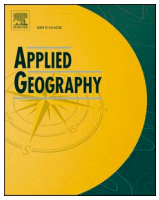
Applied Geography 178 (2025) 103591

Contents lists available at ScienceDirect

Applied Geography

journal homepage: www.elsevier.com/locate/apgeog



# How does telework impact daily and residential mobilities: New geographies of working and living in Switzerland

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ARTICLE INFO

*Keywords:*
Geography of telework
Telework
Commuting
Residential (im)mobility
Rebound effects

ABSTRACT

The practice of telework has undergone a transformative shift, fundamentally reshaping work and lifestyle choices. Switzerland, like many other regions, experienced a remarkable acceleration of this shift, with the COVID-19 pandemic propelling telework from 25% of the workforce before the outbreak to 37.1% by the year 2022 (FSO, 2023). This surge in telework adoption has potentially enabled a re-evaluation of how people engage with their professional lives, offering new possibilities for individuals with diverse lifestyles and life course situations. This article explores the implications of telework on daily and residential mobility, focusing on the Swiss context. Our research addresses two key questions: Firstly, how does telework influence commuting patterns, and what are the resulting rebound effects on daily mobility. Secondly, what transformations occur in residential situations because of telework, and how do they influence mobility or immobility, and the choice of residence locations. To answer these questions, we analyze an ad hoc survey (n = 5′100). We will be discussing teleworking practices, socio-demographic factors, mobilities, and residential situations. Our central result is that telework reduces commuting frequencies while facilitating residential immobility but creating longer distances between workplaces and residences.

## 1. Introduction

In recent years, the practice of telework has undergone a transformative shift accelerated by the Covid-19 pandemic, reshaping the way we work and live. According to the Federal Statistic Office, the number of people who telework increased from 25% (before the pandemic) to 37.1% for the year 2022 (FSO, 2023). Telework can be interpreted as a work practice that has many benefits for employees with their different lifestyles and life course situations, sparking new possibilities in how people move and where they choose to reside. We know that where people work, and their living situation is closely intertwined which is essential in creating mobilit(ies).

In this article, we will delve into the significance of telework and how it is altering the dynamics of daily and residential (im)mobility. Throughout our research, we employ the term "telework" to specifically denote the practice of teleworking from a location other than the official workplace provided by the employer. This distinction is crucial as it highlights the substitution effect of telework instead of commuting to a physical workplace (Gillespie, 2000). With our article, we want to shed light on a first research question: How does telework influence commuting patterns, and what are the consequential rebound effects on daily mobility? So, if a decrease in the number of commuting trips goes hand in hand with a higher tolerance to longer commuting. And as we delve deeper into the dynamics of the impact of telework on commuting and daily mobility, a further question emerges: What happens with the residential situations? In this article we want to explore the interplay between telework and residential situations, which can often be characterized not only by mobility but also by a sense of immobility, by remaining rooted. These two-research questions will be analyzed and discussed with our ad hoc survey, by looking at the teleworking practices, socio-demographic, mobilities and residential situations within the specific context of work, living and geographical landscape of Switzerland.

The numbers of teleworkers in Switzerland were already on the rise before the Covid-19 pandemic. According to Ravalet and Rérat (2019), there were already 24.3% teleworkers for the year of 2015 in Switzerland. But inevitably the pandemic had an impact on the practice of telework in Switzerland. Like many other countries, the Swiss

This article is part of a special issue entitled: New Working Spaces published in Applied Geography.

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https://doi.org/10.1016/j.apgeog.2025.103591
Received 31 October 2023; Received in revised form 6 January 2025; Accepted 8 January 2025
Available online 25 March 2025

Government recommended but also forced teleworking for some extended period. For the context of Switzerland, the impact of the pandemic thus accelerated the rising trend of telework as it enabled workers to experience working from home for the first time. Although experiences with these work practices are subjective, being able to telework has been received generally positive by those who can telework (Baruffini & Rossi, 2024). In our study the increase in people who telework is to around 45.3% by the year 2022. These results are quite high compared to the European context. Whereas approximately 25% still engaged regularly in telework.[1] In the context of Switzerland we see that change in practice is creating a general shift into more digital spaces and leading to a despatialization of work (Ohnmacht et al., 2020). With the possibility of telework, living close to the place where you work starts to lose further its importance, which may lead to changing commuting patterns, further local anchorage and so to a greater distance between residence and workplace (Ravalet & Rérat, 2019). So, this is the starting point for our article, 45.3% of people who telework, how does this impact the geography of work in Switzerland?

But before we discuss our hypotheses with the results of our survey, the next section gives a brief review of the literature on telework and the links to daily and residential mobility. The section after the theoretical background presents the results on daily commuting and residential situations, followed by a discussion of these findings and the limitations of our study. The conclusion ends with a review of the spatial distribution of telework and an outlook for future research regarding telework. In this article, we argue that telework decreases commuting frequencies but enables residential immobility creating longer distances between workplace and residence.

## 2. Theoretical background

Work and employment almost always require the need for physical travel across multiple places, resulting in multi-locational work practices with different mobility patterns (Cresswell et al., 2016; Hislop & Axtell, 2007; Tong et al., 2024). This employment-related mobility is influenced by further factors such as transportation infrastructure (public transportation, road systems), housing market (where do people find housing opportunities), lifestyle choices (urban, suburban, rural, mountain regions), and of course household characteristics (life course position, income, etc.). Furthermore, commuting patterns can be also impacted by unique events, such as the pandemic Covid-19 (Clemens et al., 2025; Wang et al., 2025).

Considering the 'new mobilities paradigm' which uses mobility as a lens to understand culture and society, we can gain insight into how mobility and immobility are intricately connected, particularly in the context of telework (Adey, 2006; Sheller & Urry, 2006). As a precondition to being able to telework Sullivan (2003) points out the importance of the use of Information and Communication Technology (ICT) and that the digitalization has promoted an abundance of various working arrangements, such as flexible work, home-office/remote work/telework, and so on. There are three forms of teleworking according to Thomsin (2002). Firstly, we have teleworking from home, i.e., Home-office and the ramifications on the respective commuting frequency. The second form is itinerant telework, i.e., working on the commute in public transportation. And the last form is working from a third space, i.e., cafés or coworking spaces. These forms of teleworking create different patterns of mobility behavior, in this article we will be discussing the first form of telework and the ramifications on mobility patterns.

The term 'rebound effect' (Herring & Sorrell, 2009) was first used to explain the phenomenon where expected behavioural change in energy consumption led to new or other behaviours nullifying or even increasing the energy consumption. So, we apply the notion of rebound effect in this article to refer to two specific phenomena connected to telework and mobility: Rebound effect I, decreased commuting frequency on a weekly basis and the potential rise in the commuting distance. And Rebound effect II, the potential for residential relocation or residential immobility due to reduced commuting obligations enabled by telework. In a previous article, we have done a more thorough literature review on telework and rebound effects (Hostettler Macias et al., 2022). This article aims to reveal the new geography of telework in Switzerland, our results of the survey shine a light onto the dynamics of shifting working places. Therefore, the concept of geography of work is helpful to understand, first how the practice of work in general has an organizing spatial impact creating for example economic centres with a lot of economic activities (Althoff et al., 2022; Massey, 1995). And secondly to address the shift that we have seen with our research on telework, that it is promoting moving away from work that was once place-bound to becoming an increasingly more *aspatial* work practice. We should not be simply looking at the place of work isolated as there is always a strong link between "home" and "work"(Hansen et al., 2023).

### 2.1. Impacts of telework on commuting/daily mobility

Several studies have focused on the question: how does telework influence commuting practices? Teleworking has the effect of reducing the frequency of commuting trips, as most teleworkers reduce going to their workplace as opposed to the conventional five days for full-time workers. Therefore, the question is whether being able to telework leads to a decrease in the total weekly travel distance. In terms of reduction in traffic, Wöhner (2022) has shown that teleworking does not lead to a reduction in traffic in Switzerland. There is a slight reduction in journeys during the evening rush hour rather than the morning rush hour. A study on teleworking in the US (Choo et al., 2005) showed a reduction of 0.8% in annual vehicle miles travelled. Similarly to Finland, Helminen and Ristimäki (2007) showed a reduction of travelled distance of 0.7%. And lastly, a case study in Canada (Lachapelle et al., 2018) found a decrease of 0.69%. It is important to bear in mind that these studies (except Wöhner (2022)) were conducted prior to the COVID-19 pandemic, during a period when the number of teleworkers was considerably lower than it is today. Regarding the reduction of $CO_2$, Balthasar et al. (2024) have observed that an increase in teleworking of approximately 10% can lead to a reduction of 60 kg per year as an outcome of the less commuting.

Consequently, despite reducing the frequency of commuting trips, teleworkers may cover greater distances over the course of a workweek due to the increased spatial separation between their homes and workplaces (Ravalet & Rérat, 2019). Similarly, de Vos et al.(2018) have observed that individuals working from home are willing to accept, on average, a 5% increase in their commuting times. Caldarola and Sorrell (2022) have demonstrated that teleworkers, in comparison to non-teleworkers, undertake considerably longer journeys each week, attributable to both extended commutes and additional non-work-related trips. However, Mokhtarian et al.(2004) in their case study on the state of California, point out that it remains uncertain whether the opportunity to telecommute motivates individuals to move farther from their workplaces or if telecommuting simply appeals to those who already live at a distance from work for other reasons. In conclusion we have seen that many studies have uncovered a trend among teleworkers — although they reduce their commuting frequency, they often reside farther from their workplaces, resulting in longer commutes (Nilles, 1991; Cerqueira et al., 2020; de Vos et al., 2018; Muhammad et al., 2007; Ravalet & Rérat, 2019). This leads us to the impacts telework has on residential (im)mobility.

### 2.2. Impacts of telework on residential (im)mobility

Various studies associate the timing of residential relocations with life events one of those being notable job changes (Battu et al., 2005;

[1] OECD Employment Outlook 2021

Clark & Davies Withers, 1999; Swärdh, 2009). The article by Coulter et al. (2016) serves as a motivation to rethink residential mobility and immobility, encouraging us to perceive these dynamics as active practices driven by individuals' choices rather than as depersonalized processes where external factors wield more influence than the individuals making decisions. As discussed in the preceding section, it has become evident that teleworkers tend to reside at a greater distance from their place of work than non-teleworkers. Muhammad et al. (2007) propose a hypothesis concerning telework and distance between workplace and residential location, namely that reducing the frequency of commutes enables workers to tolerate longer commuting distances. In their study within the Dutch context, it is notable that teleworkers tend to cover greater commuting distances compared to their traditional commuting counterparts. This suggests that teleworking prompts a distinct perspective on the importance of commute distance when individuals make decisions about where to live. Some studies (Althoff et al., 2022; Ewers & Kangmennaang, 2023) discuss different aspects of inequalities created by telework. Pointing out that not every worker can telework. This leads to highly skilled service professionals being able to enjoy increased flexibility in selecting their places of residence, contrary to non-teleworkers. However, the ensuing shifts in the housing choices of high-income earners could pose a threat to the economic well-being of less educated service workers in major cities, as these workers rely on local consumer service demand.

The choice of where to live are complex, choosing a place of residence involves multifaceted decisions. The choice is influeced by economic possibilites, opportunities and constraints on the housing market, social settings, sense of belonging, place attachment, household dynamics or lifestyle preferences and further marked by thoughtful consideration and not made hastily, often requiring even negotiation within households (Rérat & Lees, 2011; Hotz et al., 2010; Scannell & Gifford, 2010). This is a crucial consideration, especially in light of the potential impacts of the COVID-19 pandemic. It is possible that residential changes are still on the horizon, given the normalization of teleworking as a standard practice. In terms of future residential plans, Muhammad et al. (2007) explain the potential influence of teleworking on residential choices. They say that it is important to highlight, that while teleworking does allow for longer commutes, their study does not fully support the notion of a dramatic transformation in the perception of distance, particularly concerning future preferred places of residence.

Regarding the question of gender, the findings of Mergener and Mansfeld (2021) increased frequency of Working from Home (WfH) are associated with greater distances between one's residence and workplace. In their study, this connection appears to be more pronounced among men, which aligns with existing research indicating women's typically reduced mobility. Nonetheless, it's worth highlighting that even for women, the geographical gap between their home and workplace is significantly more extensive when they work from home compared to when they do not. Lyttelton et al. (2020) discuss that teleworking could either alleviate or exacerbate gender disparities by altering work-life dynamics. It may empower women with more schedule control and allow men to contribute more to domestic responsibilities, reducing disparities. Alternatively, it might blur work-life boundaries, potentially worsening existing gender inequalities. In essence, their study finds that gender plays a role in how parents respond to telecommuting, impacting both work and household gender disparities.

Coming back to the context of Switzerland, the Federal Office for Housing published a report on the impacts of telework and residential (im)mobility. Their results are that multi-locational work has a decentralizing effect, with two outcomes. The positive outcome would be that large centres remain attractive but there is a slight shift towards small and medium-sized centres. The negative outcome would be that decentralisation leads to existing land potentials in peripheral locations simply being filled up and the pressure of urban sprawl being (re) increased (Abegg et al., 2023). This background helped us formulate our hypotheses and discuss them with the results from our survey.

Keeping this theoretical background in mind, our article gives an overview of the practice of telework in Switzerland and the rebound effects of telework on mobility, with the focus of telework on daily mobility, thus the effects on commuting. The article is structured around four hypotheses, which we explore with our survey. The first hypothesis is that telework in its various forms has a significant impact on reducing the daily commuting frequency. The second hypothesis focuses on telework in its various forms increase the commuting distance tolerance. The threshold of distance between residence and workplace is higher for teleworkers than for non-teleworkers. Our third hypothesis looks at the relationship of whether the duration of telework practice is positively correlated with an increase in home-work distances, suggesting that as individuals engage in telework for longer periods, they are more likely to choose residences farther from their workplaces. With the last hypothesis, we intersect the topic of residential preferences: The adoption of telework leads to a shift in residential preferences, with individuals being more inclined to choose homes located farther from urban centres due to reduced daily commuting requirements. Our intention is to show the rebound effects of the geography of telework on mobility practices, which reveal some changes in the preexisting spatialities of work. This paper starts by outlining the case study of Switzerland, the data that was analyzed and the explanation of the used methods.

## 3. Data and methodology

### 3.1. Case study

The Swiss context is relevant for the research on telework, considering the specific economic, geographical, and cultural characteristics. In the year 2022, 77,4%[2] of employed people were working in the tertiary sector. Revealing the importance of this economic sector, which is the sector in which generally telework is most accessible and practiced, due to the digital affinity of the work.

Regarding the geography of work and of where people live, the Federal Office for Spatial Development shows that urban areas are home to almost ¾ of the Swiss population and to 80% of the country's economic activity.[3] This displays the geography of work in Switzerland, a centralization of work, creating economic centres with surrounding urban areas. If we further look at the geography of Switzerland, it is quite a small country (41′285 km$^2$) with the distances between urban centres being in comparison to other countries relatively short. Nevertheless, the long-distance commuting is highly prevalent with an average of 13.7 km (one-way) for work related commutes in the year 2022.[4]

Another specific characteristic of Switzerland is a highly developed network of transportation. Switzerland has one of the densest public transportation networks. A network connecting all the mayor economic centres, but even smaller cities or villages are well connected. The need to change the place of residence because of work is already lower due to these characteristics, so the people are hyper-mobile and hyper-fixed at the same time (Rérat & Lees, 2011).

Switzerland has four language regions the French-speaking (22.8%) Switzerland in the west of Switzerland, the German-speaking (61.8%) part in the middle east of Switzerland, the Rhaeto-Romanic (0.5%) Switzerland in the far east, and the Italian-speaking (7.8%) part of

[2] Most recent numbers: https://www.bfs.admin.ch/bfs/de/home/statistiken/arbeit-erwerb/erwerbstaetigkeit-arbeitszeit/merkmale-arbeitskraefte/wirtschaftsabschnitt.html.

[3] https://www.eda.admin.ch/aboutswitzerland/de/home/umwelt/geografie/staedtebau-und-raumentwicklung.html.

[4] https://www.bfs.admin.ch/bfs/fr/home/statistiques/mobilite-transports/transport-personnes/pendularite.html.

Switzerland in the south.[5] These language regions often act as real barriers to commuting.

### 3.2. Survey

The data collection consisted of a large quantitative ad-hoc web survey to question employed people in Switzerland on their telework practices. We contracted a survey institute, to carry out our survey and who guaranteed a representative sample of the Swiss workforce with 5′100 respondents in April 2022.

To guarantee the representativeness of the sample, the survey institute has contacted some Swiss workers by email on a random basis. They ensure a geographical quota of the three main Swiss linguistic regions (German-, French-and Italian-speaking regions). Once we received the data, we calculated a weight variable based on regions, gender, age and education. The reference database used to describe the Swiss workforce population was the Swiss Labour Force Survey (SLFS) from the Swiss statistical office.[6]

The survey incorporated 55 questions (the exact number per person depends on the respondents' profiles as there are some filters) with a duration of about 15min,[7] to understand the links between telework and daily mobility and further the impacts on residential situations. The survey was divided in three main sections: Employment Situation (full-time/part-time, teleworkers/non-teleworkers, workplace, length of employment), Living situation (House/apartment, location of residence, length of living there, size), and Mobility practices (Means of transportation, commuting frequencies, mobility on teleworking day/mobility on non-teleworking day). We further questioned the household situations and if applicable their partner's situation of work, residence, and mobility as well. Delving into this additional information is important to not only understand the individual level of telework but also the household dynamics, the negotiation, and the decision-making process within the household (Hotz et al., 2010).

An important indication for our survey is that we excluded self-employed individuals to ensure that our analysis remains closely aligned with the traditional employment model, where employers provide fixed office spaces for their employees. This strategic choice enables us to delve into the extent to which telework serves as a direct substitute for the conventional daily commute, shedding light on the impact of telework on both daily mobility and residential decisions.

### 3.3. Descriptives of the sample

Fig. 1 shows that he majority of our respondents 54.7% do not telework, which is of course linked to the type of work they exercise, work requiring physical presence or the simple fact of individual preference against telework. However, we do see that telework has become a significant work practice for the Swiss work population with 45.3% a high number, which is very close to the numbers from the Federal Statistical Office of the year 2021 mentioned in the introduction. With our survey we have been able to further detail where the people who do telework work from. 31.9% of the teleworkers work from home, 4.9% telework from home but also in other places (third places) and 8.5% do telework in third places but not from home (Fig. 1). There are no significant differences in the age or gender distribution between the respondents and the Swiss working population. Our study population is proportionally with the Swiss workforce.

Relating back to the theoretical background we know the three forms of telework by Thomsin (2002). Therefore, in our survey the question relating to telework was posed as follows: how often do you work at these different places during the usual working hours? (i.e., without considering overtime). The participants had to answer their workplace (official workplace, on-the-go i.e., public transport, principal residence, secondary residence, hotel/café/restaurant, co-working space, other: explain) and by further giving information on the frequency (three or more days per week, one-two days per week, several times a month, some time for a couple of hours, never). These different forms of work including telework have specific effects regarding mobility or immobility and thus create different patterns of mobility behavior. In this article, we will be only discussing the first form of telework *working from home* and the ramifications on mobility patterns.

A large part of teleworkers are living with a partner and a child or children (40.3%), then with a partner without children (26%). The average length of living in their current residence is 1–5 years and for the size of housing, the majority 31% have 4–4.5 rooms available. In our survey conducted in the year 2022, most of the teleworkers 63.6% started teleworking after the pandemic. We will now highlight some characteristics of the Swiss teleworkers, rather than presenting the results in several crosstables we have preferred presenting them through a model.

As seen in Table 1 telework is more common in the age group of 36–55 whereas younger people tend to be more present at work. The teleworkers usually have a higher degree in education. The practice of telework is more prevalent in those who work full-time and those who have their workplace in large (>100′000 inhabitants) and medium-sized (30′000–100′000 inhabitants) cities. And telework is equally common among men and women. These results are in line with other studies (Althoff et al., 2022). Although the means of transport are a further interesting outcome of our survey influencing the daily mobility of workers, especially regarding a potential reduction of $CO_2$ emission, it is to be examine in forthcoming articles.

Fig. 2 gives an overview of where participants in our study work from. With 61.5% the most frequent workplace is the workplace given by the employer (conventional workplace). Regarding mobility it means that commuting in whatever form is still much needed. The next frequent workplace is the home office, so people working from their principal home. Which further illustrates the importance of the place of residence, where the home becomes an additional place of work. This group are substituting their commute by not having to commute daily to a workplace. This group is rearranging the geography of work a "new" geography of telework.

### 3.4. Analysis

We use some univariate descriptive methods (frequencies, cross tables, etc.) and some logistic regression models. These models take a wide range of variables into account (including household type, age, gender, employment, education, and income) and measure the effect of a specific variable (for example being used to telework), all other things being equal. This effect is expressed in terms of probability (odds ratio). If the odds ratio is greater than 1, the likelihood of teleworking (to continue with the same example) increases compared to the reference modality (not being used to telework). The further the result is from 1, the greater the impact of the variable. It is therefore possible to determine a hierarchy between the different effects. Cox and Nagelkerke tests determine whether this effect is statistically significant.

## 4. Results

To answer our research question of how telework impacts daily and residential mobilities, we start by looking at o how the frequency of commuting is impacted by telework.

### 4.1. Frequency of commuting

To answer our first hypothesis, it is crucial to analyze two key factors before delving into the impact of telework on reducing daily commuting

[5] State 2022 BFS, the remaining 23.4% are other languages.
[6] Swiss Labour Force Survey (SLFS).
[7] The survey was shorter for people who do not telework.

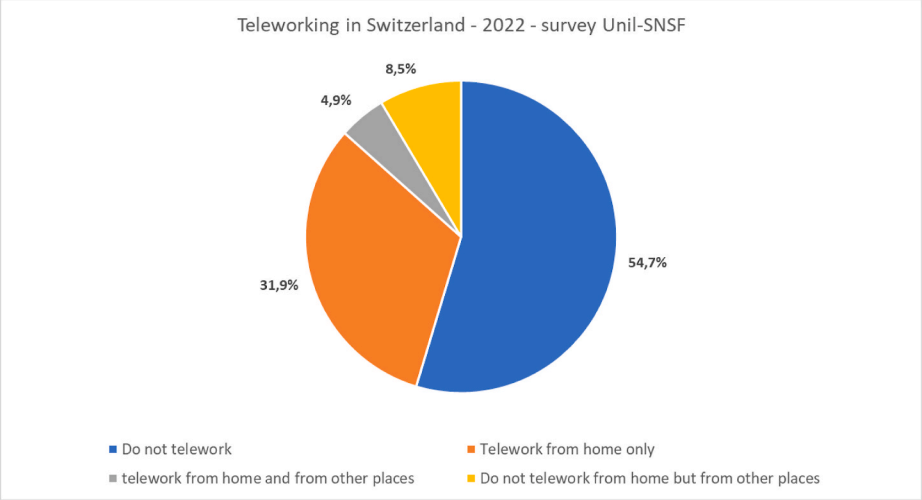



**Fig. 1.** Teleworking in Switzerland (Survey 2022).

distances aspect, which are the employment rate and the distances between home and workplace. The frequency of commuting depends firstly on the employment rate. For individuals who do not telework, it is 83.6%. For individuals accustomed to teleworking, the employment rate is 87.7%. Furthermore, in Table 2 the frequency of work from their respecitve conventional workplace (given by employer) is illustrated for non-teleworkers and teleworkers. The second element which influences the frequency of commuting, is the difference in distance between home and workplace for non-teleworkers and teleworkers, which is shown in Fig. 3. For non-teleworkers the average distance between their residential location and their workplace is 16.8 km, comparing this to 24.2 km for teleworkers.

To respond the first hypothesis on the reduction of frequency of commuting, we calculated the frequency of telework (Table 2) and the average distance between home and the workplace (Fig. 3). Together these elements allow to calculate the weekly distances done for commuting trips. Non-teleworkers commute 149.7 km per week and teleworkers do 122.6 km per week. This result which is lower for teleworkers is explained by commuted trips that are avoided (average number of teleworking days multiplied by 2 times the home-work distances) Thanks to telework, on average 101.3 km are avoided per week. There is indeed a high reduction in the frequency of commuting thanks to telework answering our first hypothesis. Answers our first hypothesis, that there is indeed a reduction in the frequency of commuting thanks to telework, it will be further analyzed in the discussion section.

### 4.2. Distance between the home – workplace

We will now turn to our second hypothesis that telework in its various forms increases the commuting distance tolerance. We argued that the threshold of distance between residence and workplace is higher for teleworkers than for non-teleworkers. Knowing that teleworkers average distance between their residential location and their workplace is 24.2 km.

We were interested to see if there is a tendency to when people telework more in relation to the distance between their place of work and their home. Therefore, some threshold distances appear (Figs. 4 and 5). Although we see that people living closer to their place of work still telework which reveals other motivations behind working from home than not having to commute, there is a stark shift in the threshold around 15–20 km for teleworkers. The further away the workers live from the workplace, the more teleworkers we see (Fig. 4). Among other personal motivations to telework, we could say that the distance is one important factor as to why people telework. This is further confirmed with the results in Fig. 5.

In our survey participants had to answer on their ideal number of teleworking days. By adding the dimension of distance again to their place of work (given by their employer) and their residence, we see that here again the threshold seems to be around 12 and 15 km so close to the same distance as in Fig. 4. These results show the relevance of distance in the motivation of telework. So, after the threshold of 12–15 km their ideal number of teleworking days goes up and they would wish to be able to telework more.

### 4.3. Duration of teleworking impacting home-work distance

Our third hypothesis was, that the duration of telework practice is positively correlated with an increase in home-work distances, suggesting that as individuals engage in telework for longer periods, they are more likely to choose residences farther from their workplaces or to accept jobs at a greater distance. When we narrow our focus to individuals who have the capability to telework and are actively doing so, considering the duration of their telecommuting experience, a noteworthy pattern emerges. The questions in the survey of *how long have you been employed* and *how long have you lived in your home,* were used to gain the results for Fig. 6. Our findings indicate that teleworkers who have had the same job for over two years and relocated within the past two years now live in closer proximity to their workplace (than those who didn't relocate). So, teleworkers who have maintained the same job for over two years and relocated appear to prioritize living closer to their workplace. This suggests that, even when telework allows for more geographical flexibility, there remains a preference or necessity to be near one's office. This could be due to hybrid work expectations, where being near the workplace leads to diminutions of commute time when occasional in-person presence is required. In contrast those who have teleworked from the same residence for over two years but changed jobs have a greater distance between their home and workplace (than those who didn't change their job). This could indicate that teleworkers prioritize their existing living arrangements over proximity to a new job when considering career changes, leveraging the flexibility telework offers. This distance may reflect a broader trend of teleworkers accepting roles that are geographically farther due to the possibility to telework, accepting a working position better suited for them but without needing to uproot their lives.

Table 3 further shows the result that teleworkers who have been teleworking for over two years tend to reside farther from their workplace compared to those who have telework for less than 2 years (recent teleworkers). This suggests that the high home-work distance of

**Table 1**
Logistic regression on teleworkers with sociodemographic variables
***p < 0.01, ** p > 0.05, *p < 0.1
Dependant variable: Telework (ref: do not telework)
Model characteristics: N = 2032, p < 0.01, Khi2: 255.618, Cox&Snell R2: 0.0.056, Nagelkerke R2: 0.076.

| télétravail domicile binaire | | B | E.S | Exp(B) |
|---|---|---|---|---|
| Gender | Woman (ref.) | | | |
| | Man | 0.011 | 0.073 | 1.011 |
| Age class | Less than 35 (ref.) | | | |
| | From 36 to 55 | 0.230 | 0.075 | 1.258*** |
| | More than 56 | 0.032 | 0.096 | 1.032 |
| Education | Compulsory education (ref.) | | | |
| | Secundary education | 0.447 | 0.203 | 1.563** |
| | Tertiary education | 0.994 | 0.203 | 2.702*** |
| Household structure | Alone (ref.) | | | |
| | Couple without child | 0.174 | 0.102 | 1.190* |
| | Couple with child | 0.083 | 0.098 | 1.086 |
| | Alone with child(s) | 0.026 | 0.148 | 1.027 |
| | Other | 0.127 | 0.139 | 1.135 |
| Living region | French-speaking region of Switzerland | −0.225 | 0.079 | 0.799*** |
| | German-speaking region (ref.) | | | |
| | Italian-speaking region | −0.541 | 0.187 | 0.582*** |
| Type of residence town | Large and medium-size center (ref.) | | | |
| | Small center | −0.731 | 0.122 | 0.481*** |
| | Suburban from a metropolitan region | −0.383 | 0.085 | 0.682*** |
| | Suburban outside a metropolitan region | −0.393 | 0.104 | 0.675*** |
| | Rural town | −0.645 | 0.114 | 0.525*** |
| Occupancy rate | Less than 50% | −0.270 | 0.133 | 0.763** |
| | From 50% to 70% | −0.605 | 0.105 | 0.546*** |
| | From 75% to 95% | −0.153 | 0.091 | 0.858* |
| | 100% (ref.) | | | |
| Possession of a zonal public transport pass | No (ref.) | | | |
| | Yes | −0.090 | 0.093 | 0.914 |
| Possession of a general pass | No (ref.) | | | |
| | Yes | 0.110 | 0.096 | 1.116 |
| Possession of a travel public transport pass | No (ref.) | | | |
| | Yes | −0.236 | 0.152 | 0.790 |
| Car ownership | No (ref.) | | | |
| | Yes | −0.065 | 0.106 | 0.937 |
| Motorbike ownership | No (ref.) | | | |
| | Yes | 0.085 | 0.083 | 1.089 |
| Ebike ownership | No (ref.) | | | |
| | Yes | 0.120 | 0.071 | 1.127* |
| Conventional bike ownership | No (ref.) | | | |
| | Yes | 0.042 | 0.073 | 1.043 |
| Constant | | −0.907 | 0.242 | 0.404*** |

teleworkers results from long-term decisions on home locations and work choices. It makes it impossible at this stage to get a complete view on the indirect effects on the Covid-19 crisis on telework and relocation. Nevertheless, teleworkers who recently (in the past 2 years) relocated don't have a higher home-work distance than these who didn't relocate, and teleworkers who recently change their work have a higher home-work distance than those who didn't change their job. These results signify there is no short-term effect of Covid-19 pandemic on distant relocations from the workplace.

### 4.4. Future residential projects

Our last hypothesis concerned the adoption of telework leading to a shift in residential preferences, with individuals being more inclined to choose homes located farther from urban centres due to reduced daily commuting requirements. This hypothesis aims to explore whether there is a potential significant impact of telework on a potential suburbanization of telework. In our survey we firstly asked whether the participants planned to move in the next three years both (Fig. 7). The majority of both groups of teleworkers and non-teleworkers did not have any plans only 32.2% of non-teleworkers and 31.6% of teleworkers did. The next survey question was only for the people who responded that they did have plans to move in the next three years. With the questions *which area would you like to move to* and the according regions it enabled us to categorize the residential preferences. Fig. 8 illustrates various relocation plans to a specific region, categorized into non-teleworkers and teleworkers, enabling a comparative analysis between the two groups. The primary finding for teleworkers is that urban centres remain highly significant, and there are limited plans to relocate away from these city areas. There is no difference in the share of people willing to move between teleworkers and non-teleworker. So, against our hypothesis we do not see a trend for future suburbanization due to the possibility to telework.

#### 4.4.1. Geography of Telework

We have compiled the data into a comprehensive map that illustrates the evolving geography of telework. The dot size represents the number of individuals working in that area, either at home (teleworking) or in their conventional workplace. The color indicates the proportion working from home. For instance, the darker the dots are the higher the proportion of home-based teleworkers in this region is.

The map distinctly outlines economic hubs and densely populated areas. If we zoom in onto the area of Zurich, it shows the largest dot meaning the highest number of individual working in Switzerland and according to the color medium grey we see that the proportion of home-based teleworkers is quite high. Around the economic hub of Zurich, we see that in the surrounding urban areas the number of individuals working there goes down, but the proportion of home-based teleworkers goes up. Which illustrates our results regarding the threshold of distance according to Fig. 4, the farther away people live from their conventional work place the higher the proportion of telework becomes. Taking another view of the map, there are several scattered points along the connecting routes between cities for example of Zurich and Bern with darker but smaller sized dots. These findings reveal that there is not really a potential trend toward the suburbanization of telework. Although further empirical details could be needed, related to commuting distance, commuting mode of transport, family situation etc. Regarding telework, we further see a potential attractiveness of some towns next to lakes (Bodensee or Brienz for example). Which could indicate that as the need to commute is reduced and the frequency of teleworking increases, meaning the people are working more time from home, there could be a motivation to live at a nice place close to nature. This new hypothesis would need more empirical details, for example we would have to look at the recent movers and find out what their motivation is. In the French-speaking part of Switzerland especially along the lake of Geneva, we see similar tendencies as for the German-speaking part. The concentration of teleworkers is higher in urban regions for example in Geneva and Lausanne. For the Italian-speaking part of Switzerland we see that the working population is smaller and thus there is less teleworking activity compared to other parts of Switzerland. With the results of our survey collected in this map we have been able to show some insights into the spatial distribution of the geography of telework in Switzerland. We conclude that the rate of teleworkers remains higher in densely populated and economically active regions.

## 5. Discussion

Our survey results have shown that telework does impact daily mobility patterns and have also an impact on residential more so immobility than residential mobility. We will now discuss and interpret the results in the following sections.

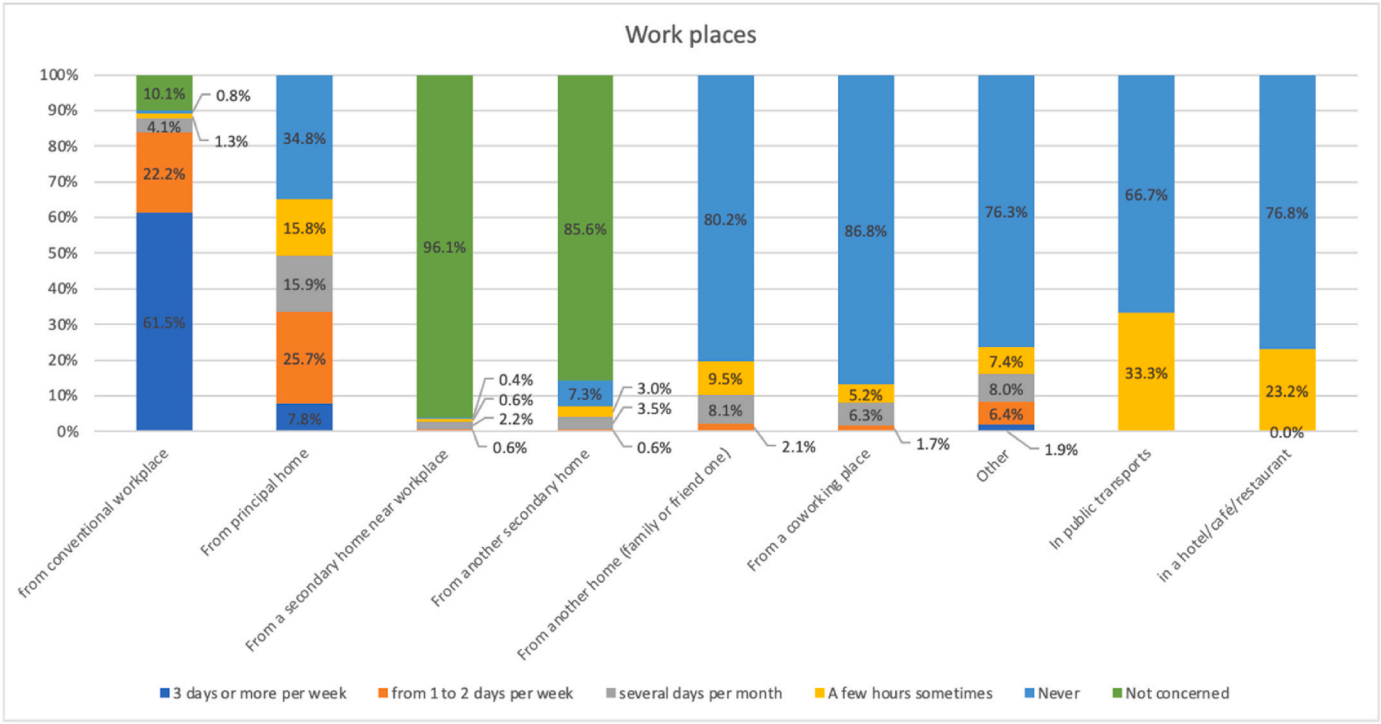



**Fig. 2.** Frequency and workplaces (conventional workplace, home office).

**Table 2**
Frequency of work from conventional workplace.

| Frequence of work from conventional workplace | | | | |
|---|---|---|---|---|
| | Do not telework | Telework from home only | Telework from home and from other places | Do not telework from home but from other places |
| 3 days or more per week | 82.70% | 40.40% | 33.80% | 24.70% |
| From 1 to 2 days per week | 16.70% | 33.30% | 36.20% | 24.00% |
| Less than 1 day per week | 0.40% | 26.30% | 30.00% | 51.30% |

### 5.1. Commuting frequency (Telework and reduction of the frequency of commuting)

The reduction of commuting frequency for teleworkers was an awaited outcome. In our survey, we have seen that 13% of the teleworkers work three or more days a week remotely. This means that their commuting frequency is reduced drastically, of course, this is the smaller group. 53% do telework one or two days a week and the remaining 34% do telework only occasionally (once or more times a month). When comparing the daily mobility in terms of kilometers non-teleworkers to teleworkers per week, we see notable differences. Non-teleworkers have an average result of 149.7 km per week. In comparison, teleworkers' average result per week is 122.6 km which is less than the non-teleworkers. Therefore, teleworkers are able to avoid 101.3 km per week by reducing their commuting frequency. These results follow in line with already existing literature on commuting frequency, nevertheless, it allows to have concrete numbers for the context of Switzerland. Drawing our attention back to the teleworkers commuting patterns, when looking closer at the results we see interesting data emerges. Namely, if the teleworkers would have to go to their official work place every day their average result of kilometers per week would be 223.9 km. Which is much higher compared to the non-teleworkers. This leads us to the next discussion point and the second hypothesis of distance between home and workplace.

### 5.2. Commuting distance (Telework and home – Work distance)

It can be observed that through the ability to telework, we see an increase in the commuting distance tolerance. Teleworkers do live further away from their official workplace than non-teleworkers. Telework enables this rebound effect of more geographical flexibility. As shown in Fig. 3, the average distance between their residential location and their workplace is for teleworkers 23 km, compared to 16.8 km for non-teleworkers. Therefore, the home-work distance for teleworkers is 37% higher than for non-teleworkers. This spatial flexibility enables widening the perimeter for residential locations for the teleworkers compared to their counterparts. Although telework relaxes the spatial constraints it is still a hybrid work practice, meaning that there is still the need to go to the official workplace. It is further linked to the frequency of telework, so how many days a week people telework and how many days they are required to be at their given workplace by the employer. Which does not completely dissolve the dimension of distance. Furthermore, what we can observe in our survey is that the duration of the practice of telework plays a role. Because the longer people have been teleworking (more than two years) the greater their home-work distance has become. What can be observed with this result is an intensification of an already prevalent characteristic in Switzerland, which is a reduced need of relocation due to work. As already mentioned, the geography of Switzerland and thanks to the improvement of transport infrastructure (highly developed and dense public transportation network) and adding the possibility to telework on top leaving people to commute for example only two days in a week intensifies residential immobility.

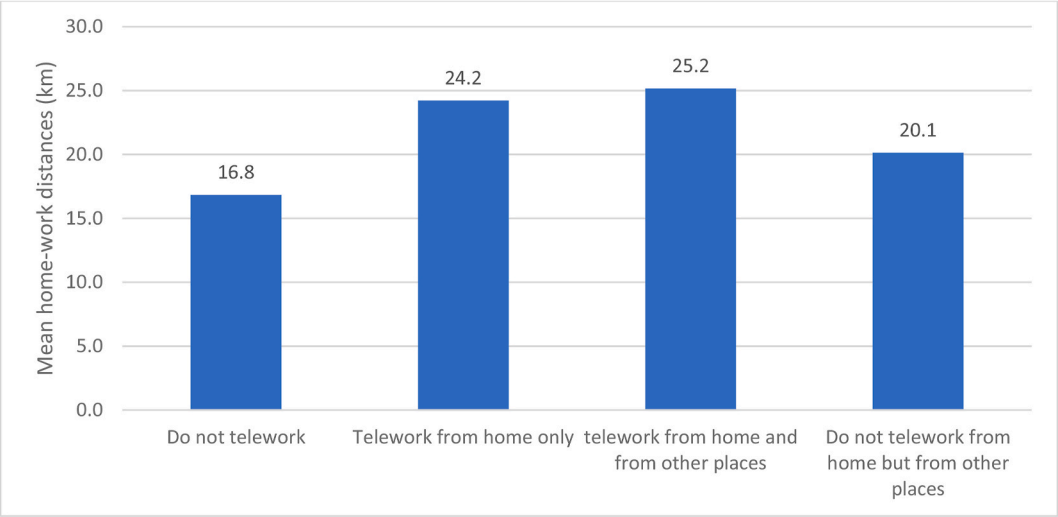



**Fig. 3.** Mean of distance between Home – Workplace for non-teleworkers and teleworkers.

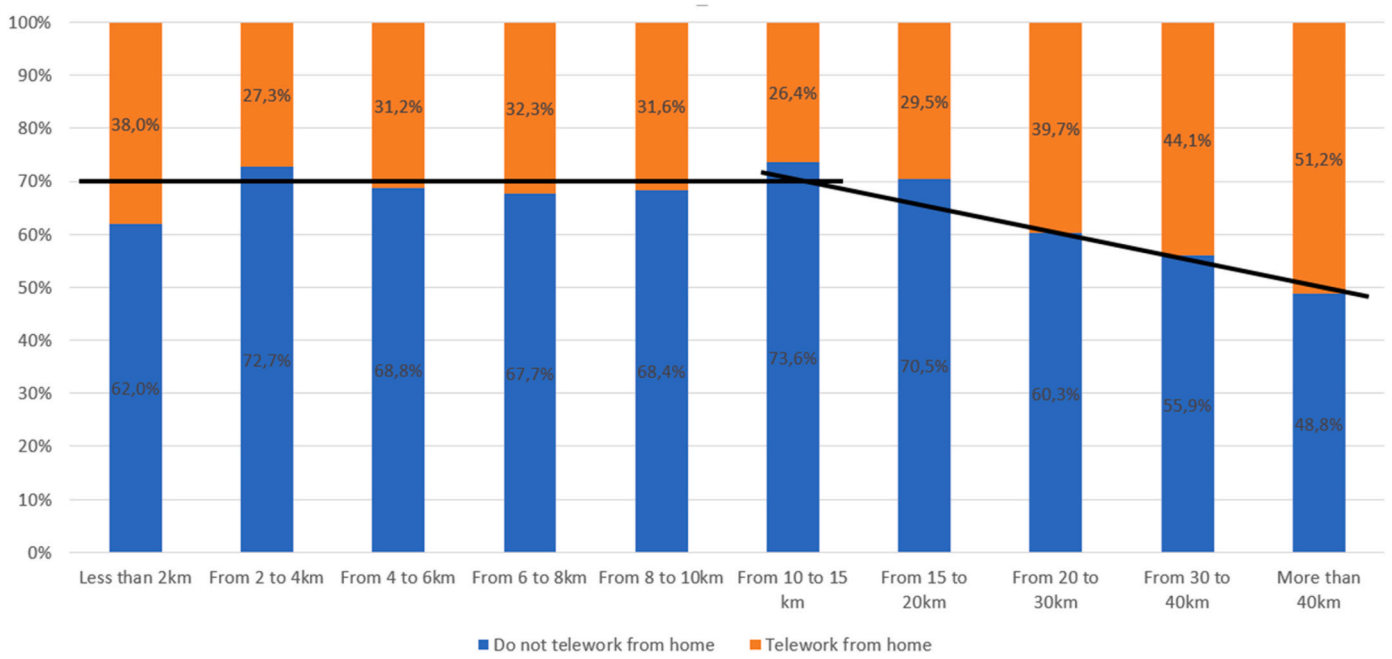



**Fig. 4.** Distance threshold for non-teleworkers and teleworkers.

### *5.3. Change over time (duration of Telework and home – work)*

Adopting a new work practice like teleworking can initiate gradual changes over time. In our results, we see that as individuals engage in telework for longer periods, they are more likely to choose residences farther from their workplaces. For teleworkers who have been teleworking for more than two years the average distance between home and official workplace is 25.2 km. In comparison, for the fairly new teleworkers (two years or less than two years),[8] we see an average of 23.5 km.

Choosing a residence is a complex decision-making process. It is well thought about, depending on the housing market, economic situation and further impacting factors. But the decision is also negotiated within the household and of course, influenced by social networks extending beyond the household. What we see from our survey is that workers who have had the same job and have been teleworking for more than two years and have moved in the last two years are living now closer to their work. Workers who have the same residence and have teleworked for more than two years and have changed work have a greater work-home distance. Interpreting this result reveals that telework enables a remoteness which seems to be more due to taking a new work farther away from the original residence and not really an active act of moving away from the official workplace.

This rebound effect of greater home-work distances must be further analyzed by looking at the characteristics of where the teleworkers are living. Referring to the report by the federal office for housing presented in the theoretical background section, we must reflect on the decentralizing effect for the context of Switzerland.

[8] Reminder: Survey was done in 2022 so two years means the teleworking practice started with the Covid-19 pandemic.

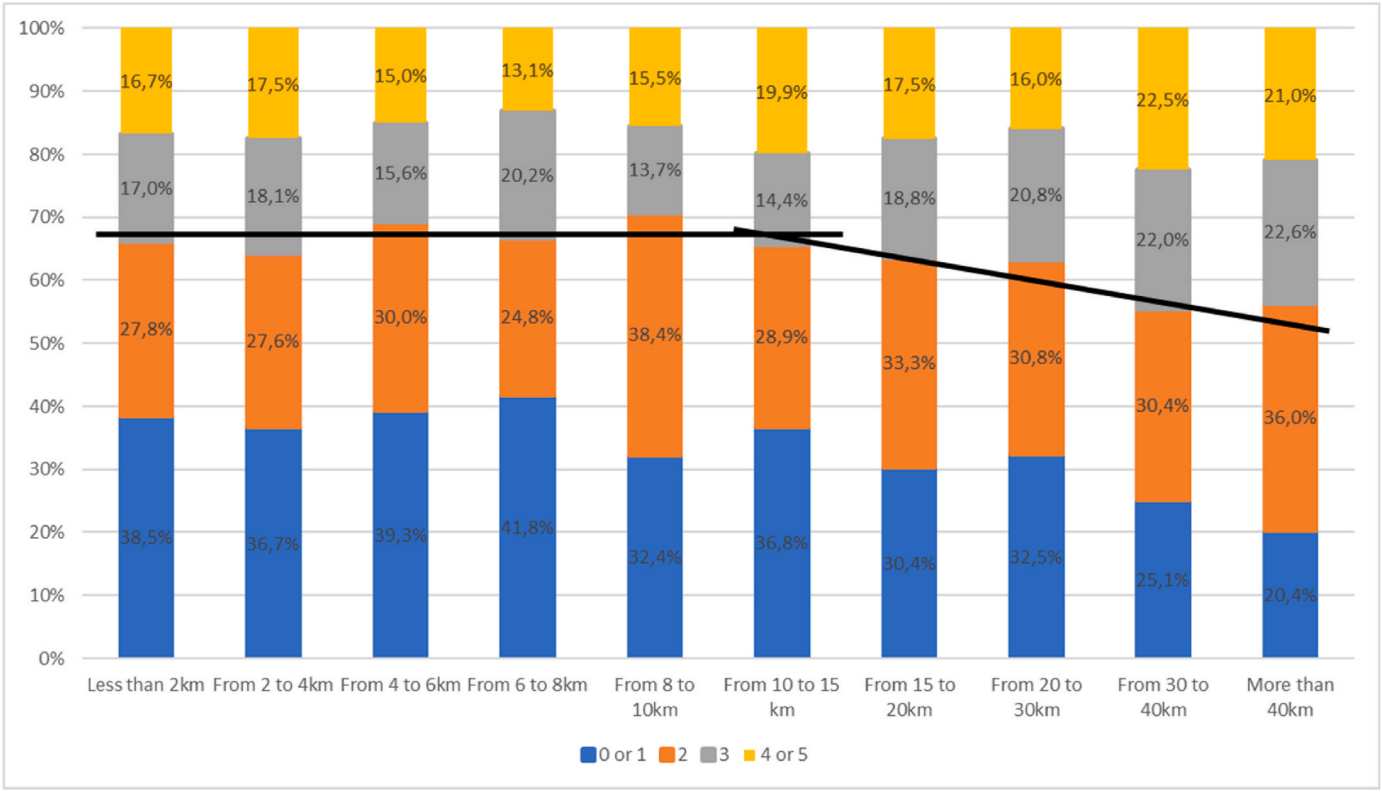



**Fig. 5.** Ideal number of teleworking days according home-work distances - a threshold effect from 15 km.

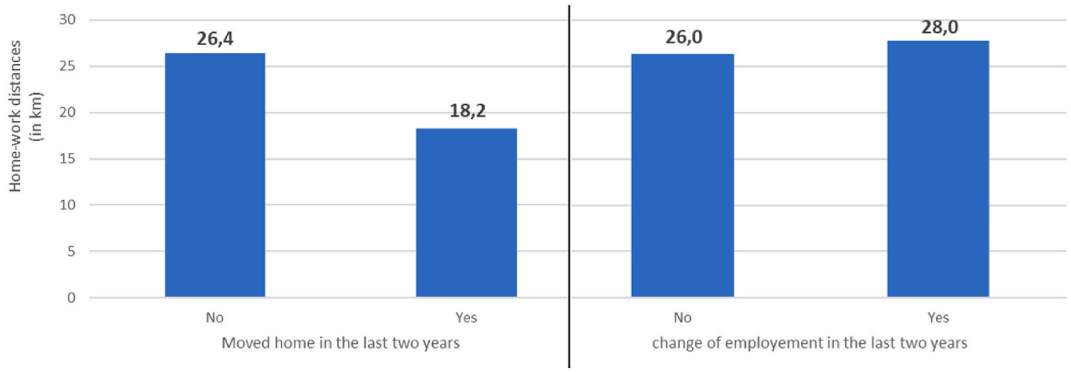



**Fig. 6.** Home-work distances in case of relocation or employment change in the last 2 years.

### *5.4. Residential location preferences and future projects (where do teleworker live, and where would they want to live)*

We are firstly interested to know where teleworkers live and whether the adoption of telework leads to a shift in residential preferences. Thinking about decentralisation, are individuals more inclined to choose homes located farther from urban centres due to reduced daily commuting requirements. Coming back to the characteristics of the teleworkers in our study. We have seen that telework is more prevalent who have their workplace in large (>100′000 inhabitants), medium-sized (30′000–100′000 inhabitants) cities, or a small city (<30′000 inhabitants). Outside of the urban context, the percentages of teleworkers wanting to move for example to a rural community or a mountain region were minor. This result indicates that there are other factors for example such as the attractiveness of cities that influence the residential location apart from the relaxation of distance by the ability to telework.

## 6. Conclusion

The purpose of this paper was to discuss and capture some insights into the changing geography of telework in Switzerland and the impacts of telework on daily mobility and residential (im)mobility. Given the increasing prevalence of teleworkers and the normalization of this work practice, it is crucial to comprehend the impact it has on daily mobility patterns and residential arrangements. Through our results from our survey for the Swiss context, we have discussed the impacts on daily mobility in the form of commuting patterns, where we do see a reduction in commuting frequency for the Swiss teleworkers. We have further seen that telework enables a deepening of already existing tendencies like long commuting patterns and residential immobility. Resulting in a higher average mean of distance between residence and workplace for teleworkers. And that linked to this result the temporal aspect regarding the duration of telework being practiced by workers impacts mobility behavior. It reveals that telework enables more distance between

**Table 3**
Linear regression model on teleworkers home-work distances considering residential and professional mobility in the last two years.
***p < 0.01, ** p > 0.05, *p < 0.1
Dependant variable: Home-work distance
Model characteristics: N = 1973, F = 7.474, Adjusted R2 = 0.044, p < 0.01

| Home-work distances | | | | |
|---|---|---|---|---|
| | | stand. Beta | S.E. | t |
| Gender | Man | 0.089 | 0.999 | 4311*** |
| Age class | From 36 to 55 | −0.017 | 1.074 | −0.781 |
| | More than 56 | −0.013 | 1.384 | −0.554 |
| Education | Secundary education | −0.011 | 2.396 | −0.212 |
| | Tertiary education | 0.086 | 2.410 | 1.719 |
| Household structure | Couple without child | 0.014 | 1.365 | 0.552 |
| | Couple with child | −0.024 | 1.272 | −0.902 |
| | Alone with child(s) | 0.004 | 1.958 | 0.204 |
| | Other | 0.003 | 1.909 | 0.164 |
| Living region | French-speaking region of Switzerland | −0.016 | 1.036 | −0.859 |
| | Italian-speaking region | −0.038 | 2.422 | −2069** |
| Type of residence town | Small center | 0.054 | 1.589 | 2626*** |
| | Suburban from a metropolitan region | 0.031 | 1.163 | 1.380 |
| | Suburban outside a metropolitan region | 0.093 | 1.386 | 4286*** |
| | Rural town | 0.069 | 1.487 | 3273*** |
| Occupancy rate | Less than 50% | −0.080 | 1.722 | −3924*** |
| | From 50% to 70% | −0.052 | 1.369 | −2512** |
| | From 75% to 95% | −0.037 | 1.265 | −1904* |
| Residential mobility in the last 2 years | Yes | −0.016 | 1.139 | −0.800 |
| Professional mobility in the last 2 years | Yes | 0.049 | 1.218 | 2568** |
| Has teleworked for more than 2 years | Yes | 0.082 | 0.919 | 4400*** |
| | (Constant) | | 3.474 | 1.573 |

residence and telework by taking a new job opportunity farther away from the residence and it not being an active act of moving away from the workplace. Therefore, the geography of telework and the relation to the main workplace given by an employer influence the daily mobility and residential immobility.

And although the possibility of teleworking, while it could enable residential flexibility, does not entirely eliminate spatial limitations due to the continued necessity of commuting to conventional workplaces designated by employers, resulting in a hybrid work approach that is more *aspatial* than before. Teleworkers exhibit increased distances between work and home, a remoteness often linked to securing new employment farther from home rather than a deliberate move away from the workplace. The map we could generate displays the geography of telework for the Swiss context. What was observed is that there is not really a potential suburbanization of telework and that major economic centres remain significant even for those teleworking. The main findings have been that for teleworkers the commuting frequency decreases, yet their home-work distances extend.

As telework in a hybrid form is continuing to become a permanent practice, this poses challenges for urban planners and policy makers. There is the need for an interdisciplinary approach to telework and urban policies (Caros & Zhao, 2024). The rebound effects of telework have implications for spatial planning and mobility practices. In regard to public transportation planning, we see a challenge in planning due to the reduction of frequency of commuters who can telework or a redistribution of commuters depending on the days that are being teleworked. For urban planners this means to consider telework when thinking about improvements in mobility and sustainability questions. A further rebound effect that we have not discussed in this article is the decrease frequency of commuting allows a substitution potentially freeing more time for leisure activities, care activities and maybe other forms of mobilities. We know that residential transformations occur over extended periods, and the shift towards telework prompted by the Covid-19 pandemic might still be too recent. It requires more time for these changes to take place and associated dynamics to stabilize. A further important aspect, that should be explored with qualitative research, is to better understand the 'why', thus the motivation behind the behavior. This leaves room for future research endeavors on the topic of telework and daily mobility and residential (im)mobility.

### 6.1. Limitations

Due to the scope of this article, we could not discuss the daily mobility in its entirety of teleworkers. One open question is concerning a further rebound effect of additional daily mobility which can take place due to the gained time by avoiding commuting on teleworking days. A further dimension to explore is multi-local living which is generally a specific spatio-temporal strategy of organizing everyday life (Schier et al., 2015) and how telework impacts this strategy rendering it possibly unnecessary or enabling a much higher multiresidentiality. Our national level study and the results could be extended by case studies of specific cities or regions to understand in more detail the dynamics facilitated by telework. Regarding our data we have the classic limits of

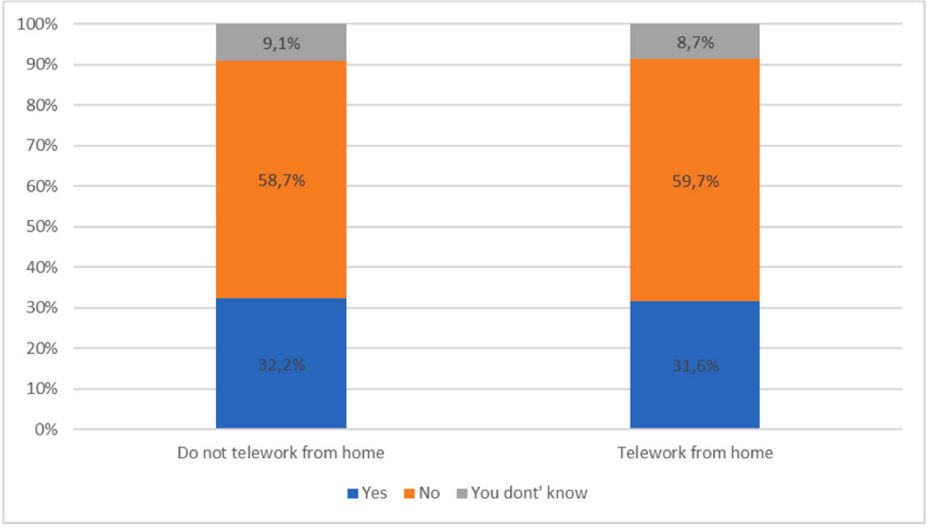



**Fig. 7.** Plan to move house in the next 3 years depending on the telework situation.

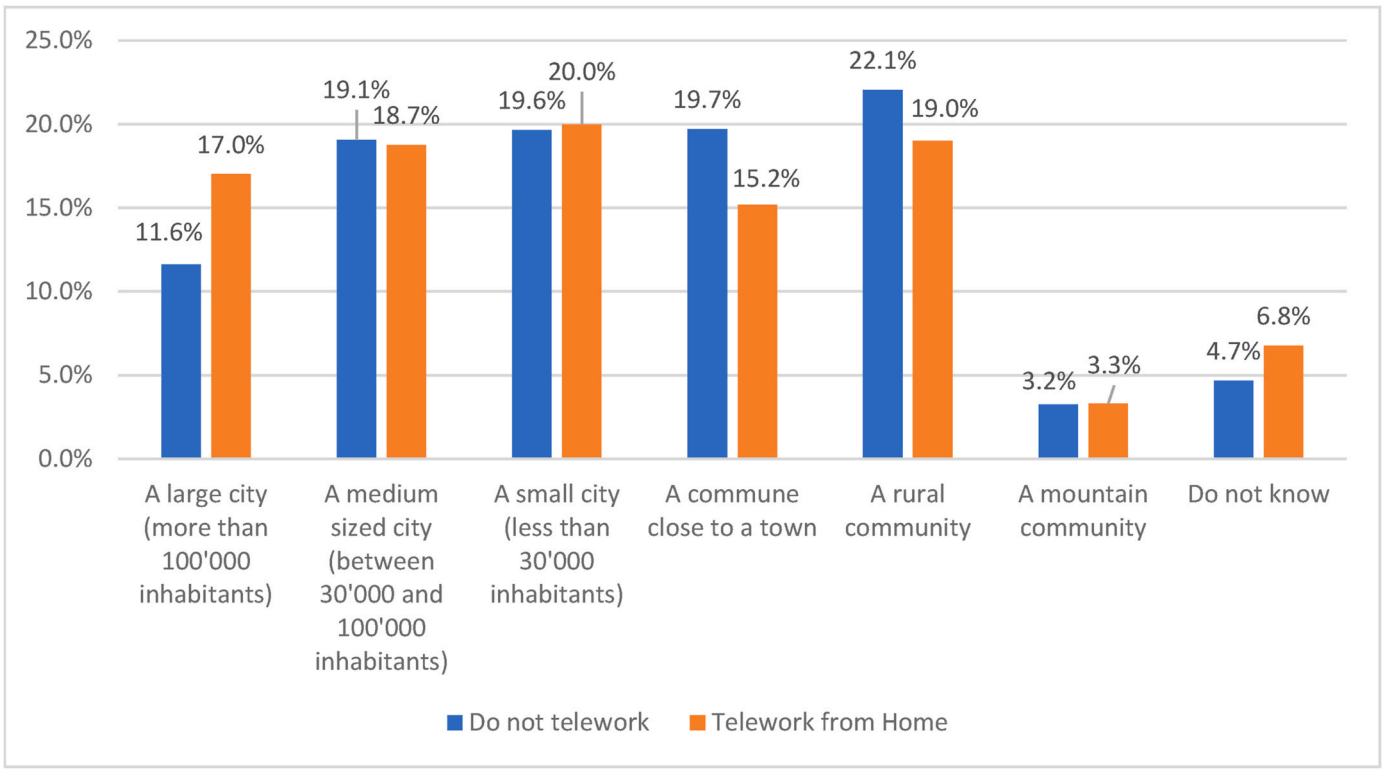
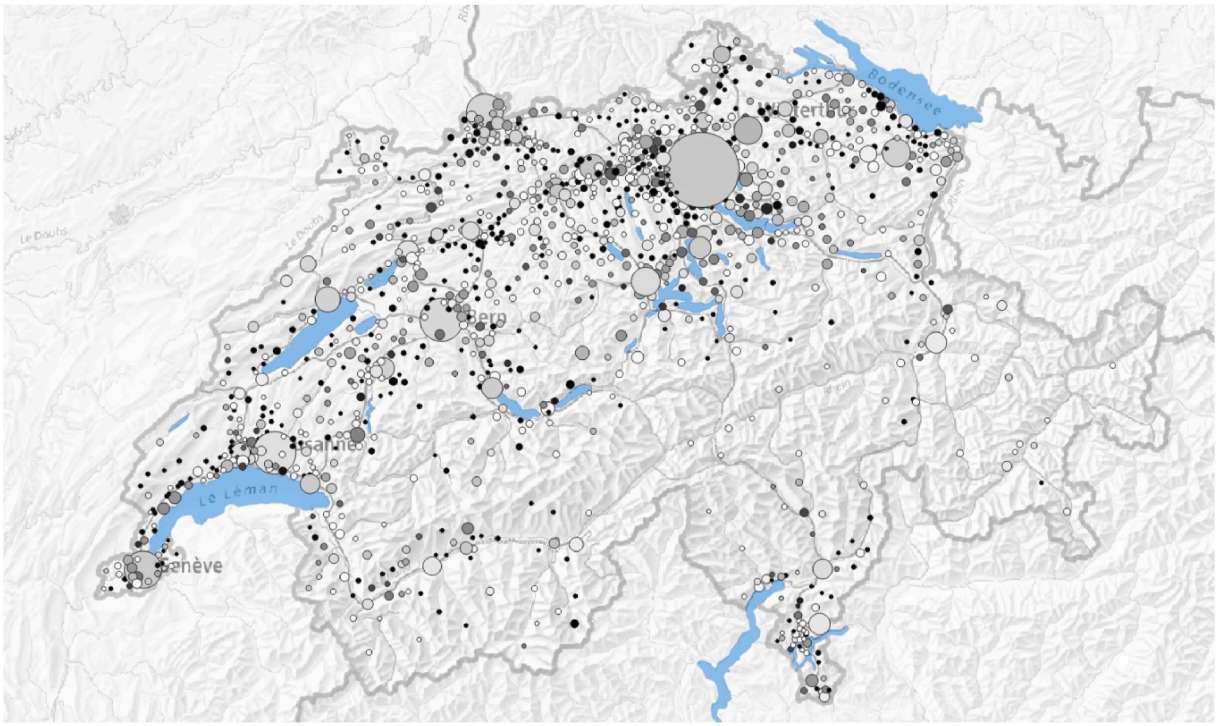



**Fig. 8.** Future residential plans for non-teleworkers and teleworkers.




**Map 1.** Number of individuals working, either at home/teleworking (darker color) or in their conventional workplace (light color). (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

declarative questions in surveys. The potential impact of this limit is reduced thanks to the high size of the sample with N = 5′100.

## CRediT authorship contribution statement

**Laura Hostettler Macias:** Writing – review & editing, Writing – original draft. **Emmanuel Ravalet:** Writing – review & editing, Writing – original draft. **Patrick Rérat:** Writing – review & editing, Writing –

original draft.

## Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Acknowledgments

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by the Swiss National Science Foundation, Switzerland [project number 10001A 192304]. The funding source had no involvement in the preparation of this paper. We would also like to thank the two reviewers for their constructive feedback that has helped to improve this article.

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