

Impact of COVID-19 on the number of days working from home and commuting travel: A cross-cultural comparison between Australia, South America and South Africa

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ABSTRACT

The COVID-19 pandemic has changed the way we go about our daily lives in ways that are unlikely to return to the pre-COVID-19 levels. A key feature of the COVID-19 era is likely to be a rethink of the way we work and the implications on commuting activity. Working from home (WFH) has been the 'new normal' during the period of lockdown, except for essential services that require commuting. In recognition of the new normal as represented by an increasing amount of WFH, this paper develops a model to identify the incidence of WFH and what impact this could have on the number of weekly commuting trips. Using data collected in eight countries (Argentina, Australia, Brazil, Chile, Colombia, Ecuador, Peru and South Africa), we developed a Poisson regression model for the number of days individuals worked from home during the pandemic. Simulated scenarios quantify the impact of the different variables on the probability of WFH by country. The findings provide a reference point as we continue to undertake similar analysis at different points through time during the pandemic and after when restrictions are effectively removed.

1. Introduction

Every country has faced major challenges since COVID-19 started in early 2020. The seriousness of this pandemic has meant that millions of people have changed the way their entire life operates. This study aims to understand the impacts of COVID-19 on work behaviour, i.e., work from home and commuting, and its effect on the transport network. Data was collected in eight different countries around the world: Argentina, Australia, Brazil, Chile, Colombia, Ecuador, Peru and South Africa to understand the impact of COVID-19 in the daily life of respondents and their work behaviour. The surveys were not identical but did share some questions used in this study to enable a cross-cultural comparison of the effects of COVID-19 in work and travel behaviour.

The governments of the countries included in this study have had very different strategies in facing this health crisis, which has led to different impacts regarding the number of cases and deaths by country and different work from home (WFH) policies and attitudes towards COVID-19. Australia has had one of the best COVID-19 management

strategies and results across the globe with 36 deaths per million inhabitants up until 1 December 2020, while other countries, such as Peru, have had the worst results out of the countries included in this study with 1106 deaths per million inhabitants.

The most useful response data in understanding the impact of COVID-19 on work behaviour is the comparison prior to COVID-19 and during COVID-19 of the number of days commuting, the mode used to go to work and the number of days working from home. In this study, modal shares and commuting days prior to COVID-19 and at the time of data collection (August–December 2020) are compared to quantify the implications of COVID-19 on the transport network.

A Poisson regression model is estimated with the dependent variable defined as the weekly number of days WFH and several explanatory variables that refer to the transport modes available and the ones used prior to COVID-19, the place of employment and the employer's attitudes towards WFH, the travel time to the office, socioeconomic characteristics such as income and age, and country-specific dummy variables. This model is estimated to understand better the probability of

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the number of days WFH and the differences across countries. Elasticities and simulations of the impact of specific variables on the probability of WFH are presented to identify different response patterns across the countries studied.

This paper is organised as follows. The following section presents a brief literature review of the COVID-19 impacts on the transport network around the world. Section 3 explains the data collection process and sample sizes. Section 4 presents a cross-cultural comparison of the different samples regarding how respondents have been affected by COVID-19, WFH behaviour, attitudes towards WFH, COVID-19 and their government. Section 5 presents the working from home Poisson regression model results as well as elasticities. Section 6 presents simulated scenarios to quantify the impact of the different variables in the probability of WFH by country. The final section discusses the main findings and implications of this study.

2. Literature review

Even though COVID-19 has had a significant impact on work and travel behaviour, there is still a limited literature on its effects, although it is growing fast. The existing literature includes general policy-oriented studies and statistical analysis of mobility data based on cross-city and city-specific surveys. This section focuses on some illustrative survey-based studies, with papers that review the broader literature on telecommuting prior to COVID-19.

Beck and Hensher (2020a, 2020b) conducted an online survey in Australia during March and April 2020 to identify the impact of health-related measures on people's travel and activities. Their results show that reported trips had decreased by more than 50%, with a higher decrease in public transport modes and commuting trips. An increase in unemployment, partial employment and WFH was observed. People with higher incomes were more likely to WFH. Social activities, such as meeting with friends or visiting restaurants, were suspended by most respondents.

Beck et al. (2020) modelled the impact on commuting and WFH due to the slow relaxing of restrictions implemented by the Australian government in May 2020 by applying a second wave of the surveys reported in Beck and Hensher (2020a, 2020b). Compared with the March–April 2020 survey, average commuting trips per week rose from 3.0 to 3.8, and more commuting was planned for the following week. A Poisson regression model found that more commuting is made in capital cities. For people who cannot WFH, a higher income is associated with more commuting trips by car. Meanwhile, people working at least 1 day per week increased from 74% to 83%, while working from home 5 days a week fell from 30% to 20%. An ordered logit choice model identified that positive attitudes towards WFH, such as having a positive experience, having appropriate space to work, or reporting more productivity, significantly influence working from home more days a week.

Vallejo-Borda et al. (2021b) applied the original survey by Beck and Hensher (2020a, 2020b) in five South American capitals (i.e., Bogotá, Buenos Aires, Lima, Quito and Santiago) to explain mode shifting from public transport to private and active modes through SEM-MIMIC models. Even though the factors that explain mode changes differ across cities, common variables related to changes to active modes include worse subjective well-being and the poor perception of authorities' response, with a negative correlation in Santiago and Bogotá, and a positive correlation in Buenos Aires. How people perceive authorities' response to confront COVID-19 is also relevant to explain migration from public transport to private modes in most cities. A good perception of authorities' response is associated with more migration to private modes in Bogotá and less migration in Buenos Aires and Quito.

Hensher et al. (2021b) focused on WFH implications during the early days of the pandemic. Using data from the first wave of surveys performed in Australia, first published in Beck and Hensher (2020a, 2020b), they performed an ordered logit model to explain the number of WFH days per week and a Poisson regression explaining the weekly one-

way commuting trips by car and public transport. As expected, respondents who could WFH or were directed to do so reported more WFH, and also, people that work in administration and services reported more days WFH. Naturally, a higher proportion of WFH days was associated with less commuting. Older respondents performed more commuting by car and public transport, and men commuted more than women in cars. Compared with the base scenario, public transport trips would be reduced by 50% and car trips by 30% if all employees could choose WFH. If people were directed to WFH, car trips would decrease by 56%, and public transport trips by 84% relative to the base scenario.

Remote work during the pandemic was also studied in surveys undertaken in the United States (Brynjolfsson et al., 2020), Chile (Astroza et al., 2020), Spain (Farré et al., 2020), among others. WFH has been identified as a determinant of commuting behaviour and, once restrictions are relaxed and we move forward, it will be vital to monitor and understand WFH as part of strategic and urban planning (Beck et al., 2020). Besides, WFH was also preferred by people as an alternative instead of commuting during the early Covid-19 periods (Bhaduri et al., 2020). Other relevant studies on WFH during the pandemic analysed mental health issues (Bouziri et al., 2020), enterprise management (Foss, 2020), employees' income (Bonacini et al., 2021), finding that with the proper digital tools, people can adequately complete their duties (Winslott Hiselius and Arnfalk, 2021).

Barrero et al. (2021) is the most recent extensive survey in the USA that surveyed over 30,000 Americans over multiple waves to investigate whether WFH will stick, and why. The most important finding is that 20% of full workdays will be supplied from home after the pandemic ends, compared with just 5% before, of which 2 days a week is not uncommon. This aligns with the Australian evidence (including a 4.6% WFH pre-COVID-19). They give five reasons for this large shift: better-than-expected WFH experiences, new investments in physical and human capital that enable WFH, greatly diminished stigma associated with WFH, lingering concerns about crowds and contagion risks, and a pandemic-driven surge in technological innovations that support WFH.

Different studies suggest a significant increase in WFH and the possibility to WFH, mainly in developed countries and younger people with high educational levels (Shibayama et al., 2021). Studies indicate that people with lower incomes have less flexibility to WFH than people with medium and high-income levels (Astroza et al., 2020; Bonacini et al., 2021). Likewise, it is also found that unemployment affects more women, who are the ones who have the greatest number of unpaid work duties at home (Farré et al., 2020).

Research on teleworking (or telecommuting), which is now referred to as work from home, suggests a relatively low degree of impact in the transport network and on commuting behaviour. Hensher et al. (2021a) and Beck and Hensher (2020a, 2020b) provide a detailed review of earlier literature (Mokhtarian, 1991; Mokhtarian et al., 1995, 2004). This section has reviewed several studies that have emerged as a result of COVID-19, which has caused a significant increase in WFH worldwide. The contribution of this research is to identify and quantify the main drivers in the number of days WFH in different countries. This study includes sociodemographic characteristics, which other studies have suggested play an important role in the decision to WFH, but it also takes into account the employer's view towards WFH and how it might influence the number of days an employee chooses to WFH. All these indicators provide a better understanding of the different social, economic and cultural context characteristics that affect the number of days people WFH.

3. Data collection

The data used in this study was obtained from online panel surveys undertaken in Australia, Argentina, Brazil, Chile, Colombia, Ecuador, Peru, and South Africa. In Australia, this comparison paper is part of a larger study on the impact of working from home on travel behaviour (Beck and Hensher, 2020a, 2020b; Beck et al., 2020; Hensher

et al., 2021b). An online survey company was hired to randomly sample respondents across Australia, using quotas only to ensure a correct representation of New South Wales (NSW) and Queensland (QLD) which are the focus of the study. In South America, key research groups were contacted in each country who recruited participants based on their connections and, in addition, participants were recruited randomly asked through social media platforms including LinkedIn, Facebook and Instagram. To increase participation and improve the representation of the sample, the requested responses in Facebook and Instagram for South America were both paid and unpaid (Vallejo-Borda et al., 2021a, 2021b). In South Africa, a market research company recruited respondents from their online consumer panel, focusing exclusively on residents of Gauteng Province. To reduce the risk of under-sampling among lower income people who are underrepresented on the panel, the sample was supplemented by face-to-face recruiting at public transport hubs in the area, after which respondents completed the survey on their own mobile phones. No financial incentive was offered.

Table 1 presents the survey collection dates and the number of observations per country. The purpose of this study is to understand how COVID-19 has changed the way people work and commute, so the data used in this study only includes workers, with a total of 4628 observations. The first survey used in this study was collected in Australia from August to September 2020 as a nationwide survey. The survey was designed to understand the impacts of COVID-19 on how people work and travel to work. It included questions on attitudes towards COVID-19, response of their authorities, number of days they used to work and where before COVID-19 and now, modes of transport used, among others. The full dataset collected in Australia includes both metropolitan and regional areas.¹ However, given that the South American and South African surveys were collected in metropolitan areas, this study only considers respondents from metropolitan areas for comparison purposes.

A similar survey was designed to collect data in different counties (metropolitan areas) in South America: Argentina (Buenos Aires); Brazil (Sao Paulo, Porto Alegre, Rio Janeiro, and Belo Horizonte); Chile (Santiago); Colombia (Bogota); Ecuador (Quito); and Peru (Lima). Data was collected from August to November 2020. These surveys were translated and adapted to the local language, in Brazil it was designed in Portuguese while in the other countries in Spanish, even though some words vary by country. These cities have varied modes of transport, so

Table 1
Collection date and number of observations per country.

Country	Collection date	Number of observations ^a	Sample %
Argentina	Sept 2020	552	12%
Australia	Aug–Oct 2020	656	14%
Brazil	Sept–Nov 2020	680	15%
Chile	Aug–Sept 2020	522	11%
Colombia	Aug 2020	155	3%
Ecuador	Sept–Nov 2020	668	14%
Peru	Sept 2020	706	15%
South Africa	Nov–Dec 2020	689	15%
Total number of observations		4628	100%

^a The working from home model that will be discussed in Section 5 pools all the data within the one model including country-specific parameters, interactions and heterogeneity which allows for a country-specific analysis. The sample size in Colombia is smaller than in other countries; however, the results show that Colombia did not have a statistically different behaviour than the other countries in South America.

¹ More information on working from home behaviour and its impact in commuting and non-commuting activity in regional and metropolitan areas in Australia can be found in Beck and Hensher (2021a), Beck and Hensher (2021b), Balbontin et al. (2021).

each survey had to be revised to include the modes available in each city. Similarly, the Australian survey was used as the base but adapted to the South African context. This survey was collected in English in the Gauteng area (Tshwane/Johannesburg) from November to December 2020. Although core questions remained unchanged, the survey was adapted to reflect local modes (particularly informal taxis) and terminology. Some non-core questions were omitted in the South African survey due to restrictions of the online survey platform. All the surveys required respondents to report their travel behaviour prior to COVID-19 and their travel behaviour in the most recent week – which is referred to in this study as *last week*.

4. Cross-cultural comparison

COVID-19 has had serious implications worldwide. This section will focus on understanding the general implications of COVID-19 on respondents' work (mainly working from home and commuting) and their attitudes. The questions included in the survey vary by country; therefore, not every country is included in the comparisons. Moreover, there are several questions with missing information – the most interesting ones will be compared in this analysis but will be excluded from the models presented in Section 5.

It is essential to get a broader picture of the effect of COVID-19 in each country to compare the effect of COVID-19 in the different countries included in this study. The first column in Table 2 presents the percentage of internet users per country according to the latest information available. The surveys used in this study were collected online and hence the percentage of internet accessibility is relevant as to their representativeness. However, it is important to note that this study includes only workers in metropolitan areas, who are more likely to have internet accessibility than the country average, and thus this percentage only provides an overview of what can be expected and inferred from this study. The percentage of internet users in Argentina, Australia, Brazil and Chile are all above 70% which suggests that the online survey data collection is likely to reach most workers in metropolitan areas. In Colombia, it is around 65%, and in Ecuador, South Africa and Peru it is below 60%. This should be considered when analysing and interpreting the results, since there might be over-representation of high-income respondents who in general have good digital connectivity.

The last two columns in Table 2 present the total number of cases and deaths from COVID-19 reported by country up until 1 December 2020. Out of all the countries included, Australia had by far the best management of the pandemic, with only 1101 positive cases and 36 deaths per million habitants. South Africa was the second best with 13,530 positive cases and 370 deaths per million habitants. Ecuador had reported 11,150 positive cases per million habitants but had 777 deaths by

Table 2
Internet users and COVID-19 total number of cases and deaths by country.

Country	Internet users (% population) ^a	Cases per million habitants	Deaths per million habitants
Argentina	74.29	31,877	866
Australia	86.55	1101	36
Brazil	70.43	30,269	824
Chile	82.33	29,175	814
Colombia	65.01	26,317	734
Ecuador	54.06	11,150	777
Peru	59.95	29,640	1106
South Africa	56.17	13,530	370

Source population density and internet users: World Bank data (<https://data.worldbank.org/>).

Source COVID-19 statistics: Google News (<https://news.google.com/covid19/map>) date 1 December 2020.

^a This column contains the latest data available in the World Bank website. The numbers shown for Ecuador belong to 2016; for Argentina, Australia, Chile and South Africa to 2017; for Brazil to 2018; and for Colombia and Peru to 2019.

million habitants. The worse results are in Peru where they had 29,640 cases per million habitants and 1106 deaths per million habitants. This is followed by Argentina which had 31,877 cases per million habitants and 866 deaths per million habitants. Brazil and Chile followed Argentina closely with around 30,000 cases per million habitants and more than 800 deaths per million habitants.

The mean and standard deviation by country of different variables of interest related to the samples in the survey are presented in Table 3, as well as the number of observations. The average age of respondents is relatively low in the South American countries, except for Brazil, which is around 40. The highest is in South Africa and around 45 years old. Even though the respondents in the South American countries are younger than in other countries, we will compare the responses directly in this section, but we will later include this variable in the WFH model to separate the effect of age on the number of days WFH. Over 60% of respondents are women in Argentina, Australia and Chile, which is allowed for in the models.

The income difference between countries is significant. The survey in Australia asked for this variable as personal income, while in the other countries the question referred to household income. Despite this difference, the highest monthly income is in Australia (AUD\$6500) which represents personal income, as opposed to household income as in the other countries. Colombia has the lowest monthly household income (around AUD\$860), followed by Ecuador (AUD\$1230). The highest household monthly income is in South Africa (AUD\$3430), followed by Chile (AUD\$3000). As mentioned above, due to the relatively low internet usage in South Africa, it is likely that high-income workers were over-sampled, which results in higher average household income than expected and will likely have an effect on the car availability. These variables, including country-specific variables, will be tested in the WFH models in case they have an effect on its probability, but this possible bias should be considered throughout the paper and in the interpretation of results.

The travel time information was complete in the Australian and South African data, but several responses were missing in the South American data. The longest reported trip to the office is in Colombia with an average trip of approximately 58 min, followed by Peru with 47 min. The shortest trip to the office is in Australia with an average of 30 min, followed by South Africa with 34 min, and Brazil and Chile with 36 min. The travel cost information had a lot of information missing in all the datasets, so it will not be possible to include it in the models, but it can still be used to compare the travel costs across countries. The lowest reported travel cost to the office is found in Argentina, followed by Colombia; and the highest is in Chile, followed by Australia.

Questions were included to understand the effect that government regulations and restrictions has had on individuals and their work. Fig. 1 presents two figures, the left one represents if the respondent or someone he/she knows has been affected by the government regulations, and the one in the right if they have been asked to work for reduced pay during the pandemic. Around 60% of respondents in the South American cities know someone who has been affected by the regulations and has been asked to work for reduced pay. However, between 20 and 30% of respondents have been affected themselves, and less than 20% have been asked to work for reduced pay in Argentina, Brazil and Chile, with a higher percentage (between 25 and 30%) in Colombia and Peru. In Australia, over 30% have been affected by the regulations or know someone that has; but less than 20% has been asked to work for reduced pay. In South Africa, around 30% have been affected, and around 45% know someone that has been affected.²

² The question regarding reduced pay (Fig. 1) was not included in the South African survey.

4.1. Working: WFH and commuting days

One of the most important variables in this study refers to the number of days worked from home or commuting. Fig. 2 presents this information for respondents' current situation (the week before they answered the survey), and it also includes the number of days commuting prior to COVID-19, which is the only pre-COVID information available in Australia and South America.

In terms of the total number of days worked at the time of the survey, which was referred to as *last week* (top left figure), in all countries the most frequent weekly number of days worked is 5. In South Africa and all South American cities, the second most frequent number of worked days is 6. In Australia, the second most frequent is 4. In all countries the less frequent number of weekly worked days is 0 and 1.

The distribution of the total number of commuting days prior to COVID-19 (bottom left figure) is relatively similar to the total number of worked days *last week*, where the most frequent number of commuting days prior to COVID-19 is 5; followed by 6 days in all South American cities and by 4 days in Australia. If we compare this latter to the number of days commuting *last week* during COVID-19 (bottom right figure), we can see the major change caused by COVID-19, where the most frequent number of commuting days is 0 days in all countries, followed by 5 days. This finding suggests that people are either working every day from home (never commuting) or commuting everyday (commuting 5 days, presumably because their work is such that it cannot be done from home). This information certainly aligns with most of the government regulations, which have encouraged people to work from home when possible.

The average number of days worked and WFH in a week for each country are presented in Table 3. The average total number of days worked in a week for every country can be rounded to 5 days, except for Colombia, which has an average of 5.57 days. Australia has the lowest average (4.50), followed by South Africa (4.83), and the second highest after Colombia is Peru (5.39). The number of days working from home has more variation across countries, where the lowest is in Australia with 1.63 average days WFH, followed by South Africa with 2.31 days; and the highest is Argentina with 3.43 days WFH followed by Chile with 3.19 days.

Fig. 3 presents the number of days respondents said they would like to WFH once COVID-19 restrictions are eased, and the average days are presented in Table 3. In all South American countries, the most frequent response was 3 days, followed by 2 days. The highest average is 3.52 days in Peru, followed by 3.30 days in Chile. In Australia, the most common response was 0 days followed by 2 and 5 days – with an average of 1.77 days. In South Africa, the most common response was 5 days, followed by 3 and 0 days with an average of 3.18 days.

4.2. Commuting modal shares prior to COVID-19 and now

The available modes of transport and which ones were used prior to COVID-19 and at the time of the survey (*last week*) are presented in Figs. 4–6. Given that several respondents were not commuting at the time of the survey (i.e., only working from home), the question about which mode of transport are they using now was not displayed in every country, so there is a lot of information missing about their current mode (details in the figures' captions).

The data shows that around 80% of respondents in Australia and South Africa have private vehicles available (i.e., car driver, passenger or motorcycle). It should be noted that it is likely that the South African only survey over-sampled high-income workers due to the general population low internet access, which probably has a positive influence in private mode availability. In Brazil private vehicles are available for around 58% of respondents, to 48% in Ecuador, to 42% in Chile, to 36% in Colombia, to 28% in Peru, and to 27% in Argentina. Public transport is available to over 90% of respondents in Argentina, Chile and Colombia, to 83% in Brazil, to 82% in Peru, to 78% in Ecuador, to 65%

Table 3
General descriptives – mean (standard deviation).

Variable/country	Argentina	Australia	Brazil	Chile	Colombia	Ecuador	Peru	South Africa	Observations
Age (years old)	36.74 (10.04)	40.05 (13.39)	40.01 (11.73)	33.04 (7.35)	33.11 (8.73)	34.57 (7.81)	35.40 (10.18)	44.47 (13.46)	4625
Gender female (0,1)	64%	64%	49%	66%	48%	56%	48%	50%	4625
Income ('00AUD\$) personal/ household ^a	\$1.38 (\$0.93)	\$6.50 (\$4.48)	\$2.84 (\$2.35)	\$3.00 (\$2.45)	\$0.86 (\$0.91)	\$1.32 (\$1.23)	\$1.42 (\$1.51)	\$3.43 (\$3.29)	4241
Employer view towards WFH after COVID: my choice (0,1)	14%	16%	9%	11%	12%	12%	16%	18%	3,464 ^b
Employer view towards WFH now: my choice (0,1)	10%	29%	16%	19%	8%	17%	13%	31%	4625
Employer view towards WFH now: mandatory (0,1)	42%	19%	31%	39%	28%	20%	30%	21%	4625
Employer view towards WFH now: not possible (0,1)	19%	21%	12%	20%	34%	24%	21%	23%	4625
Total travel time to office (minutes)	41.90 (27.89)	29.88 (29.23)	35.55 (30.62)	35.92 (25.10)	57.98 (33.51)	39.50 (25.49)	47.05 (31.54)	34.11 (25.38)	3060
Total travel cost to office (AUD\$)	\$2.69 (\$9.08)	\$5.99 (\$14.02)	\$5.87 (\$13.90)	\$6.16 (\$13.80)	\$3.27 (\$4.53)	\$5.70 (\$11.87)	\$4.40 (\$5.35)	–	2337
Car driver or passenger available (0,1)	25%	83%	57%	42%	27%	45%	24%	79%	4625
Public transport available (0,1)	94%	65%	84%	93%	95%	78%	82%	28%	4625
Number of days worked at the time of the survey ("last week")	4.90 (1.10)	4.51 (1.28)	5.13 (0.90)	5.00 (1.07)	5.60 (0.86)	5.34 (1.05)	5.45 (1.11)	4.90 (1.12)	4625
Number of days WFH at the time of the survey ("last week")	3.43 (2.13)	1.64 (2.11)	3.01 (2.15)	3.19 (2.17)	3.09 (2.47)	2.84 (2.32)	3.15 (2.44)	2.31 (2.39)	4625
Number of days WFH after COVID-19 restrictions are eased	3.02 (1.41)	1.77 (1.98)	3.07 (1.47)	2.91 (1.27)	3.30 (1.59)	3.15 (1.48)	3.52 (1.44)	3.18 (1.97)	2894

Note: The monetary values were calculated using the currency exchange rate for the date of data collection.

^a The survey collected in Australia asked for personal income, while the other countries asked for household income.

^b This question was answered only by employees, there was no information missing.

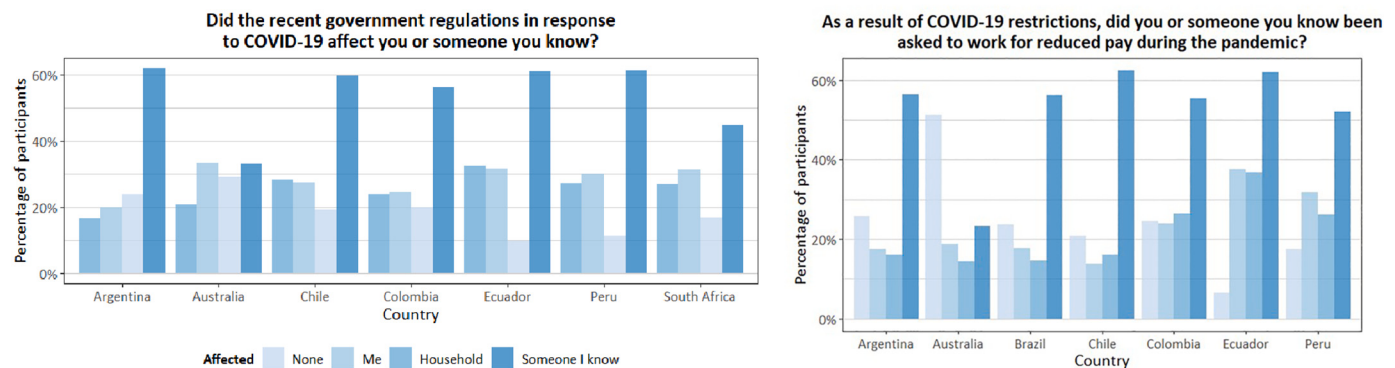


Fig. 1. Impact of government regulations in response to COVID-19.

in Australia; and the lowest public transport availability is of around 28% in South Africa.

Regarding modal shares, prior to COVID-19 private vehicle usage in Australia was of around 63%, which has increased to 68% at the time of the survey (i.e., *last week*). The public transport usage decreased from 29% to 19%; and the active modes usage increased from around 8% to 12%. The situation prior to COVID-19 in South America is a bit different, where public transport was the most frequently used mode of transport.

The difference in the modal shares prior to COVID-19 to *last week* in South America is significant. In Argentina, car/motorcycle use increased from 9% to 17% while public transport use decreased from 79% to 45%. In Chile, car use increased from 34% to 50%; while public transport use decreased from 67% to 40%. In Colombia, car use increased from 14% to 16%; while public transport use decreased from 74% to 60%. In Ecuador, the car/motorcycle use increased from 28% to 38%; while public transport use decreased from 61% to 40%. In Peru, car use increased from 15% to 19%; and public transport use decreased from 61% to 53%. However, it does not seem that all of the respondents that stopped using public transport moved to car/motorcycle, as the active

mode usage also increased in every country. The highest change was in Argentina, where prior to COVID-19 the active mode share was 11% and now it is 32%.

The private vehicle use prior to COVID-19 can be compared to car availability, and results show that 76% of respondents that have car available use it to go to work in Australia; around 57% in Brazil, Ecuador and Peru; 34% in Chile; 31% in Argentina; and 26% in Colombia. These results prior to COVID might be an indicator of other costs and difficulties associated with driving a private vehicle, for instance, parking, fuel, tolls that might have a higher influence in South American countries. Comparing the results at the time of the survey, more than 78% of respondents that have car available use it to go to work in most countries, except Argentina (which is 68%) and Colombia (58%).

4.3. Attitudes towards working from home

The survey included questions about the position of businesses towards WFH as it stands today, and the employers' position expected once restrictions end, which are presented in Fig. 7. The data suggests

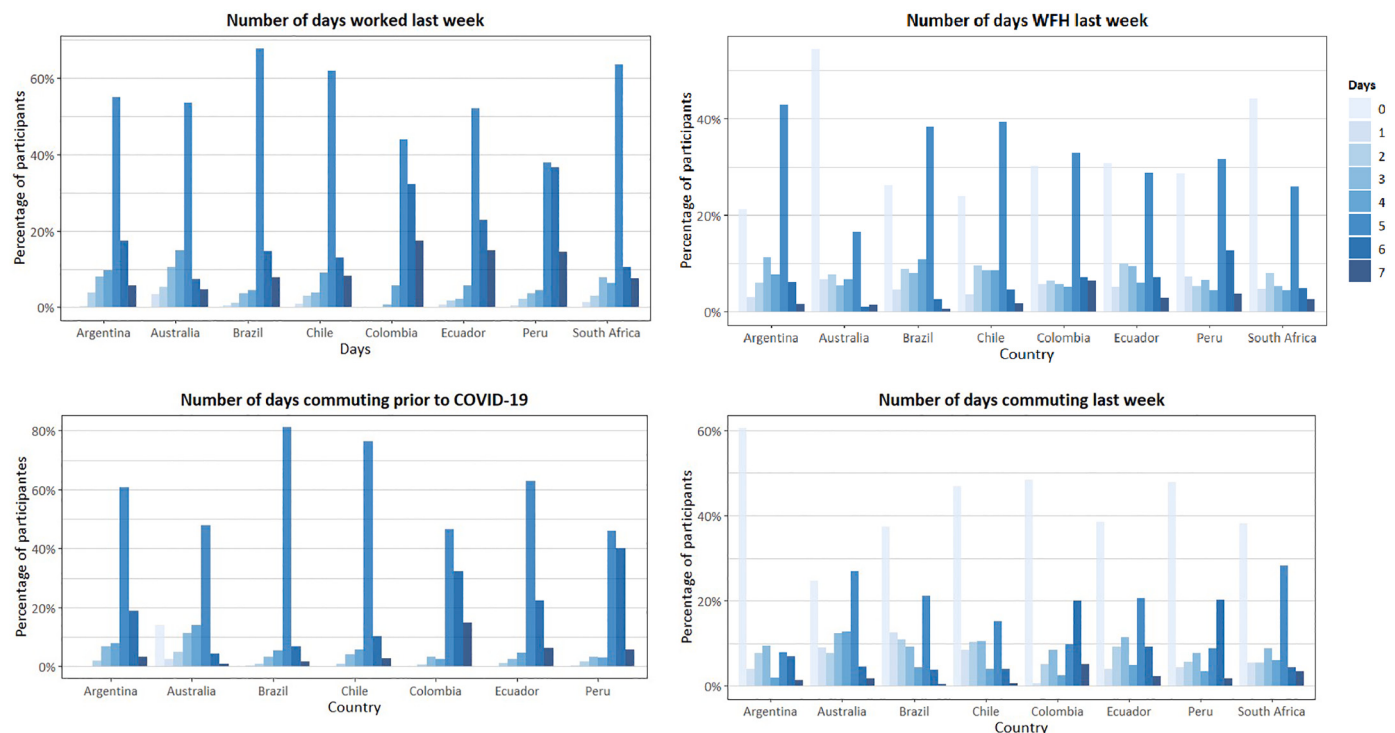
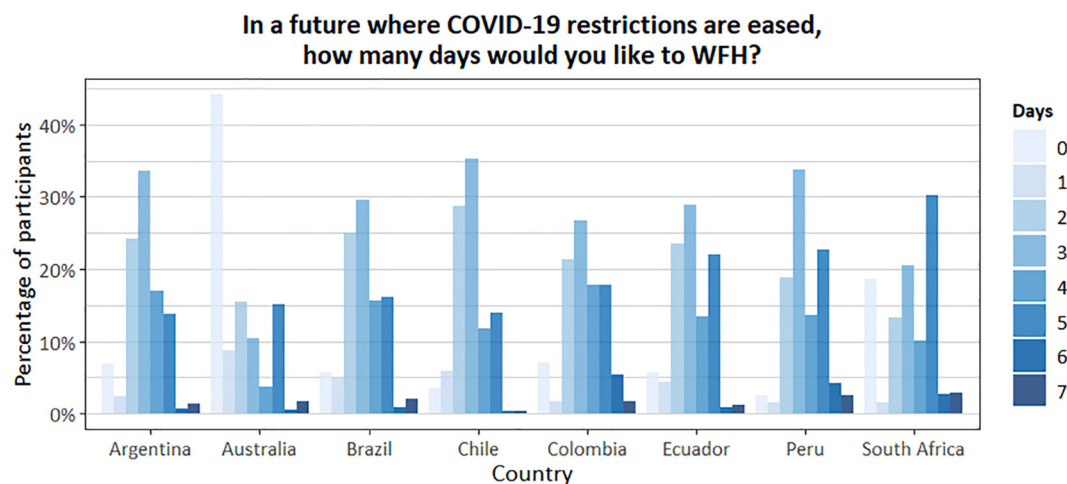


Fig. 2. Number of days worked and WFH last week, and commuted last week and prior to COVID-19.



*Missing information for 263 respondents in Argentina, 4 in Australia, 329 in Brazil, 216 in Chile, 99 in Colombia, 422 in Ecuador, and 398 in Peru.

Fig. 3. WFH number of days in the future.

that in Chile and Argentina, around 40% of respondents are required to WFH; while in Brazil, Peru and Colombia 30% are required to; and in Australia and South Africa around 20%. 35% of respondents in Colombia said their work cannot be done from home, followed by Ecuador, South Africa, Peru, Australia and Chile with more than 20% of respondents. In Australia, the most frequent response was 'not allowed' with over 30%, followed closely by 'allowed to WFH whenever I want' (almost 30%). In South Africa, over 30% of respondents reported being allowed to WFH whenever they want; in Chile almost 20% of respondents said the same; and in Brazil and Ecuador this percentage was just over 15%. In South American countries, between a 5 and 10% of respondents said their office was closed at the time of the survey, so they are not able to go to work (regardless of where they work from); and in Australia and South Africa this percentage is almost insignificant.

The right hand-side of Fig. 7 presents the positions of respondents' employers towards WFH once COVID-19 restrictions end, which was only answered by those that said they were employees (i.e., have employers). Over 40% of employees in the Australian sample said it is not possible to do their work from home, followed by 35% in Colombia and 30% in Peru. In Brazil, the most frequent response was a balance between WFH and office (over 40%), with similar percentages in Chile (35%), Argentina (35%) and Ecuador (over 30%). In Colombia, this was the second most frequent (35%) response after 'not possible to do their work from home'. In South Africa, the most frequent answer was they expect their employer to ask them to return to the office (45%) followed by a balance between WFH and office (over 35%); but the response 'not possible' was not available in South Africa. The least frequent response in every country was that the employer would allow them to WFH

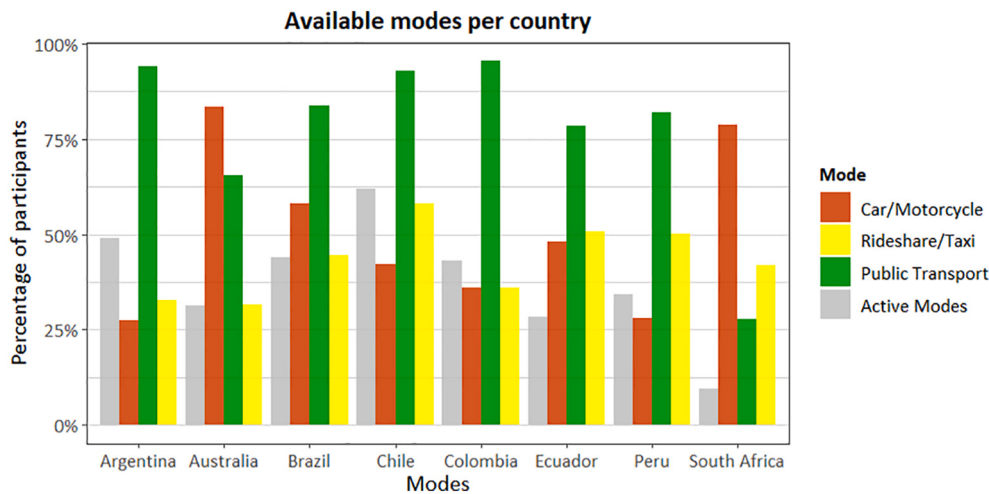
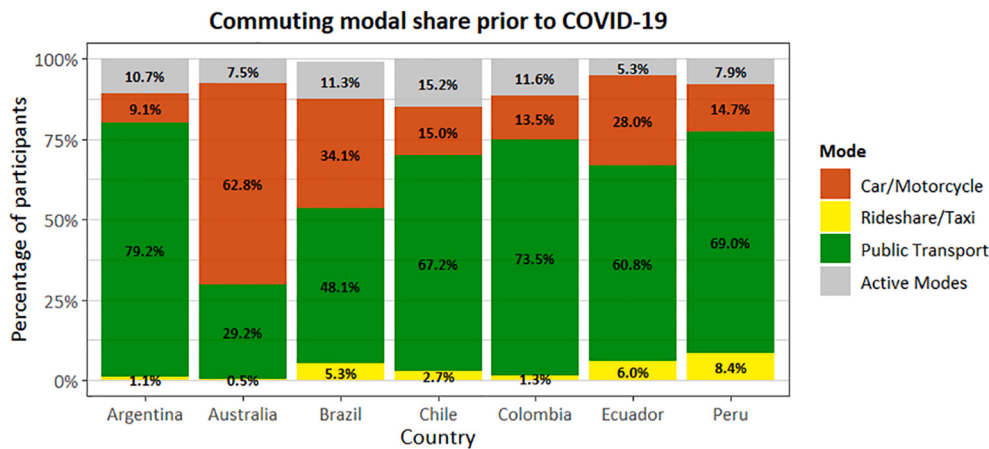


Fig. 4. Available modes per country.



*Percentage calculated for all participants, even if they did not have that mode available.
 *Missing information for 1 respondent in Chile, 3 in Ecuador and 7 in Peru.

Fig. 5. Commuting modal share prior to COVID-19.

whenever they want.

Fig. 8 presents the responses on how productive respondents feel WFH is relative to working in the office. Unfortunately, due to different survey designs, every respondent did not answer this question (as detailed in the caption), and so it cannot be included in the models later. In Brazil, Colombia Australia, Argentina and Ecuador, the most frequent response was feeling more productive – although in Argentina and Australia this answer was closely followed by same productivity level. In Chile, almost 40% of respondents said they felt less productive, while 30% said they felt the same and 30% said they felt more productive. In Peru, a bit over 35% said they felt the same, almost 35% said they felt less productive, and around 30% said they felt more productive.

4.4. Attitudes towards COVID-19 and government response

The surveys included several opinion statements, were respondents indicated how much they disagreed or agreed with each. Two interesting statements refer to how concerned people are about COVID-19 and work, given the environment they usually work in (i.e., prior to COVID); and if they believe their Federal/National government response to COVID-19 has been appropriate. In Brazil, almost 80% of respondents said they agree or strongly agree with being concerned about COVID-19; and more than 80% thinks that the government response has not been appropriate. Around 50% of respondents who work in Chile, Ecuador

and Colombia are concerned (agree or strongly agree) about COVID-19, while 20–30% are not concerned. In Ecuador, almost 70% of people think the government response has not been appropriate, while slightly more than 10% think it has; in Chile around 65% think the response has not been appropriate, while around 15% think it has; and in Colombia, around 50% think the government's response has not been appropriate, while 30% think it has.

In Peru and Argentina, around 45% are concerned about COVID-19 and their work. In Argentina, 50% of respondents think the government's response has not been appropriate, while 30% think it has. In Peru, 30% of respondents think the government's response has not been appropriate, while 40% think it has. In Australia, around 45% of respondents said they are concerned about COVID-19 and work, while more than 75% thinks the federal government response has been appropriate. These results suggest a relationship between respondent's level of concern with the government response to COVID-19.

5. Working from home (WFH) model

A Poisson regression model was estimated to understand the key variables that influence the number of days working from home. The model was estimated using the pooled data from the three different geographical jurisdictions: Australia, South America and South Africa, but estimating area-specific variables. This approach was preferred over

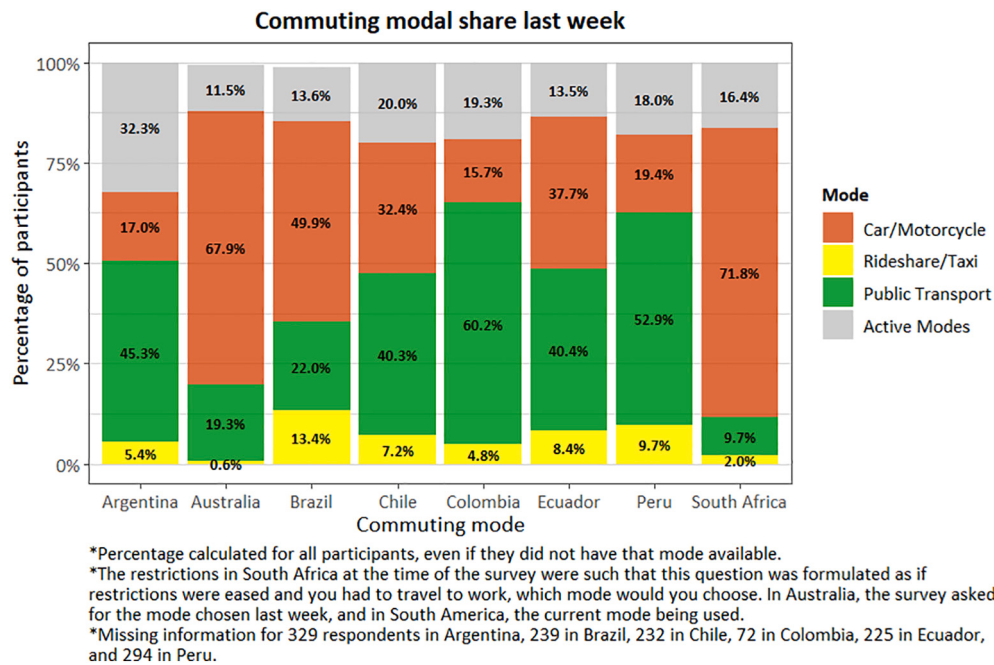
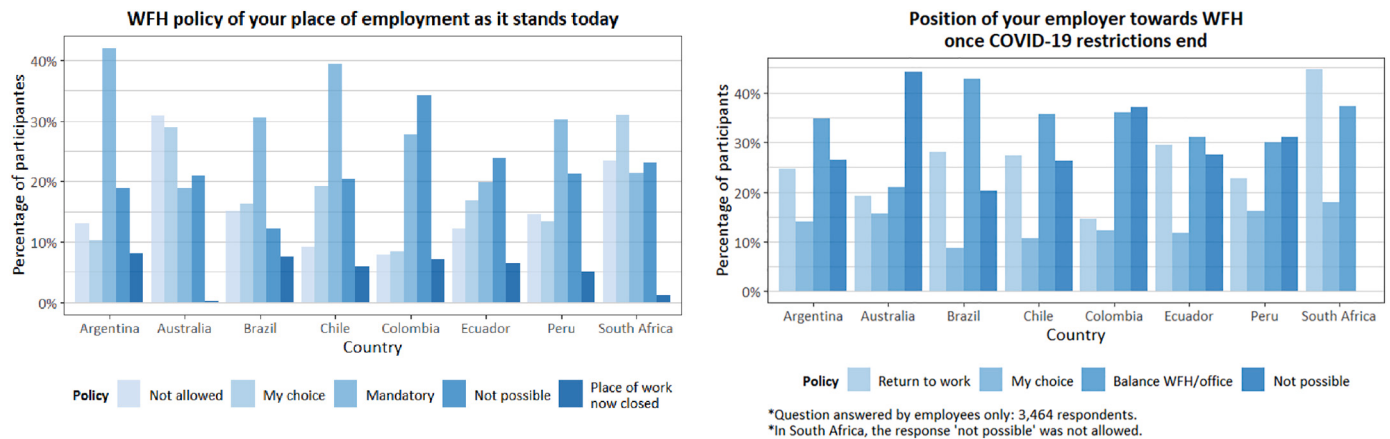
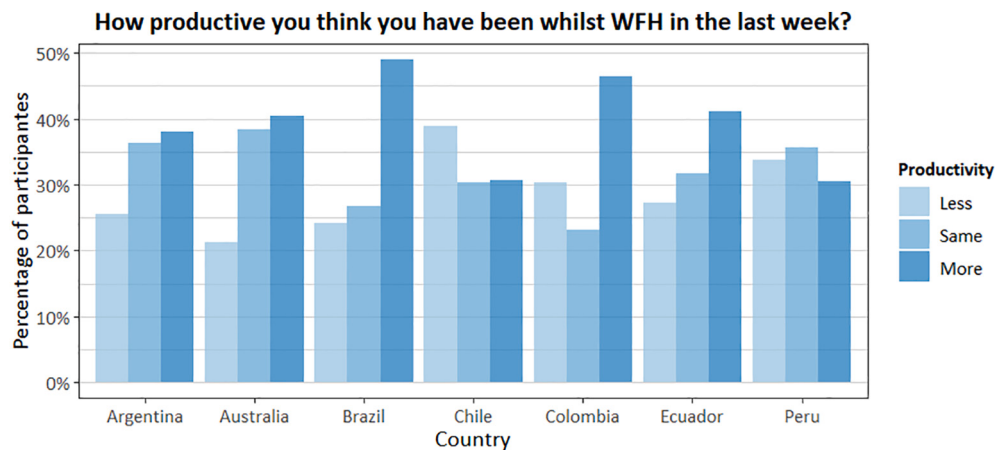
Fig. 6. Commuting modal share *last week*.

Fig. 7. Working from home (WFH) policy of your place of employment.



*Missing information for 263 respondents in Argentina, 320 in Australia, 329 in Brazil, 216 in Chile, 99 in Colombia, 422 in Ecuador, and 398 in Peru.

Fig. 8. How productive you think you have been whilst working from home (WFH) in the *last week*?

estimating a separate model for each area, as it allows for a direct comparison of behavioural outputs, enabling us to understand the different influence of the explanatory variables in the probability to WFH in each area.

As a non-negative discrete count value, with truncation at zero, discrete random variable, y_i , observed over one period of time, and observed number of days WFH in a week, k ($k = 0, 1, \dots, 7$), the Poisson regression probability is given by Eq. (1).

$$P(y_i = k | \mu_i) = \frac{\exp(-\mu_i) \cdot \mu_i^k}{k!} \quad k = 0, 1, \dots, 7 \quad (1)$$

The prediction rate, μ_i , is both the mean and variance of y_i and is defined as follows:

$$\mu_i = E(y_i = k | x_i) = \exp(\beta' x_i) \quad (2)$$

In this study, we allow for unobserved heterogeneity through the incorporation of random parameters. The prediction rate or expected frequency of the number of days WFH was calculated as a function of different explanatory variables, shown in Eq. (3).

$$\mu_i = \exp \left(\beta_0 + \sum_n \beta_n \cdot z_n \cdot d_a + \sum_m \beta_m \cdot x_m \cdot d_a + \sum_c \beta_c \cdot d_c + \varepsilon \right) \quad (3)$$

where β_0 represents the constant; z_n represents respondents socio-demographics (e.g., age, gender, income); x_m other respondents' characteristics such as mode availability, employer's attitude towards WFH, etc.; d_a dummy variables associated to each area; d_c dummy variables associated to each country – which were estimated as random and normally distributed; and the β represent the parameter estimate associated to each of the variables.

The elasticities in this nonlinear model specification are presented in Eq. (4).

$$\text{Elasticity} \Rightarrow \frac{\partial E(y_i | x_i)}{\partial x_i} \cdot \frac{x_i}{E(y_i | x_i)} = \beta \cdot x_i \quad (4)$$

The model results from the preferred final model are presented in Table 4. The constant parameters for Australia and South Africa were estimated as random and normally distributed, which represent the error variance relative to South America. We also estimated separate models for each area (i.e., Australia, South Africa and South America), but the pooled model with interactions between explanatory variables and location are more informative in a cross-country comparison (since we have controlled for scale through a single model). The results show that older respondents in South America are more likely to work from home, the same as female respondents in South America. However, these variables (age and gender) were not statistically significant in Australia or South Africa. Income was statistically significant in Australia and Ecuador and had a positive influence on WFH, which could be considered a proxy for occupation.³ The current employer view towards WFH was statistically significant with the expected relationship: if it is mandatory to WFH or if the employer allows employees to decide where they work from, then people are more likely to WFH – and the influence on the probability to WFH is higher in Australia, followed by South Africa. The dummy variable representing that it is not possible to WFH was only statistically significant in South America, showing that when respondents are not allowed to WFH, they are less likely to WFH.

Results show that the employer view towards WFH after COVID-19 also has a statistically significant influence: if the respondent believes the employer will allow him/her to decide when to WFH in the future, then he/she is more likely to WFH now. This variable was significant in all three areas, with a higher value in South Africa, followed by Australia.

Table 4

Poisson regression model results – mean (t values).

	Australia	South America	South Africa
Constant	0.807 (20.04)	–	–
Age (years)	–	0.004 (3.83)	–
Gender female (0,1)	–	0.111 (5.66)	–
Personal income ('000AUD\$)	0.025 (5.22)	–	–
Household income Ecuador ('000AUD\$)	–	0.016 (3.07)	–
Employer view towards WFH after COVID: my choice (0,1)	0.327 (4.94)	0.114 (2.53)	0.421 (7.02)
Employer view towards WFH now: my choice (0,1)	2.044 (21.87)	0.268 (9.33)	1.303 (19.32)
Employer view towards WFH now: mandatory (0,1)	2.560 (26.00)	0.499 (17.17)	1.708 (23.63)
Employer view towards WFH now: not possible (0,1)	–0.714 (3.79)	–1.150 (39.58)	–
Total travel time to the office (minutes)	0.003 (2.78)	–	0.002 (2.42)
Car driver or passenger available (0,1)	–0.220 (3.07)	–	–
Dummy variable Australia (0,1)	–2.187 (17.80)	–	–
Dummy variable South Africa (0,1)	–	–	–1.462 (18.67)
Dummy variable Brazil (0,1)	–	–0.132 (4.89)	–
Standard deviation dummy variables	0.333 (10.31)	–	0.766 (25.22)
Restricted Log-likelihood	–11,177.43		
Log-likelihood at convergence	–8748.19		
Number of estimated parameters	24		
Sample size	4625		
AIC/n	3.79		

The travel time to the office was included only in Australia and South Africa, since there was a lot of information missing in South America. The results show that the longer it takes a respondent in South Africa to get to the office, the more likely they are to WFH. If respondents have access to a car as a driver or passenger available in Australia, they are less likely to WFH, which could be a proxy for the biosecurity risk of using public transport compared to the car. The dummy variables that represent different countries show that respondents in Australia are the least likely to WFH, followed by South Africa, Chile, Brazil, and Argentina, relative to all the other countries (i.e., Colombia, Ecuador, and Peru). This finding could certainly be related to the progress of the health crisis in each country, particularly in Australia where the pandemic was fairly controlled at the time of the survey, so people are able to go to work with little or no risk.

Given the quantum of non-available data on some variables in one or more countries, there is a real possibility that this will impact on the error variance in the Poisson regression model, and hence such heterogeneity should be accounted for. We have included this and found statistically significant differences between each of the three regions. The last row in the table represents the standard deviation of the dummy variables for Australia and South Africa. Both are statistically significant, which says there are some unobserved effects that vary between locations, and the higher parameter estimate for South Africa indicates greater heterogeneity relative to Australia and South America.

The log-likelihood ratio test can be used to test if our model is superior to the restricted version with only constants, where:

$$LR_{95\%,df} = -2 \cdot [l(\theta_r) - l(\theta_c)] = -2 \cdot [-11,177.43 + 8,748.19] = 4,858.48 > \chi^2_{95\%,23df} = 35.172$$

The statistical evidence suggests that the estimated parameters in the pooled with country interactions model, improves the models overall

³ Occupation was excluded from this study since it was not asked in any of the South American cities.

statistical performance, justifying the selection of the pooled model.

The elasticities of the expected frequency of the number of days WFH for each of the variables are presented in Table 5 by country. These represent the behavioural sensitivity of the expected days working from home for each of the explanatory variables. As an example, the elasticity of car availability in Australia relative to the expected frequency of the number of days WFH is -0.182 , which says that if there is a change of not having a car available to having one, *ceteris paribus*, there is likely to be a reduction in the expected frequency of the number of days WFH of 18.2%. The elasticity of travel time shows that for a 10% increase in the travel time to the office, there would be a 0.83% increase in the number of days WFH in Australia, and a 0.76% increase in the number of days WFH in South Africa.

The contribution of this paper is to understand work from home and commuting behaviour. Except for travel time, which was the only geographically spatial variable statistically significant (only in Australia), the results show predominantly socio-economic effects (i.e., age, gender, income) and employer's support to WFH as well as country-specific dummy variables as having a statistically significant influence in the number of days WFH. From a strategic modelling and urban planning perspective, there are three main variables that play a significant role in WFH: employer support towards WFH, travel time to the office and car availability.⁴ The following section analyses the behavioural sensitivity of the number of days WFH based on these three main variables using simulated scenarios for each country, which is more interesting than looking at the evidence for the pooled data.

6. Simulated scenarios

An informative way of appreciating the different behavioural responses in terms of the number of days WFH between the various locations is to undertake a number of scenario simulations. The base scenario for each country is obtained using the variables' averages presented in Table 3, with the results summarised in Fig. 9. In the base scenario, Australia has the highest probability of 0 days to WFH (0.46), followed by South Africa (0.31) – this is also shown in the simulated average number of days WFH which is lowest in Australia (1.58), followed by South Africa (1.74). Comparing the probabilities of the South American countries, the probabilities to WFH 0 days a week is lower in Argentina and Chile, and higher in Brazil and Colombia – which is also represented with a higher and lower average number of days WFH, respectively. The countries with the lower average number of days WFH, namely Australia and South Africa, are the ones with the lowest death rates per million habitants, followed by Colombia and Ecuador (Table 2). This shows the significant impact of the different government strategies and results in the number of days WFH – those countries that have faced more difficulties facing this pandemic are the ones who have faced a higher reduction in commuting. Moreover, car availability and use are significantly higher in Australia and South Africa (Figs. 4 and 5), which could also play an important role in the decision to commute to work in what is perceived as a more bio-secure mode of transport. The estimated average number of days WFH are lower than those observed in the sample for most countries except for Chile (Table 3), where the estimated number of days WFH is higher than the observed average.

Seven scenarios were simulated to show the change in the probabilities of working from home for each country. A description of each scenario is presented in Table 6, and the results of the average number of days WFH for each simulated scenario are summarised in Fig. 10. In all the scenarios, the percentage change in the number of days WFH is highest in Australia followed by South Africa. This finding shows that the probability to WFH in Australia and South Africa – even if lower than in South America – is more sensitive to changes in the explanatory

variables.

The first three scenarios represent variations of the variable that related to the employer's view towards WFH now. The first one is the closest to the base scenario, where respondents are allowed to work from home whenever they want (their choice), except for those that said it was mandatory for them to WFH or it was not possible. This scenario represents an increase in the number of days WFH for all countries – although the percentage change relative to the base scenario is higher in Australia (34.9%) followed by South Africa (21.1%) and lower in Chile (5.5%). The second simulated scenario represents the situation where everyone can decide whether to work from home or the office (it is not mandatory to WFH for anyone), except for those that said their work cannot be done from home. The results suggest a decrease in the number of days WFH in Chile and Argentina, probably because these two countries had the highest percentage of people required to WFH (Fig. 7) and in this scenario some people would be choosing to go to the office instead of staying home every day. There was a slight decrease in the number of days WFH in Colombia, and a slight increase in Peru. In the rest of the countries, the second scenario represents an increase in the average number of days WFH relative to the base scenario – which is higher in Australia (15.0%) followed by South Africa (6.5%) and Ecuador (4.9%). The third simulated scenario allows every respondent to decide to work from home or the office (even those that said their work could not be done from home). This scenario represents an extreme situation of WFH that assumes everyone can work from home excluding those jobs that cannot be done from home and, as such, its results should be interpreted carefully as they do not replicate the full sample of workers. It is included to show a boundary condition with regards to the adoption of WFH, rather than to provide a feasible solution that could be pursued by transport policy makers. The third scenario represents an increase in the average number of days WFH for all countries relative to the base scenario, higher in Australia (39.5%) followed by Colombia (34%), and by Ecuador (27.7%); and lower in Argentina (10.7%) and Chile (10.8%).

The following two scenarios (4 and 5) represent variations in the employer's view towards WFH after COVID-19 restrictions end. Scenario 4 represents the situation where everyone can decide to WFH when they want to, except those that said their work cannot be done from home. Scenario 5 represents the situation where 100% of the sample is allowed to decide where to work from regardless of their work (similar to scenario 3 which excludes those participants whose jobs cannot be done from home). These scenarios show a significant increase in the number of days WFH, which is always highest in South Africa, followed by Australia, and lowest in Argentina, Peru and/or Colombia.

Scenario 6 represents a situation where all respondents have the car as a driver or passenger available, which only affects Australia as this variable was not significant in South Africa nor South America. This scenario represents a 5.2% decrease in the average number of days WFH. Scenario 7 represents 25% decrease in the travel time to the office, variable which was statistically significant in Australia and South Africa only. The results show that a 25% decrease in the travel time to the office would mean a reduction of 2.5% in the number of days WFH in Australia, and 1.9% in South Africa.

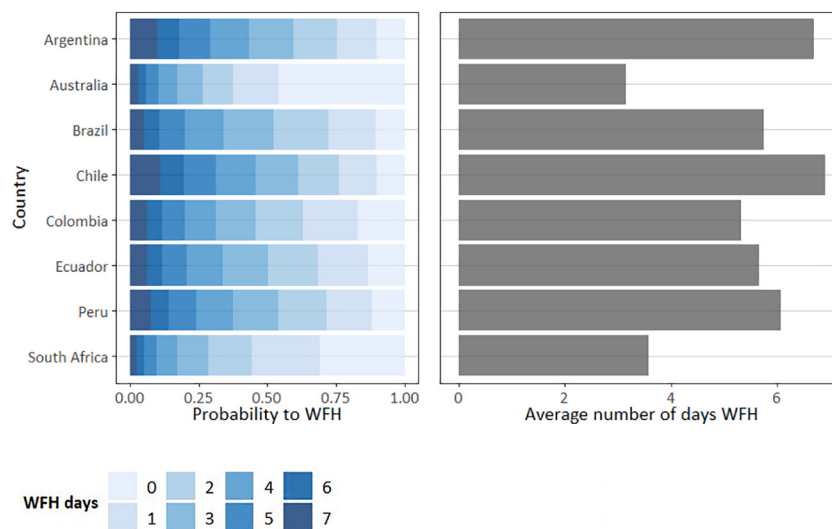
These simulated scenarios show the impact of the employer's view now and after COVID-19 restrictions end, car availability and travel time on the average number of days WFH. The results show that, even though the average number of days WFH is lowest in Australia, the simulated scenarios represent a higher percentage variation in Australia than in the other countries. In countries where the average number of days is higher, namely Argentina and Chile, the scenarios represent lower percentage changes – but this could also be explained by these two countries having more restrictions that require a higher percentage of respondents WFH.

⁴ The use and availability of active modes was not statistically significant in the models.

Table 5

Elasticity of expected frequency of the number of days WFH.

Variables	Arg.	Aus.	Bra.	Chi.	Col.	Ecu.	Peru	S. Af.
Age (years)	0.147	–	0.160	0.133	0.133	0.139	0.142	–
Gender female (0,1)	0.072	–	0.055	0.073	0.054	0.063	0.054	–
Personal income Australia ('000AUD\$)	–	0.160	–	–	–	–	–	–
Household income Chile ('000AUD\$)	–	–	–	0.049	–	–	–	–
Employer view towards WFH after COVID: my choice (0,1)	0.012	0.043	0.008	0.010	0.008	0.007	0.011	0.076
Employer view towards WFH now: my choice (0,1)	0.028	0.591	0.044	0.051	0.022	0.045	0.036	0.403
Employer view towards WFH now: mandatory (0,1)	0.210	0.485	0.153	0.197	0.138	0.099	0.151	0.365
Employer view towards WFH now: not possible (0,1)	–0.217	–0.149	–0.140	–0.233	–0.393	–0.274	–0.244	–
Total travel time to office (minutes)	–	0.083	–	–	–	–	–	0.076
Car driver or passenger available (0,1)	–	–0.182	–	–	–	–	–	–
Dummy variable Australia (0,1)	–	–2.187	–	–	–	–	–	–
Dummy variable South Africa (0,1)	–	–	–	–	–	–	–	–1.462
Dummy variable Brazil (0,1)	–	–	–0.132	–	–	–	–	–

**Fig. 9.** Base scenario WFH probabilities.**Table 6**

Simulated scenario descriptions.

Scenario	Description
0 Base	Base Scenario
1 Emp now: Choice/ Mandat./Imp.	Employer view towards WFH now: my choice for everyone that did not say it was mandatory or not possible
2 Emp now: Choice/ Imp.	Employer view towards WFH now: my choice for everyone that did not say it was not possible
3 Emp now: Choice	Employer view towards WFH now: my choice 100% of the sample
4 Emp ACv: Choice/ Imp.	Employer view towards WFH after COVID: my choice, except for those that said it is not possible
5 Emp ACv: Choice	Employer view towards WFH after COVID: my choice 100% of the sample
6 Car av. 100%	Car driver or pax available to everyone in the sample
7 TT 25%	Travel time to the office 25% faster

7. Conclusions

This study aims to understand the implications that COVID-19 has had, in eight countries, due to the increase in working from home (WFH). The relevant authorities of the countries included in this study have had very different approaches to managing COVID-19 with significantly different results, where Australia stands out with a significantly lower reported number of cases and deaths per million habitants. However, in all countries studied, the incidence of WFH has increased dramatically since the beginning of the COVID-19 pandemic in early

2020. The results suggest that a large number of respondents were working every day from home or commuting every day, where the latter supports no change in WFH behaviour. This result can be partly explained by the different government restrictions in each country; for example, in Chile and Argentina around 40% of respondents said it was mandatory for them to WFH. However, the majority of respondents said they would like to WFH one or more days in the future once COVID-19 restrictions are eased, which aligns with the US evidence in [Barrero et al. \(2021\)](#); with the highest average being 3.52 days in Peru and 3.30 in Chile; and the lowest in Australia at 1.77 days. A significant number of respondents said they believe that their employer will support a balance between WFH and the office once COVID-19 restrictions are eased – around 20% in Australia and more than 30% in the rest of the countries. Many employers have found that WFH does not impact productivity anywhere near the extent it was thought prior to COVID-19, reinforcing the value of forced change as a revealed preference experiment.

A Poisson regression model, given the count data nature of the number of days working from home, was estimated to identify the systematic influences on the number of days working from home in each country and across all eight countries. The results show that the role of socioeconomic characteristics varies between countries; for example, age and gender are statistically significant in South America only, where older respondents tend to work from home more often, as well as women; while income was statistically significant in Australia and Chile, both having a positive impact on the number of days WFH in a week. The current employer's view towards WFH was statistically significant in all countries, suggesting that when the employer is more supportive

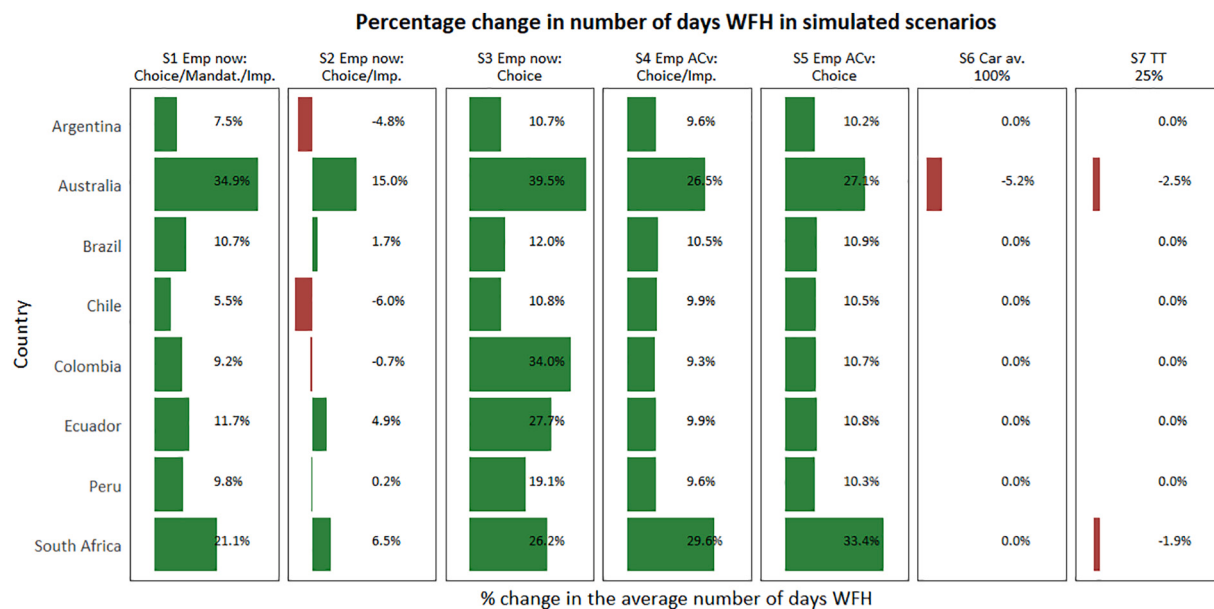


Fig. 10. Average number of days WFH simulated scenarios – percentage change relative to base scenario.

towards WFH, respondents are likely to WFH more days in a week. Interestingly, if respondents think their employer will be supportive towards WFH once COVID-19 restrictions are eased, it had a positive influence on the number of days WFH in all countries. The travel time to the office was statistically significant in Australia and South Africa and had a positive influence on WFH, i.e., if a respondent's trip to the office is longer, then he/she is more likely to have more days of WFH. Car availability had a negative impact on number of days WFH in Australia, suggesting that respondents that have a car available are likely to WFH fewer days per week. Seven scenarios were simulated to analyse the sensitivity of the expected frequency of the number of days WFH due to changes in the explanatory variables. The results show that Australia and South Africa are more sensitive to changes in these variables, which can be attributed to the fact that the average number of days WFH are lower in these countries than in South America. Contrary, Argentina and Chile are less sensitive to changes in the explanatory variables, which can be attributed to higher COVID-19 restrictions and a higher number of days WFH. It should be noted that the data was collected using online panel surveys, and internet accessibility in Ecuador, Peru and South Africa is below 60%. This is a limitation when collecting data in countries with a lower digital connectivity, as there is likely to be over-sampling of high-income workers. Although such internet accessibility is generally low for the entire country, including remote areas – our study only includes workers in metropolitan areas, who are more likely to have internet access. Regardless, the results presented in this study for Ecuador, Peru and South Africa in particular should not be transferred to the entire population without careful consideration.

The most important message from the assessment of the impact of working from home across all metropolitan areas in this study is that there is growing support from both employers and employees for more flexible working practices which has become known as the hybrid model. The reported productivity levels by employees have either increased or remained the same, and there has been growing support from employers to allow employees to decide where to work from. In Australia, for example, we have growing evidence to support a hybrid model with WFH occurring for 1 to 2 days per week for many occupations, notably professional and managers (Beck and Hensher, 2021b). This hybrid work model involves working from home to some extent and fewer days commuting to a regular workplace location. This will mean that with reduced commuting travel on any 1 day, assuming this continues beyond the pandemic period (which we are referring to as the

period of living with COVID in a vaccinated world), we can expect metropolitan planning agencies to take this transport setting into account when revising their strategic transport plans and associated modelling used to forecast traffic activity on the roads and on public transport in particular. Importantly, however, any change in the quantum of commuting associated with increased WFH will also require an assessment of what this means for changes in the amount of non-commuting travel (see Balbontin et al., 2021) and other uses of time 'saved' through reduced daily commuting. It is also likely to mean a greater focus of activities at the suburban level and pressures on governments to invest in improved local transport services including footpaths, bicycle ways and localised on-demand bus services. We describe the impact of WFH due to the pandemic as an unintended positive consequence and one that should not be lost as a return to pre-COVID-19 levels of crowding on public transport and the stress on long commutes 5 days a week. In the medium to long-term, it remains to be seen how this trend on reducing how often people commute to work might impact their household location. Whether the WFH behaviour findings will eventuate over time remains to be seen, but we have some new evidence that an increased incidence of working from home can make a positive contribution and be one of the strongest transport policy levers we have seen for many years, as long as people do not move further away from where they work.

Author statement

Camila Balbontin merged and cleaned the data collected, estimated the models presented, ran simulations, and wrote the paper. David A. Hensher and Matthew Beck designed the original survey, collected data in Australia, contributed with model estimation, analysis and interpretation of results, and writing the paper. Ricardo Giesen, Paul Basnak and Jose Agustin Vallejo-Borda organised the data collection in South America and contributed in writing the paper. Christoffel Venter organised the data collection in South Africa and contributed in writing the paper.

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