal productivity of labour. As the relative productivity of home based work increases, employers will have a greater willingness to make use of it, with flow on implications for individuals.

Figure 3 shows how changes in the productivity of working from home relative to working in the office relates to the total number of hours worked. It shows that, if firms observe increased productivity in home based work, they will be more willing to scale up the share of work hours that are from the home, even when home based work remains less productive than office based work.

The largest amount of labour is traded in the market when home based production is much more productive than office based production. However, when the

firm's office productivity is similar to the productivity of home based labour there is a lower level of labour traded than when the firm specialises in either home or office-based technology. This is because the relative increase in wages paid to home labour does not entice the individual to work more at home than they work less in the office. Instead, they substitute much of their saved time to unpaid hours.

Figure 3. Firms will adopt more home-based work as its relative productivity improves[a]




a. The horizontal axis shows the relative weights on home and office labour in the production function.

In the figure above, the values on the horizontal axis indicate various ratios of home to office productivity (i.e. $\frac{\beta_{L_h}}{\beta_{L_o}}$). How this ratio affects the firm's labour demand can been seen in equation (a), reproduced below.

$$\frac{L_h}{L_o} = \left(\frac{\beta_{L_o} w^h}{\beta_{L_h} w^o}\right)^{\frac{1}{\rho-1}}$$

Remembering again that $\rho \in (-\infty, 1)$, this shows that, holding all other variables constant, an increase in the ratio of home to office productivity $\left(\frac{\beta_{L_h}}{\beta_{L_o}}\right)$ will lead to an increase in the ratio of home based to office based work. When home based work is substantially more productive, overall labour traded is higher. This is because the commute is being avoided by the individual and they have more time overall.

There are a number of factors which could influence the equilibrium outcome between employees and employers, which are not captured in the stylised model framework used to produce figure 3. For example, the unconstrained version of the model

implies that the equilibrium ratio of office to home labour hours will be jointly determined by the preferences of the individual and the production and cost functions of the firm. In reality, equilibrium working arrangements are more likely to be determined by relative bargaining power – often with the firm setting a 'work from home' policy for employees to follow. Over time, employees who highly value the ability to work from home may change jobs or accept lower wages in order to continue working from home. Job switching and negotiation on wages provides firms with information about what attracts (desirable) workers. In this way, switching and negotiation creates a process of experimentation in which firms try different arrangements, observe outcomes, relinquish unsuitable arrangements and maintain those that yield desirable results.

## The commute can be seen as a cost

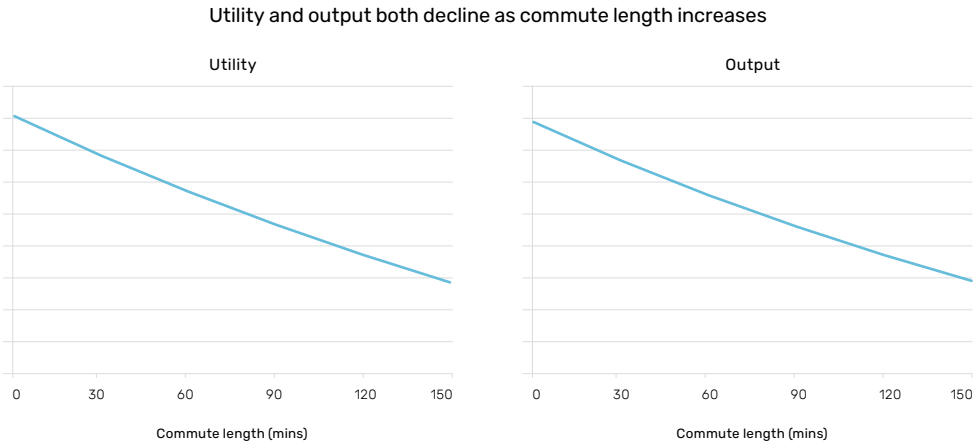
Overall labour supply increases when work from home becomes an option because the commute can be avoided. In this model, the commute does not benefit individuals or firms, except by enabling office based work. It is simply lost time for the individual. This may not be the case for all people – some people may get exercise from riding to work or get pleasure from reading on the train – but it is a reasonable assumption that the opportunity cost of the commute time is higher than any incidental benefit gained from it. Put another way: most people would not commute if they did not have to – they have other things they would rather do.

From the point of view of the individual, this is time that can be spent in paid work or unpaid activities. This division of time between these two activities is determined by the preferences of the individual as set out in the utility function.

The benefit to the firm is not explicitly captured in this model in so far as the firm is a profit maximiser with constant returns to scale technology – profits are zero in equilibrium. Allowing work from home means the individual has more time, some of which they might spend working. This means that firm output can increase through the purchase of additional labour. So, although profit remains zero, the firm expands. In terms of overall welfare, this is a weak Pareto improvement – when some of the commute is avoided, the firm is at least as well off as they were before and the individual is either the same or better off.

Figure 4 shows that as the fixed length of the commute increases, overall utility and output both decrease.

Figure 4. Increases in the commute make everyone worse off




We can see the effect of the commute on the individual's utility from the first order conditions if we consider equation (8), reproduced below.

$$\frac{\alpha_{L_o} L_o^{r-1}}{U^*} - \lambda_H(1+t) + \lambda_C w^o + \lambda_{L_o} = 0$$

$$U^* = \frac{\alpha_{L_o} L_o^{r-1}}{\lambda_H(1+t) - \lambda_C w^o - \lambda_{L_o}}$$

This shows that as the fixed length of the commute increases (the $t$ in the denominator of the second equation), holding all else constant, utility (the left hand side of the equation) will decrease. However, it is worth noting here that we are holding hours worked in the office fixed. It is also plausible that the individual could maintain a similar level of utility by accepting a longer commute and proportionally decreasing their hours worked in the office – such as by moving further away from the city centre and working more from home, a result found by Lennox (2021). As a result, city populations could become more dispersed. Nonetheless, the need to infrequently commute for those with hybrid working arrangements will likely tether many workers to cities – seeing them move at furthest to the outer suburbs rather than relocating to regional areas.

A similar logic implies that higher travel times will, in all likelihood, reduce firm output. Re expressing the equation above to have $L_o$ on the left hand side shows that increased travel times will reduce $L_o$, holding other variables constant. The corresponding re expression of equation (7) does not contain t at all, except implicitly via the other variables. Substituting the identity for $L_o$ and $L_h$ into the firm's output function, it can be seen that firm output is a negative function, ceteris paribus, of $t$ as well.

The corollary of the above point, is that enabling working from home makes everyone better off as the time saved from avoiding commute can be channelled into work. This effect is larger for people with longer commutes.

## Flexible wages produce an efficient allocation of labour

Without wages to determine the level of labour traded in the market, employers and employees must either agree how much home and office work will be done through bargaining, or the firm must set a rule and the worker must decide to take it or leave it.

In the case of bargaining, the outcome will reflect the relative level of bargaining power between employer and employee and the mechanism by which an agreement is reached. This is a complex scenario as it would either require individual bargaining, implying employees would have lower bargaining power on average, or group bargaining, which would make it hard to reflect the diverse preferences of employees.

If the firm sets the rule, then we can show that its optimal ratio of hours are unlikely to be optimal for the individual.

Consider the firm's profit maximisation problem:

$$\pi = p\left(\beta_{L_h} {L_h}^{\rho} + \beta_{L_o} {L_o}^{\rho}\right)^{\frac{1}{\rho}} - w^h L_h - w^o L_o$$

The firm is substituting between the two inputs $L_h$ and $L_o$. Assume for the moment that the firm believes people are exactly as productive at home as they are in the office and intends to weight the inputs to production equally. This implies that $\beta_{L_h} = \beta_{L_o}$. Because the production function exhibits constant returns to scale, if the wages are forced to be equal then output would only be maximised if $L_h = L_o$.

We can see this if we set $w^h = w^o$ in the firm's first order conditions. Equation (a) becomes:

$$\frac{L_h}{L_o} = \left(\frac{\beta_{L_o}}{\beta_{L_h}}\right)^{\frac{1}{\rho - 1}}$$

Setting the right hand side of the equation to 1 ($\beta_{L_h} = \beta_{L_o}$) will reduce to $L_h = L_o$.

In practice, it is possible that, because home based labour is a new technology, the firm believes work from home is less productive than work in the office (i.e. $\beta_{L_h} < \beta_{L_o}$). In this case the firm will demand more labour hours from the office than from the home. This means the firm and employee get locked into a low work from home scenario.

Once the firm sets the rule, for example $L_h = L_o$, then the individual must supply equal amounts of office and home labour or choose to move to another firm (which in our model means exiting the labour market). Because the individual faces a more complicated maximisation problem this situation will only be utility maximising for the individual under very restrictive conditions.

If we constrain wages to be equal in the case where $L_h = L_o$, then there will be an implied set of parameters ($\alpha$'s, $t$ and $r$) that are consistent with equal labour in equilibrium. Consider the individual's utility function when we substitute the constraints into it and set wages to be equal:

$$U = \left(\alpha_C(wL_h + wL_o)^r + \alpha_H(\overline{T} - L_h - (1+t)L_o)^r + \alpha_{L_h}{L_h}^r + \alpha_{L_o}{L_o}^r\right)^{\frac{1}{r}}$$

There would be a unique set of parameters that would maximise individual utility. For example, if we compared two individuals with the same substitution parameter who differ in that one has a longer commute, they would need to have a different set of $\alpha$'s to achieve the same level of utility. The individual with the longer commute (i.e. larger $t$) would have a ratio of $\alpha$'s that are shifted more towards favouring home labour, but the principle would remain the same as with the firm.

This would also be true for any different ratio of $L_h$ and $L_o$. The firm would determine the ratio $\frac{L_h}{L_o}$ given a particular set of parameters. For each ratio there will be a unique value of $\alpha$'s, $t$ and r that can maximise the objective function of the individual. Considering that (certainly in the short run) the parameters are exogenous to the individual and firm, it is very unlikely that individuals and firms in the economy have the corresponding set of parameters that will maximise their respective objective functions without a price mechanism. This implies that it is unlikely that fixed wages would lead to optimal outcomes.

### Without flexible wages, parameters evolve over time

In reality, a differential wage is unlikely to be a practical mechanism for a variety of reasons, such as equity concerns about the people who can only work from home being (potentially) paid less than their office-based counterparts.

Although fixed wages may create a short run mismatch between firms and individuals, it is possible that in practice, the $\alpha$'s and $\beta$'s may evolve over time for various reasons.

- In instances where work from home is not as productive as work done in the office (i.e. when $\beta_{L_h} < \beta_{L_o}$), firms are likely to invest in order to improve home based productivity.
- Firms that want more labour supplied from the office can also offer non wage inducements to employees to try and increase their relative enjoyment of the office (that is increasing, $\alpha_{L_o}$ relative to $\alpha_{L_h}$). This could include investing in better office space, lunches and social events.
- Individuals who place a great value on the ability to work from home also have an incentive to increase their marginal product of home based labour to ensure the firm demands more labour from the home. This could be achieved by undergoing training, developing good communication with managers, and minimising distractions at home.

Even with price adjustments, these changes are likely to happen over time as firms and workers experiment with working from home and develop their understanding of what works best for them. The model specified here also does not capture the sorting between heterogenous firms and individuals that we know will happen in the real world to resolve mismatches.

## Conclusion

To provide a theoretical foundation for the Productivity Commission's Working from Home research report we developed a simple model of working from home. We constructed a simple hedonic labour model where labour units are broken into labour supplied/demanded from the home and labour supplied/demanded from the office and impose a cost of supplying labour from the office that is borne only by the supplier of labour (i.e. the commute). We assumed that the firm values labour from each location based on its relative productivity, which can vary, while the individual has different preferences for each location.

We found that increased access to work from home increases labour supply. This increase is larger for individuals with longer relative commutes, as the time saved from commuting can be distributed between work and non-work activities. The labour supply increase is largest among those people who have a stronger preference for working from home. We found that the commute is a major cost which is borne entirely by the individual who supples labour and the removal of the constraint which prohibits working from home (i.e. allowing working from home) unambiguously increases individual utility — largely because of this commuting cost. We also found that paying a different wage to office vs home-based labour yields an economically efficient outcome. However, when wages cannot vary by location, firms and workers will likely make adjustments over time to make the distribution of work more efficient; such as by investing in home-based work technologies, or by developing processes to make distributed work more productive.

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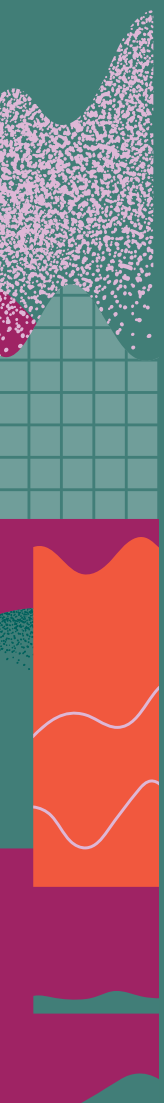

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