

Desire to work from home: Results of an Irish study

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ABSTRACT

Large levels of working from home (WfH) were induced by social distancing and viral control measures undertaken to mitigate the Covid-19 pandemic. Representing an unpredicted change in the way large amounts of people undertake their day to day work, it is expected that the legacy of this event, in terms of significant alterations to work and commuting patterns will have wide-ranging and long-lasting results. However, how persistent the current trends will be, remains an open question. Therefore, there is a need for a well-represented study of employees' preferences for the post-pandemic future and focus on white-collar workers and their well-established attitudes considering their flexibility in terms of workplace arrangements. This paper presents the results of a survey undertaken in Ireland in the summer of 2021 gauging the desire of office workers to WfH, the format that most appeals to them, the consideration of home relocation based on the ability to WfH, and the factors that may explain such preferences. Results indicate high levels of desire to WfH, either full time or partially, with increased desire to WfH positively correlated to pre-pandemic commute length, and to a perceived increase in work productivity and quality of non-work life as a result of time spent WfH. Additionally, a number of workers state that they may consider home relocation based upon the ability to WfH. These results should be interpreted as the desire to WfH or total addressable market that exists, rather than the likely levels of WfH that will be observed post-Covid.

1. Introduction

As a result of the Covid-19 pandemic, increased requirements to enforce social distancing measures to mitigate the spread of the virus resulted in the widespread adoption of working from home (WfH) practices in workplaces where such measures were possible. While WfH or teleworking had long been mooted as a means of addressing issues such as congestion, transport-related emissions, and increasing quality of life (Jain et al., 2022), the process of detaching work from conventional places of work was relatively slow (Felstead, 2012) and the pandemic represented the first time that WfH had been widely adopted. Emerging research indicates that it is highly likely that there will be a legacy impact from these measures, with both employees and employers indicating preferences to retain some of the aspects of pandemic working environment (Beck and Hensher, 2021).

From the perspective of transport modellers and planners, the adoption of such measures is likely to have significant impacts upon existing services and planned transport investments. While there are likely to be a number of benefits on both a societal and individual basis,

there are also likely to be negative impacts such as threats to the viability of transport services following a reduction in the number of commuting trips. Conversely, this reduction might be offset by an increase in non-work trips or longer commutes of employees who relocated to the sub-urban areas (Department of Transport, 2021).

As this phenomenon is still evolving, transport planners are now required to update forecasts that may have previously been considered stable, and as the impact of the pandemic on mobility is likely to represent a behavioural step change (Gkiotsalitis and Cats, 2021; Schmidt et al., 2021), rather than the natural extension of existing trends, there is an urgent requirement to collect data regarding the potential impact of long term large scale adoption of WfH. This is the area in which our paper focuses and seeks to make an impact by adding to the emerging literature in this field.

2. Background

Since the beginning of the Covid-19 pandemic, a number of studies have been conducted to examine the short-term impact of enforced WfH

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on transport demand and only a few explored the degree of likely long-term changes in working (and, hence, commuting) patterns (Currie et al., 2021; Ceccato et al., 2021). Some studies carried out immediately before the pandemic are also of relevance in the latter context and were reviewed in the literature (Jain et al., 2022; Hensher et al., 2021; Kalter et al., 2021; Nguyen and Armoogum, 2021). The substantial body of the research concentrates on changes in working patterns during the Covid-19 pandemic and its implications for undertaken trips. These studies are based on the collected data for traffic volumes and observed behaviours but do not account for the motivation of these behaviours (Currie et al., 2021).

2.1. Self-reported interest in working from home

Within Europe, Kalter et al. (2021) explored the intended behaviours when the Covid-19 restrictions no longer apply using a sample from the Netherlands. 68% of surveyed employees showed an interest in increasing teleworking activities by one day after the pandemic as compared to the number of teleworking days before Covid-19. A third of employees who started to WfH during the lockdown intend to continue doing so after the pandemic either one day a week or more. The research on perceptions of WfH in Belgium conducted on the national scale and reported by Moens et al. (2021) also indicates an increased desire to perform more work remotely in the future, a feeling common for 62.7% of Flemish employees, and compatible with satisfactory experiences with WfH during Covid-19 pandemic. Similarly, surveys in the UK as a whole (ONS, 2021) and Scotland (McGinley et al., 2020) found high levels of support for hybrid working patterns.

Beck and Hensher et al. (2021) report expectations for future WfH among Australians who work in white-collar and blue-collar professions. The scholars concluded that widespread adoption of WfH practices during the Covid-19 pandemic boosted the support for this work arrangement due to the positive experiences of both, employees and employers. The respondents expressed interest in WfH more often, with more flexible hours, and being able to commute outside peak hours. According to the analysis presented by Beck et al. (2020), the number of employees who were not involved in any telework prior to Covid-19 dropped from 71% to 39% at its lowest after restrictions were imposed. As a result of positive experience with WfH, 71% of respondents showed a desire to WfH more often in the future and 62% expressed a wish to telework at least one day a week. On average, the employees would like to work 1.7 days a week post-Covid compared to 0.86 days before the pandemic (Beck et al., 2020; Beck and Hensher, 2021). Based on the preferences stated by the respondents in Melbourne (Currie et al., 2021), post-pandemic homeworking volume is expected to be 75% above pre-pandemic levels, when 4.6% of the working population WfH on the day of the census. Beck et al. (2020) conclude that the extremes currently seen in that all work is done from home for around half of the respondents are not likely to be sustained, and rather there is a propensity for “a middle ground” in preferences. They also highlight the need for continuous monitoring of travel activities and evolving attitudes toward WfH.

Worth mentioning is that the majority of studies referring to WfH preferences in the post-pandemic world relied on convenience sampling when collecting data. On contrary, Kalter et al. (2021) used the data from the Dutch Travel Panel comprising of a representative sample of the Dutch population. Moreover, to overcome the “under-response bias” of convenience sampling, Currie et al. (2021) used a pre-stratification sampling to stratify the sample around age and income dimensions, and by regions within Melbourne. Alternatively, a post-stratification strategy was adopted by Moens et al. (2021) to ensure a more robust representation of gender, age, and education level in the Flemish sample.

2.2. Factors explaining preferences for working from home

Many factors have been said to increase preference for WfH, such as reduced commutes and increased flexibility were the key factors among both those who already WfH (pre-Covid) and those who aspired to do so. Kalter et al. (2021) found that office workers and employees who have longer commuting distances to the workplace show a greater desire to increase WfH and reduce commuting by car. Also, pre-pandemic Helminen and Ristimäki (2007) noticed that in Finland, the probability of WfH at least a day per week rises with the length of commuting trip and doubles for a 32 km commuting distance increase.

Demographic factors were found important in explaining the choice to WfH, however, limited agreement exists between scholars regarding which demographic groups favour WfH more and which less. Regarding age, the results of Nayak and Pandit (2021) show that the willingness to WfH decreases with the age of respondents. Some other studies also suggest that employees aged 55 or more prefer to WfH fewer days (Beck et al., 2020) or over-60s favour working remotely less than other age groups (McCarthy et al., 2021). However, on the contrary, older employees in Belgium were found to be more satisfied with WfH than other age groups and appreciated its benefits to a greater extent (Moens et al., 2021). Older employees in South American countries tend to WfH more frequently (Balbontin et al., 2021). There is also evidence that younger people display a greater desire to perform their work activities at the workplace rather than at home. For instance, this was noticed for respondents under-30s (McCarthy et al., 2021). Unlike all cited scholars, Currie et al. (2021) did not report any statistically reliable variation among age groups.

Concerning gender, most studies suggest that females have a more positive perception of WfH than males. For example, Nguyen and Armoogum (2021) noted that women in Hanoi, Vietnam present substantially higher preferences for teleworking. This was also true in the Australian context, where females expressed an intention to WfH on a significantly higher number of days (Beck and Hensher, 2021). Moreover, gender was revealed to be statistically significant in South America where women tend to WfH more frequently (Balbontin et al., 2021). However, an Irish study by McCarthy et al. (2021) found that men favour daily telework while women would prefer to work remotely less frequent, only several days a week. Also, López Soler et al. (2021), in an EU-wide study using 2018 (i.e. pre-Covid) data, found that male gender was an significant factor in explaining the preference for WfH.

The views regarding the role of income in explaining preferences for WfH are rather consistent in the literature and indicate that the higher income groups were more likely to favour remote work arrangements. For instance, Australian employees with high and middle incomes expressed a desire to WfH on a significantly higher number of days (Beck and Hensher, 2021). Similarly, a high-to-middle economic status of teleworkers was a predictor of WfH across pre-pandemic Europe (López Soler et al., 2021). Income was also found to positively affect the weekly amount of WfH in Australia and Chile (Balbontin et al., 2021). On a smaller scale, within the group of employees at the University of Padova in Italy, Ceccato et al. (2021) found that higher household income increases the probability to cancel the trip to work.

In addition, other factors such as improved work-life balance and higher productivity while WfH may have a positive effect on strengthening the desire to WfH. Scottish respondents to McGinley et al. (2020) stated that their staff had reported positive impacts on work-life balance, although certain groups of employees experienced negative mental health effects. Productivity emerges as a major factor influencing the decision to WfH, both for employees and managers. Felstead and Reuschke (2020) suggest that homeworking boosts productivity; as do McCarthy et al. (2021) stating that 68% of respondents agreed or strongly agreed that working remotely increased their productivity. Beck and Hensher (2021) report a positive change in productivity for one-third of Australian employees and no change noticed by around half of the employees and employers. The evidence of a more substantial

decline in productivity emerges from the study of [Shamshiripour et al. \(2020\)](#) found that only roughly one-fifth of American telecommuters believe that their productivity increased, while the vast majority have seen a decrease or no change in productivity. These contradictory findings suggest that other underlying factors, such as work arrangements might be involved.

2.3. Residential relocation

Increased frequency of WfH leads to a lower frequency of commute, making it possible to accept longer commute distances, and hence new areas become feasible residential locations ([Ettema, 2010](#)). Several authors studying changes in commuting behaviour due to advances in information technology before Covid-19 noticed that teleworkers have longer commuting distances to their workplaces than other commuters ([Gubins et al., 2019](#); [Ettema, 2010](#)). This might result from the flexibility that WfH offers or, conversely, the adoption of telework could lead to choosing a home location distant from the workplace ([Silva and Melo, 2018](#)). Interestingly, [Ory and Mokhtarian \(2006\)](#) noticed that employees already WfH relocate closer to their workplace, while the commuters who choose to move further start WfH after the relocation. The direction of residential relocation determines the total household commute ([Melo and Silva, 2017](#)). If the teleworker decides to move closer to the household member who does not WfH, the total commute will likely decrease. Alternatively, if the preferred new location is suburban or rural, there might be an increase in total distance and time travelled. Moving to a new residential context can also disrupt past transport mode choices and people's attitudes to travel ([De Vos et al., 2018](#)). Relocating from urbanised areas to suburban environments was found to increase car use and decrease walking, while an opposite effect relates to changing location from less to more urbanised.

WfH was found to be positively associated with a preference for suburban relocation ([Ettema, 2010](#)) seen as more attractive because of the green environment, bigger and more affordable houses. Another reason for such preference might be a lack of adequate provision of dwellings in urban areas caused by a low jobs-housing balance in the cities, especially in well-developed countries ([Zheng et al., 2021](#)). Furthermore, compared to households without children, families favour more remote areas - outer city, town, and rural settings - driven by a desire for a safe and green surrounding ([Ettema, 2010](#)). Another relocation option might be partially moving the workplace to a 'second home' located in the same country or abroad and used previously only for recreational purposes ([Næss et al., 2019](#)). While the literature on home relocation associated with teleworking pre-pandemic shows the general trends and patterns, the impact of increased WfH on residential relocation during the Covid-19 pandemic and post-pandemic attitudes toward it, have not been explored in the literature.

2.4. Overview of the Irish context and Covid-19 situation

The Covid-19 health measures were first imposed in Ireland in March 2020, when the businesses and schools were shut and a further "stay-at-home" order restricting movement was issued and enforced by police ([GOI, 2020](#)). The lockdown restrictions were gradually removed beginning from May 2020, imposed again in October 2020, eased for December, and subsequently imposed from January 2021. A re-opening plan for May and June was announced in April 2021 and a further easing of restrictions for June, July, and August a month later ([GOI, 2021b](#)). Since April 2021, there was a full return to classrooms for primary and secondary school students who then had summer holidays starting at the end of June. Although many of the Covid-19 restrictions were eased from May 2021, the employees were still advised to work from home if possible which advice remained in place till the beginning of 2022. Following easing public health measures from January 2022, safe return to the workplace started to be supported with safety measures in place ([DETE, 2022b](#)). The mandatory requirement to wear masks, except for

public transport and healthcare facilities, was removed on the last day of February 2022 ([GOI, 2022](#)). Employers were also encouraged to develop or finalise their blended or remote working arrangements. Moreover, the bill giving employees a legal right to request remote working is about to be written into law as a part of the government's plan to make WfH a permanent feature of Ireland's workforce ([DETE, 2022a](#)).

During the initial lockdown in 2020, the traffic volumes decreased by 70% nationwide. Car traffic volumes continued to remain below 2019 levels in 2021 gradually increasing through the first half of the year and keeping relatively constant toward the end of 2021. In April 2022 further increase in car weekly traffic volume was observed reaching a level only 1% lower than pre-pandemic for the Dublin area (where 40% of the country's population live), and a few percent lower at the regional sites ([CSO, 2022a](#)). Worth noting that April 2019 included the Easter holidays when traffic volume tends to be lower. Public transport trips increased to their highest level since March 2020, but as of April 2022, there are still 33% fewer such journeys taken than before the pandemic in 2019 ([CSO, 2022b](#)). Some increase in traffic volumes may be attributed to the government's support for returning to the workplace (since January 2022), but other non-work trips following the removal of restrictions may also play their role.

Before the Covid-19 pandemic, only 23% of Irish employees worked remotely at some point. Pandemic gave an opportunity to 80% of workers to experience some sort of WfH arrangements. Results from the public survey ([CSO, 2021](#)) suggest further that in November 2021, 65% of employees were working remotely all or some of the time. WfH arrangements are facilitated by well-developed ICT infrastructure, allowing the vast majority (92%) of households to access the Internet mainly through a fixed broadband connection, supported also in regional locations ([CSO, 2020](#)). The Irish population is concentrated in the Greater Dublin Area which employment catchment area reaches beyond its boundaries. Due to high housing costs in Dublin city, many households decide to move to the growing suburbs and nearby towns. High demand for homes in this area combined with insufficient supply and vacant relict houses adds to the ongoing housing problem.

2.5. The rationale of this study

How persistent the recent trends in WfH will be, seems to be the major gap in studying the travel and attitudes toward telework. [Currie et al. \(2021\)](#) and [Jain et al. \(2022\)](#) noticed that a well-represented study of employees' preferences is required to fill this research gap if the trends are to be accurately anticipated. The current study provides a nationally representative analysis of the post-pandemic preference of Irish white-collar to WfH and relocate, and the factors correlated to such preferences. The survey took place when public experience with WfH arrangements was already advanced, allowing for well-established attitudes to be reported. We focus on white-collar workers who show the greatest potential for switching their workplace or increasing WfH activities. The research problem presented in this work is especially interesting to inform policy on the scale of possibly large shifts in the actual travel post-pandemic. Although the conclusions drawn from this research can assist the transport authorities in planning future interventions, the analysis of the travel behaviours is out of the scope of this article.

In our study, the data collected through an online survey consists of a nationally representative sample of working adults by gender, age and region in Ireland. Our research intends to determine the self-stated preferences toward working from home post-Covid, frequency of WfH, and regional differences among office workers. To examine the factors differentiating the preference toward WfH we applied the ordinal logistic regression and explored the influence of employees' socio-economic characteristics and commuting patterns before the pandemic, as well as self-reported changes in work productivity and personal life quality. Furthermore, the traditional logit model was used to determine the relationship between a similar set of independent

variables and the consideration of home relocation.

This study specifically addresses the following research questions:

1. To what extent is there a desire to continue WfH in a post-Covid world?
2. How is such a desire related to the characteristics of individuals and their pre-Covid work and commuting experiences?
3. How does WfH impact possibility of home relocation?

Examining the possibility of home relocation due to an increased instance of WfH provides a contribution to the transport geography field. The home relocation model is a first step to try to understand the longer term trends in population distribution post pandemic. This approach, while it does have some limitations (discussed in section 3.3), provides insights as to the potential relocation of workers.

3. Methods

In order to address concerns regarding the impact of WfH on future year demand, the National Transport Authority (NTA) of Ireland commissioned a survey of desire to WfH in the summer of 2021. The response variable of interest, the stated desire to WfH, is ordinal in nature. Therefore, the ordered logistic regression model was deemed to be most appropriate for the purposes of analysis.

3.1. Data

The survey sample was collected from a nationally representative survey panel with a booster for the GDA commissioned by NTA and provided by Behaviour and Attitudes. The sample consisted of 1282 respondents, however as this analysis is only focused on white-collar workers, this reduces to 896 respondents. This group was the focus as previous research conducted in Ireland had shown they were the most likely to WfH (Crowley et al., 2021; Caulfield, 2015; Paul O’Keefe et al., 2016).

The survey was conducted online between 7th June to 16th July 2021 through the representative panel where the selected relevant panellists were invited to participate. During this period, about 110 Covid-19 cases per 100,000 people were reported (HPSC, 2022), some Covid-19 restrictions were eased such as dining outdoor (but not indoor), and schools were re-opened (till the end of June when the summer holidays start). However, employees were still advised to WfH if possible, and not till the beginning of 2022 was the return to the workplace supported. The age, sex and regional proportions of survey respondents reflect the national statistics (except for the boosted sample of respondents from the GDA) as shown in Table 1. Note that sample totals do not sum to 100% as some respondents did not identify as either

Table 1
Persons in employment by sex, age, and region in Ireland.

	Irish Labour Force, 2011	CSO Person at Work, 2011	Sample
Male Total	55%	53%	47.66%
25–34	17%	16%	10.06%
35–44	16%	16%	15.91%
45–54	13%	13%	13.57%
55–64	8%	8%	8.03%
Female Total	45%	47%	52.11%
25–34	16%	17%	18.64%
35–44	13%	14%	16.61%
45–54	10%	11%	10.3%
55–64	6%	6%	6.47%
Dublin	29%	30%	49.69%
Rest Leinster	26%	26%	23.71%
Munster	27%	27%	16.15%
Connacht/ Ulster	18%	17%	10.45%

male or female. As noted previously, the sample contains a bias for the Dublin region as this is where a concentration of Irish projects and policy are occurring, however, the other Irish regions are also well represented within the sample.

The questionnaire was designed and tested through a pilot study. The form included a mix of multiple-choice questions with single or multiple answers. Socio-demographic characteristics explored in the survey were: age, gender, number of children (under 18) in a household, role in organisation and numbers of years in the role, and home location; while commute patterns identified were pre-Covid usual mode of transport to work and pre-Covid average door to door one way commute.

3.2. Desire to work from home model

The desire to WfH, and its relationship to the characteristics of the respondents is modelling using an ordinal logistic regression models. These models are an extension of the standard binary logit model, and are suitable for variables where there the data is in the form of discrete categories, but with clear ordering present, such as Likert data. In the case of desire to WfH, once the “Can’t” option is removed, these responses can be considered ordinal, indicating increasing levels of WfH or remaining in the office.

The ordinal logistic regression is a cumulative probability model, whereby the log odds or logit of belonging to a given group, is defined by the independent characteristics of the individual, and is extracted by calculating cumulative odds and subtracting. The logit or log-odds of falling into one or a combination of the respective ordered categories (P) is given by (Snedker et al., 2002; Stata, 2022):

$$\text{logit}(P_1) = \log \frac{P_1}{1 - P_1} = \alpha_1 + \beta X \tag{1}$$

$$\text{logit}(P_1 + P_2) = \log \frac{P_1 + P_2}{1 - P_1 - P_2} = \alpha_2 + \beta X \tag{2}$$

$$\text{logit}(P_1 + P_2 + \dots + P_k) = \log \frac{P_1 + P_2 + \dots + P_k}{1 - P_1 - P_2 - \dots - P_k} = \alpha_k + \beta X \tag{3}$$

$$P_1 + P_2 + \dots + P_k = 1 \tag{4}$$

Where α represent the cut points estimated by the model, k is the number of possible outcomes that the dependent variable can take, and β denotes the coefficients that were estimated for each variable.

While this research is more focused on the role that predictor variables play in terms of impact on desire to WfH, and less concerned on calculating the exact probabilities associated with the given categories, the ordinal logistic regression model represents an appropriate means of examining such relationships, given the nature of the response variable.

3.3. Home relocation model

To examine the impact of WfH practices on individuals' desire to relocate their home, respondents were asked the following: “Would you consider changing home location based upon the ability to WfH”, with a yes/no response being required. It could be argued that this application is simplistic and ignores the potential changes in distances travelled due to relocation. However, the model does provide some insights as to what the potential longer term changes might be after the pandemic.

As this response was binary in nature, a traditional logit model was used to analyse the relationship between the response and the characteristics of the individual, rather than the extended ordinal version utilised for the previous question. This takes a similar form as the previous model, though it simplifies to:

$$\text{logit}(P) = \log \frac{P}{1 - P} = \alpha_1 + \beta X \tag{5}$$

4. Results

4.1. Descriptive statistics

The main point of interest in the survey was revealing the propensity to WfH after pandemic. The survey asked respondents if they wished to WfH post-Covid, noting that this relates to the desire to WfH, not how possible it is. Given options of various degrees working from the office or home (Fig. 1), 77.9% of respondents in the sample showed a preference for some form of WfH. Fig. 1 outlines the desire to WfH and the percentage of respondents in the respective categories for both the GDA and the rest of Ireland. These results demonstrate that the majority of respondents in both areas wish to engage in some form of WfH, either full time or a blended approach, with a mostly at home setup being the most attractive, particularly within the GDA. It is worth noting that only 10.6% of respondents within the GDA and 12.9% of those outside it, who have the ability to WfH, wish to work full time from the office. In this analysis Ireland is split between the GDA and the rest of the country.

Fig. 2 outlines the preference to WfH by day. These are based on the answers to the question asking on which of the days would the respondents like to WfH, and how often would they like to work on this day (always, sometimes, never, do not usually work this day), if they were given a free choice. The results of this analysis clearly highlight a biphasic desire to WfH, with higher levels of preference being expressed to WfH on Mondays and Fridays, with respect to the middle of the standard working week. While this only represents desire, and does not take into account how organisations may structure their staff, it does highlight potential issues for public transport services, with demand potentially being concentrated in the middle of the week.

In addition, respondents were asked about how their experiences with WfH during the Covid-19 pandemic impacted upon both their perceived productivity at work, as well as the quality of their non-work lives. Precisely, “how do you feel working from home has impacted on your work productivity?” and “how do you feel the quality of your non-work life has changed due to working from home?”. The respondents marked their answers on a 5-point scale from “greatly increased/improved” to “greatly decreased/disimproved a lot”. Fig. 3 presents the results for these questions, highlighting that the majority of respondents perceived an increase in their productivity at work and an increase in the quality of their non-work life.

4.2. Desire to work from home logistic regression results

Table 2 outlines the results of the ordered logistic regression undertaken to provide insight into the factors correlated to desire to WfH. Coefficients should be interpreted such that positive and increasing values represent a greater desire to WfH with respect to the reference level, while negative and decreasing values represent a lesser desire. For instance, the reference group for “gender” is set to be “male” and the negative coefficient value for the “female” group indicates a lesser desire for WfH expressed by females than males. However, as the model is based upon a logistic distribution, coefficient values cannot be interpreted as may be the case with a linear model where a one-point change in the independent variable results in a change to the dependent variable proportional to the value of the coefficient. In this case, the odds ratio provides a more intuitive basis for understanding as it provides the change in odds resulting from a change in the predictor variable. In the case of continuous variables, this is a one-unit change, and in the case of categorical variables, it is a change between respective levels.

Explanatory variables can be broadly classified into two categories, namely the characteristics of the commuter, and the characteristics of their regular pre-Covid commute. First examining the characteristics of the commuter, we find that desire to WfH is negatively related to the age, modelled as a continuous variable, of respondents, with younger workers displaying a greater desire to WfH. The gender of the respondent is not a significant predictor of WfH desire, nor is the number of children under eighteen present in their household with respect to the reference category of no children present.

Examining the role of the individual within their organisation of employment, while individual categories display parameters that are statistically different from the reference category at $p = 0.05$, no clear pattern emerges with regard to either their position within the organisation (junior role, middle role, senior role) or the number of years they have spent within the role. A lower desire to WfH exists for middle role workers than more junior ones, but the difference between employees in junior and senior roles does not emerge as being statistically significant.

For the role of commute characteristics, a clear positive relationship emerges with respect to pre-Covid one way commute travel time where, with the exception of respondents in the 75 to 90 min category, desire to WfH increases with respect to travel time and is highly statistically significant. This effect is most pronounced for those workers in the 90–120 min and 120+ minute categories, as may be expected given that these are quite long one way commutes.

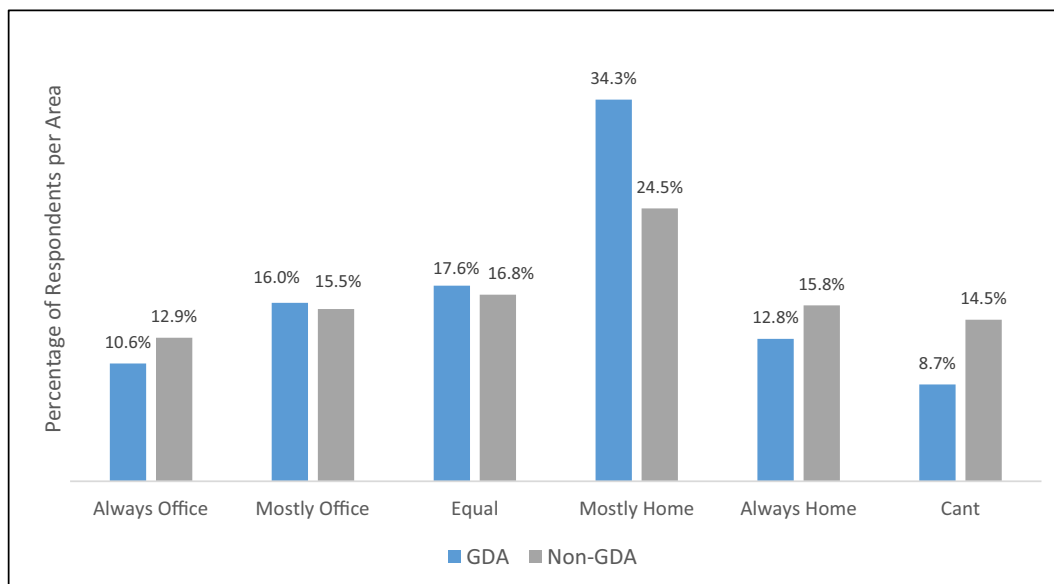


Fig. 1. White-collar employees' working from home preference by area, GDA (N = 586) vs non-GDA (N = 310).

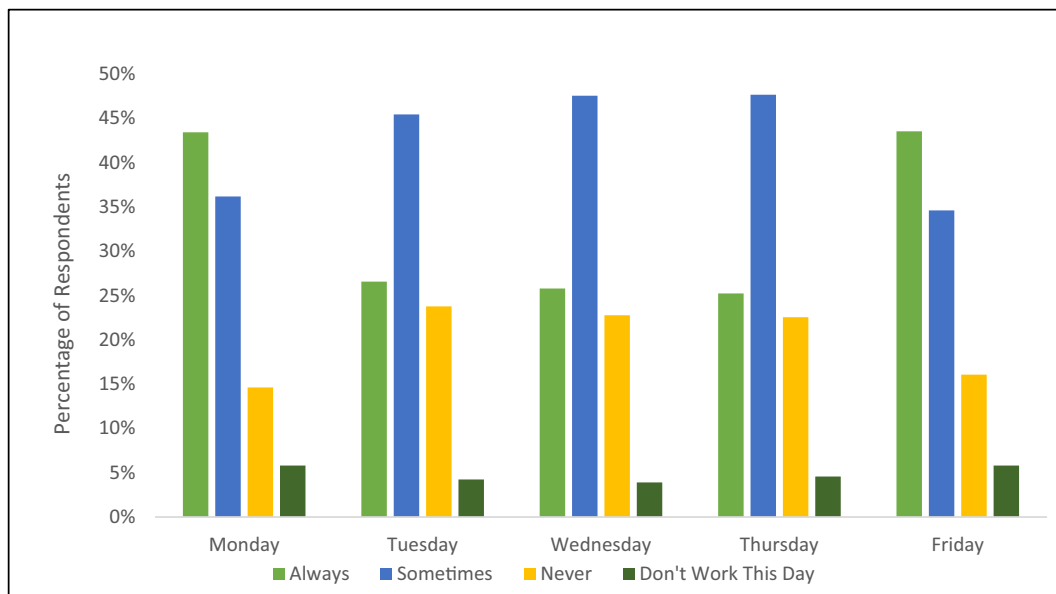


Fig. 2. White-collar employees' working from home preference by day.

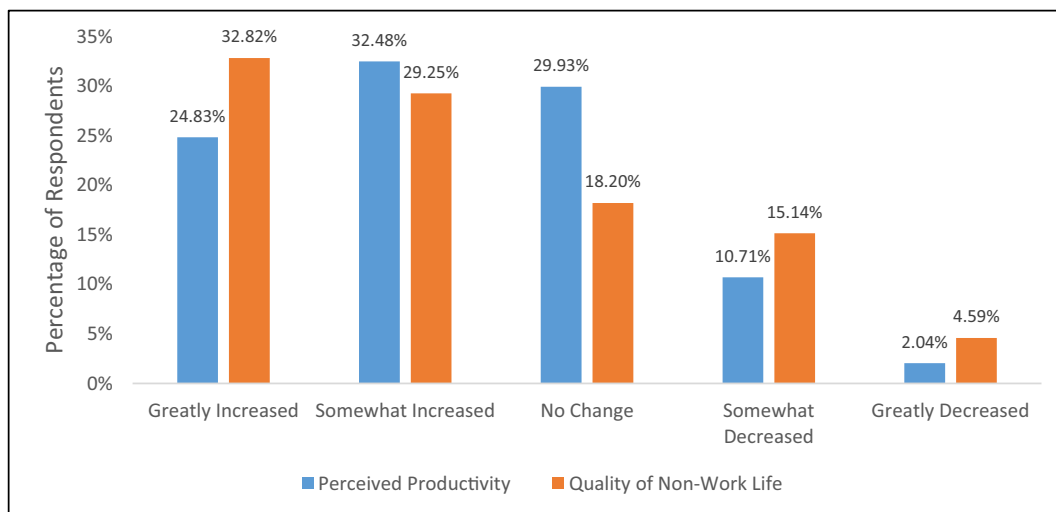


Fig. 3. Working from home-related life changes.

Dummy variables are included to capture the respondents' usual commuter modes. If the trip is multimodal, a respondent is assigned to more than one mode. It should be noted that each of the modes is represented by an individual dummy variable, rather than by a single mode categorical variable, hence the lack of a reference mode. While no mode is observed to be statistically significant at $p = 0.05$, with an odds ratio of 1.54 and $p = 0.06$ it appears that rail users are more likely to WfH than other modes, even when controlling for commute length.

Finally, the model also examines the relationship between stated changes in productivity (self-reported) and quality of work-life, with the desire to WfH. These results clearly demonstrate that greater levels of WfH is desirable to those who have seen increased productivity and increased quality of non-work life while WfH. While these results may not be very surprising, they indicate the model is operating as would be expected.

4.3. Home relocation logistic regression results

This study also revealed the attitudes of respondents toward home

relocation. The survey asked respondents if they would consider changing home location based upon the ability to work from home (yes/no question). Up to 42.5% of the white-collar respondents who have the ability to work from home state that they would consider moving. It must be noted that this does not represent 42.5% of the sample, rather those respondents within the white-collar category who had already indicated that it was possible for them to WfH.

Table 3 outlines the results of the logistic regression to identify the independent characteristics of the respondents that are correlated with their consideration of change in home location. With regard to demographic characteristics, a statistically significant difference is not observed between genders, while an increase in the age of respondents is observed to be linked with a decreased, and significant, reduction in consideration of relocating.

With an odds ratio value of 1.68, respondents living in Dublin are more likely to consider relocating based upon working from home ability, in comparison to the non-Dublin reference group. In terms of pre-Covid commute, a significant difference from the reference group is only present for those commuters who already travel over 120 min. No

Table 2
Ordered logistic regression model estimates for desire to work from home post-pandemic.

Number of obs. =		588	
LR chi2(36) =		195.22	
Prob. > chi2 =		0	
Pseudo R2 =		0.1163	
Log likelihood =		-741.786	
	Coefficient	Odds Ratio	P > z
Gender			
Male	Ref	Ref	Ref
Female	-0.14	0.87	0.38
Age	-0.03	0.98	0.01
Home Location			
Not Dublin	Ref	Ref	Ref
Dublin	0.13	1.14	0.47
Commute			
Less than 15 min	Ref	Ref	Ref
15 to 30 min	0.64	1.90	0.02
30 to 45 min	0.73	2.08	0.01
45 to 60 min	0.90	2.47	0.00
60 to 75 min	1.17	3.20	0.00
75 to 90 min	0.85	2.35	0.17
90 to 120 min	2.59	13.31	0.00
Over 120 min	2.67	14.42	0.00
Mode (dummy variables)			
Car Driver	0.03	1.03	0.90
Bike	-0.09	0.91	0.74
Bus	0.18	1.19	0.41
Rail	0.43	1.54	0.06
Walk	0.03	1.03	0.91
Perceived Change in Work Productivity			
Greatly Increased	Ref	Ref	Ref
Somewhat Increased	0.08	1.09	0.72
No Change	-0.81	0.44	0.00
Somewhat Decreased	-1.52	0.22	0.00
Greatly Decreased	-2.91	0.05	0.00
Change in Quality of Non-Work Life			
Greatly Improved	Ref	Ref	Ref
Somewhat Improved	-0.85	0.43	0.00
No Change	-1.10	0.33	0.00
Disimproved a little	-1.13	0.32	0.00
Disimproved a lot	-1.31	0.27	0.00
Children Under 18			
Zero	Ref	Ref	Ref
One	0.15	1.16	0.51
Two	-0.38	0.68	0.08
Three	0.03	1.03	0.94
Four	-1.20	0.30	0.07
Five or more	0.72	2.06	0.59
Role in Organisation			
Junior role	Ref	Ref	Ref
Middle role	-0.54	0.58	0.01
Senior role	-0.40	0.67	0.13
Not applicable (sole trader, flat work structure, etc.)	0.64	1.89	0.33
Number of years in role			
Less than a year	Ref	Ref	Ref
1-2 years	-0.42	0.66	0.11
2-5 years	-0.27	0.76	0.26
5-10 years	-0.54	0.58	0.05
10-20 years	0.11	1.12	0.76
More than 20 years	0.21	1.23	0.66

significant differences are present with regard to mode of commuting.

Regarding stated change in productivity, respondents who stated their productivity had somewhat increased are not statistically different from the reference group who stated their productivity had greatly increased, however for the other categories, consideration of home relocation appears to decline within respect to declining stated changes in productivity experienced. The same pattern is observed for respondents who stated that their non-work life had improved, where there is a divide between those categories that saw improvement, who have a greater tendency to consider relocation, and those who did not

Table 3
Logistic regression model estimates for desire to changing home location.

Number of obs. =		588	
LR chi2(32) =		117.79	
Prob. > chi2 =		0	
Pseudo R2 =		0.1469	
Log likelihood =		-342.065	
	Coefficient	Odds Ratio	P > z
Gender			
Male	Ref	Ref	Ref
Female	0.31	1.36	0.12
Age	-0.05	0.95	0.00
Home Location			
Not Dublin	Ref	Ref	Ref
Dublin	0.52	1.68	0.01
Commute			
Less than 15 min	Ref	Ref	Ref
15 to 30 min	0.13	1.14	0.70
30 to 45 min	0.58	1.78	0.11
45 to 60 min	0.08	1.09	0.83
60 to 75 min	0.24	1.27	0.59
75 to 90 min	0.01	1.01	0.99
90 to 120 min	0.99	2.69	0.19
Over 120 min	2.07	7.91	0.04
Mode (dummy variables)			
Car Driver	-0.27	0.77	0.29
Bike	-0.35	0.70	0.27
Bus	0.33	1.40	0.19
Rail	0.20	1.22	0.45
Walk	0.46	1.58	0.10
Perceived Change in Work Productivity			
Greatly Increased	Ref	Ref	Ref
Somewhat Increased	-0.14	0.87	0.61
No Change	-0.87	0.42	0.00
Somewhat Decreased	-0.47	0.62	0.21
Greatly Decreased	-2.04	0.13	0.03
Change in Quality of Non-Work Life			
Greatly Improved	Ref	Ref	Ref
Somewhat Improved	0.10	1.10	0.70
No Change	-0.15	0.86	0.64
Disimproved a little	-0.79	0.45	0.02
Disimproved a lot	-1.27	0.28	0.03
Children Under 18			
No Children	Ref	Ref	Ref
Children Present	-0.14	0.87	0.49
Role in Organisation			
Junior role	Ref	Ref	Ref
Middle role	-0.33	0.72	0.20
Senior role	-0.04	0.96	0.89
Not applicable (sole trader, flat work structure, etc.)	1.28	3.59	0.08
Number of Years in Role			
Less than a year	Ref	Ref	Ref
1-2 years	-0.41	0.66	0.19
2-5 years	-0.02	1.02	0.95
5-10 years	-0.23	0.79	0.49
10-20 years	0.18	1.20	0.66
More than 20 years	-0.71	0.49	0.30

see an improvement, and have a lower tendency to consider moving.

Due to issues of multicollinearity, the presence of children in the respondent's household has been reduced to a binary variable, compared to a categorical variable in the ordinal regression model. The multicollinearity was caused by high correlations between this and other variables leading to problems with identifying which variables explain the dependent variable. Regardless of that, the presence of children was not found to be statistically significant. In terms of role within the organisation, neither position nor the number of years within a given role are found to be related to the potential to relocate.

5. Discussion and conclusions

This research was undertaken to examine the desire to WfH and the

consideration of relocation based upon this ability in a post-Covid environment using a sample of office workers in Ireland. In terms of general trends, the results of this study highlight the presence of a large desire to continue WfH, especially in some form of hybrid model, within the sample of Irish office workers, with rough 3 out of every 4 workers desiring some form of continued WfH arrangements. Results also demonstrated that, while mostly WfH appears to be the most popular option, there is not a majority consensus regarding the most attractive balance of from-home and on-site working, suggesting that organisations and employers may need to provide multiple options to their staff.

The results presented, indicate that, given workers' free choice, there is likely to be a substantial decrease in commuter trips, and that such a decrease will not be evenly distributed across the traditional Monday to Friday work week. The reduction in peak-hour commuting will likely occur due to employees choosing to WfH. The continued practice is expected to "lead to reduced demand for the commercial services that typically support office-based activities in centralised locations such food outlets and cleaning companies" and hence "it is possible that the incidence of travel to urban centres among workers who do not engage in teleworking will also be suppressed to some extent." (Department of Transport, 2021, pp. 6–7). Yet, a decrease in commuter trips might not necessarily lead to a decline in the total number of journeys as home-based telework might induce travel. In particular, more travel was observed for single-worker households (Silva and Melo, 2018). Telecommuters make fewer commute trips but more non-work journeys and frequency of trips for other purposes can be reduced if accessibility to daily destinations is facilitated through local planning (Budnitz et al., 2020). For example, WfH reduced travel demand in Sweden and contributed to greater use of active transport modes, presumably for non-commute trips (Eldér, 2020). Therefore, an increase in non-commuter journeys is a possible outcome of intensified WfH practices to be considered by transport planners and hence there is a need for mixed land-use planning and compact development where non-commuting trips can be taken by walk or bicycle.

Examining the desire to WfH with regard to the socio-economic and travel characteristics of the respondents, pre-pandemic commute length emerges as a significant predictor of desire to WfH, with longer commute times being associated with an increased desire to spend more time WfH. This makes intuitive sense as travel time has long been identified as a negative aspect of travelling and one that many interventions seek to reduce. This link was also spotted in several studies referring to pre-Covid arrangements (Helminen and Ristimäki, 2007) and post-Covid attitudes (Kalter et al., 2021; Nguyen and Armoogum, 2021) where longer commuting distance to the workplace was associated with a greater desire to increase WfH or agree to remote work arrangements after the pandemic.

Looking at the impact of the recent experience of WfH, stated increases in work productivity as well as increases in the quality of non-work life are found within the sample. Positive changes in these metrics are found to be strongly and positively associated with an increased desire to WfH. This finding can be considered to be intuitively correct, with the majority of respondents stating that both their productivity and quality of life has increased due to WfH, and it would naturally be expected that they wish to retain these benefits. While this finding aligns with evidence in Beck et al. (2020) and Kalter et al. (2021) who noticed a higher propensity for telework associated with greater productivity, there might be some gender differences in certain geographical contexts (Nguyen and Armoogum, 2021). As noticed by Beck et al. (2020), some employees will still prefer to undertake working activities at home regardless of self-reported productivity level.

Further, this study addressed the potential for relocation based upon the ability to work from home, and specifically how this relates to the characteristics of the respondents. For the purposes of consistency, the same independent variables were used in this model as were used for the desire to WfH analysis. We found that almost half of the employees who can WfH stated they would consider changing their home location based

on the ability to WfH. Results also indicate a higher preference for Dublin based dwellers to relocate, when compared to non-Dublin based workers. While gender has not been found to be a significant predictor of consideration of relocation, a significant relationship was observed with respect to age, where younger respondents are more likely to consider relocation. Given the considerable interest in residential relocation and that, according to estimates, around 8% of employees had already relocated within Ireland since the beginning of the pandemic, there are likely to be certain changes in spatial settlement patterns influencing demand for transport and use of transport network. Implications from residential relocation following the surge in WfH, in contrast to limited pre-pandemic experience, can be profound. Initially, it is expected that commute length for households that would relocate will increase, however with a lower frequency of the trips made (Melo and Silva, 2017). Relocation to low-density areas following the ability for remote working has also the potential to revive rural communities vulnerable to depopulation (GOI, 2021a). Exploring the implications of home relocation further with reference to preferences and evolving trends is a highly advisable direction for future research.

Overall, the results of this analysis show that there is a considerable desire for large parts of the working population to continue some form of WfH in a post-Covid world, and that only some of the factors that determine this can be considered to be forecastable at the level that transport modellers traditionally operate. Moreover, the positive attitudes and intention to WfH only translate into action when work activities are feasible to be done remotely and when social and employer support is given (Jain et al., 2022). Hence, to achieve higher precision in forecasting the impacts on public transport, walking, cycling, and traffic volumes, further research could focus on employers' attitudes toward WfH practices and their support for long-term remote work arrangements. However, the results presented in this paper do outline that there is a very considerable addressable market for both WfH, and home relocation as a result of this. This also demonstrates that working from home as a transport demand management tool provides policymakers with an important instrument to use when formulating transport and spatial strategies.

CRediT authorship contribution statement

Agnieszka Stefaniec: Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Resources, Data curation, Writing – original draft, Writing – review & editing, Visualization. **William Brazil:** Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Resources, Data curation, Writing – original draft, Writing – review & editing, Visualization, Supervision, Project administration. **Warren Whitney:** Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Resources, Data curation, Writing – original draft, Writing – review & editing, Visualization. **Brian Caulfield:** Conceptualization, Methodology, Software, Formal analysis, Resources, Data curation, Writing – original draft, Writing – review & editing, Visualization, Supervision, Project administration, Funding acquisition.

Data availability

The data that has been used is confidential.

References

- Balbontin, C., Hensher, D.A., Beck, M.J., Giesen, R., Basnak, P., Vallejo-Borda, J.A., Venter, C., 2021. 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. *J. Transp. Geogr.* 96, 103188.
- Beck, M.J., Hensher, D.A., 2021. Australia 6 months after COVID-19 restrictions part 2: The impact of working from home. *Transp. Policy*. <https://doi.org/10.1016/j.tranpol.2021.06.005>. ISSN 0967-070X.

- Beck, M.J., Hensher, D.A., Wei, E., 2020. Slowly coming out of COVID-19 restrictions in Australia: implications for working from home and commuting trips by car and public transport. *J. Transp. Geogr.* 88, 102846.
- Budnitz, H., Tranos, E., Chapman, L., 2020. Telecommuting and other trips: an English case study. *J. Transp. Geogr.* 85, 102713.
- Caulfield, B., 2015. Does it pay to work from home? Examining the factors influencing working from home in the Greater Dublin Area. *Case Stud. Transp. Pol.* 3 (2), 206–214.
- Ceccato, R., Rossi, R., Gastaldi, M., 2021. Travel demand prediction during COVID-19 pandemic: educational and working trips at the University of Padova. *Sustainability* 13 (12), 6596.
- Central Statistics Office (CSO), 2020. Information Society Statistics - Households 2020. <https://www.cso.ie/en/releasesandpublications/ep/p-isshh/informationstati statistics-households2020/householdinternetconnectivity/> [24.05.2022].
- Central Statistics Office (CSO), 2021. Pulse Survey - Our Lives Online - Remote Work November 2021. <https://www.cso.ie/en/releasesandpublications/fp/fp-psolo/puls esurvey-ourlivesonline-remoteworknovember2021/workingremotely/> [24.05.2022].
- Central Statistics Office (CSO), 2022a. THA21 - Average Weekly Volume of Cars for Selected Traffic Count Sites. <https://data.cso.ie/> [24.05.2022].
- Central Statistics Office (CSO), 2022b. Transport Bulletin May 2022: Public and Other Transport. <https://www.cso.ie/en/releasesandpublications/ep/p-tb/transportb ulletinmay2022/publicandothertransport/>.
- Crowley, F., Doran, J., Ryan, G., Daly, H., Caulfield, B., 2021. The impact of labour market disruptions and transport choice on the environment during Covid-19. *Transp. Policy* 106, 185–195.
- Currie, G., Jain, T., Aston, L., 2021. Evidence of a post-COVID change in travel behaviour: self-reported expectations of commuting in Melbourne. *Transp. Res. A Policy Pract.* 153, 218–234.
- De Vos, J., Ettema, D., Witlox, F., 2018. Changing travel behaviour and attitudes following a residential relocation. *J. Transp. Geogr.* 73, 131–147.
- Department of Enterprise, Trade and Employment (DETE), 2022a. Right to Request Remote Work Bill 2021. <https://enterprise.gov.ie/en/Legislation/Right-to-Request-Remote-Work-Bill-2021.html> [24.05.2022].
- Department of Enterprise, Trade and Employment (DETE), 2022b. Transitional Protocol: Good Practice Guidance for Continuing to Prevent the Spread of COVID-19. <https://enterprise.gov.ie/en/Publications/Transitional-Protocol-COVID-19.html> [24.05.2022].
- Department of Transport, 2021. National Investment Framework for Transport in Ireland: Background Paper 14: Alternative Demand Scenarios [Online]. Department of Transport, Dublin. Available from: <https://web.archive.org/web/20210523030620/https://assets.gov.ie/129012/dbb1b875-0e56-44e7-83e8-053c3e021dde.pdf> [accessed 4 October 2021].
- Eldér, E., 2020. Telework and daily travel: new evidence from Sweden. *J. Transp. Geogr.* 86, 102777.
- Ettema, D., 2010. The impact of telecommuting on residential relocation and residential preferences: a latent class modeling approach. *J. Transp. Land Use* 3 (1), 7–24.
- Felstead, A., 2012. Rapid change or slow evolution? Changing places of work and their consequences in the UK. *J. Transp. Geogr.* 21, 31–38.
- Felstead, A., Reuschke, D., 2020. 'Homeworking in the UK: before and during the 2020 lockdown', WISERD Report, Cardiff: Wales Institute of Social and Economic Research. Available for download from: <https://wiserd.ac.uk/publications/homeworking-uk-and-during-2020-lockdown>.
- Gkiotsalitis, K., Cats, O., 2021. Public transport planning adaption under the COVID-19 pandemic crisis: literature review of research needs and directions. *Transp. Rev.* 41 (3), 374–392.
- Government of Ireland (GOI), 2020. Statement from the National Public Health Emergency Team - Thursday 12 March. <https://www.gov.ie/en/press-release/96eb4c-statement-from-the-national-public-health-emergency-team/>. Press release [24.05.2022].
- Government of Ireland (GOI), 2021a. Making Remote Work. National Remote Work Strategy [Online]. Available from: <https://www.gov.ie/en/publication/51f84-makin g-remote-work-national-remote-work-strategy/>.
- Government of Ireland (GOI), 2021b. New Public Health Measures Announced: The Path Ahead. Press release. <https://www.gov.ie/en/press-release/0bd80-new-public-health-measures-announced-the-path-ahead/?referrer=http://www.gov.ie/en/press-release/81029-government-announces-phased-easing-of-public-health-restrictions/> [24.05.2022].
- Government of Ireland (GOI), 2022. COVID-19: Reframing the Challenge, Continuing our Recovery and Reconnecting. Press release. <https://www.gov.ie/en/press-release/60083-covid-19-reframing-the-challenge-continuing-our-recovery-reconnecting/>?
- referrer=<http://www.gov.ie/en/press-release/0fc0d-government-announces-that-most-of-the-public-health-measures-currently-in-place-can-be-removed/> [24.05.2022].
- Gubins, S., van Ommeren, J., de Graaff, T., 2019. Does new information technology change commuting behavior? *Ann. Reg. Sci.* 62 (1), 187–210.
- Health Protection Surveillance Centre (HPS), 2022. Epidemiology of COVID-19 in Ireland [24.05.2022].
- Helminen, V., Ristimäki, M., 2007. Relationships between commuting distance, frequency and telework in Finland. *J. Transp. Geogr.* 15 (5), 331–342.
- 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. *Transp. Res. A Policy Pract.* 148, 64–78.
- Jain, T., Currie, G., Aston, L., 2022. COVID and working from home: long-term impacts and psycho-social determinants. *Transp. Res. A Policy Pract.* 156, 52–68.
- Kalter, M.J.O., Geurs, K.T., Wismans, L., 2021. Post COVID-19 teleworking and car use intentions. Evidence from large scale GPS-tracking and survey data in the Netherlands. *Transport. Res. Interdiscipl. Perspect.* 12, 100498.
- López Soler, J.R., Christidis, P., Vasallo, J.M., 2021. Teleworking and online shopping: socio-economic factors affecting their impact on transport demand. *Sustainability* 13, 7211.
- McCarthy, A., O'Connor, N., Síocháin, Ó., Frost, D., 2021. Remote Working: Ireland's National Survey: Phase III Report [online]. NUI Galway Whitaker Institute & Western Development Commission, Galway. Available from: <http://whitakerinstitute.ie/wp-content/uploads/2014/02/Remote-Working-National-Survey-Phase-III-Report-final.pdf> (accessed 4 October 2021).
- McGinley, M., James, N., Howell, R., 2020. COVID-19, Travel Behaviours and Business Recovery in Scotland: A Survey of Employers to Understand their Attitudes [Online]. LUC and University of Edinburgh on behalf of ClimateXChange, Edinburgh. Available from: <https://www.climatechange.org.uk/media/4572/cxc-businesses-working-practices-travel-and-covid-19-survey-report-december-2020.pdf> [accessed 4 October 2021].
- Melo, P.C., Silva, J.D.A., 2017. Home telework and household commuting patterns in Great Britain. *Transp. Res. A Policy Pract.* 103, 1–24.
- Moens, E., Lippens, L., Sterkens, P., Weytjens, J., Baert, S., 2021. The COVID-19 crisis and telework: a research survey on experiences, expectations and hopes. *Eur. J. Health Econ.* 1–25.
- Næss, P., Xue, J., Stefansson, H., Steffansen, R., Richardson, T., 2019. Second home mobility, climate impacts and travel modes: can sustainability obstacles be overcome? *J. Transp. Geogr.* 79, 102468.
- Nayak, S., Pandit, D., 2021. Potential of telecommuting for different employees in the Indian context beyond COVID-19 lockdown. *Transp. Policy* 111, 98–110.
- Nguyen, M.H., Armoogum, J., 2021. Perception and preference for home-based telework in the COVID-19 era: a gender-based analysis in Hanoi Vietnam. *Sustainability* 13 (6), 3179.
- ONS, 2021. Business and individual attitudes towards the future of homeworking, UK: April to May 2021, Analysis of the effects of the coronavirus (COVID-19) pandemic on office working and of business and individual attitudes to future working practices. ONS, UK.
- Ory, D.T., Mokhtarian, P.L., 2006. Which came first, the telecommuting or the residential relocation? An empirical analysis of causality. *Urban Geogr.* 27 (7), 590–609.
- Paul O'Keefe, Brian Caulfield, Brazil, William, 2016. Peter White, The impacts of telecommuting in Dublin. *Research in Transportation Economics* 57, 13–20. ISSN 0739-8859.
- Schmidt, K., Sieverding, T., Wallis, H., Matthies, E., 2021. COVID-19—a window of opportunity for the transition toward sustainable mobility? *Transport. Res. Interdiscipl. Perspect.* 10, 100374.
- Shamshirpour, A., Rahimi, E., Shabanpour, R., Mohammadian, A.K., 2020. How is COVID-19 reshaping activity-travel behavior? Evidence from a comprehensive survey in Chicago. *Transp Res Interdiscip Perspect.* <https://doi.org/10.1016/j.trip.2020.100216>, 100216. Epub 2020 Sep 6. PMID: 34173469; PMCID: PMC7474875.
- Silva, J.D.A., Melo, P.C., 2018. Does home-based telework reduce household total travel? A path analysis using single and two worker British households. *J. Transp. Geogr.* 73, 148–162.
- Snedker, K., Glynn, P., Wang, C., 2002. Ordered/Ordinal Logistic Regression with SAS and Stata [online]. University of Washington. Available from: <https://staff.washington.edu/glynn/olr.pdf> [accessed 4 October 2021].
- Stata, 2022. Manual to ologit — Ordered logistic regression [online]. Available from: <https://www.stata.com/manuals/ologit.pdf> [accessed 4 October 2021].
- Zheng, Z., Zhou, S., Deng, X., 2021. Exploring both home-based and work-based jobs-housing balance by distance decay effect. *J. Transp. Geogr.* 93, 103043.