

INVESTIGATING THE CHANGE IN PREFERENCE OF LIVING AND TRANSPORT DURING COVID-19

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ABSTRACT. The COVID-19 pandemic meant that people had to perform most of their daily activities from home. This study intends to investigate if a period of working from home has changed living preferences concerning housing size and location. The data was collected through a web-based survey. The literature is divided regarding the potential benefits of reduced commuting due to increased home office utilization. There is a prevalent risk of rebound effects as saved travel time might lead to increased travel on leisure, which could counterweight the benefits of reduced daily commuting in cities. Most of the respondents in this study want to work from home 2–3 days a week. The respondents that desire to move to a less central location state the lower square meter price as one important reason. Analyses in prevailing research did not investigate the preference for larger homes combined with increased home office use. Future studies should also investigate the desire for larger homes to achieve a holistic evaluation of the emissions related to telecommuting.

KEYWORDS: COVID-19, teleworking, telecommuting, emissions.

1. INTRODUCTION

The COVID-19 pandemic has affected many people either directly or indirectly. In attempts to reduce the spread of the virus, a lot of people have worked from home aided by modern information and communication technology (ICT). The long-term societal effects of the pandemic remains unclear, but it illuminates the importance of the sustainable development goals (SDGs) for human and planetary prosperity [1, 2]. However, the results of impeded mobility and inactive industries have reduced greenhouse gas (GHG) emissions and improved the air quality in cities, which benefits SDG 13 (climate action) [1–3]. Moreover, albeit good news, a sensible assumption is that this is a deviation whilst society will return to its old behavior patterns once the pandemic is over [3, 4]. Nevertheless, it is imperative to investigate this endeavor as utilization of the home office for a long time might affect the perception people have of their work and housing situation [4, 5]. It might contribute to a situation where people demand larger homes due to a continuation of the home office. As housing prices generally decrease with greater distance to city centers, it might also increase urban sprawl. Furthermore, as larger homes demand more energy and material whilst residents in the periphery, to a more considerable extent, depend on their cars, the positive environmental effects might be reversed instead. This paper intends to investigate this notion and ask the following research questions:

- (1.) How has a period of working from home changed people's preference of distance to work and housing size?
- (2.) What potential challenges can derive from

a changed preference in commuting and housing size?

1.1. LITERATURE REVIEW

When investigating the potential positive and negative implications of increased utilization of the home office it is sensible to mention the aspects of “teleworking” and “telecommuting”. The literature defines a teleworker as a person that uses information and communication technology (ICT) to work from another location than the physical workplace [6, 7]. Furthermore, according to Cerqueira et al. [8] a distinction is to be made between a teleworker and homemaker, with the former working part-time from home and part-time from work while the latter identifies the home as the physical workplace. O’Keefe et al. [9] defines telecommuters as anyone that works from home at least one day of the workdays during the week. Thus, a telecommuter is a person that partially works from home at least one day a week and commutes to work all other days not working from home [7].

In this paper, the term telecommuter is adopted and used in the results to describe a person that works from home at least one day of the workweek. Thus, the term is overarching and includes the aspects of the term teleworker as well. Moreover, the characteristics of teleworking and telecommuting are not limited to a change in environmental burdens such as emissions from commuting or energy use in buildings, there are also social aspects to consider [10]. However, the scope of this paper focuses on the potential environmental benefits or burdens of changed living and transport preferences in a situation when more people are choosing to work from home.

1.1.1. POSITIVE ASPECTS OF INCREASED USE OF HOME OFFICE

The advance in ICT has enabled the home-space to become an environment for work as well as any office for many people. And some potential benefits of this type of work arrangement are the reduced congestion in traffic and the need for fewer square meters in office spaces [6, 11, 12]. Furthermore, with less commuting, there are direct environmental benefits like the reduction in greenhouse gases (GHG) from vehicles with internal combustion engines (ICE) [13]. The indirect benefits deriving from reduced demand for office space are reduced embodied (less material needed) and operational emissions (decreased energy demand for heating and cooling) [14, 15]. An analysis of travel patterns based on mobility reports provided by Google during the COVID-19 pandemic combined with multi regional-input output data (MRIO) of the global economy demonstrates that there is a significant reduction potential of environmental stressors. This is the conclusion in the work of Pomponi et al. [16] as the developed scenario for increased teleworking together with 50 % reduction in energy demand in offices would lead to a 5 % reduction of global GHG emission. The authors put into the context of the Paris agreement and state that it is half of the yearly decrease in GHG needed to align with the goal for 2050 [16]. Through stakeholder involvement and backcasting, quantitative scenarios were developed and calculated in the article by Godínez-Zamora et al. [17]. The authors conclude that telecommuting is essential in reducing transport-related emissions in cities. In a framework developed by Shabanpour et al. [12] the consequences of teleworking are investigated in three adoption levels and the results show that daily CO₂ and PM_{2.5} emissions can be reduced with 696 (-0,7 %) and 167 (-1,14 %) tonnes a day on average 0,7 % and 1,14 % in their study performed in Chicago. In a study performed by Giovanis [18] the change in air quality in a Swiss city was analyzed in a scenario where increased teleworking decreases the traffic volume. The result after analysis of demographic household data indicates that it reduces toxic pollutants as fewer commute to work and should be included in sustainable urban planning strategies. O’Keefe et al. [9] performed a study based on the results of census data from the greater Dublin area and complemented it with a survey for deeper analysis. They determine that 27 % of the population work from home at least once a week and that a majority of the respondents (53–74 %) prefer to work from home at least once a week. Thus, the authors conclude with the use of proxy values for kg CO₂ emissions that a scenario with 20 % of the population working from home one day a week for a year, the total saving would amount to 60,000 tons of CO₂ [9]. It amounts to about an 8.6 % reduction in total CO₂ emissions deriving from transport in Dublin [9, 19]. Finally, Güereca et al. [13] investigate carbon abatement strategies for a research institute on a university

campus in Mexico City, and the results from a process-based life cycle assessment approach demonstrate that a scenario with reduced commuting will reduce the total CO₂ emissions. If half of the staff and students would work remotely two out of five days, then the total emissions would be reduced by 15 %, and combining this with increased car-sharing would lead to a 22 % reduction in total emissions.

1.1.2. POTENTIAL NEGATIVE ASPECTS OF INCREASED USE OF HOME OFFICE

Zhu and Mason [15] investigate the potential telecommuting has for reducing travel distance and indirectly GHG-emissions emissions in the USA by scrutinizing data gathered from the US National Household Travel Surveys (NHTS). The results reveal that CO₂ emissions have increased for the telecommuting population. There might be a potential rebound effect when telecommuting in combination with increased fuel efficiency induces people to accept longer distances to work and increase non-work-related trips instead. Similarly, Cerqueira et al. [8] discovered that CO₂ emissions deriving from teleworkers are higher than non-teleworkers due to rebound effects of increased distances for commuting and non-related work trips. There is a potential for an increase in this pattern when developments in ICT make the home office more efficient. Furthermore, if more people utilize their home as office space the home the electricity consumption will increase and time saved from not commuting leaves people with more time to travel longer distances in their spare time [20–22]. In the findings from Cerqueira et al. [8] CO₂ emissions from teleworkers are higher than non-teleworkers due to increased kilometers needed during the days traveling to work. It also identifies men as being responsible for a higher share of direct emissions since they traveled long distances by car. In comparison to non-telecommuters, the telecommuter has a larger travel budget which entails that they are less dependent on having access to a physical workplace and other amenities [21]. Zhu et al. [21, p. 25] describe them as “footloose” as working from home enables a lifestyle that is decoupled from geographical locations and consequences might be increased instead of decreased travel demand. As aforementioned, reduced commuting enables more time for non-work trips [20–22] and Alonso et al. [22] demonstrate the potential rebound effects as vehicle kilometers (VK), energy use, and emissions increase in a scenario where increased teleworking is assumed.

1.1.3. HOLISTIC APPROACH

To increase telecommuting urban planners need to be cautious of how neighborhoods are designed and be aware of the consequences that demographic aspects have for the adoption of teleworking among inhabitants. The socio-economic, neighborhood characteristics and accessibility are factors that determine where inhabitants chose to live [7]. Additionally, urban forms are also influential as high street connectivity, access

to public transport, and density make fewer people work from home. For neighborhoods with higher land use per person, irregular street patterns, and less accessible public transport the utilization of the home office is higher [23]. If given the opportunity to work from home at least once a week workers are less inclined to let the distance to work be a deterministic factor as workers accept increased commuting time (5% longer) between home and the work place [6]. Allen et al. [7] provides a rich review of the literature when investigating the multifaceted outcomes of telecommuting and concludes that there is not a clear answer to whether telecommuting is beneficial or not. A multidisciplinary approach is sought as the topic of telecommuting must be addressed holistically. Thus, not only consider the environmental but also acknowledge the softer social aspects that influence the adoption of working from home. The demand for local amenities such as affordable and diverse housing, ICT, schools, daycare, and leisure influences the decision to work from home or not [7, 10]. For example, no accessibility to kindergarten might leave people with no other option than combining child care and working from home [7]. There is also an aspect of gender since women care for children to a higher extent than men and are more likely to have to combine work with childcare [7, 10]. The economical aspects are also prevalent. For example, tax reductions for the one working from home due to infrequent use of cars compared to a regular day commuter using a car to and from work [24].

2. METHOD AND SAMPLE

A self-assisted web-based survey was used to collect the opinions and experiences of people living conditions in Trondheim (Norway) during the pandemic. The data collection lasted two and a half months from mid-June to the end of August 2021. The samples were created through convenience sampling by distributing one thousand flyers in residential areas (mailboxes) and public spaces. The use of a web-based method was advantageous in mid-pandemic times regarding infection risk, being spatial-temporal flexible, and in collecting a number of respondents within the project's framework. Anonymity was an important aspect of the study, as for the layman transportation research often is associated with strong intentions towards sustainable transport which may contribute to social desirability bias; skewed results in favor of what is deemed "correct" behavior.

From the information on the flyer, the survey could be accessed by scanning the QR-code or typing the URL address. The residential areas were of mixed housing types and were centrally located in the city. There is a propensity of participation bias as the accessibility to mailboxes varied according to housing types (difficult to access mailboxes for some apartment complexes). Aside from residents, the flyers were placed in public areas like at bus stops, outside groceries

stores, public bulletin boards, and other busy areas. Thus, the geographical scope of the study is not limited to the residences in central areas of the city but expands outwards to respondents that live further out but that happened to have errands in the central area of the city. Responses from visitors or tourists were discarded from the results. The approach used when distributing the flyers means that it is not possible to provide any response rate as multiple people might have been informed through the same flyer.

The survey consisted of four parts; the first part covering demographic information of the respondent, the second subjective questions on residence location and other facilities, the third investigating the prospect of work-from-homes, while the fourth and last part collected information regarding travel habits covering the primary mode and commute time, and preferred travel time for various activities.

3. RESULTS AND DISCUSSION

3.1. HOUSING LOCATION

The respondents were asked if their preferences towards residence location had changed regarding centralization or decentralization. 57% of the respondents stated unchanged preferences, about 19% state they want or already have moved more centralized during the pandemic, and the rest 24% state wanting to or already moved further away from the city center. Furthermore, the respondents that stated changed preferences were asked to rate the degree of influence on these preferences on a list of different aspects of travel activity, living conditions, or residence characteristics. Among the respondents stating an increased preference for centralization, the accessibility to public transport and mobility by active modes was deemed important aspects, see top rows in Figure 1. On the opposite range, aspects having relatively low influence are "closeness to health services" and the aspect of "less residence area to maintain". Oppositely, the respondents stating an increased preference for more decentralized residence location, favor residence-related aspects, see Figure 2. Living further away from heavy traffic areas as well as access to a garden are also deemed important aspects. On access to parking space for the private car, only 47% deemed it as influential. The increased rate of telecommuting has not induced the strongest effect on preferences, having 60% stating an effect, where only 25% percentage being "substantial effect". Food delivery services and digital alternatives for socializing were not assessed as very influential aspects regarding location preferences.

The aspect of residents wanting to move to larger homes was not covered in the literature as the consequences of telecommuting and teleworking were foremost discussed in terms of emission from reduced or increased travel [8, 9, 15, 16, 18, 21]. The potential increase in energy use in the homes was discussed [20–22] but the demand for larger homes due

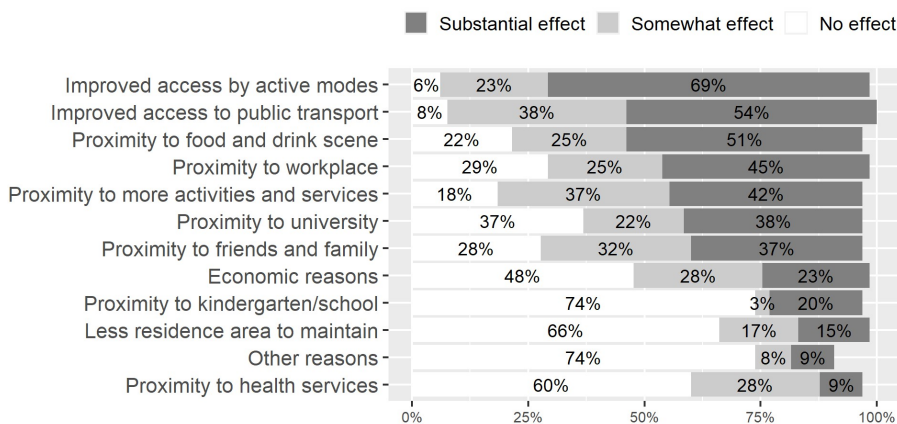


FIGURE 1. The assessed effect of each aspect on preferences for centralization (n = 63).

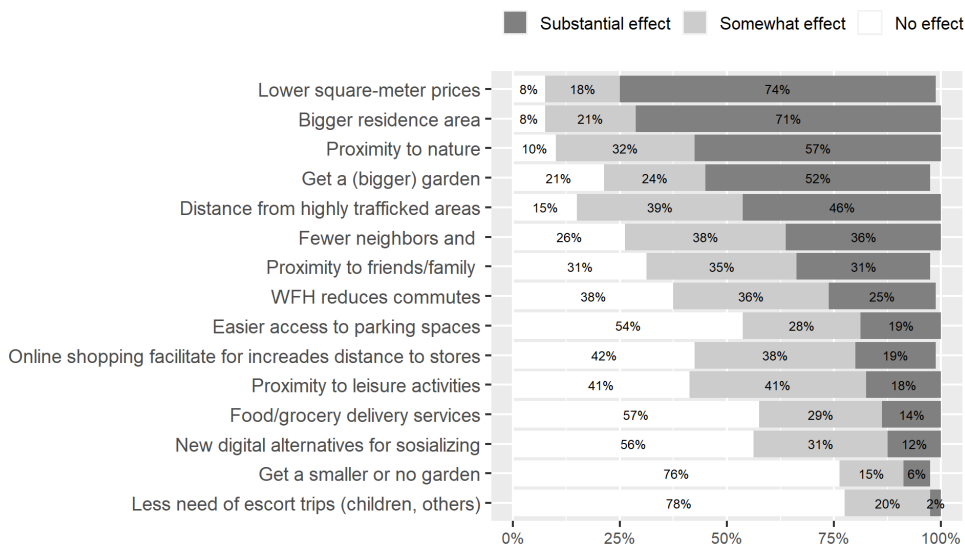


FIGURE 2. The assessed effect of each aspect on preferences for decentralization (n = 80).

to telecommuting was not covered is perplexing since it is an important aspect when discussing emissions in the built environment. However, it is imperative to investigate as holistic assessments are sought for when discussing telecommuting [7]. The impact of house size adds another dimension to the debate of the impacts of telecommuting. This is since residents living in larger homes felt more content with their home office situation. Regarding telecommuting, the respondents preferring centralization have on average fewer commuting days and the least willingness or possibility to telecommute post-pandemic compared to the “unchanged” and “less central” respondents. These results may indicate a tendency of more positive attitudes towards telecommuting when having preferences towards decentralization rather than centralization or vice versa, an attitude on telecommuting that depends on location preferences.

In general, 48% of the respondents stated being just as content with their residence during the survey response moment (mid-pandemic) compared to pre-pandemic times. About 28% stated being less content and 20% being more content, while the rest stated not

being sure. In combination with other variables, level of contentment seem to have no clear correlation with stated residence density, residence type, residence size, age, household type, gender, and income.

3.2. TRANSPORT MODE AND TRAVEL TIMES

The respondents were asked to assess the maximum acceptable travel time for various trip purposes independent of their current residence location. Not all purposes were applicable and the least relevant were kindergarten, primary school, and high school by only 30% of respondents, see Figure 3. The lowest average accepted travel time is for bus stops at 6 minutes, whereas the next lowest is grocery stores at 9 minutes. On the opposite end, trips to the workplace or cinema/theaters have on average an accepted travel time of 25 minutes. The fact that workers are willing to accept longer commute times makes an increased adoption of home office an interesting scenario in the post-pandemic future. The respondent’s general priorities in residence location may be based on their assessment of important aspects and their maximum acceptable travel time for different destinations. It

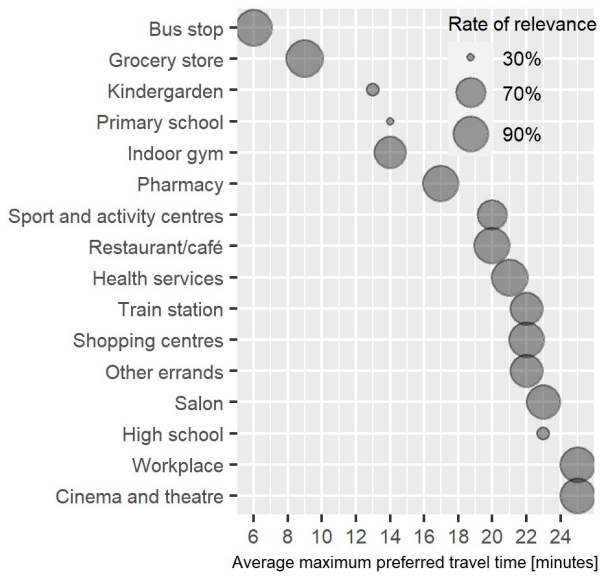


FIGURE 3. The average maximum preferred travel time by the various trip purposes. The dots' sizes represent the share of applicability for the respondents.

reveals that commute times may be one of the more flexible variables compared to trip purposes with much lower acceptable travel times. The lower the travel times, the more restrictive the vicinity to this destination becomes in residence location compared to other activities/destinations given the assumption that each destination is equally important for the individual. It is important to notice that the time assessment states a desire or a preferred estimate, but do not tell us the relative importance of each trip purpose when facing the dilemma of fulfilling the max criteria of several different destinations (e.g. more than 6 minutes to bus stop versus more than 14 minutes to the gym). To assess the importance of the destinations/activities, one could conduct a stated preference survey followed by a calculation of the travel time elasticities per activity/destination. While not accounting for the individual destination importance, our sample reveals public transportation to be the dominant primary mode for both work and leisure purposes, making the proximity to bus stops at 6 minutes quite relevant as confirmed in the assessment of aspects that affect the preference for centralization. Thus, the potential impact of increased car use due to teleworking [8, 15, 21, 22] is not revealed in this study as a geographical decoupling is potentially not viable when respondents are dependent on public transport services as much as they were in this study. The requirement for bus stops nearby reveals that a relocation further away is not preferable as the frequency of bus stops usually decreases with a lower density of residencies. The average commute is 23 minutes while the average accepted commute is 27 minutes, see Figure 4 for the distribution of the time difference between the respondents' acceptable commute times and their actual commute times. The density

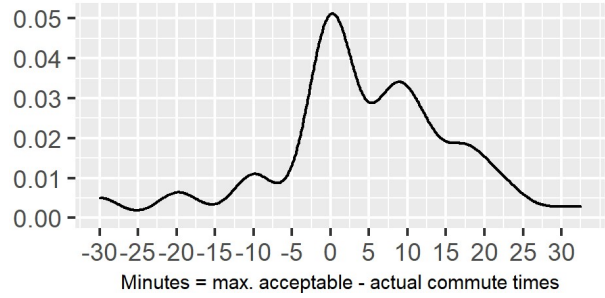


FIGURE 4. The density distribution of the time difference between maximum acceptable commute times and actual commute times (n = 182).

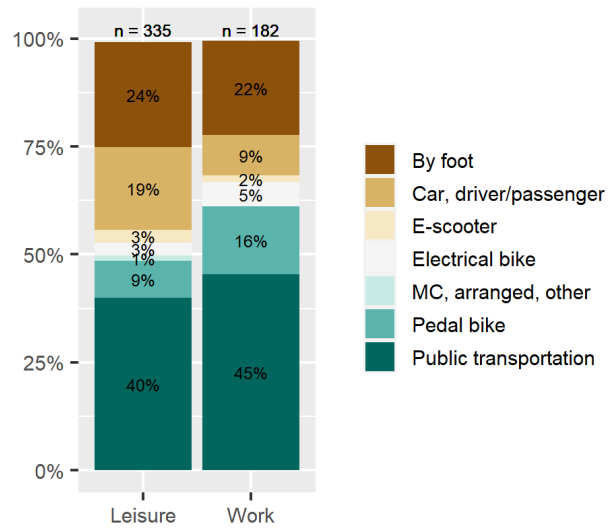


FIGURE 5. Transport mode distribution each for work and leisure purpose.

distribution shows a peak at 0 minutes, indicating that a majority of respondents do not prefer any additional travel time by any means. The graph has more volume on the right side which reveals that most of the workers have commute times within their maximum travel time. Though, it is also apparent that there are some incidents of negative values (the other side), indicating that a few individuals are currently commuting longer than they want to.

The distribution of primary modes for commute trips (n = 183) show that public transport dominate with 45%, see Figure 5. Mind the newly emerging mode e-scooters make up almost 2% of the main modes in respect to commuting. Given car as the main mode, the total pool of cars accessible (can be more than one car) consist of 40% electrical powered cars, 36% gasoline, 20% diesel, and the rest powered by alternative energy sources. On a national level, 12% of the private cars are electric-powered, but this share is higher for the average car commuter living in urban areas that cross a toll ring – as an electric car pays no fees passing the toll per this date 2022 [25]. The mode distributions are similar across genders, households, and education levels. The mode distributions are similar across genders, households, and

education levels. Tendencies for a higher share of car use are found among households with children, households with higher income, single-family residences, or row houses compared to apartments.

The modal distribution seems to be strongly related to the travel times for work trips, with active modes as the dominant mode choice for shorter trips until public transport takes over. The car share does not vary the same as the other modes, where a possible explanation for this is its ability for trip chains (e.g., escort trips to school/activity), having space to bring more people and goods, reducing any walking and waiting time and requiring marginal physical effort.

For leisure trips ($n = 338$) the mode distribution was 40% for public transport, still a great share, but less than the modal distribution for work trips, see Figure 5. Given car as the main mode, 37% of the accessible cars are powered by gasoline, 37% by diesel, 20% electric, and 7% alternative energy sources. The percentage of car use is higher for leisure than commutes, which is a bit surprising as the fact that students' mode choices are included in leisure (and not in the distribution for commute trips) was thought to have a reducing effect on the share of car usage. It was revealed that the cause of this was mostly due to workers having public transport as their main mode for commutes but switching to the car as their leisurely main mode. This is interesting as some findings in the literature indicated that car trip distances increase when working from home [8, 22].

When asked of walking time to the closest public transport stop/station, 76% state less than 5 minutes and 20% from 5 to 10 minutes. There was no clear correlation between mode choice and vicinity to public transport stops.

3.3. WORKING FROM HOME AND THEIR WILLINGNESS TO MOVE

When asking full-time, part-time workers and students (total $n = 302$) about their preferences regarding telecommuting, 50% were positive to telecommuting ($n = 148$), though of those 7% and 6% stated a wish for telecommuting but experienced challenges with inadequate workspace at home and not being sure of the employer would allow it, respectively. 30% stated not wanting to telecommute post-pandemic, and 5% was not sure. Out of those wanting to work from home, 12% stated a wish of working max 1 day a week, 65% was willing to work up until 2–3 days a week and 18% stated a willingness for 4–7 days a week. There is some inconsistency among the answers, as 4.3% answered a willingness of 0 days a week after stating a willingness for telecommuting. Zhu et al. [21, p. 25] described teleworkers as “footloose” since they are less dependent on the physical location of the workplace and amongst the respondents, half of them state a wish to, some extent, continue to work from home after the pandemic. The results show that among the full-time workers there is a greater share willing to telecom-

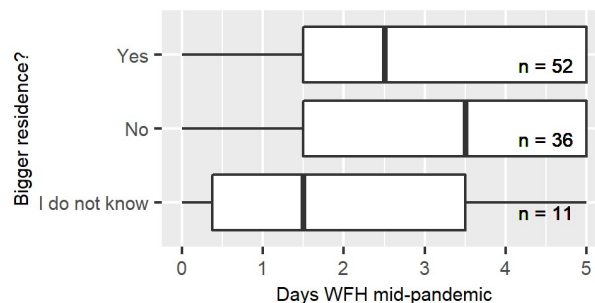


FIGURE 6. Willingness to move for increased residence size given the possibility to telecommute in respect to number of days telecommuting mid-pandemic.

mute compared to part-time workers. The part-time workers state more often that their work tasks cannot be conducted from home. Of those $n = 163$ willing to telecommute post-pandemic (50%), aside from asking about the willingness of the number of days telecommuting, they were asked about their willingness to move for increased residence size and if they're willing to move further away from their current workplace. When asked about their willingness to move for a bigger residence given the possibility of telecommuting, 59% were willing, 29% were not, and 12% were not sure. 41% ($n = 64$) were willing to move further away from their workplace, 40% were not, and 19% were not sure. It is as expected that some would be willing to increase the residence size without the compromise of moving further away, though our results also show the opposite, where some individuals want to move further away without increasing the residence size ($n = 8$). The results show different relations between location preferences and days telecommuting compared to “willingness to increase residence size” and days telecommuting, as a viable increase in residence often involves relocation less central (not necessarily, but often a correlation). Given the possibility of teleworking in the future, respondents answering “no” to a willingness of increased residence had an overall higher median number of days telecommuting during the pandemic compared to those positive to increase residence size, see Figure 6.

The results on the hypothetical post-pandemic telecommuters indicate that their willingness to move further from their workplace is not influenced by their work-from-home frequency mid-pandemic, as those willing to move further and those not wanting to move have the same wishes of working from home in the future.

There are as many reasons to move residence as there are individuals, but the contentment level of their residence may be an overarching factor for a general indication of their willingness to move. This study asks respondents about their willingness to move residence relatively to their workplace, and further questioning on transport are only asked those who report a willingness to move further away from their workplace as opposed to those who do not want that.

This is because moving further away would generally increase commute times, reduce the propensity for active modes of public transport and therefore increase traffic-related burdens (e.g. rush hour, congestion, local pollution). Results indicate that the respondents being less content with their residence have a higher willingness to move given the possibility of telecommuting. Though, the effect of contentment is not unidirectional as those being “more content” show a level of willingness lying just in between the “less content” and “unchanged”, when it would have been expected to show the lowest willingness (below the level of those answering “unchanged”).

3.3.1. TRANSPORT AND TRAVEL TIME GIVEN TELECOMMUTING

The respondents that answered a willingness to move further away from their workplace given the possibility of telecommuting, were asked to assess the potential acceptable increase in commute times. For all transport modes except biking, there was stated a range of increased travel time, see Figure 7. It is noticeable how some pedestrians would be willing to walk that much longer if not thinking of changing mode in such a context. Mind that each sample is limited and a few extreme values may therefore have a relatively big influence on the aggregated results. A look at the current commute times and the willingness of increasing these show no clear tendency between the two variables. The number of stated maximum days of telecommuting post-pandemic do not seem to have a clear relation with the willingness for longer commute times as showing big variations among the answers.

The group of workers ($n = 64$) stating a willingness to move further from their workplace (the 41% positive to telecommuting), though a small group, have a transport distribution that reveals, compared to the distribution for all workers, that PT and e-bike users were slightly over-represented, pedal bike users under-represented, pedestrians and car users were “balanced” represented in their willingness to move further away from their workplace. This is a bit surprising as one would expect the ones having the least distance-sensitive modes (e.g. car) to show a greater willingness to move decentralized. Given this study’s sample, among students and workers, 4–6% self-predict increased car use given a reduction in PT/ biking (when willing to move further away from the workplace due to telecommuting). With a bigger sample size, it would be possible to look closer into which primary modes that predict the biggest modal shift.

The potential benefits of telecommuting are foremost reported in the form of reducing emissions related commuting transport and traffic congestion.

Literature has shown that telecommuting reduces commute frequency, but may have an increasing effect on leisure trips. This since time saved on commuting from might increase car use instead as it is a popular

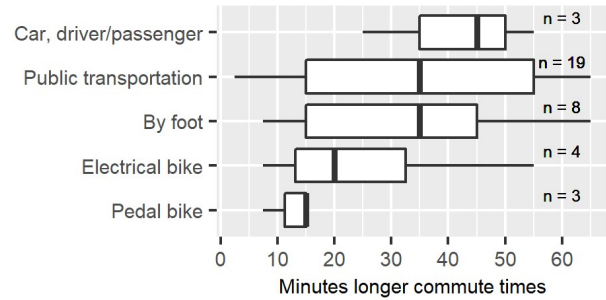


FIGURE 7. Willingness for longer commute times given new residence location due to telecommuting, grouped by stated primary transport mode.

mode of transport for leisure [8, 15, 21, 22]. Although, the literature describes how the car is utilized to a further extent for spare-time trips than commuting there was no clear distinction of this rebound effect in the results from the questionnaire as a majority stated public transport and walking as the primary mode for leisure. A possible effect of fewer commute trips by PT users is the “lower value for money” when traveling on the same period ticket for fewer trips – which may result in omitting the purchases of period tickets altogether in favor of private modes like car or bike.

Other studies highlight that telecommuters tend to commute further when going to their workplace, indicating that their homes are located further from work compared to non-telecommuters which is problematic with the primary mode being car [8]. The respondents that used motorized transport stated that them working more from home would make them accept longer commutes. About half of the workers were willing to work from home 3–5 days a week post-pandemic and the accepted increase in commute times was 35–45 minutes (depending on transport mode) which is significantly higher than suggested in literature [6]. However, the sample size is limited and has volatile results due to the marginal influence of a few extreme values.

3.4. LIMITATIONS

The study was conducted in a university city resulting in a data collection recruiting an overweight of students. The survey sample, although recruited as evenly as possible within limited time and financial resources, cannot be regarded as demographically representative of the entire population, but rather as indicative of the residential experience in a city during the pandemic. As a limitation of this study and discussion of the article, the presented analyses are mostly overarching, and rather point into general directions or tendencies of main mechanisms. As such, there is a demand for future research to go beyond the descriptive results presented in this article and focus on finding potential variables with the least or most influence on the observed tendencies.

4. CONCLUSIONS

The conclusion sets out to answer the two research questions asked in the introduction of this study.

4.1. HOW HAS A PERIOD OF WORKING FROM HOME CHANGED PEOPLE'S PREFERENCE OF DISTANCE TO WORK AND HOUSING SIZE?

In total there are almost equal shares of respondents having changed preferences towards centralized and decentralized locations, where people favoring decentralized locations have had and wish to continue telecommuting more than those with other preferences. Given the 50% respondents being positive towards future telecommuting, the average willingness of maximum days telecommuting is 2–3 days a week. About three out of five future telecommuters state a willingness to increase their residence size due to telecommuting. There is no clear correlation between the frequency of home office mid-pandemic and the wish for a larger residence, though it is worth mentioning that resourceful individuals more often possess the types of jobs more suitable for home office; one of several potential mechanisms. But for the number of days wanting to telecommute post-pandemic, respondents willing to move had a higher median day per week of maximum days telecommuting than the individuals who did not want to move.

4.2. WHAT POTENTIAL CHALLENGES CAN DERIVE FROM A CHANGED PREFERENCE?

The literature is divided regarding the environmental benefits of telecommuting. An increase in telecommuters reduces the emissions related to omitted commute trips, but a possible rebound effect may occur in the form of longer leisure trips. In total, the changes in travel habits may cancel each other out or the rebound effect outweighs the benefits. The potential emissions from the changed preferences amongst the respondents were not addressed in this paper but scenario testing with a focus on embodied and operational emissions from transport and housing should be investigated further. The findings from the study demonstrated that respondents preferred to travel by public transport for commuting and leisure purposes. Thus, infrastructure and transport services are important factors even if telecommuting increases. The rebound effect discovered in the literature was not prevalent in this study as public transport is used more than cars. The desire for larger homes when working from home adds another dimension to the potential rebound effects of the home office. The benefit of the reduction in required office space should be analyzed with the desire of people wanting to increase the size of their homes. Finally, some suggestions for further research:

(1.) a larger cross-sectional study similar to this study in cities with other work cultures;

(2.) scenario testing with a focus on embodied and direct emissions from groups with various work arrangements;

(3.) the potential consequences of the desire for larger homes when working from home should be investigated further.

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A. APPENDICES

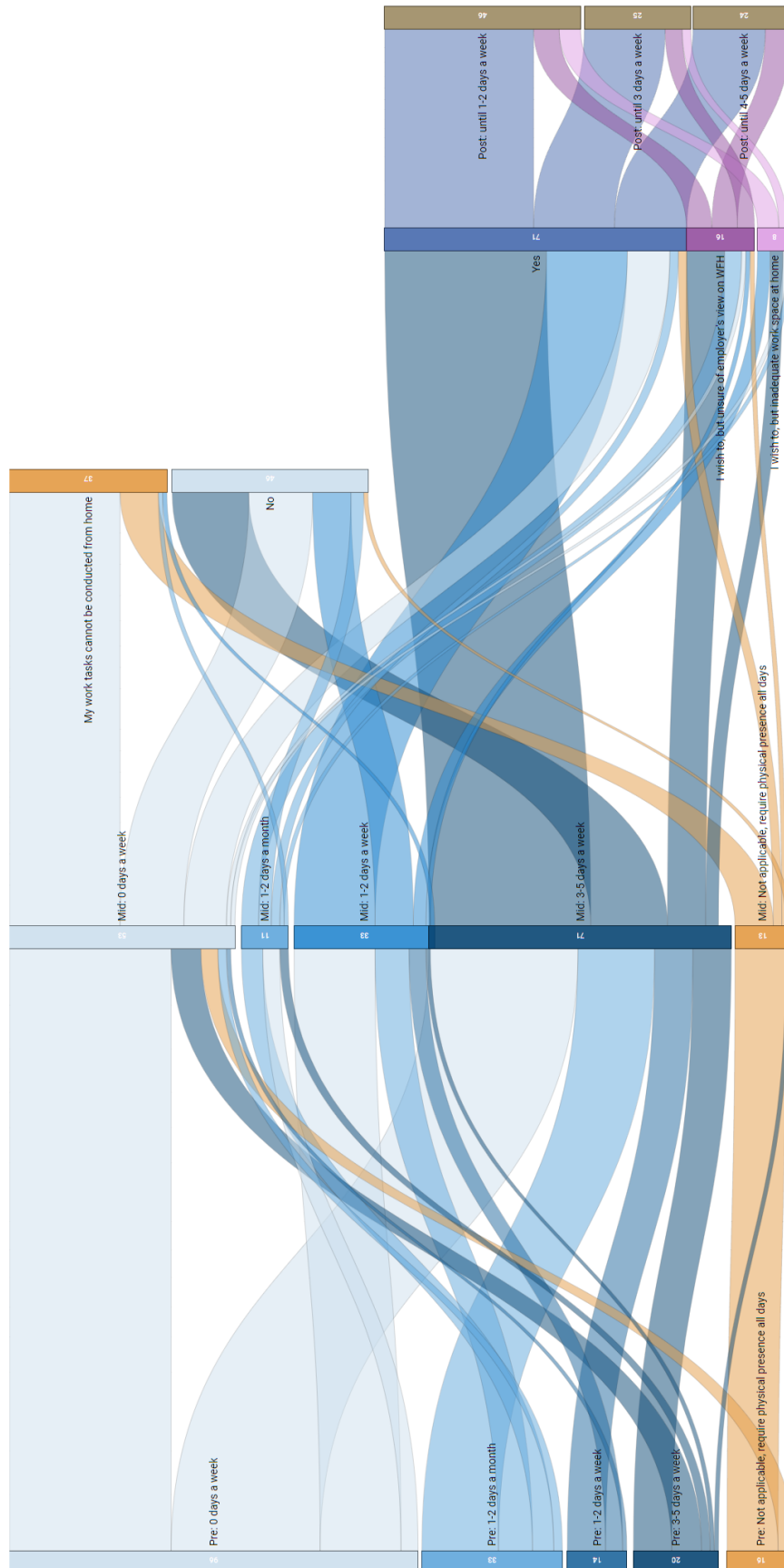


FIGURE 8. Share of respondents having telecommuting before, during and wanting to after the pandemic.