Insights into Working from Home in Australia in 2020: Positives, Negatives and the Potential for Future Benefits to Transport and Society.

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TITLE: Insights into Working from Home in Australia in 2020: Positives, Negatives and the Potential for Future Benefits to Transport and Society.

ABSTRACT: The year 2020 has been marked by the most extraordinary event we have witnessed since World War II. While other health threats and geographical disaster have occurred, none have been on the global scale of COVID-19. While many countries have experienced more than one wave of the pandemic throughout 2020, Australia has been able to contain the virus with numbers less than ten at any one time in a way that makes it a stand out (with New Zealand) in the way that it has been contained, with an exception in Victoria from July to early November, linked to failed quarantine procedures for travellers returning from overseas. This paper builds on earlier papers by the authors on the Australian response, with a focus on the role that working from home (WFH) has played in response to reducing the risk of seeding the virus in local sources. Given the volatility of exposure and transmission, WFH to some extent has growing support from employees, employers and government as a way of not only containing the virus but as a positive unintended consequence in contributing to the future management of the transport network, especially in larger metropolitan areas. We report on the findings from the first three waves of data collected in Australia between March and September 2020, highlighting the potential future benefits of WFH to society more generally what this might mean for the future revision of transport plans and priorities.

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1. Introduction

1.1. Short Overview of COVID-19 in Australia

The impact of the COVID-19 global pandemic needs no introduction. The disease has brought sweeping disruptions to travel and activity on a global scale. At the time of writing (early January 2021), there have been in excess of 80 million confirmed cases, and over 1.8 million deaths attributable to the disease (OWD 2021). In terms of global movements, in May 2020 air passenger travel fell by 91% relative to the same time last year, and is not expected to return to pre-COVID-19 levels until 2024 (IATA 2020). In more narrow geographic terms, cities also witnessed similar seismic shifts in transit as activities were curtailed and in many instances the home also became the main place of work. Governments around the world enacted varying measures to reduce the transmission of the virus. Figure 1 shows different levels of workplace closure since March 2020 for a selection of countries (0 = no measures; 1 = recommend closing (or work from home); 2 = require closing (or work from home) for some sectors or categories of workers; 3 = require closing (or work from home) all but essential workplaces). As can be seen, the strictness of policy ebbs and flows as the pandemic is more, or less, "under control" (Hale et al. 2021).
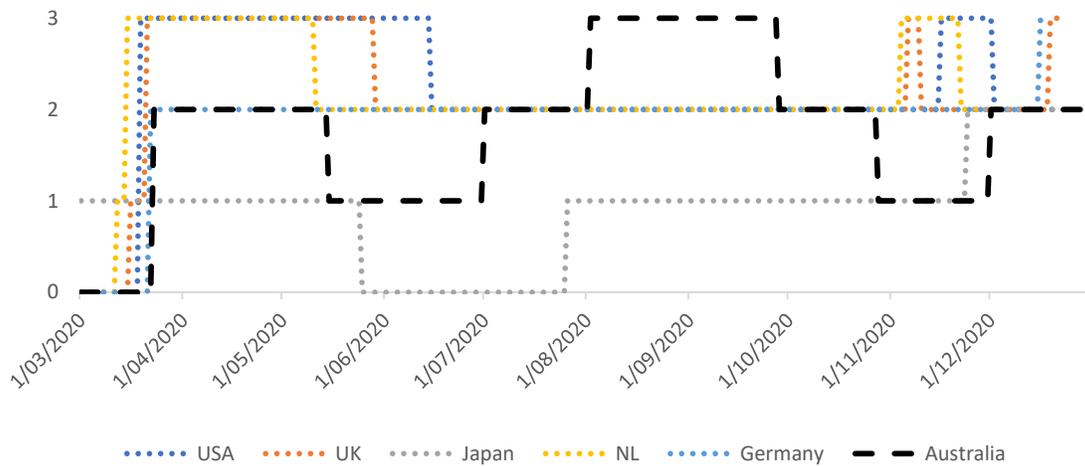

Figure 1: Workplace Closures due to COVID-19

In terms of enacting government policy and the overall impacts of COVID-19, Australia has had a very different experience to many other countries. In part, being an island nation meant that it was easier to restrict the movement of people into the country and thus the prior prevention of the introduction of the SARS-CoV-2. Equally, systematic and unified institutional response was developed. On March 13th 2020, an intergovernmental decision-making forum composed of the prime minister and state and territory premiers and chief ministers called the National Cabinet was formed, responsible for endorsing and coordinating national actions in Australia in response to the coronavirus pandemic. National Cabinet was/is advised by the Australian Health Protection Principal Committee, a body composed of the Chief Medical Officer of the Commonwealth and the Chief Health Officer of each of the states and territories[1]. In Australia, at the time of writing, there were a total of approximately

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[1] The formation of National Cabinet was so successful it now replaces the former Council of Australian Governments (COAG) as the primary intergovernmental forum in Australia.

28,500 total cases resulting in 909 deaths, 820 of which were in Victoria where a second wave occurred in July thru to the end of October due to a breach of hotel quarantine arrangements (DoH 2021).

As with many countries, a key component has been the requirement to work from home since the onset of the pandemic. Victoria, as a result of the aforementioned second wave, still has a large proportion of employees working from home. As at 30th of November 2020, office workers have been able to return to the workplace with up to 25 percent of the workforce being able to attend onsite, from 11th of January 2021 that will be increased to 50 percent in due course. On the 14th of December 2020 the public health order in New South Wales requiring employers to allow employees to work from home (where it is reasonably practicable to do so) was repealed. The upshot of these measures can be seen in aggregate data collected in the Google Mobility Report (Google 2021), showing reductions time spent at the workplace (Figure 2), which in turn has meant less time spent in transit stations as a result reduced travel to work (Figure 3).
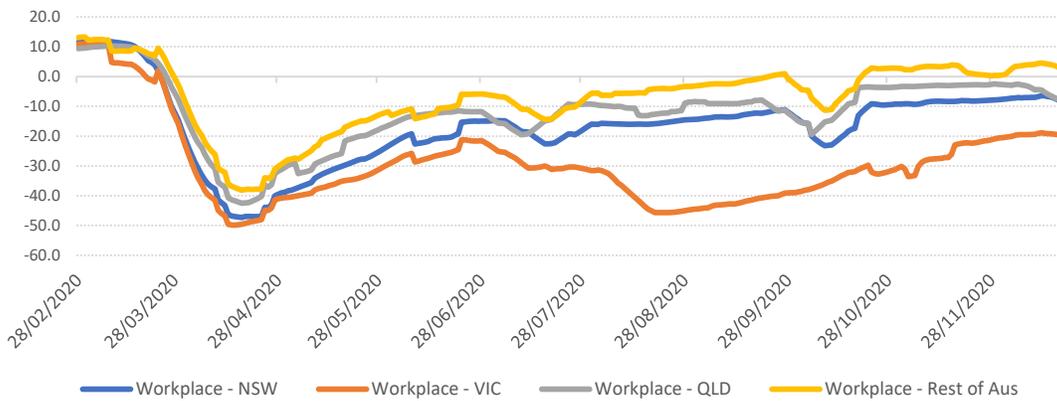

Figure 2: Time Spent at Workplace (Google Mobility Data)
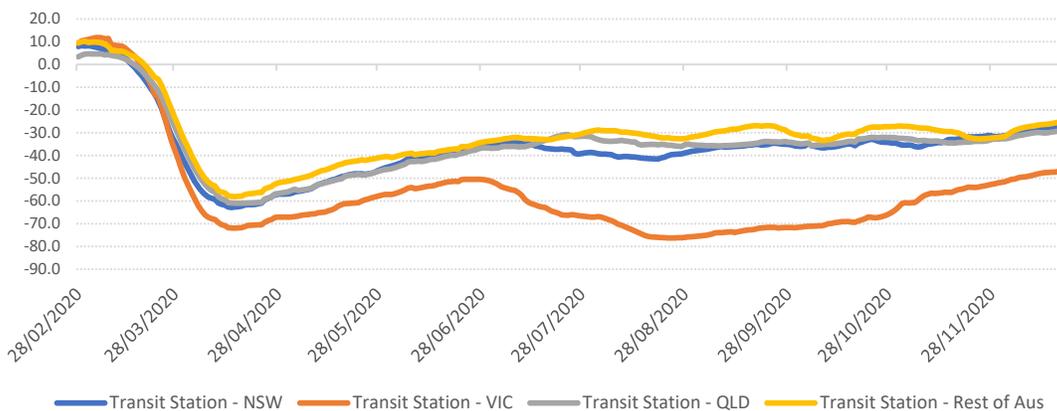

Figure 3: Time Spent at Transit Stations (Google Mobility Data)

1.2. Telecommuting and Transportation

From a transportation perspective, working from home represents a long-discussed policy lever for reducing congestion as far back as the energy crisis of the 1970's (Nilles 1973). With the widespread

and enduring increase in working from home we have witnessed both in Australian and globally over 2020, others have noted the significant reductions in road-based congestion at the height of the initial response to COVID-19 (Singhal 2020) and as working from home continued throughout the year (Rabe and Gladstone 2020). A phenomenon noted globally in ongoing tracking studies like those in Switzerland (MOBIS 2021), or the United States where analysis of Federal Highway data indicated that with the reductions in driving seen as at January 2020, if driving returned to pre-coronavirus levels by June, total vehicle miles travelled would still match that from 1998 where there were 42 million fewer registered drivers (Tomer and Fishbane 2020).

While the reduction in car use and congestion in major cities have been most noticeable in the extremes of lockdown response, the idea of telecommuting or working from home as a mechanism for reducing congestion during the peak has long been of interest to the transport community. From an early focus on the role of telecommuting in the white-collar sector (Salomon and Salomon 1984) and the challenges that such work might engender such as lack of social interaction, inability to separate home from work, and visibility for advancement (Salomon 1986, Hall 1989, Mokhtarian 1991), along with potential benefits such as greater flexibility in time management (Nilles 1988, Olszewski and Mokhtarian 1994). Research has also explored the societal benefits that might accrue as a result of increased working from home including improved traffic flows (Kitamura et al. 1990; Maynard 1994) and reductions to energy consumption[2] (Mokhtarian 1991) and air pollution and CO_2 emissions[3] (Nilles 1988). The many forms of telecommuting have also been explored, from different times of the day or work, different locations, frequency or proportion of work time and duration and type of employment (Mokhtarian and Salomon 2005, Pratt 2000) noting that home-based businesses and overtime work should not be considered telecommuting due to the small impact such behaviour would have on commuting (Mokhtarian 1991).

Some studies have shown the potential for significant benefits related to telecommuting, including time savings of up to 44 hours per year for the telecommuter (Lari 2012), and that forecasted uptake of telecommuting in the city of Tokyo could result in a 7-11% reduction in congestion and cost savings equivalent to up to 26% of annual spending on public transportation (Mitomo and Jitsuzumi 1999). Others have found that while benefits are experienced by the individual working from home in the form of reduced work-life conflict (Hayman 2009), it is similarly beneficial to business in the form of capacity for longer work hours (Hill et al. 2010); one study noting that majority of respondents used the time saved commuting to work more (O'Keefe et al. 2016), another finding that more flexible work arrangements resulted in less voluntary staff turnover (Choi 2019). Overall, the availability of flexible work arrangement leads to greater enrichment from work to home, which, in turn, is associated with higher job satisfaction and lower turnover intentions (McNall et al. 2009).

Many studies have examined the factors that lead to differing uptake of telecommuting, similarly finding that land use patterns, internet infrastructure, socio-demographic characteristics, access to high speed internet, the presence of children at home, public transport access and cost of travel and

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[2] Although it has been suggested that energy consumption at home has increased due to greater presence and notably higher computer use time. See for example Cheshmehzangi (2020) who suggests that "The impact on household entertainment is likely to increase in the longer term, with a potential increase in computing entertainment that became more popular in recent months. Hence, we anticipate steady and higher energy consumption for household entertainment activities."

[3] Working from home instead of the office during summer saves the typical British commuter around 400kg of carbon emissions each year, which equates to 5% of their annual carbon footprint. This is because the carbon emissions produced by commuting exceeds those created by simply using energy at home. (Source: https://www.refinery29.com/en-gb/is-working-from-home-sustainable).

fuel can serve to influence rates of telecommuting (Choo et al. 2005, Fu et al. 2012, Caulfield 2015); women being more likely to telecommute for family reasons, personal benefits and reduced stress levels, while men were less likely to telecommute due to lack of professional interaction, household distractions, and they view themselves as lacking discipline (Mokhtarian et al. 1998). High-level professionals (scientific, technical, healthcare, ICT professionals, and so forth) are more likely to have a flexible work schedule (Alexander et al. 2010).

Irrespective of the benefits or the different rates of uptake, the growth of telecommuting pre-COVID-19 has been marginal, much less than original commentators might have thought, and arguably disappointingly so. Mokhtarian (2009) provides 12 possible reasons why, with the ongoing spread of ever-improving technologies, travel and congestion continue to increase. These include noting that not all activities have a telecommuting (work from home) counterpart, that even when feasible telecommuting may not always a desirable substitute, and the fact that some degree of travel might afford positive utility. When looking to what might facilitate more flexible work, it is common place to find that management trust of employees, the ability to secure the technology involved, and a rational workplace culture which emphasises human resources and member participation, facilitate telecommuting (Harrington and Ruppel 1999). Indeed, work-related characteristics and ICT usage have been found to be more important for work-schedule flexibility than sociodemographic characteristics (Alexander et al. 2010), with perhaps the most predominant barrier to being able to telecommute is being in a job or having a manager that does not allow it to happen (O'Keefe et al. 2016) and/or an ingrained norm of not doing so (Hopkins and McKay 2019).

In Australia, the number of people who have worked from home regularly since 2001 prior to COVID-19 was 4.6%, and only for an average of 11 hours per week (DSS 2019). A report by the Productivity Commission found that rising demand for telecommuting was effectively stymied by incompatible management practices and cultural norms in workplaces rather than technology barriers (PC 2014). An interesting study in Australia that was conducted prior to COVID-19 showed the existence of a positive attitude toward anywhere working (work conducted anywhere outside of the traditional office that formal work might be done), regardless of the amount of time spent the participant commuting each day (Hopkins and McKay 2019). Importantly, the authors also found that the desire for anywhere working grew stronger once workers had participated in anywhere work themselves, suggesting the reality of anywhere working is even more appealing than the concept.

1.3. Outline of the Paper

While ostensibly looking at the impact of COVID-19 on travel and activity in Australia, the project at the heart of the data that will be discussed herein expanded to look at the experience of working from home / telecommuting given that the COVID-19 measures have disrupted norms that have limited telecommuting, and restrictions resulting in the widespread uptake of work from home irrespective of the existing management position toward it. Having introduced the Australian context and provided an overview of the literature, the remaining structure of this paper is as follows: In Section 2 we outline the timing of ongoing waves of data collection and summarise the composition of each of the three initial waves of data; in Section 3 we examine nine different aspects of the working from home experience in Australia; in Section 4 we draw insight from the analysis and summarise what the working from home experience might mean moving forward, especially for the transport network and commuter activity; in Section 5 we provide a summary of limitations and outline areas for future research; and in Section 6 we provide concluding remarks and policy recommendations. This paper

builds on the contributions of Beck and Hensher (2020a,b) where the focus was on the early days under restriction (Wave 1) and under easing of restrictions (Wave 2).

2. Overview of Data

The data discussed herein is comprised of three waves of data collection across 2020. Wave 1 was completed in March immediately after National Cabinet announced the restrictions on travel and activities. The survey asked respondents to provide information on their level of employment prior to the COVID-19 outbreak as well as after, including their ability and instances of working from home. Wave 2 was in field from the 23rd of May to the 15th of June, after a relatively sustained period of low new case numbers and just prior to the second wave of infection in Victoria. It built upon the Wave 1 survey and started to examine work from home behaviour in more detail as it became increasingly apparent that the disruption to where work was done was large and ongoing. Wave 3, the most recent data, was collected across the 4th of August the 10th of October: a period that saw the second wave in Victoria (VIC) result in significant lockdowns (including border closures between States) while the rest of Australia had either practically eliminated COVID-19 or had experienced low rates of community transmission (almost exclusively Sydney)[4].

Table 1: Overview of National Sample in Each Wave

	Wave 1	Wave 2	Wave 3
Female	52%	58%	58%
Age	46.3 (σ = 17.5)	48.2 (σ = 16.2)	48.2 (σ = 16.2)
Income*	$92,826 (σ = $58,896)	$92,891 (σ = $59,320)	$62,551 (σ = $46,964)
Have children	32%	35%	35%
Number of children	1.8 (σ = 0.8)	1.7 (σ = 0.9)	1.8 (σ = 0.8)
# Workers**	714	916	741
Total Sample	1074	1457	956
New South Wales	22%	32%	31%
Aust. Capital Territory	2%	2%	1%
Victoria	28%	24%	24%
Queensland	22%	18%	22%
South Australia	11%	11%	9%
Western Australia	11%	10%	10%
Northern Territory	1%	1%	1%
Tasmania	2%	3%	1%

* In Wave 1 and 2 household income was asked, in Wave 3 personal income was asked.

** A worker is defined as anyone who was working at least 1 day prior to COVID-19 restrictions.

The online survey company PureProfile was used to randomly sample respondents and surveys were available across Australia to examine the widespread impact of COVID-19. Table 1 provides an overview of the sample composition in each of the three waves. Quotas were not introduced on those completing the survey, other than ensuring representation from all states and territories. The impact

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[4] Wave 4 went in field in late February after a period of significantly reduced cases, dominated by returning travellers in quarantine who in some cases infected transport drivers taking some persons between designated quarantine hotels and airports.

of COVID-19 is, however, sufficiently widespread that no demographic can escape the disruption caused. Figure 4 provides an overview of case numbers within Australia, identifying the time periods during which data was collected and the level of severity of the workplace restrictions in place at that time. Note that Wave 2 was larger than the other waves due to accidental over sampling by the survey firm.
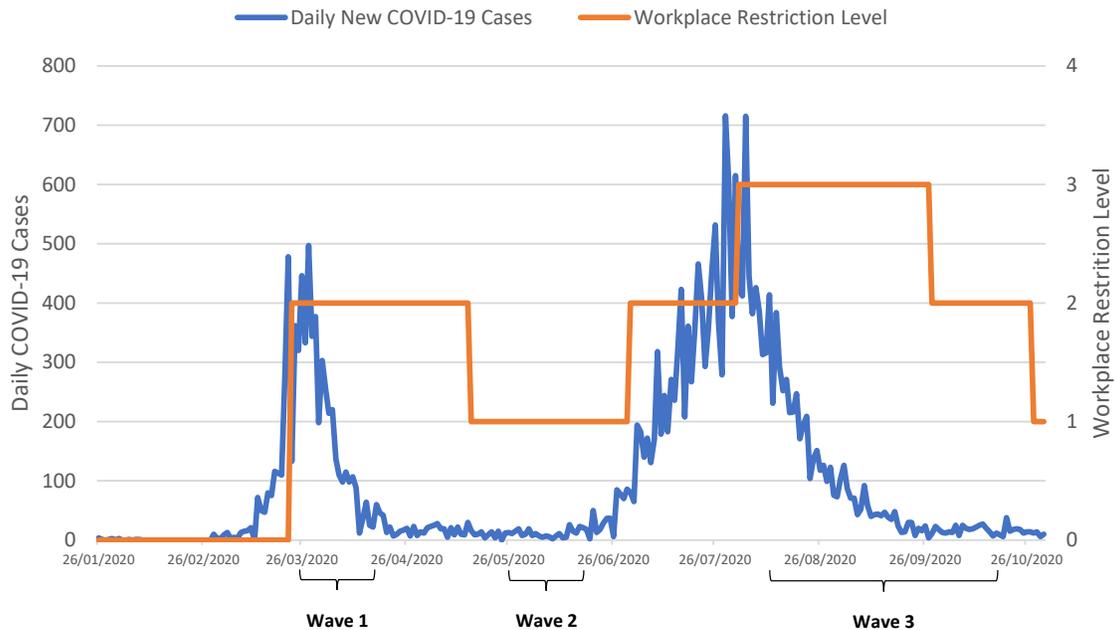

Figure 4: Daily COVID-19 Cases vs Workplace Restrictions in Australia

3. Results

Before discussion of results, it should be noted that the ongoing data collection efforts seek to explore many different impacts of COVID-19. As such, it is not possible to ask every question in every wave. While a subset of questions are asked in every wave, others are rotated in and out and new questions are added over time. The results for each question asked are presented herein for each wave where it is asked.

Sociodemographic differences are explored based on gender, age (younger (18 to 34); middle-age (35 to 54); older (55 or older), personal income (lower income ($40,000 or less); middle income ($40,001 to $80,000) and higher income (more than $80,000), and occupation (white-collar versus other). Additionally, we further explore differences in behaviours and attitudes based on whether a respondent is in a metropolitan or regional location; whether a respondent is in Victoria or another state in Australia.

3.1. Changes to Work and Working from Home

Figure 5 shows the dual impact of COVID-19 and associated restrictions on the availability of work and the nature of working from home. During Wave 1, one quarter of respondents who were working at

least one day per week (or more) had zero days of work. During Wave 2 and Wave 3 we saw this number start to return towards the pre-COVID-19 levels of employment. Interestingly, in the early stage of the pandemic younger respondents and those on lower incomes were impacted more heavily, working significantly less days per week on average than other respective age and income groups. However, in the Wave 3 data the only broad socio-demographic different identifiable is that older respondents on average work less days per week in Wave 3, but also worked less days per week prior to COVID-19. In Victoria, where the entire state was effectively placed in lockdown (including curfews in place in Melbourne restricting the hours a person was allowed outside their home), unemployment had moved back towards the highs of Wave 1.

With regards to working from home, in Wave 1 almost half of the respondents (47%) indicated they could work from home, particularly more prevalent among those on higher incomes and/or from middle age groups. This trend, including the differences by age and income, held through to Wave 3 where 29% of respondents indicated that all of their work could be done from home, and a further 33% that some of their work could be done from home. There are also broad geospatial differences in terms of the type of employment where work can be done from home, with regional respondents more likely to not be able to work from home at all (46%) versus those in metropolitan areas (32%). Much like with employment, over the waves of data collection we see that as the infection is brought under control, people work from home less, albeit still at a rate that is significantly higher than before COVID-19 (average of 1.5 days across the sample in Wave 3, versus 0.8 before COVID-19). Again, the opposite is true in Victoria where the reintroduction of restrictions resulted in working from home levels similar to those observed in Wave 1.
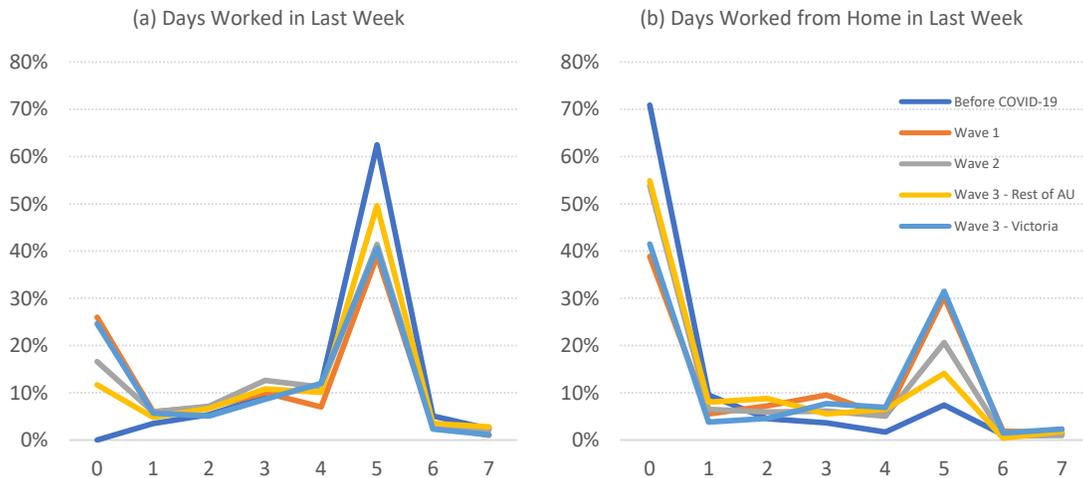

Figure 5: Changes to Work and Work from Home in the Last Week

The ability to work from home is a function of workplace policy, which in turn is likely to differ based on the occupation of the individual. In Table 2 we see that in Wave 3, white collar professions such as managers, professionals, and clerical and administration are more likely to be directed or given the choice to work from home, whereas blue collar or service delivery occupations are more likely to be in employment were there are no plans to allow work from home, or where work from home is not possible in the main due to the nature of the job. As a result, those in the three white-collar

occupations highlighted work significantly more days from home than others (4.2 days on average compared to 1.5 for other occupations). These differences exist through each wave of data collection. Table 3 shows that the white-collar professions have also benefitted most from changes to workplace policy, in that while they could do so before COVID-19, they are now able to work from home at higher rates. In both tables, the colour blue represents a relative under representation of the work from home policy for an occupation, whereas red represent a higher relative proportional share (paler cells are in the middle).

Table 2: Workplace Work from Home Policy by Occupation (Wave 3)

	No Plans to WFH	Cannot WFH	Choice to WFH	Directed to WFH	Workplace Closed
Manager	25%	12%	28%	34%	1%
Professional	27%	13%	24%	34%	2%
Technician & Trade	42%	29%	23%	7%	0%
Community & Personal Services	51%	24%	16%	10%	0%
Clerical and Administration	30%	12%	29%	27%	2%
Sales	38%	32%	13%	15%	3%
Machine Operators / Drivers	55%	40%	0%	0%	5%
Labourers	29%	65%	3%	3%	0%

Table 3: Change in Workplace Work from Home Policy by Occupation (Wave 3)

	None before, none now	Could before, same now	More now allowed	Less now allowed
Manager	28%	27%	41%	4%
Professional	34%	14%	47%	5%
Technician & Trade	65%	16%	13%	7%
Community & Personal Services	69%	10%	16%	6%
Clerical and Administration	32%	16%	48%	3%
Sales	67%	14%	17%	3%
Machine Operators / Drivers	100%	0%	0%	0%
Labourers	94%	7%	0%	0%

3.2. Benefits and Challenges of Working from Home

As part of the Wave 2 data collection (3 months after the initial COVID-19 outbreak and thus at a point in time when the widespread working from home conditions had been sustained for a considerable duration), a series of questions were asked to identify the challenges along with the potential benefits that respondents had experienced while working from home[5]. As shown in Figure 6, the most beneficial aspect of working from home is not having to commute (particularly the case among younger and middle age respondents), followed by having a more flexible work schedule (also more prevalent among younger and middle-aged respondents, along with females). Spending more time with family, while relatively lower in terms of the perceived benefit, is significantly more important among those respondents with children. Interestingly, there are no differences in the perceived benefits of working from home between metropolitan and regional areas.
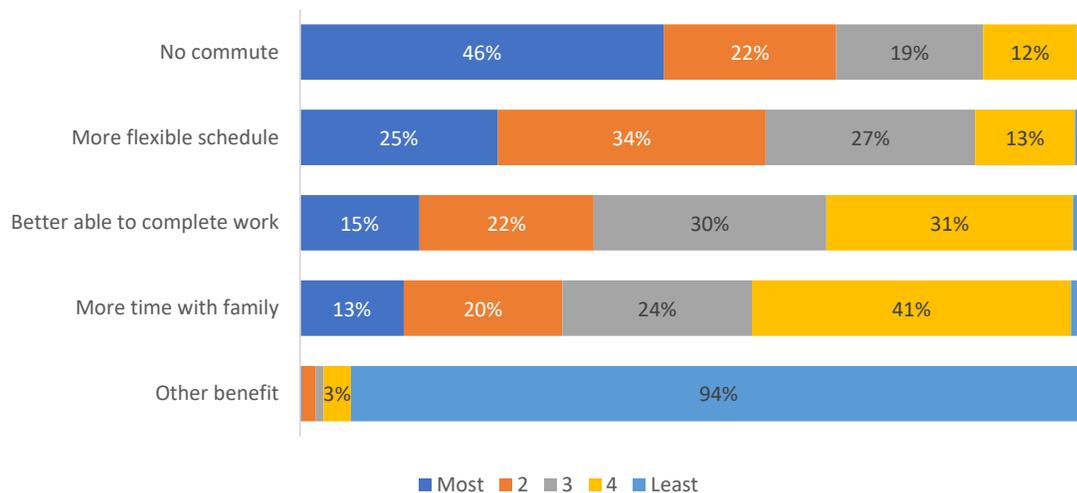

Figure 6: Most Important Benefits of Working from Home (Wave 2)

Investigating the challenges of working from home, Figure 7 shows that the greatest challenges are interruptions from family and children during working hours (a bigger challenge for those with children as one would expect), followed by being able to concentrate on work. The challenges are largely the same across gender, age, income and whether living a regional or metropolitan area, although younger respondents were less likely to rate dealing with email and communication as one of their most or second most challenging aspects of working from home. With respect to meetings and collaboration, Wave 2 data also revealed that respondents had an average of 3 online meetings per week (σ = 6) and for those that had them, they found them to be just as effective on average as normal face to face meetings (Figure 8). Additionally, there is no correlation between the number of meetings had and the overall perceived effectiveness of those meetings.

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[5] The ongoing data collection efforts seek to explore many different impacts of COVID-19. As such, it is not possible to ask every question in every wave. While a subset of questions are within each wave, others are rotated in and out. All data presented in this paper
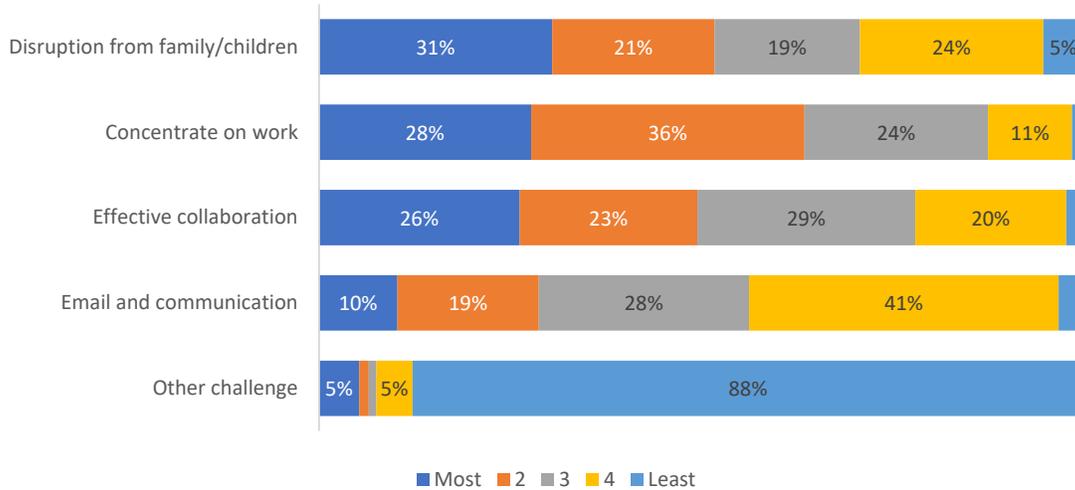
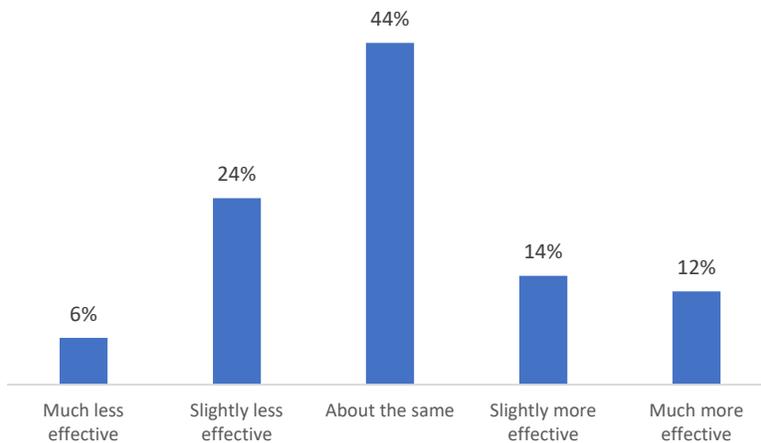**Figure 7: Most Challenging Aspects of Working from Home (Wave 2)**

Figure 8: Relative Effectiveness of Online Meetings (Wave 2)

3.3. The Experience of Working from Home

In Waves 2 and 3 we also explored various attitudes towards working from home, namely questions that examined how the current experience might be perceived and how that might translate into desires for changes to working arrangements in the future as a result of the experiences being had during the COVID-19 pandemic. Figure 9 compares the responses to these statements over the two waves of data, showing that from 3 months after the initial outbreak, to 9 months after, the experience of working from home has remained, on average, unchanged and has overall been a positive one when taking all factors into account; this is also true in Wave 3 for those respondents living in Victoria and experiencing very onerous restrictions on work compared to those elsewhere in Australia. Interestingly, there is no difference, on average, in any of these attitudes based on if a person worked

from home one day a week or more before COVID-19 compared to that did not work from home in a normal pre-COVID-19 week.
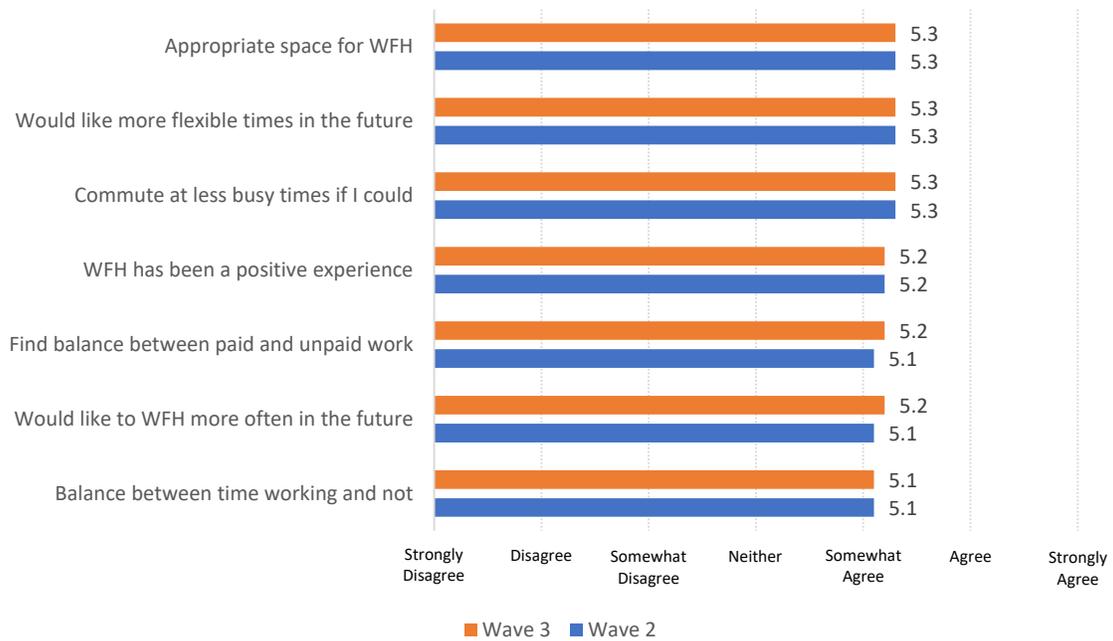

Figure 9: Evaluation of the Work from Home Experience (Wave 2 and Wave 3)

Socio-demographic difference do exist:

- Females agree more strongly that work from home has been a positive experience, that they would like to work from home more often in the future, and that they would like more flexible working times in the future

- Older respondents agree more strongly that they have an appropriate space to work from home, that they can better find the balance between paid and unpaid work, and that they are also able to balance time working and not.

- Respondents living in metropolitan areas have lower agreement that they have an appropriate space to work from home, and that they can find a balance between paid and unpaid work.

In terms of looking at the sustained robustness of the work from home experience, Figure 10 shows the distributions of responses to the question about the positiveness of the overall experience and the desire to work from home more often in the future than they did prior to COVID-19. The overall numbers of respondents agreeing to the statements substantially exceeds those who disagree. Additionally, there is a significant and strong positive correlation (r = 0.78) between the two statements indicating that the more positive the experience the more likely someone would want to work from home more in the future. There are also significant, albeit weak, positive correlations

between the number of days worked from home in the last week during Wave 3 and how positive the experience has been (r = 0.17), and the desire to work from home more in the future (r = 0.24), indicating the working from home has seemingly been more beneficial for those working from home to a greater extent. Unsurprisingly, the group of white-collar professions (manager, professional and clerical/administration) report significantly higher agreement with both statements than those in occupations that are not white collar.
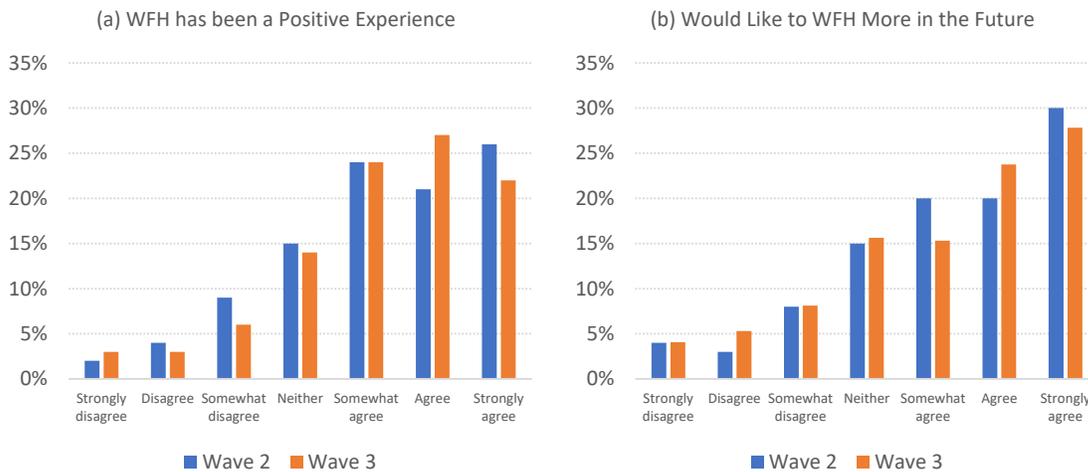

Figure 10: Current Work from Home Experience and Preference for Future (Wave 2 and Wave 3)

3.4. Equipment and Space to Work from Home

In Wave 3 we asked questions to get a broad overview of the extent to which those people working from home had acquired what they need to work from home, and the nature of the space in which they were working at home. In our sample, almost three-quarters of respondents (74%) worked from their own room or space when working from home, with the remaining sharing a room/space. Figure 11 shows again that respondents are of the view that they have what is required to work from home successfully, but that half of respondents show some level of agreement that they still require more equipment in order to work from home as well as they would like[6]. This was consistent across all socio-demographic groups, with the exception of males who reported stronger agreement that they have everything needed to work from home successfully.

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[6] See https://renovatingforprofit.com.au/blog/top-5-ways-covid-19-has-changed-our-homes/ as an example of renovations that are increasing during COVID-19. In https://www.savings.com.au/home-loans/how-much-a-home-office-costs-to-build, in Sydney, an existing room renovation cost $552.23 per square metre, while the new room was more than twice as expensive at $1,206.65 per square metre (both inclusive of GST). In the end, the two cost around $6,000 and $16,000 respectively.
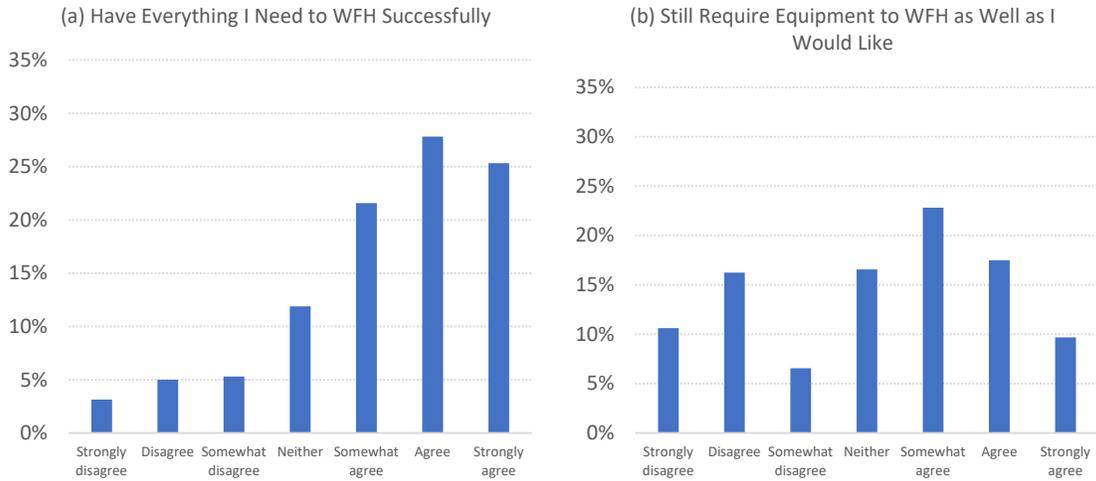
Figure 11: Equipment to Work from Home (Wave 3)

3.5. Relative Productivity of Work from Home

An important component of working from home is the extent to which employees are able to be productive while doing so. In starting in Wave 2 we asked respondents to assess how productive they felt they had been in the last week while working from home, relative to their normal work before COVID-19. In aggregate, Figure 12 shows that employees perceive their productivity whilst working from home to be at least the same as it was in their normal working conditions prior to COVID-19, and indeed in both Wave 2 and Wave 3, with testing against the neutral point (3 = about the same) revealing that on average respondents perceive themselves to be significantly more productive both in Wave 2 (3.11) and in Wave 3 (3.23). Although the difference is statistically significant it is only slight so one should not read too much into this result. That aside, the data indicates that productivity remains relatively unchanged and potentially people are becoming more productive as working from home becomes entrenched and new norms are developed.
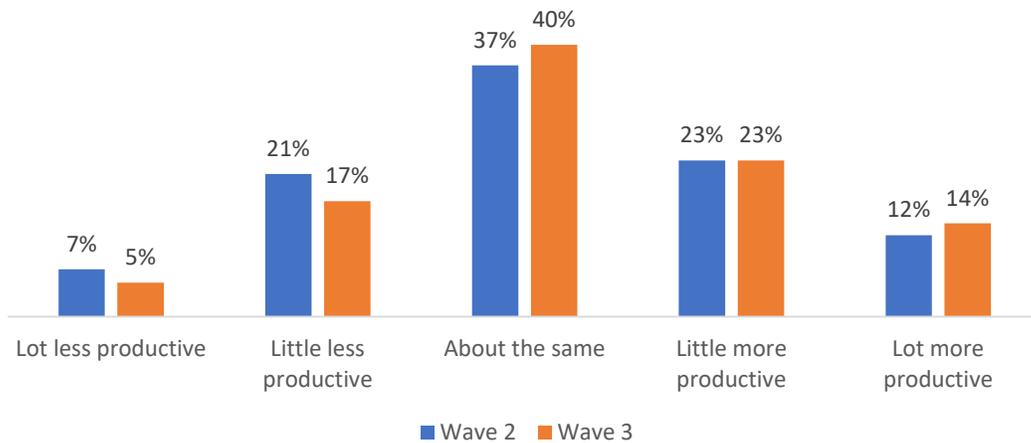

Figure 12: Relative Productivity while Working from Home (Wave 2 and Wave 3)

There is a weakly positive significant correlation in the number of days worked from home before COVID-19 and relatively productivity reported in the most recent Wave 3 data (r = 0.12), as well the number of days worked from home in Wave 3 (r = 0.11), providing some indication that the more you work from home the more productive you find the experience to be. There are no differences in productivity across occupation, gender, age, gender or income. Productivity in Victoria during their restrictions observed in Wave 3 is the same on average as relative productivity of working from home that is occurring in the rest of Australia.

3.6. Working from Home and Commuting

With respect to how commuting behaviour has changed in response to COVID-19 restrictions and the resultant increase in working from home, we see in Figure 13 that the number of commuting trips more than halved in Wave 1 compared to the average number of one-way trips conducted before COVID-19 (a 53% fall). There was a reduction in all modes, but it was particularly pronounced for the public transport modes of train (92% below pre-COVID-19 levels) and bus (78% lower). In Wave 2 we saw an uptick in commuting as restrictions eased and more people returned to work (41% below pre-COVID-19), which appeared to have stabilised for all states excluding Victoria in Wave 3. Within Victoria, however, the rising second wave and resulting restrictions saw commuting levels fall once more (54% below pre-COVID-19 behaviour). In both Wave 2 (r = -0.51) and Wave 3 (r = -0.60) there are significant and strongly negative correlations between the number of commuting trips made per week and the number of days worked from home, which is to be expected. Bio-security risks associated with public transport remain despite the effort by government to move away from the initial messaging (in the Wave 1 and 2 periods) to not use public transport, and that with social distancing (every 3rd seat can only be used on trains and buses) it is now (Wave 3) safe and mask wearing is recommended. Hensher et al. (2021) found that biosecurity concern associated with using regular public transport was a statistically significant positive influence on the increased probability of working from home.
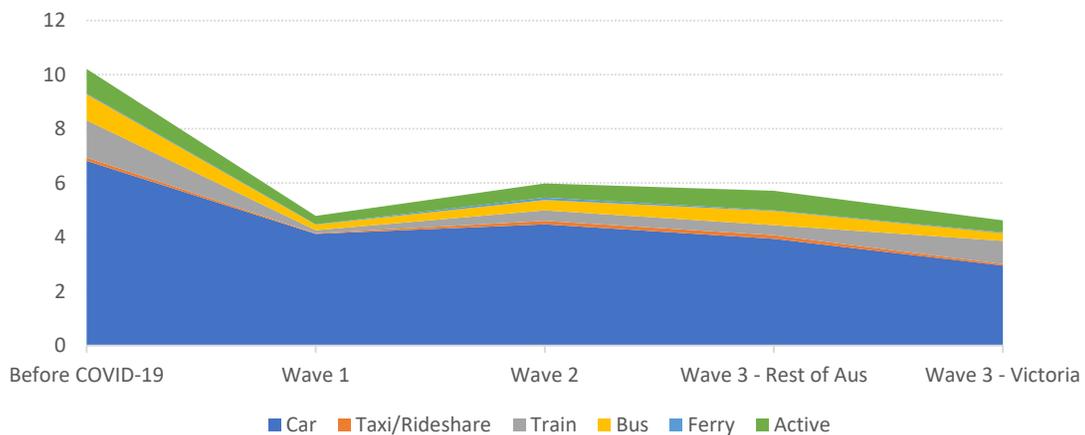

Figure 13: Commuting Activity by Mode (Wave 2 and Wave 3)

With respect to when people are working from home (and thus when they might be commuting), Figure 14 shows that working from home behaviour is relatively consistent across the working week,

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with approximately 30% of respondents working only from home on any one day, with just over half travelling for work. It should be noted that Figure 14 does not consider when travelling may be occurring for those that do – it might be the case that with increased ability to work from home people might also be taking this opportunity to stagger their working hours so that when they do travel for work, they can do so outside of peak periods and thus avoid traffic congestion or crowding on public transport.
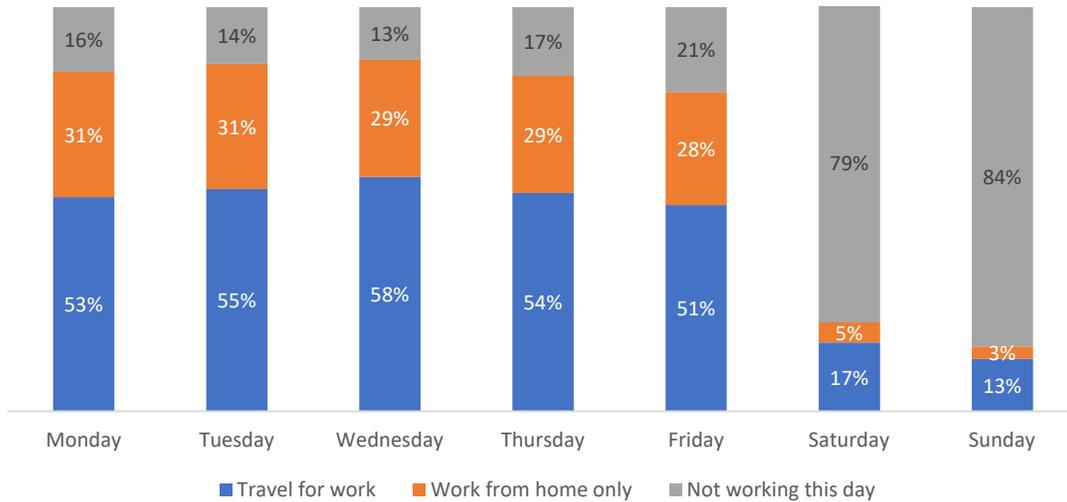

Figure 14: Commuting / Work Travel and Working from Home by Day of Week (Wave 3)

3.6. The Desire to Work from Home in the Future

Wave 2 and Wave 3 of the survey also asked respondents to indicate how many days they would like to work from home in the future as COVID-19 restrictions are eased over time. Figure 15 shows that the number of days that respondents would like to work from home has fallen from Wave 2 to Wave 3 (the average of 1.6 days from Wave 3 is significantly lower than the average of 1.9 from Wave 2). However, it is interesting to note that the number of days that respondents would like to work from home in the future is no different to the level being observed now (excluding Victoria due to the severe restriction in that state during Wave 3 data collection). There are no differences by gender, however the average days older respondents would like to work from home in the future is significantly lower than other age groups, respondents on high income groups want to work from home more days on average, and those who live in metropolitan areas more days in the future than those in the regions.
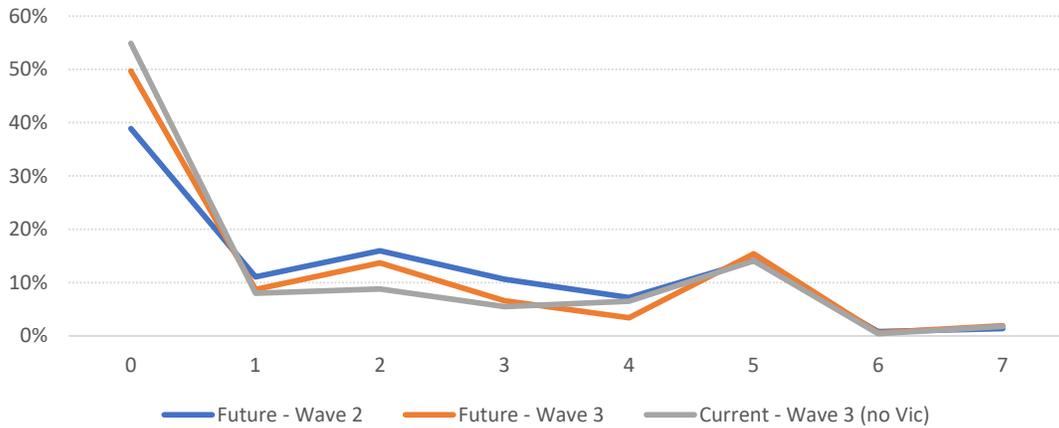
Figure 15: Days Like to Work from Home When Restriction Ease (Wave 2 and Wave 3)

Figure 16 shows that once again the predominately white-collar professions wish to work from home more often, on average. It should be noted that the number of days a person would like to work from home on average, does not vary by the size of the organisation (in terms of number of employees).
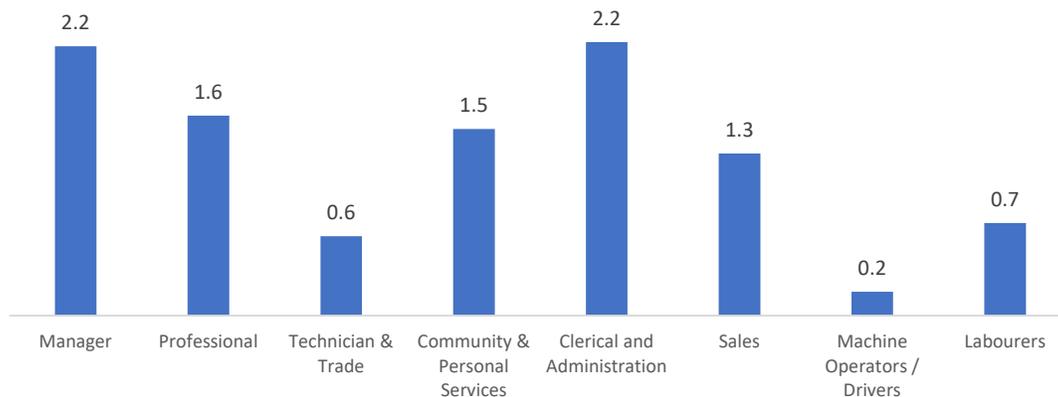
Figure 16: Days Like to Work from Home by Profession (Wave 3)

3.7. The Workplace and COVID-19

The concern that employees have about the risk of COVID-19 in their workplace was also examined, with the results being shown in Figure 17. The majority of respondents show some concern about the risk, particularly those in Victoria during the second outbreak in that state (Wave 3 data collection). There are no socio-demographic differences other than metropolitan respondents expressing significantly higher concern about COVID-19 and their place of work. There is also no difference observed between white-collar and other occupation types, however those that work in larger organisations (20 employees or more) express significantly more concern about the risk of COVID-19 and the workplace compared to those employed in smaller organisations. Interestingly there are also no differences based on the type of physical environment in which a person works.

Figure 17: Concern about COVID-19 in the Workplace (Wave 2 and Wave 3)

3.7. Adding an Employer Perspective

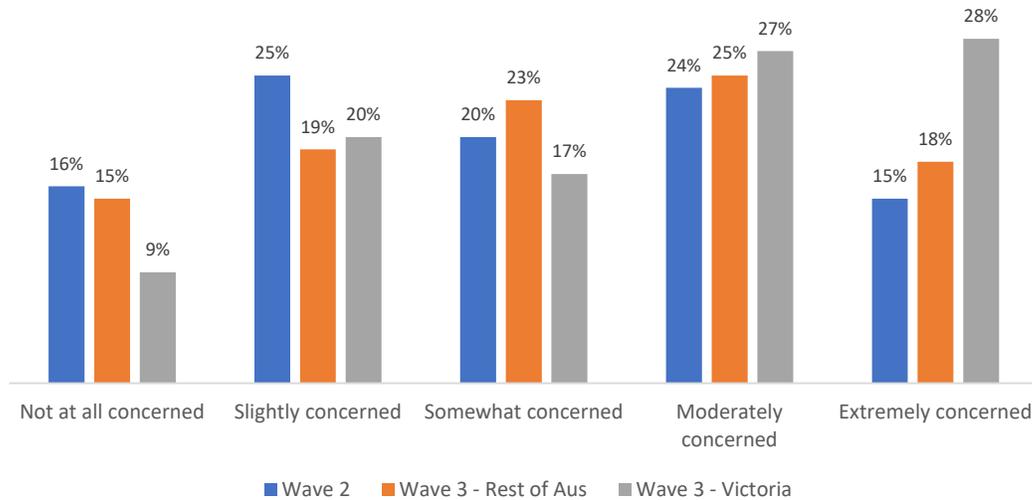While not ostensibly a focus of the survey sampling frame, the random sample of respondents across Australia means that employers and managers make up a component of each survey (Wave 2 = 106, Wave 3 = 125). Importantly, many employees in an organisation act in an employer-like role in terms of any advice and decisions being made about the support or otherwise for employees to be able to work from home to some extent. With regards to the risk that COVID-19 presents in the workplace, employers and managers are no less concerned than employees, however employers and managers in larger companies of 20 or more employees are significantly more concerned about the risk than those who are in smaller businesses.

With regards to future policy towards working from home, while one must allow for sample variation, there does appear to be an increase in the number of employers who would adopt a flexible work policy whenever COVID-19 restrictions were to end between Wave 2 and Wave 3 (Figure 18). Also shown is the response from employees in Wave 3 which also highlights a potential mismatch between what they might think is the policy their workplace would adopt versus what an employer or manager might support; specifically, there is the potential that employers might be more supportive of increased working from home than an employee might think. This is a finding that Brewer and Hensher (200) found many years ago when interviewing employers and employees on telecommuting options presented in an interactive agency choice experiment.
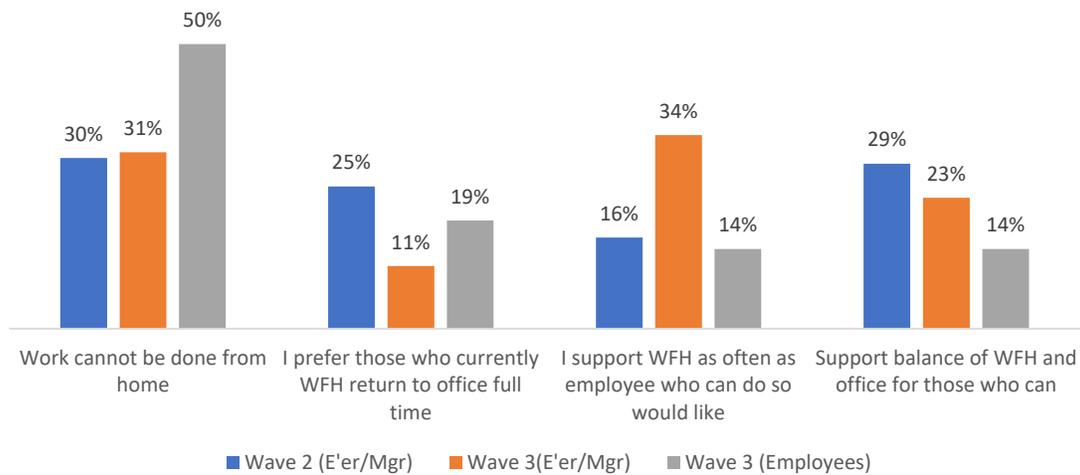
Figure 18: Employer and Employee View on Work from Home Policy when Restrictions End (Wave 2 and Wave 3)

Figure 19 shows the number of days that an employer and manager think are appropriate for staff to work from home (with the number of days an employee would like to work from home in the most recent wave of data collection provided for contrast). The results are very similar in Wave 2 and Wave 3, with no significant difference in the average number of days thought to be appropriate; however managers and employers provide an average number of days of work from home that is higher than what an employee states that they would like. This again does give some preliminary indication of a mismatch in the level of supportive for work from home among employers, and that which the employee might expect. There is no difference in the average number of days based on size of business; however managers in white collar roles support a higher average number of days working from home in the future.

Employers and managers were also asked to provide a reason for the number of days given. In Wave 2, those arguing for high levels of work from home did so because it works, it minimises office space or they believe staff like it. Those advocating for a balance tended to cite reasons around maintaining collegiality, keeping connections, generating value through interaction, the need for face-to-face meetings, and mentoring. In Wave 3, the nature of the responses is similar. Those who state that employees cannot work from home do so because of the nature of the job restricting the ability; those advocating a mix do so because of the ability of an employee to concentrate while working from home, but still needing the interaction of colleagues for team building, collaboration and working on complex problems. Interestingly several employer's state that while most of their work cannot be done from home, some can be done from home and thus one day a week might be appropriate moving forward. On the other hand, a small number also state that an employee could work from home as often as they would like, so long as productivity is not diminished.
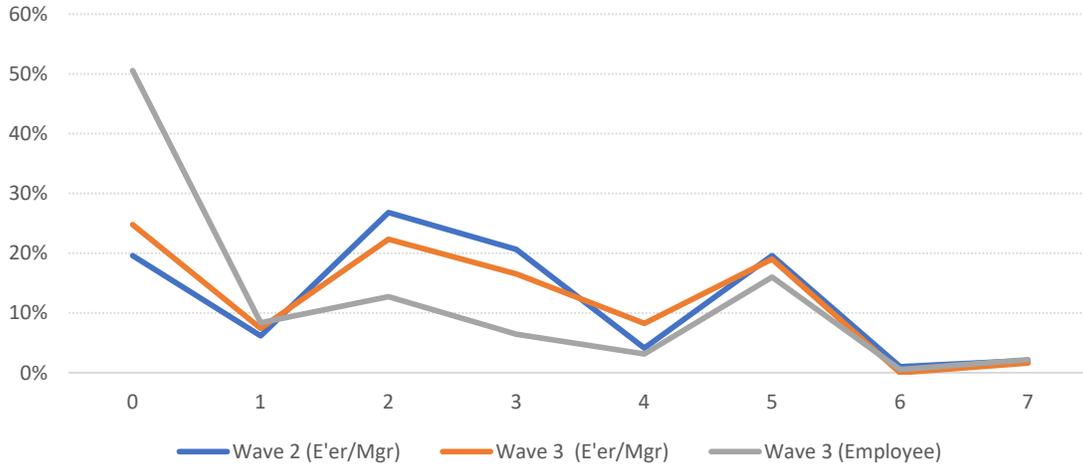
Figure 19: Number of Days Appropriate for Staff to Work from Home when Restrictions End (Wave 2 and Wave 3)

With regards to productivity of staff, Figure 20 similarly shows that the perspective of employers and managers has been stable from Wave 2 to Wave 3, with the perspective being that productivity has remained unchanged from what was normal prior to COVID-19; though employers and managers are less enthusiastic about productivity than the employees in the most recent Wave 3 sample. Female employers/managers report significantly higher average productivity scores for staff, and at a 10% level of significance those working in white collar professions also report higher average productivity, as do those working in larger organisations (20 or more employees). There is a significant positive correlation between productivity and the number of days that an employer/manager thinks appropriate for a staff member to work from home once restrictions end. There are no differences based on metropolitan versus regional responses.

Figure 20: Relative Productivity of Staff while Working from Home (Wave 2 and Wave 3)

3.8. Working from Home as a Proportion of Work

While the previous sections address working from home as aggregate days, Figure 21 presents the level of working from home as a proportion of the days worked (i.e., days worked from home / total days worked in the last week). Whil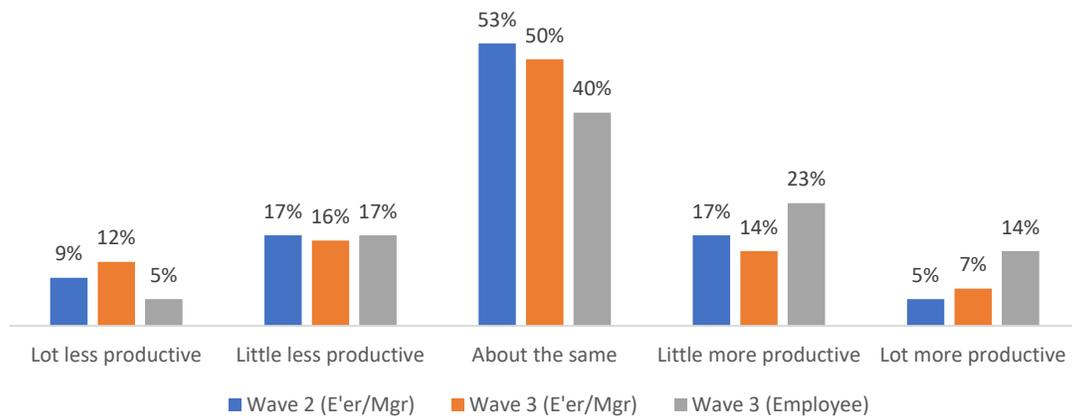e almost half of all respondents are now doing some of their work from home, it is interesting to note that over a quarter were completing all their work from home in Wave 3. Once again, we see that the future intentions for working from home mirror the current behaviours in Wave 3; some respondents not currently working from home seek to be able to do some work from home, and slightly less wanting to do all their work from home.

Females want to do a significantly higher proportion of their work from home in the future, as do those in younger to middle aged groups, or metropolitan areas, or in white-collar occupations. While there is no correlation in how many days a person works and the proportion of that work they do from home, there is a significant and positive correlation between relative productivity and the amount of work a respondent would like to do from home in the future when restrictions end.
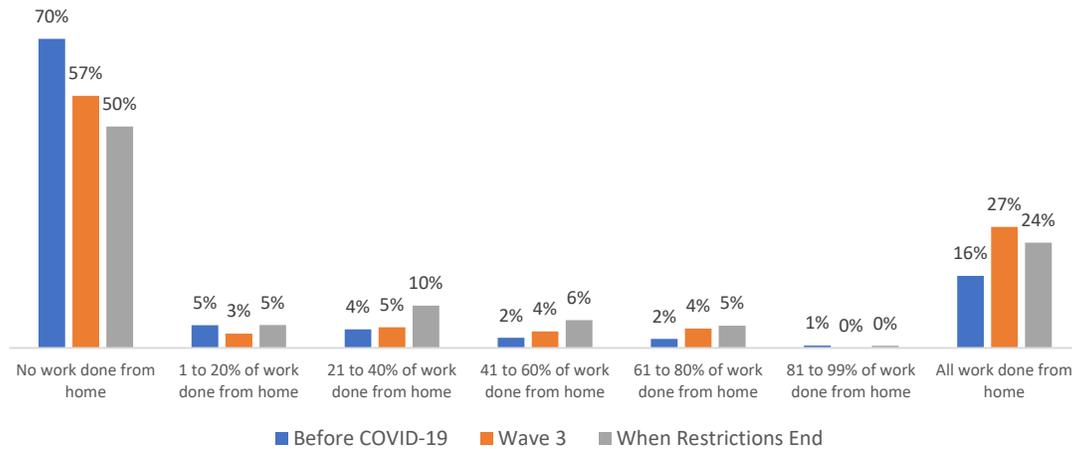
Figure 21: Work from Home as a Proportion of Days Worked (Wave 3)

3.9. Potential Commuting Time Savings due to Working from Home

As discussed in Section 3.2, a large benefit of working from home is not having to commute. In Wave 3 we asked respondents approximately how long it takes them to get to work via their main mode of transport. Across all modes of transport, the average one-way commute time is 32.4 minutes (σ = 28.1), with the average respondent spending 243 minutes (or just over four hours) commuting per week. Prior to COVID-19, across the sample respondents, they were able to save an average of 53 minutes per week by working from home which more than doubled to 133 minutes (σ = 255) minutes during Wave 3. If respondents are able to work from home at their desired rate as COVID-19 restrictions end, we would see a potential average weekly travel time savings of 114 minutes per week minutes (σ = 209). Even though these calculations do not factor in that only about half of respondents are able (or want) to work from home (Figure 21), the time savings engendered by greater working from home in Wave 3, and the potential for time savings in the future, are significantly higher than they are now.

As is obvious, time savings associated with WFH, the greatest transport policy lever we have seen over the last 70 years, is able to deliver greater travel time savings than any infrastructure or transport demand management initiative. We translated these time savings into dollar for Waves 1 and 2 (Hensher et al. 2021a) and for Wave 3 (Hensher et al. 2021) for the Greater Sydney Metropolitan Area, and found that on average, in Wave 3 each commuter saved in generalised cost[7] $3,546 per annum, of which $906 is out of pocket costs. This compares with Wave 2 where we have an average of $3,147 of which $461 is out-of-pocket costs. This compares with pre-COVID-19 estimates of $5,841 time costs and $2015 out-of-pocket costs, a total generalised cost of $7,946.

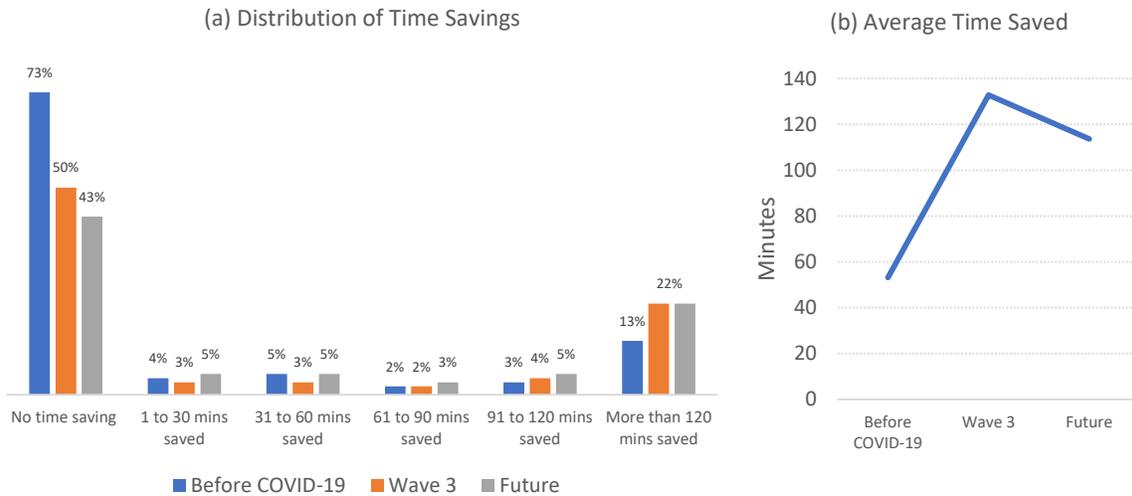(a) Distribution of Time Savings

(b) Average Time Saved

Figure 22: Weekly Time Savings by Not Commuting (Wave 3)

Sociodemographic differences in time savings are shown in Table 4 above. Males save significantly more time through working from home at Wave 3 levels than females, though this difference disappears based on future intentions. White collar workers save significantly more than other occupation types both during Wave 3 and in the future, as to those working in metropolitan areas. As income increases so does travel time savings experienced during Wave 3 and potential savings if future intentions are able to be enacted. During Wave 3 there were no significant differences in travel time savings through working from home, however in the future younger and middle-aged respondents have the potential to save significantly more time than older respondents. In terms of the potential for future time savings, there is a significant positive correlation between the amount of time saved and the perceived relative productivity of the respondent, indicating that those who are more

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[7] The generalised cost per person trip per for car (GCpersT) and generalised cost per person trip for public transport (GCPubT) are given as follows: GCpersT=VTTS*in-vehicle time +VoR*buffer time + operating cost ($/trip) + tollcost ($/trip) for all purpose of trips (peak/offpeak). GCPubT= invt VTTS *invehicle travel time + out-of-vehicle VTTS *out of vehicle travel time +PT fare ($/trip) for all purpose of trips (peak/offpeak). For car, we apply the values recommended by Transport for NSW of $17.72 for the value of travel time savings per person hour (VTTS), and $30.12 for the value of reliability (or travel time variability (VoR). For public transport, we also applied the recommended values from TfNSW for in vehicle and out of vehicle VTTS of $17.72 and $26.28 respectively. The operating costs ($/trip) and toll cost ($/trip), as well as peak and off-peak travel times for each of the O-D pair, were obtained from the MetroScan system networks (Hensher et al. 2020).

productive working from home could also save more time by doing so compared to those who are less productive.

Table 4: Sociodemographic Differences in Weekly Commuting time Savings

	Average Weekly Commuting Time Saving (Wave 3)	Future Potential Weekly Commuting Time Savings
Female	100	105*
Male	180	125*
White-Collar Worker	171	139
Other Occupation	52	59
Regional	89	81
Metro	173	143
Lower Income	54	66
Middle Income	100	109
Higher Income	227	156
Younger	105*	121
Middle Age	154*	129
Older	104*	73

* No significant differences found – results presented for comparison

4. Discussion

4.1. Summary of Insights

The public health orders put in place to combat the spread of COVID-19 have clearly impacted on working from home. For the majority of 2020 (an indeed in the early months on 2021), workplaces in Australia have either been encouraged to allow staff to work from home, or have been required to allow staff to do so wherever it is reasonably practicable to do so. Only in the relative height in the second outbreak in Victoria did the state government legislate the closure of non-essential workplaces to stop the rise of transmission. As a result, Wave 1 of data collection has shown that almost two-thirds of employees have now had some experience working from home. Even though the level of working from home now is less than the original amount witnessed after the first outbreak, for most of 2020 a large number of Australians have been working from home a relatively consistent amount week in, week out. While there are many other strategies that have meant that relative to global experiences, Australia has had extremely low levels of COVID-19 case numbers, there is no identified cluster of transmission that has been linked to an office-based workplace (rather the predominant places of infection have been gyms, bars and clubs, restaurants, and more recently a bottle shop).

While many Australians have been working from home over the last 9-10 months, others have been doing so more often and more successfully. Those in white-collar occupations[8] are in workplaces with more accommodating work from home policies and in roles where they have been able to work from home a significantly higher number of days per week, and those in metropolitan regions are also working from home more than those in the regions; likely because of the risk of COVID-19 being larger in urban environments in Australia (almost all outbreaks are in metropolitan areas) and that white-collar employment is more dense within urban areas. Those who are working from home to a greater extent are more likely to be male, middle-aged, and on higher incomes.

For those working from home, the major challenges include disruption of family and/or children, and the ability to concentrate on work in the home environment. These challenges, however, are balanced by the benefit of not having to commute and having a more flexible work schedule that allows greater freedom to manage home and work like. There are very few sociodemographic variations in the perceive benefits and challenges, indicating just how uniform that experience has been across Australia. The rapid uptake of work from home has meant a shift to more online communication; and at an average of three online meetings per week, it would seem that the number is not onerous, more over the effectiveness of those meetings are more or less the same as a "normal" meeting. It should also be noted that dealing with email and communication is a top two challenge for only one third of respondents.

All of the attitudes that formed about working from home have been consistently positive from Wave 2 (2-3 months experience working from home) to Wave 3 (5-6 months experience working from home) and that by month six of the work from home experience the majority of respondents now have everything they need to do so successfully, even though some feel they require more to work from home as well as they would like to. Indeed, as a result of the widespread positive experience, more than half of respondents indicate that they would like to work from home more in the future than they did in the past.

4.2. Benefits to the Individual

Interestingly, future intentions match rather closely the current levels of working from home that are observed during Wave 3, so rather than having to imagine what that future would look like, one need only use the current levels to see what the future could look like: on any given week-day there would be 30% of people working exclusively from home, meaning a significantly lower number of commuting trips and thus commuters on the road or public transport networks and the average person saving 114 minutes per week which would otherwise be lost to the commute. Assuming the average person works 48 weeks of the year (with 4 weeks of annual leave), this equates to 90 hours of saved time or just over two and a half standard working weeks (there are 38 hours per standard working week in Australia). This is not an insignificant amount of time that a person could spend in ways that offer themselves, or their family, higher utility. Given that a large percentage of Australians have been working from home at consistently higher amounts for what is now an extended period of time, there is reason to believe that those doing so have developed new habits towards working from home and have begun to embed routines that will see them be able to maintain their desired level of working from home and work successfully.

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[8] Managers (chief executives, general managers, farm managers, specialist managers, hospitality, retail and service managers); Professionals (Arts and Media, Design, Engineering, Science, Education, Health, ICT, Legal and Social); and Clerical and administration (Office Managers, Personal Assistants, General Clerical, Numerical Clerks, Office Support).

4.3. Benefits to the Employer

While there are time savings benefits that accrue to the employee working from home, there are also benefits for employers. Most directly, there is also the potential for significant cost savings on rent, should work from home be adopted in a meaningful way. For example, in the Sydney CBD the average commercial rent is $1075 per square metre per annum (Lenaghan 2020), with an estimated 8-12 square metre needed for each employee (Calautti 2019). By having more staff work from home, with needed less office space overall, the potential savings to the business quickly add up, typically $8500 to $13000 per employee per year. There is also the indirect benefit of staff who are working from home having more time to spend on work. A number of respondents indicated that the time saved on the commute was of benefit because it allowed them to reinvest that time into more hours of work. The research surveyed in the preceding literature review also strongly indicates that working from home and flexible working arrangements lead to better staff retention and create a more attractive employment offer, particularly important for attracting highly skilled workers.

Importantly, the experiences of staff and employers/managers discussed in this paper indicate that flexibility can be given without any loss to productivity. Crucially, both employees *and* employers/managers indicate that in the face of a huge to the nature of wok, productivity has remained *unchanged* relative to what it was prior to COVID-19. While these are relative measures of productivity, the results do indicate that management should be more amenable to allowing staff to work from home more in the future than they did in the past, especially given that in aggregate what is wanted moving forward are the levels of working from home we are now witnessing (Wave 3), and it is working. Indeed, there are many reports of large organisations already embracing increased working from home in a significant way (e.g., Bleby 2020, Smith 2020).

Many employees also express reservations about their workplace and the risk of COVID-19. At the time of writing, a cluster in Sydney emerging, with one of the more the concerning hotspots being an inner-suburb bottle-shop where a close contact of a hotel quarantine worker infected a staff member in the store, who in turn infected another staff member, and as a result over 2000 customers are now being asked to get tested and self-isolate immediate (additionally there is a cluster in Victoria (with links to Sydney) emanating from a single restaurant). Workplaces, particularly large white-collar workplaces that are often indoors and in shared spaces, represent a risk for forming a COVID-19 cluster. As such, any organisation seeking to manage risk should be looking at policies such as rotating staff through the office on different days, to minimise the impact on the business should one staff member develop the disease. Finally, the practical reality is that it would also be beneficial from a public relations standpoint, to be able to point to a robust COVIDSafe plan.

4.4. Wider Economic Benefits

While working from home benefits confer more fully to segments of the working population, such as those in white-collar, office-based employment, on higher incomes, in middle-age or younger age groups, and living in metropolitan areas, there are non-trivial wider benefits that can also be shared with people who are able to work from home successfully being able to do so more often.

A recent report by Infrastructure Australia (IA 2019) highlighted that in the six largest capital cities and neighbouring satellite cities, the total annual cost of road congestion (pre-COVID-19) was $19 billion in 2016, and the cost of public transport crowding was estimated at $175 million. By 2031 this was projected to grow to forecast total annual cost of road congestion of $39 billion, and $837 million for public transport crowding. During the height of the pandemic private vehicle use plummeted with aggregate indicators such as the Apple Mobility Trends showing car use falling by up to 60% (Apple 2020). Global GPS firm TomTom also publishes data via their Global Traffic Index (TomTom 2020),

wherein they construct a metric termed the Congestion Level index. An index level of 100 percent means that a 30-minute trip takes an hour to complete (i.e., due to traffic on the network, travel time doubles). During a typical pre-COVID-19 weekday, peak Sydney records a congestion level of approximately 80, but throughout April 2020 it only went above 30 on two days. These results indicate a very large reduction in congestion. Data collected on one Melbourne freeway showed a reduction in congestion of between 88% and 95% for weekday peak periods as a function of vehicle numbers only reducing by 28%; highlighting the potential to improve network efficiency by relatively minor decreases in traffic (AARB 2020).

While car use was never expected to stay at the low levels observed during March/April, it has rebounded strongly: SCATS (Sydney Coordinated Adaptive Traffic System) data shows that car use is now tracking 5-6% below that of a similar time last year (MySydney 2020). The fact that it remains some percentage lower is still important in gaining significant improvements in traffic flow. For example, a report by Infrastructure Victoria (2016) indicated that if just five per cent of drivers change their behaviour, driving conditions on Melbourne's road network would be the same as in the school holidays, every day of the week.

Not only was there a fall in private car use, but there has been an even bigger and sustained reduction in public transport patronage. During April, monthly trips on public transport as recorded by the electronic ticketing Opal Card data fell by 80% compared to the same period in 2019. As of November, total trips on all public transport modes remain 45% below the same period last year, and over 2020 public transport patronage has more than halved on the year, down 54% (TfNSW 2020). While much of this reduction (and subsequent rebound in car use) can be explained by the concerns people have towards the risk of COVID-19 on public transport (Beck and Hensher 2020a, 2020b), encouraging working from home as restrictions ease is a viable and cost-effective measure for transport authorities to ease crowding during the peak. Reduced crowding will have significant positive dividends for those individuals who do have to commute to work, given that negative crowding events are memorable (Abenoza et al. 2017) and may be the main driver of public transport dissatisfaction (Börjesson and Rubensson 2019).

There are also potential benefits to regional areas in terms of growth in economic activity. Recent media reports highlight the strong growth in regional house prices, which have risen at a higher annual rate than in capital cities for the first time in more than 15 years (Terzon 2020). It is speculated that part of the reason for the 7% average increase across all regional marketplaces (compared to 2% in cities), is the desire for urban dwellers to leave the city as a result of COVID-19 and the associated ability to work from home. While it is hard to disentangle if the interest in regional areas is due to prior growth in the regions, or the desire to move out of an urban environment because of COVID-19 itself, the disruption and consequent uptake of digital work solutions cannot be ignored as a factor in making working outside of capital cities a more tenable proposition. If the increase in property prices is a leading indicator of potential growth and thus improved economic activity in regional areas, there are positive long-term implications for jobs, accessibility and amenity[9]. Growth in regional areas is a noted strategic objective (DIRD 2017), especially given that 51% of the national population is in the three capital cities of Sydney, Melbourne and Brisbane (ABS 2020).

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[9] We would also suggest that the relevance of physical connectivity that is the cornerstone of agglomeration economies (also known as effective employment density) is no longer as relevant with a growing use the digital connectivity. Hence the ability to undertake business from a geographically more disperse location is expected to change the meaning and metric of agglomeration economy.

5. Limitations and Future Research

It has been long known in transport that humans are habitual (Goodwin 1977, Banister 1978, Verplanken et al. 1994, Aarts and Dijksterhuis 2000) and cognitive dissonance is common (De Vosa and Singleton 2020), and these habits are powerful and hard to change (Bamberg et al. 2010, Walker et al. 2015). There have been many studies of disruption in the transport literature, ranging from those looking at planned short-term disruptions (Currie and Delbosc 2011, Parkes et al. 2016), to unplanned infrastructure failures (Zhu et al. 2010), to city wide impacts of natural disaster (Chang and Nojima 2001). A number of meta-analyses have been conducted: Zhu and Levinson (2008) find that previous studies were not sufficient to assist recent research efforts in individual-based travel demand modelling; Marsden and Docherty (2013) find that responses to planned major disruptions show that significant shifts in behaviour can be managed, and those to unplanned major disruptions show the potential for innovation; Marsden et al. (2020) use disruptive events to show that there is a much greater adaptive capacity in the mobility system than currently allowed for; and Van Cranenburgh et al. (2010) find that while most substantial changes (major unconventional change) had transitory impacts, those related to the emergence of ICT and 9/11 could be classed as enduring.

Overall, human behaviour can be difficult to change and is notoriously sticky. The evidence about long term changes to local or urban travel as a result of a large disruption is inconclusive. Interestingly though Kontou et al. (2017) find that people return to normal working schedules within three months, they also find that telecommuting can allow commuters to keep their productivity levels high during post-disaster period. What is clear, however, is that COVID-19 represents a scale, scope and duration of disruption unlike anything seen since the Second World War[10]. The research being done now is only the start of what should be an ongoing research program. Moreover, it would behove the transport community to synthesize the previous analysis and avoid ambiguous use of terminology that has previously hampered understanding (Van Cranenburgh et al. 2012).

While in this study there are limited sociodemographic differences that have emerged thus far, showing just how widespread disruption has been, it does not mean that such differences or inequalities will not arise or become embedded in the future. This is something the transport community and indeed social scientists more broadly should be keenly aware of, such that we do not further embed income or social exclusion inequalities or give rise to new forms of inequality associated with technology accessibility, for example.

While we use the term "working from home" within this paper, there is also the concept of the third office, or 'anywhere working" (Blount and Gloet 2017) which covers any space where work might be completed that is outside of the traditional office environs. There is contemporary anecdotal evidence which suggests that individuals conduct paid work from public locations such as coffee shops, parks and libraries, yet no documented evidence of the rate of use of these alternative locations was found outside of one study that found a small percentage of telecommuters worked from summer cottages or from 'elsewhere' (Helminen and Ristimaki 2007). More research could be done to determine exactly where people have been doing work from, and how productive that work has been[11].

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[10] Researchers and commentators who use evidence of return to normal associated with major cataclysmic events to support a post-COVID-19 society are in our view misplaced. The GFC, and many physical disasters as well as previous viruses such as SARS were highly localised as well as better defined in terms of risk and volatility, and hence non comparable to the global impact of COVID-19.

[11] Importantly, the remote or satellite office outside of the home can be used as a very effective way of holding meetings with other members of staff or clients, and the ability to travel to such sites should not be an issue if

There is also the need to explore increased levels of working from home as either a complement or substitute for non-commuting trips. In many jurisdictions, the current data being collected on travel activity may not yet be appropriate for such analysis, as it is likely that travel activity is still suppressed, to varying degrees. There is research prior to COVID-19 but the evidence is mixed. Mokhtarian et al. 1995 find a reduction in both commute and non-commute-based trips (Mokhtarian et al. 1995), however others have found that telecommuting can increase personal travel and non-commute activity (Zhu 2012, Kim et al. 2015). In unpublished research on Wave 3, the authors have found that using Poisson regression models, that working for home has impacted on most trip purposes. Specifically, the number of one-way weekly trips for home-based commuting, non-home based trips (incl. work related travel), home-based education and home-based other trips (incl. social-recreation, visiting care support) have declined, but that home-based shopping and personal business trips have not been impacted by increased working for home.

6. Conclusion

While COVID-19 has been a crippling event, working from home has the potential to be an unintended positive consequence of the widespread disruption. There are benefits to the individual employee, to employers and businesses, and to the wider economy, including the transport network. Our data indicates that those working for home have found the experience to be positive and would like to continue doing so to a greater extent moving forward than they ever did before. Additionally, our data also shows that productivity remains relatively unchanged and the employees are potentially becoming more productive as working from home becomes entrenched and new norms are developed. It is clear that the benefits are great and not to be ignored in any ambition to the return to pre-COVID 19 'normality'.

While there may be pressure from certain circles for employees to return to the office en-masse, to do so would ignore not only the inherent risks that still exist with larger indoor gatherings, but also the redistributive impact of working from home on more localised or suburban economic activity. While the impact on central business districts (CBDs) is currently large, a greater balance between working from home and the office is likely still enough activity to revitalise much of the business in the supply chain that is currently suffering. While traffic has been quick to rebound, there is currently a lower CBD focused congestion which may return if the uplift in second-hand car purchases (IA 2020) combined with the concern about public transport indicates that a higher car mode share may persist for some time. To avoid congestion at levels which would be *worse* than before COVID-19, authorities and policy makers should do everything in their power to facilitate the choice to work from home rather than the choice to drive to work or consider what has been, to this point, the politically unpalatable option of road pricing.

A barrier that might exist to ongoing working from home is the position of management within organisations: research cited in the literature review shows that managerial resistance is perhaps the biggest barrier. However, the widespread and extended nature of the disruption is potentially such that this barrier has been broken; our data indicating that managers/employers show favourable attitudes to increased working from home that have remained stable over the periods of data collection. That said, research has also shown that many managers express a low self-confidence in their ability to manage workers remotely which in turns undermines their support of working from home (Parker et al. 2020). Rather than reduce working from home due to a lack of managerial confidence, organisations should rather seek to equip managers with new skills to boost their ability

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carefully planned. Indeed it not only avoids the need to meet at someone's home when the traditional office location has been downsize, its flexibility enables the location to be booked to suit the group attending.

to manage in technologically advanced environment. This is especially true as a meta-analysis of 46 telecommuting studies proves the benefits on job satisfaction, performance, employee turnover and stress that working from home can have (Gajendran and Harrison 2007). There is also clearly more work required to understand the response of employers to COVID-19.

Lastly, it is important to note that working from home is not and should not be seen as an all or nothing affair. Analysis herein indicates that respondents would like to continue to do so to some extent, at levels that are higher than before. It should be noted that neither we nor any authority should expect working from home to be an all or nothing proposition, rather simply *more* working from home than was the case before COVID-19 would have significant positive dividends. We also understand that the widespread increase in working from home that has occurred does not mean that the barriers to working from home well have disappeared. To that end policies that support formal childcare resources could relieve the family-to-work conflict and encourage people to work at home (Zhang et al. 2020), direct financial support for telecommuting facilities or a subsidy for firms adopting telecommuting could be considered (Mitomo and Jitsuzumi 1999), or even rethinking the opening hours of shops and leisure facilities (Saleh and Farrell 2005). As a formidable transport policy lever, working from home must become embedded in the psyche of transport planners and decision makers as well as the tools they use to arrive at a future that can benefit from the unfortunate imposition of a virus pandemic. This is the challenge that we all should work on as we seek to understand what the new priorities might be for the future delivery and maintenance of and efficient and effective transport network that aligns with the aspirations of society.

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