Australasian Transport Research Forum 2021 Proceedings
8-10 December, Brisbane, Australia
Publication website: http://www.atrf.info

THE IMPLICATIONS OF WORKING-FROM-HOME FOR TRANSPORTATION: Literature Review

Long Vo[1], Brett Smith[1] and Sharon Biermann[2]
[1]UWA Business School, M261, Perth WA 6009 Australia
[2]Planning and Transport Research Centre (PATREC), UWA, M257, Perth WA 6009 Australia
Email for correspondence: brett.smith@uwa.edu.au

Abstract

In this paper several opportunities and challenges of working-from-home (WFH) practices are discussed; with a focus on the reduction of travel demand and pressure on constrained transport networks. Findings for Australia indicate the combined effects of heightened concern related to public transport hygiene, vehicle capacity limits complying with social-distancing requirements, and a generally positive experience associated with WFH are expected to lead to a higher level of WFH compared with pre-pandemic levels.

1. Introduction

Despite the unprecedented challenges the COVID-19 pandemic has brought, Australia has fared relatively well in terms of economic and public health performance. Australia's GDP was 2.4% lower in 2020 than in 2019, but this decline was much smaller than the average across advanced economies. At the time this article was written, the economy had regained around 90% of the activity it lost in mid-2020 (Australian Trade and Investment Commission, 2021). Western Australia (WA) had relatively few community transmissions (117 as compared to 118,900 nationally)[1] and apart from an initial 30 day lockdown (March 29th 2020 to April 28th 2020) interruptions to economic activity have been short.

An important aspect of these developments that will likely have an accentuating impact on Australians' lifestyle is the widespread adoption of an unprecedented level of WFH and virtual commerce, education and other activities. The primary purpose of this article is to examine the most recent literature concerning the impacts of WFH on transport demand, with a particular

[1] These data will change daily. Source: https://www.health.gov.au/news/health-alerts/novel-coronavirus-2019-ncov-health-alert/coronavirus-covid-19-case-numbers-and-statistics

focus on the Australian experience. As early as the mid-1990s, travel demand management measures, including WFH practices, have been proposed by planners across the world to reduce peak travel demand, and was raised again as one of the most viable options for alleviating traffic congestion just prior to the outbreak of the pandemic (Hopkins & McKay, 2019).

One overarching advantage of WFH is reducing pressure on constrained transport networks, and policies based on WFH will be an important step towards a more sustainable post-pandemic transport future. Indeed, surveys in Australia during the pandemic suggested that the most important benefits of WFH perceived by workers are not having to commute often and more flexible work schedules (Beck and Hensher, 2020b). These advantages should be considered by transport authorities seeking to solve congestion problems and/or to encourage peak spreading during weekdays. However, Ipsen et al (2021) noted that employees indicated that the lack of interaction with colleagues, uncertainty of tasks and poorly equipped workspaces were key disadvantages experienced when working from home.

However, this positive effect could be offset by a preference for private vehicle use over public transport modes due to infection concerns and social distancing requirements on public transport. This could undermine decades of government efforts to reduce congestion, greenhouse gas emissions through reducing single occupancy vehicle travel and prevent underutilisation of costly existing and planned public transport infrastructure. Associated reduced farebox returns translates to less funding for continual enhancement of the public transport network and services (e.g. reduced demand-side drivers of investment). Even a relatively minor mode shift to private car use could dramatically increase network congestion.

The remainder of the paper is organised as follows: Section 2 provides perspectives on the impact of the pandemic on travel demand. This is followed by a discussion of the implications of WFH practices for land use planning in Section 3. The future of such practices and the recovery path for transport in Australia is the topic of Section 4. The last section concludes and discusses potential future research avenues

2. Impact of COVID-19 on travel demand

Transportation is among the most disrupted sectors during the COVID-19 pandemic due to various travel restrictions. Though there was a significant reduction in public transport ridership in most of the world's populous metropolitan areas immediately following shelter-in-place/lockdown orders, the magnitude of such a drop varied depending on the stage of the virus spread and policies implemented by local authorities. During lockdown periods, early estimates suggest that this drop was 80% to 90% in major cities in China, Iran and the U.S, and as much as 70% for some operators in the U.K (UITP ANZ, 2020). According to reports from the International Energy Agency, global road transport activity was almost 50% below the 2019 average by the end of March 2020 and commercial flight activity almost 75% below 2019 by mid-April 2020 (Sung & Monschauer, 2020; IEA, 2020). In the first eight months of 2020, rail travel in Australia and New Zealand dropped by 268 million trips, or an average of 33 million trips each month (Australasian Railway Association, 2020)

During the period of March-April 2020, Beck & Hensher (2020a) conducted the first wave of a survey across all Australia states and territories in order to examine the widespread impact of COVID-19 on transport behaviour, and documented a 53% reduction in the number of trips made by households per week on average, down from 17 to 8 trips per week pre-pandemic. Estimates by PWC (2020) showed that public transport trips in Sydney and Melbourne were

down by 80% in mid-April 2020, with similar drops in CBD pedestrian counts. According to Beck and Hensher (2020a) the fall in public and private transport is attributable to three key drivers that are distinctive but have interdependent impacts, namely, government regulations, public perception and work practice shifts. Firstly, the World Health Organisation (WHO) encouraged social distancing when the outbreaks began. Governments worldwide took a number of immediate measures such as suspending public transport completely (e.g., in Wuhan, China). Others placed restrictions on the use of public transport for essential travel only, such as healthcare and frontline workers, e.g. in California, Washington D.C., New York, and many cities in Italy (UITP ANZ, 2020), or urged the public to stagger their travel and practice social distancing, e.g. in Australia. Secondly, as the discussion around social-distancing became more pervasive, commuters changed their behaviour in the way they used public transport. Many followed government guidelines and used public transport for essential travel only, while others avoided all perceived crowded spaces including public transport. As a result, commuters switched to active transport modes as well as rideshare and driving (Hossain, 2021). Finally, employers also incorporated social distancing as part of their business plans. Businesses continue to operate virtually by having their employees WFH. For example, in Australia, using surveys conducted during restriction periods, Beck and Hensher (2020a, 2020b) documented a rising number of workers in some occupation classes working from home for one to two days a week. The likelihood of working from home is highly dependent on the employee's role, of the 177 interviews 78% of professionals reported at least one WFH day in the previous week, compared to 16% for machine operators (Hensher et al., 2021). This rising trend is supported by employers who in general observe no significant changes in productivity for employees who are currently working from home compared to before COVID-19.

Regarding non-commute travel, Google Mobility data which provides information on trip purposes and changes in activity patterns across the world, indicated that during the period 13 April to 25 May 2020, Western Australia recorded a 19% decrease in retail and recreation trips, 51% fewer trips to the parks, 45% reduction in public transport trips, 12% less journeys to work, but at the same time a 10% increase in homebased activities and 4% more visits to supermarkets and pharmacies (Google, 2020). Figure 1 provides indicative mobility data from Apple mobile tracking (Apple 2021) for two Australian cities. After the national lockdown form March to May of 2020, Victoria experienced two long subsequent lockdowns in June – Aug, 2020 and Aug-Oct, 202. On the other hand, WA implemented three short (under a week) mobility restrictions. Of not is that the percentage decrease in public transport was greater than the decrease in driving, for both cities, and despite the stark differences in the impact of COVID-19 since the national lockdown, public transport has maintained a lower level of recovery.

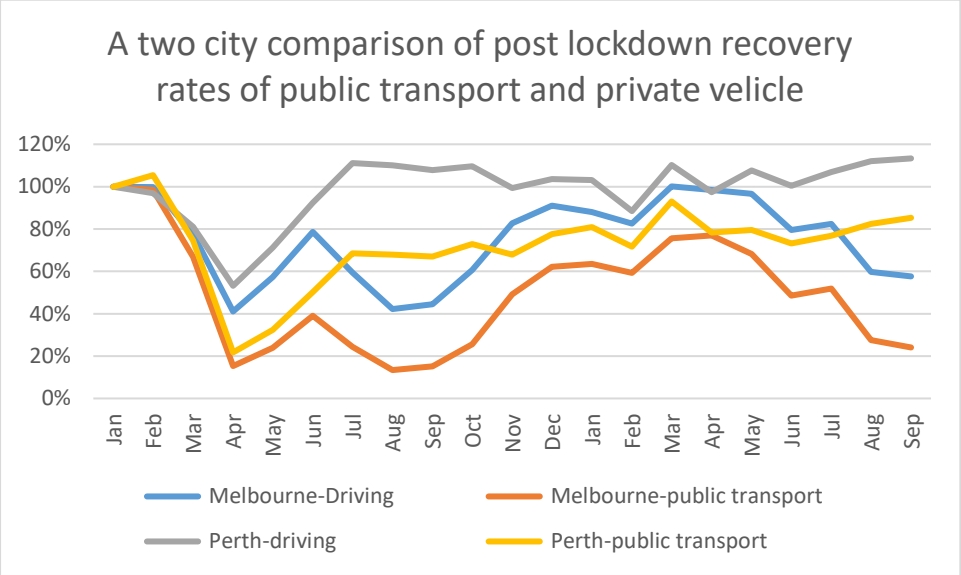

Figure 1: Private Vehicle and Public Transport use relative to pre-pandemic levels, Source Apple Mobility Tracking (Apple, 2021)

3. Implications of WFH for land use planning

The COVID-19 pandemic and WFH practices, though contributing to the significant reduction of public transport ridership globally, have also brought about positive impacts for urban planning and transport systems. Half of employed Australians considered their employers have used the period social restrictions as a chance to invest in business growth and development, especially to realise the gains of working flexibility (Renton et al., 2020). Beck and Hensher (2020c) report that businesses consider WFH as a viable option to reduce the cost of office space provision and workers can avoid the need for the stressful and costly commutes. For all capital cities, the average vacancy rate has risen to 12% from the pre-covid base of 9% (Property Council, 2021). However, recent evidence of demand for offices in Perth CBD and neighbouring zones (Lenaghan, 2021) may be a leading indicator that demand for office space will grow when restrictions are lifted.

Previous pre-COVID studies on the association between reduced transport demand and WFH found the effects to be modest (Banister & Stead, 2004; Nelson et al., 2007; De Graaff & Rietveld, 2007; Rietveld, 2011; Fu et al., 2012), primarily because of the rebound effects, such as non- commute travel and increased energy use. Hensher (2020) indicated that WFH is likely to reduce the CO2 footprint for commuters whose journey to work is greater than 6 kilometres, but for shorter trips or those done by public transport, WFH could increase emissions due to extra residential energy consumption.

A more general approach to understanding the wider impacts of COVID-19 and WFH practices is to consider how they shape spatial residential and employment choices. Office space managers expect a 36% rise in worktime outside their offices (Lund et al., 2020) and as such, office vacancy rates in the U.S are predicted to rise to 20.2% by the end of 2022, compared with 16.8% at the end of 2019 (Davidson, 2020). While higher housing demand in outer suburbs may push up prices in these areas, the fall in residential and office-space prices in core locations is expected to more than offset this increase.

Barrero et al. (2021) estimated that the shift to WFH will directly reduce spending in major U.S city centres by at least 5 to 10% relative to the pre-pandemic situation. In contrast, businesses in outer suburbs tend to benefit from the shift to WFH as the patronage of services located near workplaces is transferred to establishments located near where people live (De Fraja et al., 2021). Whether the above mentioned short-term trends are sustained in the future remains to be seen.

It follows that workers who are able to switch to WFH enjoy larger welfare gains by saving commute time and moving to more affordable neighbourhoods. Commuting time and cost saving is also the highest ranked WFH benefit by Australian workers in multiple recent survey rounds conducted by Beck and Hensher (2020a, 2020b, 2020c). Similar findings to the above are documented with an Australian spatial conditional general equilibrium (GCE) modelling exercise undertaken by Lennox (2020).

4. Transport demand recovery and the future of WFH

In the following discussion, we show why it is reasonable to expect a higher post-pandemic level of WFH compared with the pre-pandemic level (but lower than during the pandemic), not only because of its perceived benefits to workers and employers, but also because of lingering public health concerns and capacity limits on public transport. The level of WFH will most certainly be heterogeneous across occupations/industries, locations, and demographic groups, among which benefits and costs of WFH and/or its desirability vary considerably. Importantly, welfare gains from WFH may be concentrated in the older and more affluent population, which could increase long- term inequality.

4.1. Transport demand

In Australia and New Zealand, private transport recovered much faster than public transport: In June 2020, public transport usage was 55% down from 2019, while use of toll roads was only 20% lower than the previous year[2] (Australasian Railway Association, 2020). Similarly, in a recent research brief, Biermann et al. (2020) documented that traffic volumes in Western Australia started picking up following the ease of the first restriction period: By early May 2020, the all-day traffic in and out of Perth CBD recovered to 80% of the pre-COVID level but public transport patronage recovered to just more than 20%. One year later, this diverging recovery pattern persisted, with metropolitan public transport ridership recovering to 70% of pre-COVID levels of patronage, but traffic increasing to 107% levels from a year earlier (Wynne, 2021). Infrastructure Victoria modelled possible post-lockdown recovery scenarios for Melbourne's inner metropolitan area, noting that the significant shift away from public transport will more than offset any expected congestion relief from the assumed higher WFH levels (Infrastructure Victoria, 2021).

A reduction in demand for shared modes of transport including bus, train and rideshare was observed in Australia between March and June, 2020 (Beck & Hensher, 2020a). In the likely scenario of growing effectiveness and acceptance of WFH, public policies to support demand

[2] This is a headline figure for toll road and does not differniate between travel to the CBD or otherwise nor the shares of private travel and freight.

recovery for shared modes could potentially include operational changes to ensure hygienic transport environment, and the promotion of micro-mobility modes (scooters and bikes) and carpooling (Hensher, 2020). In addition, as commuters who were previously public-transport users might be more willing to tolerate traffic congestion and parking costs for two to three days a week, private car usage for commuting is expected to increase (Hensher et al., 2021). Measures to increase public transport use should be accompanied by measures to reduce car use in order to maintain road network service efficiency and meet strategic transport objectives. Distance-based charging during periods of heavy congestion and parking fees and tolls have been proposed although a higher level of tolerance of costs associated with driving (including of congestion) has been identified as a risk to limiting car travel (Terrill, 2019; Hensher & Beck, 2020).

Divergence in recovery paths strongly illustrates the influence of concern about hygiene standards as well as capacity limits imposed on public transport. The percentage of people who expressed extreme hygiene concerns fell from 60% earlier in the pandemic when restrictions began, to 35%, but still much higher than the 5% observed pre-COVID (Beck & Hensher, 2020b). According to Gkiotsaliti & Cats (2020), many public transport service providers worldwide have resumed or will resume services following the national regulations of one to two metres physical distancing, implying a major capacity drop of 60%-90%. However, the recovery rate of transport services, which depends on the duration of restriction, varies significantly across countries and regions (Sung & Monschauer, 2020).

4.2. The future of WFH

With respect to the likelihood of WFH practices forming an integral part of the transport mix moving forward, the discussions in previous sections also urged an important question: How sustainable is the current level of WFH in the long run? The answer to this question can be glimpsed from the study of Barrero et al. (2021), who surveyed more than 30,000 Americans and found that 20% of full workdays are planned by employers to be supplied from home after the pandemic ends, compared with just 5% before. Survey respondents, particular those with higher income and education, are also willing to accept pay cuts as much as 7%, on average, for the option to WFH two or three days per week after the pandemic. Beside lingering concerns about contagion risks, this significant change was attributed to three other factors that improve the better-than-expected WFH experience: new investments in physical and human capital that enable WFH, a surge in technological innovations that support WFH, and diminished stigma associated with WFH. In the long run, higher levels of personal and institutional investments in upgrading WFH setups and facilitating communication can improve WFH experience and employees' mental health and productivity (Kitagawa et al., 2021). Interestingly, conventional productivity measures only capture one-fifth of this productivity gain, because these do not account for the time saving from less commuting.

From the Australian experience, as of October 2020, Renton et al. (2020) found that since COVID- 19 was declared a global pandemic, two in five respondents (41%) had commenced WFH of these 24% are still WFH, 13% were back in the office and 4% indicated that they were no longer employed. In addition, the future of work is likely to be hybrid, with 61% of respondents preferring a mix of WFH and on-site work. The ideal scenario for more than a third of respondents is that the majority of time is spent WFH and employees only come into the office for meetings/project collaboration. According to the Taking the Pulse of the Nation survey conducted by the Melbourne Institute, in September 2020, 70% of respondents who

identified as WFH indicated they would prefer to continue doing so post-pandemic. In November, though the share of WFH respondents fall, the preference to remain at home increased to 73% among those who still WFH (Wooden & Lim, 2020). Beck & Hensher (2020b)'s survey indicated that among those who can WFH, little change in productivity was perceived, and almost double the number of respondents find working from home to be a lot more productive (12%) than a lot less (7%).

Similar opinions are recorded from surveys conducted by the research institute OnePoll in Australia, France, Germany, Italy and the U.K with 70% of employees saying they are more productive from home and 38% saying they work even longer hours (NAB, 2020). Beck & Hensher's (2020b) study further revealed that middle-aged respondents and those on higher incomes report high levels of productivity, on average. There was also a strong agreement among respondents that the appropriate balance between work and non-work hours can be found, and that the space at home is appropriate for work. Interestingly, females report a significantly higher average level of agreement, as do those on higher incomes. However, younger respondents report significantly less positive experience than other age categories.

With respect to the longevity of WFH, in general respondents would like to WFH more than they did before COVID-19. Younger and middle-age respondents would, on average, choose to work more days from home as restrictions ease than older respondents. The desires for partial WFH are persistent across all groups defined by age, education, gender, earnings, and family circumstances in the U.S, even though the preferred frequency varies substantially among individuals (Barrero et al., 2021).

4.3. Challenges to WFH

Even though the desirability and positive perception towards WFH is appealing, its long run continuation is impaired by the fact that the potential for remote work is only concentrated among highly skilled, highly educated workers in a number of industries, occupations, and geographies. Lund et al. (2020) analysed 2000 activities and 800 occupations in 9 countries and found that only up to a quarter of the workforce in advanced economies can WFH three to five days a week while the majority cannot work remotely, as their work either involves physical or manual activities or requires the use of fixed equipment, such as in agriculture and construction. In contrast, the finance, management, professional services and information sectors have the highest potential for remote work. Survey evidence indicates that the net productivity impact of WFH is positive as employees gain more experience. However, it is currently debatable and difficult to objectively measure this impact, as conventional productivity measures may not capture all effects of WFH (Barrero et al., 2021).

Despite its multiple benefits, ill-designed WFH arrangements could also lead to overwork and blur the boundaries between work and home. For example, about 54% of the respondents from Microsoft (2021)'s large-scale survey felt overworked and 39% reported exhaustion. In addition, online meetings are significantly longer, messages sent over Microsof Teams increased by 45% and 41 billion more emails were sent over Microsoft Exchange in a single month.. The attitude towards WFH varies significantly across age: while senior workers and managers experienced "thriving" WFH conditions, the younger generations – specifically the Gen-Zers (aged between 18 and 25) – are struggling to balance work with life and reported difficulties feeling engaged or excited about work, participating in online discussions and presenting new ideas (Mark, 2021).

Another challenge to consider when designing future work schedules is a possible expectations gap between employers and employees regarding WFH. In addition, from the perspective of employers, while some tasks can be done remotely, they are much more effectively done in person, such as coaching, counselling, and providing advices, which have become prevalent during the crisis. As a result of this mismatch, the actual level of WFH will most likely be lower than the share of work that can potentially be done from home. A recent report by Boston Consulting Group of some of Australia's largest companies revealed that while 64% of employees prefer a hybrid model that involved at least some WFH, employers expected that this will only be feasible to 40% of their workforce (Mattey et al., 2020). Similarly, employers think one-third of their staff who can work remotely will be back in the office full-time, but only 15% of employees agree to comply (Patty & Wade, 2020). Bringing back employees once restrictions were eased is a policy that was supported by the New South Wales state government, as shown by the relaxation of WFH order in December 2020 (Hirst, 2020).

5. Concluding Remarks

The COVID-19 lockdowns in several Australian cities has induced significant changes to individual mobility patterns that were brought about by abrupt enactments of mobility-restriction and social- distancing regulations. Despite the great challenges these developments pose to public transportation, they also provide a unique opportunity for employers, workers and transport infrastructure managers to adopt new approaches to promote various beneficial behaviours and outcomes with support from historical experience (Beck & Hensher, 2020c). Examples of such outcomes include the reduced demand for peak-time travel as well as the need for costly infrastructure investment, and potentially enhanced WFH productivity in the longer run.

In this article, we highlighted a number of important challenges and opportunities encountered by stakeholders in the transportation sector in Australia, a country that has evaded the worst of the pandemic while maintaining relatively stable economic performance. To maintain this performance, there is an urgent need to develop and deploy methods and tools that support planners in pursuing the dual objective of minimising the public health risks associated with mass transportation/shared transport modes and managing crowds, while sustaining critical functionality of public transport systems.

On the other hand, demand for private transport may rise as this tends to be preferred by commuters when there are fewer commuting days. Beck and Hensher (2020a) documented that soon after the national lockdown, private vehicle demand remained relatively stable at around 70% share of trips but the use of public transport falls from 15% of trips on average to 7%. This is reflected in Apple mobility tracking data to September 2021 (see Figure 1). This shift in mode could heighten road congestion levels. COVID-19 could therefore undermine efforts of promoting public and active transport modes in recognition of the safety, environmental, social equity and productivity benefits of these modes (PWC, 2020). Another outcome that has a profound implication for Australian transport is the future prevalence of WFH practices, including rotation and/or staggered working arrangements, even as the economy recovers from the pandemic. Should WFH become a new normal/established practice, the reduction in vehicle numbers is expected to have a significant effect on congestion levels due to changes to peak travel demand. In short, if social distancing mandates and mode shift behaviours continue, WFH could be the solution for the "crowding out" adverse effect on public transport.

However, no solution comes without cost. Whilst reduced travel due to WFH can relieve or delay expenditure on road infrastructure, it also exposes the operational budget of the public transport system to a loss in revenue on its most lucrative services, such as the Mandurah and Joondalup train lines and some express bus services such as the 950 service (Biermann et al., 2020) thus affecting wider transport policy objectives. There are also several other challenges to WFH from both employees and employers' perspectives, and future research will need to explore these along with potential benefits in order to support the government and the wider community to make WFH a valiable long-term proposition. Further understanding around how WFH practices can reshape transport patterns will be a key element of post COVID-19 urban planning. For example, to support WFH, governments may need to prepare to offer tax relief to employers who arrange staggered working hours after social distancing is relaxed. In addition, to reduce congestion, WFH could be encouraged in conjunction with conventional congestion-suppression policies such as road-user charge reform and incentive-based reward systems (Hensher, 2020).

6. References

Apple (2021) Apple Maps Mobility Trends Reports https://covid19.apple.com/mobility

Australasian Railway Association (2020). The Impact of COVID-19 on Passenger Rail In Australia and New Zealand. Policy Brief. Available at: https://ara.net.au/wp- content/ uploads/ARA-member-briefing-The-impact-of-COVID-19-on-passenger-rail-in- Australia-and-New-Zealand-1.pdf

Banister, D. & Stead, D. (2004) Impact of information and communications technology on transport. Transport Reviews, 24(5), 611-632.

Barrero, J. M., Bloom, N., & Davis, S. J. (2021). Why working from home will stick. Working paper 28731. National Bureau of Economic Research.

Beck, J. & Hensher, D. (2020a). Insights into the impact of COVID-19 on household travel, work, activities and shopping in Australia – The early days under restrictions. Transport Policy, 96, 76–93. doi:10.1016/j.tranpol.2020.07.00

Beck, J. & Hensher, D. (2020b). Insights into the impact of COVID-19 on household travel and activities in Australia – The early days of easing restrictions. Transport Policy, 99, 95–119. doi:10.1016/j.tranpol.2020.08.004

Beck, J. & Hensher, D. (2020c). What might the changing incidence of Working from Home (WFH) tell us about future transport and land use agendas. Transport Reviews. Forthcoming. DOI: 10.1080/01441647.2020.1848141

Biermann, S., Reed, T. & Chi, S. (2020). Impacts of COVID-19 on travel in Perth. Working paper. Planning and Transport Research Centre. The University of Western Australia. Available at: https://patrec.org/wp-content/uploads/2020/07/Perspective-COVID- impacts.pdf

Davidson, P. (2020). Will the remote work craze sparked by COVID-19 sound a death knell for office buildings? Accessed on May 13th 2021. Available at: https://www.usatoday.com/story/money/2020/07/13/jobs-home-more-people- telecommute-office-market-could-shrivel/5410812002/

De Fraja, G., Matheson, J., & Rockey, J. (2020). Zoomshock: The geography and local labour market consequences of working from home. COVID Economics, 64, 1–41.

De Graaff, T. & Rietveld, P. (2007) Substitution between working at home and out-of-home: The role of ICT and commuting costs. Transportation Research A, 41(2), 142-160.

Deloitte (2021) Post-pandemic traffic jams: What they might mean for tech, media, and telecom Available at: https://www2.deloitte.com/ca/en/pages/technology-media-and- telecommunications/articles/post-pandemic-traffic-jams.html

Fu, M., Kelly, J.A., Clinch, P., & King, F. (2012) Environmental policy implications of working from home: Modelling the impacts of land-use, infrastructure and socio-demographics. Energy Policy, 47, 416-423

Gkiotsalitis, K., & Cats, O. (2021). Public transport planning adaption under the COVID-19 pandemic crisis: literature review of research needs and directions. *Transport Reviews*, *41*(3), 374-392.

Google (2020). COVID-19 Community Mobility Reports. https://www.google.com/covid19/mobility/

https://www.gstatic.com/covid19/mobility/2020-05-25_AU_Mobility_Report_en.pdf.

Hensher, D. A. (2020). What might COVID-19 mean for mobility as a service (MaaS)?

Transport Reviews, 40(5), 551–556. DOI: 10.1080/01441647.2020.1770487

Hensher, D. A. & Beck, J. (2020). COVID has proved working from home is the best policy to beat congestion. The Conversation. Accessed on 1 May 2021. Available at: https://theconversation.com/covid-has-proved-working-from-home-is-the-best-policy- to-beat-congestion-148926

Hensher, D. A., Beck, M. J., & Wei, E. (2021). Working from home and its implications for strategic transport modelling based on the early days of the COVID-19 pandemic. *Transportation Research Part A: Policy and Practice*, *148*, 64-78.

Hensher, D. A., Wei, E., Beck, M., & Balbontin, C. (2021). The impact of COVID-19 on cost outlays for car and public transport commuting - The case of the Greater Sydney Metropolitan Area after three months of restrictions. Transport Policy, 101, 71-80. DOI: doi.org/10.1016/j.tranpol.2020.12.003

Hopkins, J., & McKay, J. (2019). Investigating 'anywhere working' as a mechanism for alleviating traffic congestion in smart cities. Technological Forecasting and Social Change, 142: 258-272DOI: 10.1016/j.techfore.2018.07.032

Hossain, M. (2021). The effect of the COVID-19 on sharing economy activities. Journal of Cleaner Production, 280(1), 124782. DOI: 10.1016/j.jclepro.2020.124782

Hirst, D. (2020). NSW Government to ease a raft of coronavirus restrictions in time for Christmas and New Year. ABC News. Accessed on 14 April 2021. Available at: https://www.abc.net.au/news/2020-11-25/nsw-government-to-ease-coronavirus-restrictions/12916818

Infrastructure Victoria (2021). Transporting Melbourne's Recovery: immediate policy actions to get Melbourne moving Technical Report. Available at: https://www.infrastructurevictoria.com.au/wp-content/uploads/2021/01/Transporting-Melbourne-s-Recovery-January-2021-FINAL.pdf

International Energy Agency (2020). Global Energy Review 2020: The impacts of the COVID-19 crisis on global energy demand and CO2 emissions. Technical Report. Available at: https://www.iea.org/reports/global-energy-review-2020

Ipsen, C., van Veldhoven, M., Kirchner, K., & Hansen, J. P. (2021). Six key advantages and disadvantages of working from home in Europe during COVID-19. *International Journal of Environmental Research and Public Health*, *18*(4), 1826.

Kitagawa, R., Kuroda, S., Okudaira, H. & Owan, H. (2021). Working from home: Its effects on productivity and mental health. COVID Economics, 74, 142–171.

Lennox, J. (2020). More working from home will change the shape and size of cities. Working Paper G-306. Victoria University: Centre of Policy Studies/IMPACT Centre. Available at: https://ideas.repec.org/p/cop/wpaper/g-306.html

Lund, S., Madgavkar, A., Manyika, J. & Smit, S. (2020). What's next for remote work: An analysis of 2,000 tasks, 800 jobs, and nine countries. Technical Report. McKinsey Global Institute. Available at: https://www.mckinsey.com/featured-insights/future-of- work/whats-next-for-remote-work-an-analysis-of-2000-tasks-800-jobs-and-nine- countries

Mark, G. (2021). The evidence is in: Working from home is a failed experiment. The Guardian. Accessed on 13th May 2021. Available at: https://www.theguardian.com/business/2021/apr/08/working-from-home-is-a-failed-experiment

Mattey, C., Russell, R., Sibilio, N., & Wong, D. (2020). The expectation gap in the future of work. Technical Report. Boston Consulting Group. Available at: https://www.bcg.com/en-au/publications/2020/understanding-the-expectation-gap-in- the-future-of-work-australia

Microsoft (2021). The next great disruption is hybrid work: Are we ready? Work Trend Index: Annual Report. Available at: https://ms-worklab.azureedge.net/files/reports/hybridWork/pdf/2021_Microsoft_WTI_Report_March.pdf

Nelson, P., Safirova, E., & Walls, M. (2007) Telecommuting and environmental policy: lessons from the ecommute program. Transportation Research D, 12(3), 195-207.

Patty, A, & Wade, M. (2020) Bosses and employees divided over working from home rules. The Sydney Morning Herald. Accessed on May 10th 2021. Available at: https://www.smh.com.au/business/workplace/bosses-and-employees-divided-over- working-from-home-rules-20201130-p56j3m.html

PWC (2020). Where next for transport: How Australia's transport sector can be rebooted for a sustainable future. Report. Available at: https://www.pwc.com.au/government/where- next-for-transport.pdf

Renton, S., Zuidersma, H., & Duffin, B. (2020). Australians post COVID-19: Understanding how COVID-19 has shaped our society. Technical Report. McCrindle Research. Available at: https://mccrindle.com.au/wp-content/uploads/reports/COVID19-Phase3- Report-2020.pdf

Rietveld, P. (2011) Telework and the transition to lower energy use in transport: on the relevance of rebound effects. Environmental Innovation and Societal Transitions, 1(1), 146-151.

Sung and Monschauer (2020). Changes in transport behaviour during the Covid-19 crisis. Technical Report. International Energy Agency. Available at: https://www.iea.org/articles/changes-in-transport-behaviour-during-the-covid-19-crisis

Terrill, M. (2019). Why it's time for congestion charging: better ways to manage busy urban roads Technical Report. Grattan Institute. Available at: https://grattan.edu.au/report/why-its-time-for-congestion-charging/

UITP ANZ (2020). Public transport authorities and covid-19 impact and response to a pandemic. International Association of Public Transport Policy Brief. Available at https://www.lek.com/sites/default/files/PDFs/COVID19-public-transport-impacts.pdf

Wooden, M. & Lim, G. (2020). Working from home: Is it here to stay? Chapter 3 in Coping With COVID-19: Rethinking Australia. Melbourne Institute. Available at: https://melbourneinstitute.unimelb.edu.au/ data/assets/pdf_file/0007/3565114/Chapt er-3-Working-From-Home-Is-It-Here-to-Stay.pdf

Wynne, E. (2021, March 4) Perth commuters stick to the car avoiding public transport despite COVID restrictions lifting, Australian Broadcasting Commission available at: https://www.abc.net.au/news/2021-03-05/perth-stays-in-the-car-despite-covid- restrictions-lifting/13217562