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Interpreting an unfolding future: Is teleworking as common after the pandemic as we expected? and what does it mean for policy?

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ABSTRACT

While many studies lead to expectations of significant post-pandemic telework, has this actually become the reality? Teleworking (work-from-home) may significantly change activity patterns and land markets in metropolitan areas. It stands to gut the downtowns of major metropolitan areas of their knowledge workers. Towards understanding what telework means for future transportation policy, this study explores how teleworking has changed based not only on employees' expectations of the future, but also based on teleworking rates experienced after the pandemic. Moreover, this study explores what teleworking changes are likely to mean with respect to early fears that downtowns will become hollowed out. Using two waves (2021 and 2023) of the Future Mobility in Canada Survey (FMCS), this study updates estimates of future teleworking using fall 2023 data to reflect on the changing policy implications of teleworking propensities.

Using descriptive statistics and inferential models, this study finds teleworking has lessened between 2021 and 2023, it has decentralized out of the downtowns, it no longer disproportionately offsets transit use, and it is becoming more prominent in households with two or more vehicles. Increasing disconnects between in-person younger workers and virtual older workers portend workplace challenges. Moreover, findings suggest that policymakers will need to wrestle with the question as to whether telework should be viewed as an economic good (notably serving high-income households) or as a merit good (notably serving latent teleworking demand by women). Despite significant uncertainty over the longer-term, significant policy implications appear to hinge on non-transportation outcomes, including time poverty, workplace mentoring, and the meaning of downtowns as work hubs.

1. Introduction

The rise of telework (work-from-home) after the Covid-19 pandemic appears to be on track to have been one of the most transformative changes to commuting in at least a generation. But considering the fast and dynamic changes that both resulted from the pandemic and which became normalized, it remains unclear whether early prognostications of work-from-home replacing physical commuting will be realized or not. While early evidence suggested that employees who teleworked during the pandemic would continue doing so – at least in a hybrid format (some days in the office and some days working from home), it is unclear whether this expectation has become a reality. The impacts of this question are enormous. In terms of opportunities, many highlight potential greenhouse gas emissions reductions (Cerqueira, Motte-Baumvol, Chevallier, & Bonin, 2020), reduced vehicular travel (Wang & Mokhtarian, 2024), and increases in more healthy and active travel modes (Wohner, 2023). In terms of consequences, many note that downtowns have the lowest office occupancy rates in a generation (Chapple, et al., 2023; Haider & Anwar, 2023), commuting to downtowns (particularly by transit) has plummeted (Haider & Anwar, 2023), and the outlook for physically disconnected urban systems becomes increasingly likely (Tan, Fang, & Lester, 2023). There is significant uncertainty, as different studies suggest that teleworking may have either negative (Giménez-Nadal and Velilla, 2024) or positive impacts on subjective well-being (Sterkens, Baert, Moens, Wuyts, & Derous, 2024). Likewise, it is unclear whether teleworking will increase (Sepanta, Sirati, & O'Brien, 2024) or decrease energy use (Phoung, Hittinger, Guhathakurta, & Williams, 2024). There is even uncertainty around whether telework is likely to reduce auto travel (Wang & Mokhtarian, 2024), increase it (Kappler & de Abreu e Silva, 2025; Sweet & Scott,

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2024), or whether the potential for telework to reduce or increase auto travel is conditional (Asmussen et al., 2024b). Real estate market norms, expectations of spatial structure (Sweet & Scott, 2023), and the very assumptions underlying population and job growth forecasts, including planning decision-support systems, stand to be revisited considering the uptake of teleworking and other new technologies (Polzin, Batur, & Pendyala, 2025).

This research makes new contributions in three critical areas. First, it provides an empirical update on the current and future state of telework in six major Canadian regions (representing approximately 45 percent of the nation's population) based on repeated cross-sectional data from both the fall of 2021 and the fall of 2023, respectively, 1.5 and 3.5 years after the start of the pandemic in Canada and (in the case of 2023) half a year after the World Health Organization downgraded the pandemic (Infection Prevention and Control Canada, n.d.). As such, while 2021 represents a time during which the pandemic was already quite far along, the 2023 data reflect a period just after the pandemic. Both years include survey questions related to teleworking before the pandemic, during the pandemic, during the fall of the survey year (2021 or 2023), and under ideal circumstances. This allows an exploration of changes over time using these four frames and two waves of data (2021 and 2023) and it also allows an exploration of the types of groups (e.g. related to demographics, household characteristics, or access to mobility tools) which telework most or least and how this has changed over time. Second, considering research evidence that teleworking will gut downtown agglomerations of their knowledge workers, this study explores how the changing geography of teleworking is unfolding in major cities. Third, by fusing survey data collected in the fall of 2021 with survey data collected in the fall of 2023, this study provides evidence not only on how teleworking changed between those two time periods, but also on how *employees' expectations* of past, current, and future teleworking changed.

2. Literature review

The pandemic-induced upswing in work-from-home practices has led to significant changes in working habits and commuting. While it is unclear whether this shift portends a longer-term transition towards radical work, social, and mobility change, the stakes are of enormous consequence. Four of those consequences are of particular interest to this study.

First, work plays an organizing force in social relationships and function – leading disruption to have broader implications (Suzman, 2021). Second, telework adoption has become widespread among a significant share of the working population – leading to potential new habits and norms of daily interaction (Sweet & Scott, 2022). Third, work-from-home appears poised to have secondary impacts on travel behavior outcomes – leading to possibilities to rethink mobility (Lyons, 2023). Finally, the increased adoption of telework appears to have unequal geographic implications, both between city-regions and within them – leading downtown agglomerations to be gutted of knowledge workers (Hensher et al., 2021a). Each of these four issues is discussed in turn. Given the paucity of explicit ties between the "post-Covid" travel behavior research and the knowledge foundation from pre-Covid travel research (Haghani, et al., 2024), explicitly linking these time periods and these bodies of research is paramount to better understanding the future.

3. Work in society

Research on work-from-home (telework), splits the history of work and commuting in at least three broad typologies (Suzman, 2021). First, in pre-industrial societies, the boundaries of "work" and other activities were blurred, just as the meaning attributed to "working" from home or from elsewhere was comparatively less meaningful. For example, pre-industrial apprenticeships and indentured servants were largely remunerated through room and board at their places of work (Lucassen, 2018). Such pre-industrial societies precede contemporary efforts for transportation planning based on assessments of travel supply and demand and, in this context, the notion of commuting would also be very different. Second, during early and mid-industrial societies, the modernist boundaries between "work" and other activities took on new meaning with the rise of factory work, the professionalization of labor, and the specialization of both laborers and capital. It is from this industrial society that most contemporary western norms around work and place emerge – even with the gendered norms and frequent rending of women's work to invisible labor (Sheller, 2018). Transportation planning, travel demand forecasting, and contemporary understandings of commuting as being one of the most important trip purposes (e.g. assessments of "peak" commuting hours) emerge from these industrial understandings of work and home dynamics (Martens, 2017). Finally, in many globally connected cities of the late 20th and early 21st century, the nature of "workplace" has changed due to the impact of information and communication technology (ICT) (Shearmur, 2021) and robotics (Suzman, 2021). In this context, the role of discretionary travel has increased as a share of overall travel and it has become a more central lynchpin which affects broader opportunities (Hook, 2025). In turn, this has relegating commuting travel as one of many important trip types – as opposed to the central focus of travel demand forecasting (Zhou, Yang, Chen, Liu, & Yuan, 2023). The role of these new technologies has led to forces of spatial concentration among global cities but has led to forces of spatial diffusion among secondary and tertiary cities on the global stage (Sassen, 2006; Castells & Hall, 1994).

Telework has become a new option for large swaths of the working population and has further disrupted the spatial implications of ICT-induced urbanization processes. While its mass adoption stemmed from temporary measures to mitigate the spread of the Covid-19 virus, it appears to be poised to change the mobility ecosystem for some time (Lyons, 2023). For while global cities have largely benefitted from augmenting physical proximity-based agglomeration with ICT-enabled communications, telework appears to have most disrupted the in-person working habits of employees in global cities (Chapple, et al., 2023). These technology-based changes to communication networks, mobility, and economic activity have been accelerated by the exogenous shock of the Covid-19 pandemic, which showed what was possible and has led to changes in housing construction (Sayantani, 2024; Siriban, Bernard, Pojani, & Wilson, 2025), office use and vacancies (Hensher, Wei, & Beck, 2023), and commuting (Hensher et al., 2021b). Transitions are best understood in 40–50-year timelines (Geels, Kemp, Dudley, & Lyons, 2012) so early indications on post-pandemic teleworking may provide relatively weak evidence on whether a new mobility transition may evolve from broader ICT and pandemic-induced changes to work and commuting.

Nevertheless, even the above story of telework rests on several heroic assumptions and simplifications. First, plotting a shift from pre-industrial to industrial to knowledge-oriented economies ignores the great variety within these three constructs and their very coexistence at various times and places. Significant elements of this differentiation are also highly gendered – whereby women's activities are often not viewed as "work" in the same way, leading the construct of 'work-from-home' to be distinctly masculine, as it represented something worth highlighting as deviating from "normal.' These simplifications also ignore the highly variegated power dimensions with respect to mobility (Sheller, 2018), as well as (more recently acknowledged) obligations to travel among "frontline" and "essential" workers – even during global pandemics.

Second, despite the magnitude of the shift towards telework during and in the immediate aftermath of the Covid-19 pandemic, it is not clear whether the new ICT-induced spatial reorganizations have truly weakened global cities (Chapple, et al., 2023) or whether this is a temporary aberration from ICT's broader tendency to lead to global city primary at the expense of second-tier cities (Sassen, 2006; Castells & Hall, 1994). For one, even if teleworking disproportionately increased (and may

continue at higher levels) in large, congested, global cities, the reduction in in-person working does not necessarily mean a weakening urban economy among global megacities. For another, up to fifty percent of workers in many western societies managed to shift towards work-from-home for extended periods following the beginning of the Covid-19 pandemic, so those workers may (in time) simply resume something closer to the norms which existed in 2019. Alternately, the new telework opportunities afforded to many workers may structurally and irrevocably change norms and equilibria around where work is conducted and how – particularly for the largest and most congested global cities. Within the deeper historical context of cities, even a multi-year shift in production may be interpreted as a blip in the historical record.

Third, a weakness of the three typologies is that they are largely descriptive considering the wide variety of work functions and are only weakly theoretical. One possible cohesive feature of the three may be conceived of as the distinguishing role of technology and its social construction (Shearmur, 2021; Sheller, 2018). Pre-industrial societies' technologies were inherently place-based, as most energy use was still human in terms of both producing things and in terms of moving them. In contrast, energy producing and transferring technologies (the steam engine, electric motors, telephone, the internal combustion engine) spurred the industrial age. Human-supported machines could produce and distribute more than human labor alone could accomplish. Technologies play central roles in transportation systems and transport planning (Latour, 1996) and have served to physically separate but also functionally connect activities (e.g. cars, steamboats, steam trains, etc.) while enabling place-based technologies (e.g. manufacturing plants) to become highly specialized and physically separated. This has led to many common conceptions of work and home as being physically distinct.

But a newer generation of information and communication technologies (ICT) has reached a level of maturation which has supported the shift towards work-from-home. Much research has covered the role of ICT in substituting for or complementing in-person activities and travel at the individual level. Significant research has highlighted that ICT more frequently serves to complement travel and in-person interactions (Mokhtarian, 2003, 2009). It remains to be seen whether ICT and in-person interactions may be complements at a geographic or a societal level, though, as it could be that ICT interactions may spur the need for physical human interaction in qualitatively different ways.

Geels et al. (2012) highlight characteristics of new theoretical perspectives needed to understand mobility transitions, one of which highlights the "co-evolutionary and 'systemic' view of transportation (p. 16)," which leads to the need to understand the social production of change through individuals, social meaning, policy, the built environment, and technologies. A deeper understanding of the future of work-from-home may benefit significantly from such an approach. Telework is not only about a bundle of ICT technologies which enable remote work; rather, it rests on workplace relationships, intra and inter-household social dynamics, land markets and mobility, and broader cultural processes. The normalization of the modernist workplace ecosystem took centuries to refine and has entailed multiple socio-cultural transitions. The verdict on the long-term future of work-from-home will likewise only emerge slowly with crumbs of evidence coming from labor economics literature, some from transportation geography literature, some from sociology, etc.

Geels and Kemp (2012), in specific, highlight that based on the multi-level perspective for studying socio-technical transitions, transitions often occur through an iterative 'fit-and-stretch' process. Accordingly, new mobilities begin by 'fitting' old social norms and expectations before the novel capabilities of new technologies and their associated social relationships lead to a 'stretching' process into new ways of functioning. An example of this fit-and-stretch process may be reflected by the work of Scott et al. (2012), according to which telework is not only a function of individual considerations, but also a broader socialization process. Likewise, this fit-and-stretch process may be illustrated by Krasilnikova (2024), whereby a northern Germany municipality explores the potential to rethink the role of the public sector in regulating and/or providing office space based on the collectivization and devolution of officing responsibilities using lessons from Covid work-from-home experiences. The fit and stretch approach noted by Geels et al. (2012) may prove to be effective scaffolding for research to explore the longevity and broader social implications of work-from-home. Using this 'fit and stretch' metaphor, literature strictly on telework adoption is best interpreted as the 'fitting' which is tightly focused just on telework, whereas research on telework's travel behavior and location implications (which are both technologies unto their own right) may be thought of as the bridge into a possible 'stretch' emerging from telework towards broader social and environmental impacts.

4. Telework adoption

While teleworking was already on the rise leading up to the Covid-19 pandemic, teleworking dramatically increased starting in early 2020. Teleworking had grown significantly before the pandemic (Melo & de Abreu e Silva, 2017) from approximately two to as much as ten percent of commuting in some North American regions (Stiles & Smart, 2021) based on the significant advocacy of organizations viewing teleworking as a travel demand management tool (Stiles, 2020). Teleworking adopters tended to be high-income workers and managers (Stiles & Smart, 2021). Likewise, teleworkers are more likely to be younger individuals, males, and highly educated individuals (Sweet & Scott, 2024). Teleworkers are more likely to work in technology fields and knowledge industries (Beck, Hensher, & Wei, 2020; Golden & Fromen, 2011).

Growing pandemic-induced teleworking adoption also led to changes in users. Based on a Canadian study, while age-related and education-related differences in telework propensities were not as significant before the pandemic, they become dominant factors during and after the pandemic (Sweet & Scott, 2022). In contrast, while students, households with children, and individuals with health-induced mobility challenges were more likely to telework before the pandemic, the pandemic erased these relatively higher propensities of telework (Sweet & Scott, 2022). Evidence even suggests that during the pandemic, teleworkers became more productive – particularly high-income teleworkers (Shi, Richard, Moudon, Lee, & Ban, 2022).

Focusing on changes after the pandemic, studies confirm that high-telework individuals during the pandemic are also likely to anticipate high levels of teleworking after the pandemic (Wang, Kim, & Mokhtarian, 2023). While some urban contexts appeared to be teleworking less or more in the late pandemic relative to ideal future teleworking (Sweet & Scott, 2022), other contexts appeared to significantly favor hybrid work (partly in the office and partly at home) across significant shares of the mobility market (Asmussen et al., 2024a). In a study of Texas, for example, Asmussen et al. (Asmussen et al., 2024b) find that young individuals are most likely to increase future teleworking – leading to broader questions about travel behavior implications among this high-frequency travel group. In contrast, a U.S. study found that existing norms around telework propensities being highest among high-income and high-education workers would likely change, as teleworking has become more prominent among individuals with different education and income levels (Barbour, Abdel-Aty, & Sevim, 2024). Together, these findings suggest a dynamic process, whereby future telework adoption – much less its implications – remain uncertain (Wang, Kim, & Mokhtarian, 2023).

5. Telework and travel behavior

Teleworking has been proposed as a possible means to mitigate auto-based travel demand (Giovanis, 2018) but the links between telework and travel behavior have changed between pre-pandemic, during pandemic, and post-pandemic periods. Nevertheless the question as to teleworking's broader impacts on travel behavior is far from clear

(Caldarola & Sorrell, 2022; Wohner, 2022). Early pre-pandemic research explored whether the information and communication technologies (ICT) which enable telework would ultimately complement or substitute for travel (Gaspar & Glaeser, 1998; Mokhtarian, 1990). While ICT-induced increases in productivity led to the primacy of many global cities (Sassen, 2006), transportation planners and geographers explored the potential for telework to offset automobility (Caldarola & Sorrell, 2022) and reduce overall travel (Hensher et al., 2021a; Rafiq, McNally, Uddin, & Ahmed, 2022) – often finding those opportunities to be contextual (Cerqueira, Motte-Baumvol, Chevallier, & Bonin, 2020).

During the pandemic, teleworking significantly reduced overall travel across multiple modes. Studies suggest that teleworking significantly reduced driving during the pandemic, but that findings are subject to factors such as stress motivators (Wang & Mokhtarian, 2024). Teleworking substituted significantly for public transit trips and especially those facing high commuting burdens (Sweet & Scott, 2022), as evidenced by the plummeting ridership levels during and after the pandemic (Haider & Anwar, 2023). In particular, concerns over teleworking decreasing transit ridership have materialized, as transit ridership has decreased most in large and congested areas – where teleworking practices have also been most sticky (Chapple et al., 2023; Hensher et al., 2021a; Monahan & Lamb, 2022).

With respect to the broader implications of telework on travel behavior after the pandemic, newer research suggests that telework is more likely to induce additional travel than to offset travel demand. Travel simply manifests at different time periods, using different modes, and to different destinations. Several of the implications of teleworking include more use of active and healthy modes (Wohner, 2023), and more use of retail and meal delivery services (Colaço & de Abreu e Silva, 2025). Evidence likewise suggests that teleworking is expected to lead workers to either engage in the same amount of driving or more than before depending on specific contexts, while also consuming more online goods delivered by car (Tan, Fang, & Lester, 2023). Similarly, in a comprehensive assessment of teleworking's impacts on a broad range of travel behavior outcomes, Anik and Habib (2024) find that compared to pre-pandemic teleworking, post-pandemic teleworking is associated with a higher auto mode share; less transit, walking, and biking; and longer trip distances. In short, despite pre-pandemic expectations that telework could serve as a demand management strategy, many post-pandemic findings suggest the opposite.

6. Spatial implications of telework

Telework stands to disrupt urban spatial structure by shifting intra-urban real estate markets (Anenberg & Ringo, 2024). Teleworking is expected to encourage residential sprawl, to gut demand for downtown offices, and to lead to shifts between urban real estate markets – whereby large and congested cities appear to have experienced the most sustained growth in telework (Chapple, et al., 2023). But the verdict on these expectations based on empirical evidence is still emerging (de Abreu e Silva & Colaço, 2025). First, with respect to intra-urban geographic implications, there has been significant debate as to whether teleworking induces geographically more disconnected home-work commutes or whether teleworking is an adaptation strategy to reduce commuting burden among those already facing long commutes (Mokhtarian, 1990). While telework as an adaptation strategy implies that its impacts would be constrained to travel outcomes, its role as a tool to access preferred but more distant residences (de Abreu e Silva & Colaço, 2025) or job locations (Versigghel, Ermagun, Hook, De Vos, & Witlox, 2026) would have broader impacts on real estate markets and urban sprawl. The impacts of teleworking on workplace locations appears to be most concentrated within downtown cores based on a Toronto example (Sweet & Scott, 2023) and validated through broader descriptive analyses in North America (Chapple, et al., 2023).

Similarly, and in global, technology-oriented cities (Chapple, et al., 2023), the potential longer-term implications for teleworking on real estate markets are significant. Teleworking uptake across city-regions varies significantly and depends not only on the city size and commuting burden, but also on other local factors – even within the same nation-states (Haider & Anwar, 2023). For example, Sweet and Scott (2022) highlight that Canada's capital, Ottawa, had significantly higher rates of teleworking partly due to the prevalence of federal jobs and the high rates of work-from-home encouraged by federal employers.

Overall, whether public policymakers want it to or not, work-from-home appears to have established the seeds for significant transitions in how people live, work, and commute across the world (Hostettler Macias, Ravalet, & Rerat, 2025). The circumstances are evolving rapidly in many travel markets and the propensities for work-from-home changes – much less their broader social implications – are far from clear. This lack of clarity undermines transportation planners and geographers' abilities to align major policy and infrastructure decisions strategically and robustly, making it critical to augment traditional forecasting tools with more dynamic and context-sensitive approaches using scenario-based approaches (Polzin, Batur, & Pendyala, 2025). To help better inform this important space, this study provides new evidence on how work-from-home practices have evolved in the Canadian context.

7. Research design

This study focuses on six major metropolitan areas in Canada and contributes towards understanding how telework practices have recently evolved and may evolve into the future by focusing on three specific research questions. First (Q1), to what extent is telework growing before and after the Covid-19 pandemic in six major Canadian metropolitan areas? Second (Q2), among what groups does telework appear to play an outsized role (and how is this changing)? Third (Q3), what have the spatial patterns of teleworking been – both within and between major urban regions? These three research questions are, respectively, given the shorthand of Q1 (the changes in teleworking in the six major metropolitan areas), Q2 (group differences in teleworking and teleworking change), and Q3 (spatial differences in teleworking and teleworking change).

To answer these questions, this study uses survey data collected in the fall of 2021 (after the peak of the pandemic) and in the fall of 2023 (just after the World Health Organization declared the pandemic emergency to be over). Both surveys ask questions related to pre-pandemic teleworking, teleworking during the pandemic, recent teleworking (meaning either in the fall of 2021 or the fall of 2023), and ideal future teleworking. Again, it is important to keep in mind that the effects of the pandemic were still very real in 2021 while the circumstances had changed markedly by fall of 2023. In turn, this means that the stated recent teleworking rates in 2021 reflect late pandemic experiences in comparison with the fall 2023 survey, which reflected conditions just after the pandemic was materially over. Findings are interpreted with respect to the potential for teleworking to complement and/or substitute for other technologies, including access to mobility tools (e.g. transit passes, automobiles, bicycles, etc.) and the built environment, as related to the place of work and place of residence.

8. Methodology

This study uses survey data from the two waves (2021 and 2023) of the Future Mobility in Canada Survey (FMCS). The FMCS is conducted in six Census Metropolitan Areas (CMAs) in Canada which collectively represent approximately 45 percent of the Canadian population (Hamiditehrani, Scott, & Sweet, 2024a; Hamiditehrani, Scott, & Sweet, 2024b). Those six CMAs are Toronto, Montreal, Vancouver, Calgary, Ottawa, and Hamilton.

8.1. Survey data

The broader FMCS includes 10,002 survey responses, of which 5002 are from the fall of 2021 wave and 5000 are from the fall of 2023 wave. This study focuses only on employed individuals and includes 3403 in 2021 and 3726 in 2023. The survey includes several modules, including individual characteristics, household characteristics, recent travel behavior, mobility tool holdings and access, prospective future travel (e.g. related to automated vehicles), and travel-related attitudes and preferences. A section of the FMCS is dedicated towards teleworking and includes questions on teleworking before the Covid-19 pandemic, teleworking during the pandemic, recent teleworking (in fall of 2021 or fall of 2023, depending on the wave) and expected ideal rates of teleworking. The survey was administered through a third-party survey research company (Savanta) which recruits participants through available survey panels via mail. Survey respondents are incentivized via Savanta's proprietary points-based program. Before administration, the FMCS was approved by all relevant university research ethics board protocols.

8.2. Survey weighting

While the survey is administered based on a stratified sample design (meeting specific quotas with respect to residence in the six metropolitan areas, age groups, and gender), survey weights are also employed for descriptive analyses to ensure that findings best reflect the underlying population of interest. The FMCS is only administered to 18- to 75-year-olds residing (but not necessarily working in) the six metropolitan areas of interest and this study focuses only on individuals who are employed (full-time or part-time). In comparing the unweighted sample descriptive statistics with the publicly available microdata from Statistics Canada, weighting is proposed to best align the survey with the population of interest. Weights are administered differently for each of the six census metropolitan areas (CMAs) based on the limits of the sample sizes within each CMA. For example, Hamilton, Calgary, and Vancouver had the smallest number of observations, leading the dimensionality of weighting to be relatively lower in those cases. As such, weights are used to better align the survey with the population of interest even while considering the sample size limits of the survey. Weights range from 0.035 to 24.1 and are based on the following combinations of variables:

- Year (2021 or 2023)
- CMA of residence (Toronto, Montréal, Vancouver, Ottawa-Gatineau, Calgary, and Hamilton)
- Age group (18–35, 36–55, 56–75)
- Household income (<$40,000, $40,000 to $99,999, ≥$100,000)
- Education (no college/university, college/university degree holder)
- Gender (female, male) –
- Household size (1–2 vs. 3 or more)

Each CMA is weighted differently based on the need to retain sufficient observations to comprise each of the smallest groups. As such, while Toronto and Montreal had 36 sub-groups, Ottawa-Gatineau only had nine for each of the two study years (2021 and 2023). Those groups are broken down as follows:

- Calgary – 18 groups for each of two years (2021 and 2023): age (three groups) * household income (three groups) * gender (two groups)
- Hamilton – 18 groups for each of two years (2021 and 2023): age (three groups) * household income (three groups) * education (two groups)
- Montreal – 36 groups for each of the two years (2021 and 2023): age (three groups) * household income (three groups) * household size (two groups) * education (two groups)
- Ottawa-Gatineau – nine groups for each of the two survey years (2021 and 2023): age (three groups) * household income (three groups)
- Toronto – 36 groups for each of the two years (2021 and 2023): age (three groups) * household income (three groups) * gender (two groups) * education (two groups)
- Vancouver – nine groups for each of the two years (2021 and 2023): age (three groups) * household income (three groups)

All respondents with unknown or unstated household incomes are randomly allocated to one of those three categories in proportion with the relative propensities observed based on the Statistics Canada microdata for 2021. Similarly, all individuals indicating that they are neither a man/male or woman/female are randomly allocated to one of those groups for weighting purposes.

Descriptive statistics are shown for the 2021 and 2023 FMCS samples for employed persons both based on the unweighted sample and the weighted sample – each of which is compared with the 2021 weighted microdata from Statistics Canada (see Table 1). It should be noted that the illustrated descriptive statistics do not always conform precisely to the variable coding used above for the purposes of weighting.

9. Modeling and analysis

Using the survey data, two approaches are adopted to provide guidance on the underlying research questions. First, descriptive statistics are generated. Second, ordered logistic regression models are estimated to explore more nuanced relative changes in propensities to adopt telework among different survey respondents, within different geographies, and over time. Thus, while descriptive statistics provide guidance on the magnitude of change in telework and variations among the six metropolitan areas, the inferential models provide more refined guidance on the relative propensities among different demographic groups and among different types of urban contexts.

9.1. Descriptive statistics

Weighted descriptive statistics are calculated to explore changes in teleworking among employed individuals between the 2021 and 2023 waves of the FMCS. Descriptive statistics are calculated based on the entire FMCS sample of employed individuals ($n = 7{,}130$, of which 3,403 are for 2021 and 3,726 are for 2023). Key survey questions range from pre-pandemic to prospective ideal circumstances. Possible categorical responses to each survey question are identical. To assess pre-pandemic teleworking, respondents are asked, *"Prior to the COVID-19 pandemic in Canada (February 2020), how many days did you typically telework in a month?"* To explore teleworking during the pandemic, respondents are asked, *"During the COVID-19 pandemic in Canada, how may days did you typically telework in a month?"* Recent teleworking (respectively related either to the fall 2021 or fall 2023 waves) is identified using the survey question, *"How many days over the past month did you telework?"* In addition, prospective ideal teleworking is explored, *"Ideally, how many days would you like to telework in a month?"* Non-zero options available to the survey respondents include, *"a few days a month," "1–2 days per week," "3–4 days per week,"* and *"5 days or more per week."*

Weighted descriptive statistics are first estimated exclusively based on the ordinal category of telework frequency and are cross tabulated based on the year (2021 or 2023), the geography (average plus each of the six CMAs), and condition (pre-Covid, during Covid, during the fall of the survey year, and under ideal circumstances). Next, the ordinal teleworking categories are transformed into the weighted average number of teleworking days per week using the following assumed central values for each of the ordinal categories: *"never"* – zero days per week, *"a few days a month"* – 0.5 days per week, *"1–2 days per week"* – 1.5 days per week, *"3–4 days per week"* – 3.5 days per week, and *"5 days or more per week"* – 5 days per week.

Table 1
Survey Descriptive Statistics for Employed Persons (percentages).

		Statistics Canada (2021)	Weighted ('21)	Weighted ('23)	Unweighted ('21)	Unweighted ('23)
CMA (residence)	Calgary	8.9	8.9	8.9	8.1	10.1
	Hamilton	4.4	4.4	4.4	3.8	4.5
	Montréal	25.3	25.3	25.3	25.2	20.5
	Ottawa-Gatineau	8.8	8.8	8.8	7.5	7.6
	Toronto	36.3	36.3	36.3	38.9	45.4
	Vancouver	16.2	16.2	16.2	16.6	11.9
Age Group	18–34	35.8	35.8	35.8	36.7	38.4
	35–54	52.1	52.1	52.1	41.4	47.0
	55–75	12.1	12.1	12.1	21.9	14.6
Gender	Female	48.6	48.3	48.9	46.8	47.2
	Male	51.4	51.7	51.1	53.2	52.8
Education	Did not finish high school	37.0	2.6	2.2	1.8	1.1
	High school diploma		20.0	18.1	14.5	12.5
	Trade diploma		8.2	9.7	5.2	5.3
	College diploma	63.0	19.9	18.8	26.0	21.2
	Bachelor's degree		35.7	40.3	38.3	47.8
	Medicine		1.6	1.4	1.9	1.6
	Graduate degree		12.1	9.6	12.4	10.5
Employment Status	Full-time	79.1	80.7	81.5	76.7	80.7
	Part-time	20.9	19.3	18.5	23.3	19.3
Occupation Type	Professional, managerial, technical	–-	45.4	47.7	43.4	50.7
	General office	–-	19.9	18.6	18.8	17.0
	Sales & services	–-	14.9	15.9	16.2	15.8
	Manufacturing, construction, and trades	–-	10.1	7.6	10.0	6.9
	Other	–-	9.7	10.1	11.6	9.5
Student Status	Full-time	–-	9.8	11.0	9.1	9.5
	Part-time	–-	7.9	7.7	7.6	7.4
	Non-student	–-	82.3	81.3	83.3	83.1
Immigrant Status	Non-immigrant	59.5	72.4	77.1	69.0	76.0
	Immigrant	35.9	25.6	20.5	28.5	21.5
	Non-permanent resident	4.7	2.1	2.4	2.6	2.6
Health Affects Mobility	No	–-	90.9	90.7	90.8	91.5
	Yes	–-	9.1	9.3	9.2	8.5

		Statistics Canada (2021)	Weighted ('21)	Weighted ('23)	Unweighted ('21)	Unweighted ('23)
Household Size	1 person	37.7	15.1	13.9	20.1	14.1
	2 people		28.1	24.1	27.8	24.0
	3 people	62.3	23.7	33.1	23.9	35.2
	4 or more people		33.1	28.9	28.2	26.6
Annual Household Income	<$40,000	6.6	6.2	6.3	15.4	8.9
	$40,000-$99,999	26.9	28.3	28.7	43.7	32.2
	$100,000-$124,999	66.5	27.1	20.8	15.3	16.5
	$125,000-$174,999		19.1	19.6	12.1	17.6
	>$175,000		13.3	19.5	8.3	20.9
	No Answer		4.1	3.3	3.7	2.6
	Unknown		1.8	1.8	1.6	1.2
Number of Children (age 0–15) in Household	0	–-	63.7	56.9	68.7	57.7
	1	–-	20.2	29.8	18.6	30.3
	2	–-	12.1	9.7	10.0	9.0
	3 or more	–-	4.0	3.5	2.8	3.0
Driver's License	Yes	–-	92.8	94.8	91.7	95.5
	No	–-	7.2	5.2	8.3	4.5
Bike Holding	Yes	–-	66.2	68.7	62.4	67.4
	No	–-	33.9	31.3	37.6	32.6
Transit Pass	Yes	–-	49.3	59.4	52.1	61.2
	No	–-	50.7	40.6	47.9	38.8
Household Vehicles	0	–-	8.4	5.8	11.8	6.1
	1	–-	41.8	43.2	46.9	43.6
	2	–-	36.2	37.3	30.5	37.3
	3 or more	–-	13.7	13.8	10.9	13.1
Housing Tenure	Own	67.7	67.5	70.7	59.7	69.6
	Rent	32.3	32.5	29.3	40.3	30.4

"–" denotes that a variable is not available from Statistics Canada in a sufficiently comparable format. For example, while information on children in the family are available from Statistics Canada, the categories do not overlap sufficiently (e.g., not including 15-year olds), representing families rather than households. Other variables (notably those related to travel) are categorically unavailable from the 2021 Statistics Canada data.

9.2. Ordered logistic regression models

Inferential models are developed to better understand both the geographic and demographic changes in teleworking over time, focusing on full-time (not part-time) employed persons who reside 0.5 km or more from their place of work. Inferential models are estimated exclusively based on the responses to recent teleworking rates (for fall 2021 and fall 2023) and stated ideal teleworking rates (again, for fall 2021 and 2023). Respondents' stated teleworking rates before the pandemic as well as during the pandemic are not estimated using inferential models and are exclusively shown in the descriptive statistics.

Ordered logistic regression models are estimated based on the following ordered telework frequency categories: never, a few days a month, 1–2 days per week, 3–4 days per week, and 5 days or more per

week. Teleworking frequency (either for "recent" or "ideal" circumstances) is estimated as a function of individual characteristics, household characteristics, mobility tool holdings and access, and spatial structure characteristics. Spatial structure characteristics are calculated based on the geocoded respondents' places of residence and work. Places of residence are known at the six-digit postal code level (a highly localized geography), while places of work are known based on a combination of potential inputs which are given preference according to the following order: six-digit postal code, closest major intersection, or three-digit forward sortation area (i.e., the first three digits of a six-digit postal code). While valid residential postal codes were required for survey participation eligibility, not all work locations were successfully geocoded – leading those observations to be omitted from inferential models but not from the descriptive analyses. Moreover, approximately one-third of respondents entered their place of residence as their work location. In cross tabulating those individuals against stated telework frequencies, it was found that respondents entering their place of work as their place of residence only had a ten percent lower share of not teleworking. This means that respondents who entered their work location as their place of residence likely did so as an error, rather than to reflect that they necessarily worked from home all the time (or even significantly more regularly). Initially, models are estimated either for all occupation types (controlling for occupation type) or when only focusing on professional, management, technical, and office jobs (which are expected to be most likely to telework), but findings are broadly consistent for each. Ultimately, final models are only shown for which both a) individuals residing less than 500 m from their place of work are omitted and b) all occupation types are included (leading to occupation type control variables). Overall conclusions are robust across specifications.

For the purposes of estimating the significance of changes in recent or ideal teleworking between 2021 and 2023, interaction effects are employed between the variable of interest and a binary indicator distinguishing a 2023 from a 2021 survey respondent. The term "base case" is used to describe the inferential findings when independent variables are not interacted with the binary indicator for 2023 – meaning that base case results refer to those specific to 2021 (the end of the pandemic) or both 2021 and 2023 when the interaction term is statistically insignificant. All variables (both continuous and binary) are mean centered – thereby allowing interaction effects and thresholds to be interpreted relative to a hypothetical "mean" survey respondent. Interaction effects are tested for each model – leading only those which are significant at the 0.20-level to be retained or the indicator for an 'unknown' or 'unstated' household income level (which is retained to maintain a comprehensible and cohesive reference category). Thus, the interpretation of interaction effects between the mean centered binary indicator for 2023 (vs. 2021) and the mean centered independent variables of interest is of key importance. The magnitude and significance of these interaction terms indicate the relative changes in recent or ideal teleworking between 2021 and 2023 – providing guidance on how teleworking has and may continue to change over time.

Spatial structure variables are of key importance to account both for the urbanization contexts of respondents' places of work and their places of residence and to answer the third research question (Q3: spatial differences in teleworking and teleworking change). Spatial structure metrics are calculated based on respondents' home and work locations' Euclidian distances from their respective central business districts and the closest major job sub-center, using metrics generated by Sweet, Bullivant, and Kanaroglou (2016). Sub-center controls were ultimately omitted due to lack of significance. Similarly, Euclidian distance between respondents' home and work location are estimated. Some respondents reported work locations significantly distant from their home locations (e.g., living in the Vancouver CMA but one's usual place of work being in Toronto). All distances greater than 200 km were truncated at 201 km, similarly to Axisa, Scott, and Newbold (2012), to avoid the prospective influence of outliers. A metric of job-residence distance is likewise included in the modeling as a binary variable considering whether the geocoded location of residence and work are 35 or more kilometers apart. This distance threshold is tested at 5-kilometer intervals and preferred based on model fit. In addition, spatial structure metrics based on place of work and place of home are estimated based on several potential variables, including population density, daytime population density (number of residents and workers during the day), and daytime worker population density (number of workers during the daytime). This latter variable is the closest variable available at a sufficiently local geographic scale while also representing urban spatial structure across all major Canadian metropolitan areas. Each of these are based on Environics data downloaded through Simply Analytics (a data repository) based on Statistics Canada data for 2021. Environics is a private data research firm which generates derivative products based on public administrative data. Each of these variables are available based on three scales: the local dissemination area (a smaller Statistics Canada administrative geography), the local forward sortation area, and a ten-kilometer buffer of forward sortation areas around the place of work or residence. Ultimately, the spatial structure variables which are included in the preferred models include work-to-CBD distance, home-to-CBD distance, whether work and home are more than 35 km apart, and the population density within ten kilometers of the place of work.

10. Results

Towards addressing the three research questions (Q1 to Q3) by exploring telework changes over time (Q1) and the relative demographic (Q2) and spatial distribution / changes therein (Q3), first descriptive findings are explored before inferential model findings are discussed. Descriptive statistics pertain to (and distinguish between) full-time and part-time employed people, regardless of home-work distance. Inferential models only include full-time employed people residing 0.5 km or more from their place of work, as described in the research design. Descriptive findings illustrate the magnitude of the return to work between 2021 and 2023, although 2023 teleworking rates remain significantly higher than those before the pandemic. While differences vary somewhat across CMAs, the most critical differences in teleworking rates and how these changed between 2021 and 2023 related to the characteristics of individuals, their access to varying mobility technologies, and (particularly relevant to planners) the spatial structures within cities. Each of these are discussed in turn.

10.1. Descriptive findings

Overall, both teleworking and "ideal" teleworking (i.e. actual teleworking and expectations of teleworking) decreased significantly between 2021 and 2023 (see Table 2). Teleworking shares are further converted into average days per week spent teleworking, leading to more concrete estimates of how much teleworking decreased between 2021 and 2023 (see Table 3).

10.2. Telework shares

First, the ordinal frequencies of regular teleworking and their changes over time are displayed for each of the six CMAs and provide guidance for the first research question (Q1: the changes in teleworking in the six major metropolitan areas). On average, across the six CMAs, approximately half of employees never teleworked before the Covid-19 pandemic, while only approximately 40 percent never teleworked during the pandemic. Conversely, approximately a quarter of individuals teleworked five days per week during the peak of the pandemic, while this share remained essentially unchanged at 23.6 % in 2021 and dropped significantly to 8.6 % in 2023. As such, in many ways, teleworking rates in 2021 had similarities with teleworking rates during the peak of the pandemic. Several changes in expected ideal teleworking rates are observed and these generally suggest that workers desire less

Table 2
Telework Frequency Before, During, Fall of Survey Year (2021 or 2023), and Ideally (percentages).

		Pre-Covid		During Covid		Fall of Survey Year (2021 or 2023)		Ideal	
	Telework Frequency	2021 Survey	2023 Survey	2021 Survey	2023 Survey	2021 Survey	2023 Survey	2021 Survey	2023 Survey
All	Never	63.0	53.0	43.5	37.9	52.3	52.8	52.9	53.4
	A few days/mo.	15.9	20.3	10.8	13.6	4.2	7.2	5.6	8.0
	1–2 days/week	9.8	14.3	8.8	14.3	10.6	19.5	7.8	14.7
	3–4 days/week	4.3	5.8	8.6	11.0	9.2	12.0	14.1	10.7
	5 + days/week	7.0	6.6	28.3	23.2	23.6	8.6	19.6	13.2
Calgary	Never	64.2	51.4	41.0	38.4	49.5	51.4	51.0	51.7
	A few days/mo.	16.1	19.8	9.8	14.7	3.6	8.7	4.3	9.6
	1–2 days/week	7.2	18.3	11.2	17.1	12.1	23.1	5.6	21.3
	3–4 days/week	6.6	4.2	11.2	10.5	10.8	10.2	18.1	9.0
	5 + days/week	5.9	6.3	26.9	19.2	23.9	6.6	21.1	8.4
Hamilton	Never	70.9	74.4	57.7	44.5	64.0	69.3	63.6	70.3
	A few days/mo.	9.9	10.4	6.0	9.2	6.0	6.8	1.3	7.9
	1–2 days/week	13.3	1.8	10.1	6.1	3.3	8.0	5.3	2.4
	3–4 days/week	0.7	5.5	3.4	7.9	8.0	7.4	8.6	7.3
	5 + days/week	5.3	7.9	22.8	32.3	18.7	8.6	21.2	12.1
Montréal	Never	61.5	53.5	41.8	38.3	52.1	50.6	53.0	51.3
	A few days/mo.	11.8	17.5	11.4	11.1	3.9	5.9	7.3	5.8
	1–2 days/week	10.9	13.8	8.0	13.0	12.0	20.9	8.1	13.3
	3–4 days/week	4.6	5.5	9.0	11.6	9.3	12.6	12.9	12.4
	5 + days/week	11.1	9.8	29.8	25.9	22.7	10.1	18.8	17.1
Ottawa-Gatineau	Never	60.2	45.3	37.7	32.3	44.3	45.1	44.3	45.9
	A few days/mo.	19.7	26.8	9.7	16.5	2.7	5.2	6.7	10.1
	1–2 days/week	9.7	15.8	7.7	15.2	6.3	24.1	5.0	19.0
	3–4 days/week	2.3	5.5	5.7	9.8	9.3	14.3	14.0	8.6
	5 + days/week	8.0	6.7	39.3	26.2	37.3	11.3	30.0	16.5
Toronto	Never	60.6	50.8	43.3	38.3	53.0	53.9	53.4	54.4
	A few days/mo.	19.8	22.4	12.0	14.5	4.1	8.4	5.5	9.1
	1–2 days/week	9.7	14.9	8.9	15.6	11.2	17.7	8.5	14.2
	3–4 days/week	4.6	6.7	7.5	10.9	7.4	11.8	14.9	11.1
	5 + days/week	5.3	5.2	28.3	20.8	24.4	8.2	17.7	11.3
Vancouver	Never	69.4	56.5	47.3	37.7	53.8	54.5	54.0	55.2
	A few days/mo.	13.1	19.6	9.8	14.6	6.0	6.6	4.9	7.3
	1–2 days/week	8.9	14.0	8.9	13.5	11.1	19.8	9.1	14.9
	3–4 days/week	3.6	5.3	12.0	11.8	12.4	12.5	13.8	10.3
	5 + days/week	4.9	4.7	22.0	22.4	16.7	6.6	18.2	12.3

Table 3
Weekly Telework Frequency Before, During, Fall of Survey Year, and Ideally (2021 and 2023).

		Pre-Covid		During Covid		Fall of Survey Year		Ideal	
	CMA	2021	2023	2021	2023	2021	2023	2021	2023
Full-Time Employees	All	0.8	0.9	2.1	2.0	1.8	1.3	1.7	1.4
	Calgary	0.7	0.9	2.0	1.8	1.9	1.1	1.8	1.2
	Hamilton	0.6	0.7	1.7	2.1	1.4	0.9	1.5	1.1
	Montréal	1.0	1.0	2.2	2.1	1.8	1.4	1.7	1.7
	Ottawa-Gatineau	0.7	0.9	2.5	2.1	2.5	1.6	2.2	1.6
	Toronto	0.7	0.8	2.1	1.8	1.8	1.2	1.7	1.3
	Vancouver	0.6	0.7	1.8	2.0	1.6	1.2	1.7	1.3
Part-Time Employees	All	0.6	0.7	1.2	1.2	1.0	0.8	1.1	0.7
	Calgary	0.9	0.6	1.6	1.0	1.3	0.8	1.6	0.7
	Hamilton	0.1	0.7	0.6	1.9	0.8	0.7	1.3	0.3
	Montréal	0.7	0.7	1.1	1.1	1.0	0.7	0.8	0.8
	Ottawa-Gatineau	0.6	0.7	1.3	1.0	1.2	0.8	1.3	0.7
	Toronto	0.7	0.8	1.1	1.3	1.0	0.7	1.1	0.8
	Vancouver	0.5	0.6	1.2	1.0	1.0	0.8	1.1	0.8

teleworking than they desired in the recent past but that they desire more than they currently experience.

Ottawa-Gatineau had higher rates of teleworking while Hamilton and Vancouver had comparatively lower rates. Approximately half of respondents did not telework in the fall of the survey year (either 2021 or 2023) or were not interested in teleworking at all based on ideal circumstances. Teleworking rates shifted dramatically between 2021 and 2023 from the 5 days or more category towards hybrid work, defined here as lower (but non-zero) weekly rates. For example, while approximately a quarter of individuals teleworked five or more days per week during the pandemic as well as during the fall of 2021, this rate fell to 8.6 % in fall of 2023 and 13.2 % based on respondents' "ideal" circumstances in 2023. In contrast, between 2021 and 2023, teleworking 1–2 days per week (from 10.6 % to 19.5 %) or 3–4 days per week (from 9.2 % to 12.0 %) increased. Only Calgary and Hamilton deviated (albeit minimally) from this trend – whereby teleworking 3–4 days per week remained stable or decreased. Even shifts in "ideal" teleworking between 2021 and 2023 show an increased appetite for teleworking at low frequencies (up to 2 days per week), while high-intensity teleworking (3 or more days per week) decreased between 2021 and 2023. Only Montréal appears to be significantly different whereby 1–2 day per week teleworking is expected to increase in ideal circumstances, but all other rates are expected to decrease somewhat.

Focusing on teleworking before and during the pandemic, there are

modest differences between individuals' recollections of their teleworking at those time periods – depending on whether they took the survey in 2021 or 2023. However, as shown in the next section, these differences lead to similar rates when converting telework frequency categories to average daily telework days.

10.3. Weekly estimates of teleworking

Next, the ordinal frequencies of regular teleworking are converted into average weekly frequencies for each of the six CMAs (see Table 3), providing insight into all three research questions. To address the first research question (Q1: the changes in teleworking in the six major metropolitan areas), weekly teleworking rates are estimated independently for full-time (those working 30 h or more per week) (see Fig. 1 and Fig. 3) and part-time workers (see Fig. 2 and Fig. 4). Among full-time workers, average weekly teleworking rates show remarkable consistency between the 2021 and 2023 surveys for the expected weekly teleworking frequencies before and during the pandemic, indicating approximately 0.8 to 0.9 days of teleworking per week before the pandemic and 2.0 to 2.1 teleworking days per week during the pandemic (see Fig. 1). Teleworking frequency decreased by 0.5 days per week during the fall of 2021 to the fall of 2023 (from 1.8 to 1.3 days per week) while it decreased by 0.3 days per week under "ideal" rates between 2021 and 2023 (from 1.7 to 1.4 days per week) – see Fig. 3. Drops in teleworking were most intense in Ottawa-Gatineau between 2021 and 2023 (from 2.5 to 1.6 days per week) – see Fig. 3. Under "ideal" teleworking rates, expectations decreased between 2021 and 2023 in all CMAs except for Montréal, where they remained unchanged at 1.7 days per week – suggesting that even though teleworking had decreased among full-time employees in Montreal to 1.4 days per week, there continued to be latent demand for more teleworking (1.7 days per week) in Montreal under ideal circumstances (see Fig. 3). This implies a more rapid return to work in Montreal than desired by workers. Conversely, part-time workers in Hamilton stated significantly lower ideal teleworking rates (0.3 days per week ideally in 2023) than observed in 2023 (0.7 days per week), implying the opposite: that teleworking was continuing longer than desired by workers. These patterns are displayed in Figs. 1–4.

Next, descriptive analyses address the second (Q2: group differences in teleworking and teleworking change) and third (Q3: spatial differences in teleworking and teleworking change) research questions. Results focus on recent (fall of survey year: 2021 or 2023) and ideal teleworking and weekly teleworking rates are estimated based on different household, demographic, and built environment characteristics of survey participants, their locations of residence, and locations of work.

As shown in Table 4, several significant differences emerge with respect to group differences in teleworking and teleworking change (Q2). For one, both recent and ideal teleworking drops more precipitously for younger age groups than for older age groups. Gender differences are also significant, whereby women teleworked more in 2021, their teleworking remained higher than men's teleworking, and their ideal teleworking did not decline as fast as that of men. Teleworking remained flat for individuals with no college education, and they

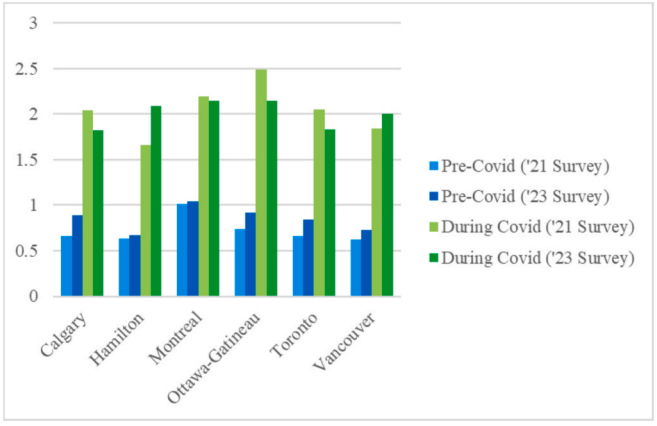

Fig. 1. Weekly Teleworking (Days) Before and During the Pandemic (Full-Time Workers).

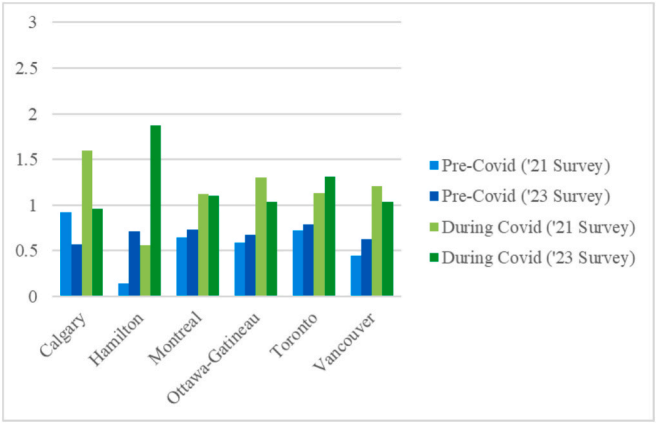

Fig. 2. Weekly Teleworking (Days) Before and During the Pandemic (Part-Time Workers).

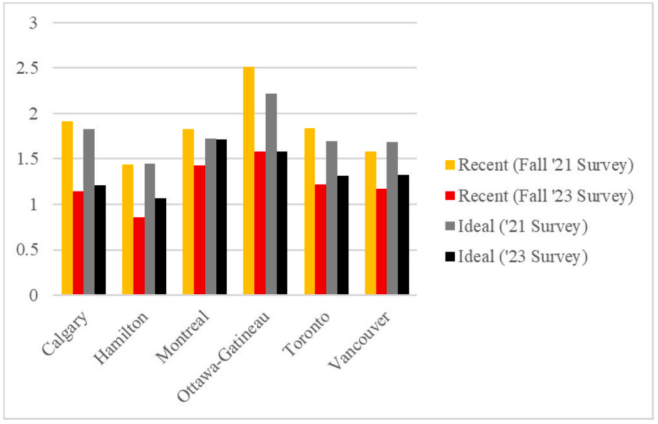

Fig. 3. Weekly Teleworking (Days) in Fall of Survey Year and under "Ideal" expectations (Full-Time Workers).

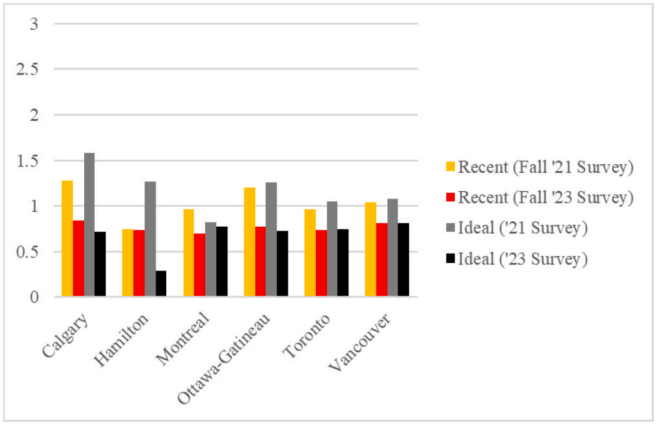

Fig. 4. Weekly Teleworking (Days) in Fall of Survey Year and under "Ideal" expectations (Part-Time Workers).

Table 4
Changes in Weekly Teleworking (days per week) for Recently Monthly and Ideal Teleworking – by Demographic Characteristics.

		Recent Monthly (telework days/week)			Ideal (telework days/week)		
Category	Sub-Group	2021	2023	change ('21-'23)	2021	2023	change ('21-'23)
Age Group	18–34	1.79	1.12	−0.67	1.7	1.27	−0.43
	35–54	1.92	1.31	−0.61	1.8	1.46	−0.34
	55–75	1.68	1.43	−0.25	1.67	1.55	−0.12
Gender	female	1.91	1.36	−0.55	1.82	1.57	−0.25
	male	1.81	1.18	−0.63	1.7	1.28	−0.42
Education	no college	0.91	0.85	−0.06	0.9	1.02	0.12
	college degree or higher	2.22	1.41	−0.81	2.08	1.55	−0.53
Occupation	manufacturing, construction, trades	0.35	0.37	0.02	0.35	0.55	0.2
	office	1.91	1.51	−0.4	1.88	1.9	0.02
	other	0.71	0.56	−0.15	0.77	0.62	−0.15
	professional, management, technical	2.37	1.47	−0.9	2.21	1.57	−0.64
	sales, services	1.51	1.06	−0.45	1.34	1.1	−0.24
Student Status	full-time	1.29	1.38	0.09	1.14	1.69	0.55
	part-time	1.78	1.28	−0.5	1.72	1.48	−0.24
	non-student	1.9	1.26	−0.64	1.8	1.39	−0.41
Immigrant Status	non-immigrant	1.86	1.27	−0.59	1.73	1.4	−0.33
	immigrant	1.86	1.21	−0.65	1.81	1.45	−0.36
	non-permanent resident	1.85	1.41	−0.44	2.05	1.64	−0.41
Household Size	1	1.97	1.57	−0.4	1.85	1.76	−0.09
	2	1.83	1.39	−0.44	1.74	1.57	−0.17
	3	1.88	1.14	−0.74	1.78	1.2	−0.58
	4-plus	1.8	1.15	−0.65	1.7	1.4	−0.3
Household Income	< $40 k	0.85	0.98	0.13	0.89	1.16	0.27
	$40-$99 k	1.45	1.29	−0.16	1.37	1.47	0.1
	$100 k-plus	2.15	1.28	−0.87	2.03	1.42	−0.61
	unknown	1.14	1.11	−0.03	1.08	1.22	0.14
Household Children	No	1.82	1.3	−0.52	1.72	1.47	−0.25
	Yes	1.92	1.22	−0.7	1.82	1.35	−0.47
Driver's License	No	1.06	1.01	−0.05	1.02	1.17	0.15
	Yes	1.9	1.27	−0.63	1.8	1.42	−0.38
Bike Ownership	No	1.83	1.24	−0.59	1.76	1.37	−0.39
	Yes	1.9	1.31	−0.59	1.76	1.51	−0.25
Transit Pass	Yes	2.14	1.27	−0.87	1.97	1.44	−0.53
	No	1.61	1.26	−0.35	1.57	1.39	−0.18
Household Vehicles	0	2.17	1.66	−0.51	2.07	1.88	−0.19
	1	1.99	1.3	−0.69	1.85	1.51	−0.34
	2-plus	1.75	1.19	−0.56	1.67	1.25	−0.42
Housing Tenure	Own	2	1.31	−0.69	1.9	1.45	−0.45
	Rent	1.52	1.15	−0.37	1.42	1.33	−0.09
Home-Work Distance (euclidian)	a) 0-5km	1.76	1.23	−0.53	1.66	1.31	−0.35
	b) 5-10km	1.84	1.25	−0.59	1.8	1.55	−0.25
	c) 10-35km	2.01	1.28	−0.73	1.86	1.54	−0.32
	d) 35km-plus	1.85	1.49	−0.36	1.77	1.73	−0.04
Work-CBD distance (euclidian)	a) 0-5km	2.74	1.47	−1.27	2.46	1.67	−0.79
	b) 5-10km	1.67	1.37	−0.3	1.7	1.43	−0.27
	c) 10-35km	1.4	1.09	−0.31	1.36	1.24	−0.12
	d) >35km	1.65	1.12	−0.53	1.55	1.3	−0.25
Home-CBD distance (euclidian)	a) 0-5km	2.35	1.24	−1.11	2.02	1.35	−0.67
	b) 5-10km	2.01	1.37	−0.64	1.95	1.5	−0.45
	c) 10-35km	1.77	1.19	−0.58	1.7	1.37	−0.33
	d) >35km	1.18	1.46	0.28	1.15	1.61	0.46
Pop. density, place of work, w/in 10km	a) less than 1sd below mean	1.32	1.06	−0.26	1.28	1.24	−0.04
	b)up to 1sd below mean	1.61	1.18	−0.43	1.56	1.29	−0.27
	c) up to 1sd above mean	2.24	1.48	−0.76	2.13	1.66	−0.47
	d) more than 1sd above mean	2.64	1.44	−1.2	2.37	1.62	−0.75

modestly hoped for a higher level of teleworking between 2021 and 2023. In contrast, teleworking was more than twice as prominent (2.22 vs. 0.91 days per week) among individuals with a college diploma or higher and both recent and ideal teleworking dropped precipitously. Unsurprisingly, recent and ideal stated teleworking rates are higher among some professions (office, professional, management, technical) than others – notably manufacturing, construction and trades, and hence dropped more rapidly between 2021 and 2023. Differences in teleworking by household size were trivial in 2021 but both recently and ideal teleworking dropped significantly among individuals in larger households between 2021 and 2023 – suggesting that work-from-home can be challenging for larger households. Household income differences are extremely pronounced, whereby in 2021 individuals residing in the highest income households engaged in significantly more recent teleworking (2.15 days per week) than the lowest income households (0.85 days per week). But between 2021 and 2023, the teleworking rates declined more rapidly among the highest income households, leading differences to be significantly reduced for both recent teleworking in 2023 (0.98 to 1.29 days per week) and ideal teleworking in 2023 (1.16 to 1.47 days per week).

Further addressing Q2, differences in teleworking based on access to varying mobility tools indicate significant differences (see Table 4). For

example, survey respondents with a driver's license teleworked more in 2021 than those without a driver's license, but rates became more similar by 2023. Differences between bike owners and non-bike owners were less pronounced. Transit pass holders teleworked more based on stated recent rates in 2021 and ideally in 2021 but rates between transit pass holders and non-holders became more similar between 2021 and 2023. In contrast, zero and one-vehicle households teleworked more in 2021 (both in the recent month and ideally) and the disparity largely increased in comparison with households with two or more vehicles even though rates decreased for everybody.

Finally, in addressing the third research question (Q3: spatial differences in teleworking and teleworking change), recent monthly and ideal teleworking based on place of residence and place of work indicate that the pronounced urban bias of teleworking in 2021 is reduced by 2023 (see Table 4). While higher home-work distances were associated with more teleworking in 2021, this effect diminished by 2023. Likewise, while both work and residential locations closer to the CBD were associated with higher rates of teleworking in 2021, the differences were much smaller by 2023. Finally, while work locations with higher population densities had higher rates of teleworking in 2021 (2.64 for the highest densities and 1.32 for the lowest densities), the differences became much smaller in 2023 (1.48 for the second highest densities and 1.06 for the lowest densities).

11. Modeling results

While descriptive results indicate the overall changes in teleworking, modeling results provide a picture as to (Q1) how recent teleworking and ideal stated teleworking changed between 2021 and 2023 in the six metropolitan areas, (Q2) how it changed among different demographic

Table 5
Ordered Logit Model Results – Recent Teleworking During Fall of Survey Year (2021 or 2023) and Stated Ideal Teleworking.

	Recent Teleworking Model		Ideal Teleworking Model	
Variable	Base (2021)	Interaction (2023)	Base (2021)	Interaction (2023)
2023 (binary)				−0.13**
Age 18–35 (reference)				
Age 36–55 (binary)	0.19***		0.18***	
Age 56–75 (binary)	0.27***	0.39**	0.27***	0.38**
Female (binary)			0.11**	
Highest education − no college/university	−0.61***		−0.6***	
Highest education − college / university (reference)				
Highest education − graduate school or higher	0.26***		0.19**	
Non-student status	−0.22**		−0.18*	
Health problems (yes)	0.21*		0.26**	
Occupation − manufacturing, construction, trades	−1.68***	0.86***	−1.59***	0.71**
Occupation − professional, management, technical (reference)				
Occupation – office				
Occupation – other	−1.28***		−1.22***	
Occupation – sales	−0.44***		−0.53***	
Ethnic Asian (yes)	0.28***	−0.26*	0.32***	
Immigrant and ethnic Asian (interaction)			−0.64***	
Household size (continuous)		−0.1*		
Children in household (yes)	−0.1*	0.17		
Household income (<$40,000)	−0.65***		−0.6***	
Household income ($40,000-$99,999) − reference				
Household income ($100,000-$174,999)	0.13*	−0.5***	0.11	−0.46***
Household income ($175,000-plus)	0.42***	−0.64***	0.34***	−0.41**
Household income (unknown / unstated)	0.01	0.08	−0.07	0.2
Distance from residence to CMA CBD (ln − km)	0.1***		0.11***	0.08
Distance from work to CMA CBD (ln − km)	−0.18***	0.13**	−0.17***	
Distance from work to home >= 35 km (yes)	0.96***	−0.41	0.97***	
Pop. density, place of work, w/in 10 km (ln)	0.09***	−0.1**	0.09***	−0.07*
Calgary CMA residence (reference)				
Hamilton CMA residence (yes)	−0.26		−0.22	
Montreal CMA residence (yes)		0.25*		0.27**
Ottawa CMA residence (yes)	0.28**		0.25**	
Toronto CMA residence (reference)				
Vancouver CMA residence	−0.33***	0.37**	−0.24***	
Driver's license (no)	−0.54***		−0.55***	
Transit pass (yes)	0.32***	−0.25**	0.25***	−0.19
Household vehicle count (0=yes)	0.41***		0.45***	0.39*
Household vehicle count (1 = reference)				
Household vehicle count (2 or more = yes)	−0.11*	0.44***	−0.11*	0.25**
Threshold − never: a few days a month	0.09*		0.12**	
Threshold − a few days a month: 1–2 days per week	0.4***		0.46***	
Threshold − 1–2 days per week: 3–4 days per week	1.2***		1.09***	
Threshold: 3–4 days per week: 5 or more days per week	1.9***		1.86***	
Observations	3323		3323	
Residual Deviance	13352.48		13505.8	
AIC	13448.48		13591.8	

Variables omitted if not significant at the 0.20-level or better, except "unknown" household income (which is included but not significant). Significance denoted at the 0.01 (***), 0.05 (**), and 0.10 (*) levels.

Variables omitted if not significant at the 0.20-level or better, except "unknown" household income (which is included but not significant). Significance denoted at the 0.01 (***), 0.05 (**), and 0.10 (*) levels.

groups (including with access to different mobility technologies), and (Q3) the different spatial patterns through which teleworking evolved. Modeling results (see Table 5) are presented each for a) survey participants stated frequency of teleworking during the fall of the survey year (2021 or 2023 wave) and with respect to b) stated ideal teleworking in each survey wave. Results are discussed considering the three core research questions.

11.1. Teleworking changes

As confirmed in the descriptive statistics (see Table 3), teleworking rates decreased significantly between 2021 and 2023 based on ordered logistic regression model results in both models of recent and ideal teleworking (Q1).

11.2. Teleworking and demographics

However, in confirming the answer to research question two (Q2: group differences in teleworking and teleworking change) based on the descriptive statistics, inferential results indicate that the return to work between 2021 and 2023 was highly unequal by demographic group (see Table 5). Both individuals aged 36–55 and those aged 56–75 were more likely to telework than younger individuals (the reference case) in the base case. The base case refers to the model of either recent or ideal teleworking when the independent variables are not interacted with the binary indicator for the survey year 2023 (as opposed to 2021). In fact, in the model of recent telework, the relative difference between individuals aged 56–75 and those aged 18–35 became even more pronounced between 2021 and 2023 (based on the findings using the interaction term), while the gap between those aged 18–35 and 36–55 remained present but unchanged. This suggests that most of the return to work between 2021 and 2023 stemmed from changes in behavior among individuals aged 36–55 and individuals aged 18–35.

Findings related to gender suggest that although being a woman is unassociated with recent teleworking rates, models of ideal teleworking suggest that women would prefer higher rates of teleworking than men. While inferential models are based on all else being equal, this finding is different than in the descriptive statistics, where women were more likely to telework in both 2021 and 2023, their teleworking decreased less from 2021 to 2023, and their ideal teleworking was significantly higher than that of men in both 2021 and 2023. This implies that the differences between men and women with respect to recent teleworking in 2021 and 2023 manifest largely through co-determined processes (e.g. differences in occupation types) even while ideal teleworking is materially higher for women. With respect to education, higher levels of education are significantly associated with higher rates of recent teleworking and of ideal teleworking, while no statistically significant changes have emerged between 2021 and 2023. In contrast, not being a student is associated with lower rates of teleworking.

Unsurprisingly, occupation differences are significant in the inferential models, just like in the descriptive analyses. Compared to office, professional, technical, and management occupations, all other occupations are less likely to engage in recent telework and have preferences for less telework under ideal circumstances in the base case. The relative differences change only for manufacturing, construction, and trades – whereby this industry (which was already much less likely to telework) was comparatively less likely to shift away from telework between 2021 and 2023. This may suggest more market stability because of less flexibility in telework arrangements among individuals in those sectors – regardless of whether they telework or not.

Estimates of the links between immigration and ethnic status and teleworking paint a complex portrait of teleworking and teleworking change. Three immigration categories are tested: non-permanent residents, immigrants, and non-immigrants, while three ethnic categories are tested based on the sufficiency of sample sizes: ethnic Europeans, ethnic Asians, and non-European/non-Asians. Results indicate that two groups have some distinct differences: ethnic Asians and ethnic Asians who are also immigrants (using the additional interaction effect). Ethnic Asians prefer more telework under ideal circumstances, although stated ideal teleworking is lower among Asians who are also immigrants (based on the interaction effect). In other tested model specifications, some evidence suggested less recent teleworking in the fall of the survey years among all immigrants, although the estimated effects of being Asian or of being both Asian and an immigrant were more stable.

In continuing to unpack group-level differences in teleworking and teleworking changes between 2021 and 2023 (Q2), findings indicate complex links between household structure and teleworking. Larger households were no different than smaller households in the base year (2021), but became less likely to telework in 2023 based on the interaction effect. Households with children were less likely to have adopted teleworking in the base case, although households with children became more likely to telework between 2021 and 2023 based on the interaction term.

Finally, respondents from higher income households were progressively more likely to telework in the base case. However, the return to work between 2021 and 2023 was distributed unequally across household income groups. Between 2021 and 2023 (based on the interaction effect with 2023), the highest income households experienced an accelerated return to work (a negative coefficient in the interaction term – suggesting a lower possibility of teleworking) or a decreased rate of ideal teleworking. These findings are broadly consistent with those of Barbour, Abdel-Aty, and Sevim (2024), who find that low-income groups are likely to catch up to high-income groups with respect to teleworking rates.

11.3. Teleworking and mobility technologies

Additional group-level differences in teleworking and teleworking changes between 2021 and 2023 (Q2) are found based on access to different mobility technologies. Results indicate that holding a driver's license, household vehicle ownership, and transit pass holdings are each associated with teleworking to various degrees. Not having a driver's license is associated with less recent and ideal teleworking in the base (2021) condition but interaction effects with 2023 are statistically insignificant. Having a transit pass is associated with higher rates of teleworking in the base year but this effect is largely offset by a negative and statistically significant interaction effect (with the indicator for 2023) in the model of recent teleworking, while the interaction effect is insignificant at the 0.10-level or better in model of ideal teleworking. As such, while transit pass holders largely returned to work (like non transit pass holders), they continued aspiring for higher ideal teleworking rates. Finally, residing in a zero-vehicle household is associated with significantly higher rates of recent and ideal teleworking. The interaction effect is statistically insignificant at the 0.10-level or better in the model of recent teleworking but suggests a strengthening relationship in the model of ideal teleworking (a positive and significant coefficient at the 0.10-level). In contrast, residing in a two-plus-vehicle household is weakly significant (but negative) in the base year. The interaction effect with 2023 is both significant and positive in both the model of recent teleworking and of ideal teleworking – providing some evidence of increasing teleworking among households with high rates of vehicle ownership.

11.4. Spatial patterns of teleworking

Finally, in addressing spatial differences in teleworking and teleworking changes (Q3), results indicate the teleworking changes within CMAs are significantly more impactful than those between CMAs (as implied based on aggregate estimates from the descriptive statistics). Focusing on the differences between CMAs in the base year, Hamilton and Vancouver appear to have less teleworking and Ottawa has more than the other CMAs. Ottawa has significantly higher teleworking, most

plausibly due to the high concentration of federal jobs which were more likely to shift towards telework. But focusing on the interaction effects between the CMA-level controls and the year (2023) binary variable, results suggest that all CMAs decreased teleworking at similar rates with two exceptions: Montréal and Vancouver. The statistically significant and positive coefficient for Montreal (including both recent fall 2021/2023 and "ideal" teleworking) suggest that the rate of return to work was significantly slower for Montréal than for most other CMAs (as implied in the descriptive statistics as well). Similarly, the positive and significant coefficient for the interaction term for Vancouver in the model of recent teleworking shifts between fall of 2021 and 2023 indicates that Vancouver was also much slower to return to the office than most other CMAs.

Shifting focus towards intra-metropolitan spatial structure controls, individuals residing further from the CBD were more likely to telework and express a desire to telework at increased levels in ideal circumstances. In contrast, the interaction effect with 2023 suggests that no statistically significant changes materialized in recent teleworking or in ideal teleworking between 2021 and 2023.

In contrast to residential distance from the CBD, higher work distances from the CBD are associated with lower levels of teleworking in the base case. The interaction effect with 2023 was insignificant in the model of ideal teleworking, while it was significant and positive in the model of recent teleworking. This indicates that the concentration of recent teleworking in CBD-proximate workplaces had essentially been neutralized between 2021 and 2023 but that the desire for more downtown teleworking (by place of work) remains a latent demand based on stated ideal teleworking. Overall, this represents a significant and positive change for the outlook of major downtown office occupancy rates and hence real estate prospects – even while latent demand for teleworking (as expressed in "ideal" teleworking) remains more concentrated in downtown work locations.

Moreover, the coefficient estimate for the binary variable indicating whether a respondent's work and home address are 35 km apart (Euclidian distance) or not indicates the effect is significant and positive in both the model of recent and ideal teleworking. The interaction effect (with 2023) is statistically insignificant in the model of ideal teleworking but is very weakly significant (0.10-level) in the model of recent teleworking. These findings suggest that the higher rates of teleworking among respondents with home-work distances exceeding 35 km weaken between 2021 and 2023 (albeit not statistically significantly so).

Finally, the metric of population density within 10 km of respondents' places of work suggests that, in the base year, denser urban environments are associated with more teleworking both for recent teleworking and for ideal teleworking. However, when considering the interaction effect with 2023, the positive base effect is offset by a significant negative interaction term which is significant (0.05-level) in the model of recent teleworking and marginally significant (0.10-level) in the model of ideal teleworking.

12. Discussion and conclusion

Study findings on the first research question (changes in teleworking over time) indicate that teleworking grew significantly during the Covid-19 pandemic, but that it has unambiguously decreased across different occupations and metropolitan areas since the pandemic and has decreased materially between 2021 and 2023. Hybrid work (some days in office and some days at home) has become the norm for approximately 40 percent of workers (up from 24 percent in 2021), while 8.6 percent (down from 23.6 percent in 2021 or 28.3 percent during the peak pandemic) work at home five or more days per week, and half never telework. Nevertheless, these decreases in teleworking obscure the variability in those aggregate changes.

Despite the intensity and speed of teleworking's uptake, this remains an evolving space and long-term certainty is far from clear. Most notably, there remain disconnects between stated recent teleworking (in both 2021 and 2023) and stated "ideal" teleworking. This suggests significant potential for continued evolution and latent demand for teleworking. For example, while models of recent teleworking suggest no gender-based differences, models of ideal teleworking suggest a latent demand for more teleworking by women. Now that teleworking has become a reasonable option – analogous to a "niche," based on the Geels and Kemp (Geels & Kemp, 2012) Multilevel Perspective on Transition – it may scale up into new ways of organizing social processes (termed "regimes" by Geels and Kemp). For example, telework may help address time poverty among women who are balancing work, parenting, and the burden of (typically higher) domestic responsibilities (Sweet & Kanaroglou, 2016) and may, in turn, lead to new geographies of work-home-care.

In addressing research question two (Q2: group differences in teleworking and teleworking change), lessons with respect to respondents' access to mobility tools and teleworking decisions also paint more positive pictures for sustainability and urban contexts in 2023 than in 2021. For example, while holding a transit pass was associated with a significantly higher propensity to telework in 2021 (also, rationally, implying lower transit ridership), this effect attenuated significantly between 2021 and 2023. Similarly, while high household auto ownership levels were associated with less teleworking in 2021, this pattern largely equalized– suggesting better hope for teleworking to serve as a tool offset auto-based commuting, even if not total auto use.

In further addressing research question two (Q2: group differences in teleworking and teleworking change), significant demographic variations lead to questions about the distribution of benefits and burdens. Findings, for example, indicate that while teleworking occurs in other professions, most of the shifts in teleworking occur in professional, management, technical, and office occupations. Thus, while teleworking (admittedly at a lower rate) has reached something closer to a stable equilibrium in non-office jobs, most of the questions around teleworking are centered on how office-oriented industries and occupations evolve. In turn, this has consequences for broader real estate investments – whereby one might expect significantly more fluctuations and uncertainty in the commercial office real estate industry, rather than in real estate related to manufacturing, trades, sales, or services (at least ones which are not immediately dependent on office clientele).

Demographic distributions of benefits and burdens of teleworking also lead to significant questions around inter-generational needs. Notably, younger individuals were less likely to telework historically and most of the return to work has been dominated by younger individuals returning to the office while older individuals have become more likely to continue work-from-home practices (all else being equal). This leads to broader possibilities of physical disconnection in mentoring and the challenges related to the transfer of knowledge between generations. Office complexes dominated by younger employees beg to question what place-based agglomeration benefits are most valuable in the new knowledge economy. This may suggest that place-based benefits currently relate to broader camaraderie and building a collective sense of purpose, while this begs to question whether more tangible knowledge transfer processes are happening in person. In other words, is collective bonding really the most important feature of in-person office work? Or is it wrong to conclude that knowledge industries have partly abandoned the organic, in-person communicative elements of inter-generational knowledge transfer?

Similarly, demographic findings also lead to questions around equity and "for whom" transportation systems are being planned. Individuals from high-income households have vacillated in shifting to/from telework. Historically, they have been most likely to telework but were also most rapid to return to the office and to state lowering ideal levels of teleworking between 2021 and 2023. These high-income, marginal teleworkers are fickle with respect to their decisions – leading to questions as to how strong and how sustained these teleworking propensity signals really are and whether they should be considered in long-term transportation planning and forecasting.

In addressing research question three (Q3: spatial differences in teleworking and teleworking change), while this study focuses on Canadian cities, overall lessons on how teleworking has evolved between 2021 and 2023 represent good news for cities and urban cores more generally, with respect to increases in in-person work. Montréal and Vancouver (which already had a lower telework rate), respectively Canada's second and third largest CMAs, were the slowest to return to work while all six CMAs experienced less work-from-home in 2023 than in 2021. Perhaps most noteworthy for urban real estate, while work locations closer to the downtown core engaged in significantly more teleworking in 2021, the effect was essentially neutralized between 2021 and 2023 – indicating a pattern of teleworking which is less spatially concentrated in the downtown cores. The intra-metropolitan shifts in teleworking are of particular importance and suggest tremendous restructuring of land markets and activity patterns within city-regions which continue to evolve. Differences between the models including respondents of all occupation types (which are shown in this manuscript) and models only including office-related occupations (which are not shown in this manuscript) provide suggestive evidence that occupation-based location decisions and teleworking decisions may be made in conjunction with one another. Similarly, higher regional population densities (within ten kilometers) are associated with higher rates of teleworking in 2021 but this effect diminishes by 2023 (although this is not the case in unshown models exclusively focused only on office jobs). Again, this implies occupation-based work location decisions in which teleworking is simultaneously considered – a hypothesis in need of future testing. However, when considering European countries in which the historic central cities do not play a different cultural and economic role in the broader city-region, the vulnerability of urban centers may not be as pronounced as that illustrated here in the Canadian context.

Finally, several of these findings underscore the need to understand telework as either an economic or a merit service – leading to significant policy implications. Insofar that telework was (perhaps only briefly?) dominated to such an extent by a high-income mobility market, using evidence from the pandemic and/or its recent aftermath may bias long term decisions in favor (or against) those marginal teleworkers. Most specifically, over or underestimating telework in specific neighborhoods may over or underestimate travel demand in ways which are either highly regressive or (conversely) naively progressive. Similarly, insofar that there are highly nuanced differences and rates of change in ethnic Asian, and intersectional (immigrant and ethnic Asian) propensities to telework, the travel needs of specific groups may be under or overestimated. Conversely, if the evidence for latent teleworking demand among women is robust, this suggests that teleworking may be interpreted as a merit good – perhaps based on the Capabilities model (Vecchio & Martens, 2021) – whereby the specific capabilities (e.g. telework as a form of accessibility) may lead to better functionings across different domains (e.g. domestic, parenting, and work responsibilities).

Overall findings paint a portrait of significant new opportunities for cities to absorb teleworking into their daily landscapes of activity. The rapid changes in teleworking over time indicate that transportation policy will need to be adaptive. Prognostications about urban decline in the wake of teleworking appear to be unwarranted. Instead, many of the most active spaces of churn in translating teleworking niches into regimes of function will likely center on the actions of individual employers (e.g. requirements and/or freedom to telework), individual workers, and the households in which those workers are embedded. Half of the employees continue working exclusively outside of the home. Hybrid work appears to have become significantly more common, so commercial offices may similarly face the challenges of highly concentrated peak occupancy (e.g., 1–2 days per week) while office spaces remain underutilized during other weekdays. This Schumpeterian crisis of production will likely take time to unfold. However, for public sector actors, it may be prudent to continue monitoring observed teleworking while engaging in scenario-based analyses to clarify the robustness of alternative transportation infrastructure interventions considering different potential futures. Likewise, there are limitations in studies like these, as they consider a finite period of change (in this case using survey waves from 2021 and 2023 and survey questions designed to look at teleworking before the pandemic, during the pandemic, in the fall of the survey year, and under ideal circumstances). As such, these findings will need to be tested further to explore what changes end up sticking and which do not.

CRediT authorship contribution statement

Matthias Sweet: Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Darren M. Scott:** Writing – review & editing, Writing – original draft, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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