GEORGIA DOT RESEARCH PROJECT 22-04

Final Report

WHAT IS THE NEW NORMAL? AN ANALYSIS OF POST-COVID-19 COMMUTE AND WORK PATTERNS

Office of Performance-based Management and Research
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7. Author(s): Ilsu Kim (https://orcid.org/0000-0001-6517-363X); Patricia L. Mokhtarian, Ph.D. (https://orcid.org/0000-0001-7104-499X); Giovanni Circella, Ph.D. (https://orcid.org/0000-0003-1832-396X)		8. Performing Organization Report No.: 22-04
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16. Abstract:
This study aims to understand the post-COVID work and commute patterns of Georgia (adult) workers and investigates how those patterns are related to the workers' characteristics relevant to travel behavior and demand. An online survey was designed to gather information on attitudes on various topics, job characteristics, work and commute patterns, vehicle ownership status, residential location, and sociodemographic traits. The survey was distributed to (1) an online opinion panel (OP) managed by Qualtrics and (2) the Georgia respondents who consented to be contacted again for a future survey when they participated in the 2017 National Household Travel Survey (NHTS) and/or the survey administered for Georgia Department of Transportation (GDOT) Research Project (RP) 16-31. (Trimmed) sample weights were developed and applied to the working dataset (N=1931) to make the sample as representative of Georgia workers as feasible with respect to key sociodemographic traits, employment status, working-from-home engagement, and residential location region. Key findings were obtained from the trimmed-weighted sample: (1) detailed work and commute patterns of Georgia workers and (2) comparisons among region and worker types with respect to many variables collected (e.g., attitudes, sociodemographic traits, commute distance/mode, vehicle ownership, residential location). The study concludes with potential uses of the collected data and policy implications.

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AN ANALYSIS OF POST-COVID-19 COMMUTE AND WORK PATTERNS

By

Ilsu Kim
Graduate Research Assistant,
Civil and Environmental Engineering, Georgia Institute of Technology

Patricia L. Mokhtarian, Ph.D.
Clifford and William Greene, Jr. Professor,
Civil and Environmental Engineering, Georgia Institute of Technology

and

Giovanni Circella, Ph.D.
BOF Professor of Mobility,
Department of Geography, Ghent University
Director, 3 Revolutions Future Mobility Program,
Institute of Transportation Studies at the University of California, Davis

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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yard	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
		NOTE: volumes greater than 1000 L shall be shown in m^3		
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
		TEMPERATURE (exact degrees)		
^oF	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	^oC
		ILLUMINATION		
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	candela/m^2	cd/m^2
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.314	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
		TEMPERATURE (exact degrees)		
^oC	Celsius	1.8C+32	Fahrenheit	^oF
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m^2	candela/m^2	0.2919	foot-Lamberts	fl
		FORCE and PRESSURE or STRESS		
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

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LIST OF ABBREVIATIONS AND SYMBOLS

ACS	American Community Survey
AL	Alabama
ANOVA	Analysis of variance
ATL MSA	Atlanta–Sandy Springs–Alpharetta, Georgia Metropolitan Statistical Area
COVID(-19)	Coronavirus Disease (2019)
CPS	Current Population Survey
DFA	Dallas–Fort Worth–Arlington
EFA	Exploratory factor analysis
EU	European Union
GA	Georgia
GDOT	Georgia Department of Transportation
Georgia Tech	Georgia Institute of Technology
IP	Internet Protocol
IQR	Interquartile range
IRB	Institutional Research Board
MSA	Metropolitan Statistical Area
NextGen NHTS	Next Generation (2022) National Household Travel Survey
NHTS	National Household Travel Survey
NTWer	Non-TWer
NUTWer	Non-usual TWer
OP	Opinion panel

Pax	Passenger
Post-COVID	Post-Coronavirus Disease 2019
PRC	People's Republic of China
Pre-COVID	Pre-Coronavirus Disease 2019
Q	Question (e.g., Q5 = Question 5)
RP	Research Project
RW	Regular workplace
SC	South Carolina
TN	Tennessee
TOMNET	Teaching Old Models New Tricks
TW(ing)	Telework(ing)
TWer	Teleworker
US (or U.S.)	United States
UTWer	Usual teleworker
VMD	Vehicle miles driven
WAA	Washington–Arlington–Alexandria
WFH	Work(ing) from home

EXECUTIVE SUMMARY

The COVID-19 pandemic forced dramatic short-term changes in commute and work patterns onto residents of Georgia, with longer-term effects that are not well understood – on traffic, transit demand, vehicle ownership, and residential location, among others. Hence, re-evaluating what we used to know about travel and activity patterns is essential in developing land-use and transportation plans and policies for the post-COVID era. Therefore, this study aims to capture the post-COVID work and commute patterns of Georgia workers and examine how the patterns are associated with the workers' individual and household characteristics relevant to travel behavior and demand. To be more specific, the main topics of interest include (1) the adoption rate and frequency of working from home,[1] (2) characteristics of employees working from home (separately for those with lower and higher frequencies), (3) activity patterns on teleworking[2] days, and (4) differences in commute patterns (e.g., commute length and mode), vehicle ownership status, and residential location across worker types (non-teleworkers, non-usual teleworkers, and usual teleworkers).

The research team administered a survey specifically designed to collect information on attitudes on various topics, job characteristics, work and commute patterns, vehicle ownership status, residential location, and sociodemographic traits. The survey (formatted in Qualtrics) was distributed online for the time and cost efficiency in data collection and entry, in view of the short project timeline (March 1, 2022 – November 1, 2023). The survey design process started a

[1] In this summary, we will use the acronym "WFH" to mean either "work from home" or "working from home".
[2] "Teleworking" (TWing) is defined as doing paid work from *home* or *alternative telework locations* instead of the *regular workplace* or *customer locations*. See Section 2.1.2 for key definitions in the survey. Also, "telework" is abbreviated to "TW" as appropriate in this summary.

few months earlier than the official start date, which enabled to start data collection in March 2022.

Survey respondents were recruited from two sampling frames: (1) an online opinion panel (OP) managed by Qualtrics, and (2) the Georgia respondents who indicated their interest in participating in future surveys when they responded to the 2017 National Household Travel Survey (NHTS) and/or the survey administered for Georgia Department of Transportation (GDOT) Research Project (RP) 16-31 (*The Impact of Emerging Technologies and Trends on Travel Demand in Georgia*). Data were collected from March 22, 2022 to June 30, 2022 (N=1,978) for the OP survey and from March 14, 2022 to May 31, 2022 for the recontact survey (N=228). After conducting quality checks and data cleaning to fix or remove cases with many invalid, inconsistent, questionable, and missing responses, we retained a working sample of 1,931 cases (OP survey: 1,710, recontact survey: 221). Subsequently, we developed sample weights to make the sample more representative of the study population (i.e., adult workers in Georgia) with respect to key sociodemographic traits, employment status, WFH engagement, and residential location region. The resulting trimmed-weighted sample (see Section 2.3.3 for details) closely represents the study population with respect to the ten variables used in sample weighting.

Chapter 3 (Empirical Findings) presents the key findings we obtained from the *trimmed-weighted* sample. We primarily make comparisons among worker types and region types. The three worker types are "usual teleworker" (UTWer, WFH for full days at least three times a week), "non-usual teleworker" (NUTWer[3], WFH for full days less than three times a week), and

[3] We will use the term "TWers" to refer to UTWers and NUTWers together in this summary.

"non-teleworker" (NTWer). The three region types are "the ATL MSA" [4] (29 counties), "other MSAs" [5] (45 counties), and "non-MSA" (85 counties) (see Section 2.3.3 for more details). Please note that working for a "full day" indicates working (at a certain location) for the *entire* normal work schedule that day, while working for a "partial day" means working for *only some* of the normal work schedule.

Listed below are *selected* key questions with short answers from the *trimmed-weighted* sample representing Georgia workers in the spring and early summer of 2022.

- ***What share of workers can telework (Section 3.1)?*** The (maximum) *feasible telework frequency* is restricted by the permission of supervisor(s) and the nature of the job. In Georgia, 25.6% of workers are allowed to telework at least once a week (ATL MSA: 31.9%, other MSAs: 18.7%, non-MSA regions: 10.8%) and 17.6% are allowed to telework at least three times a week (ATL MSA: 21.7%, other MSAs: 13.4%, non-MSA regions: 7.4%).

- ***How often do people telework, at various kinds of locations and amounts of the workday (Section 3.2)?*** The most popular way of teleworking is working from home for full days. For instance, the statewide share of employees working from home for full days at least once a week is 24.1% (partial-day WFH: 12.6%), while the corresponding shares for working at alternative telework locations are much lower (full day: 4.6%, partial day: 4.1%). The ATL MSA has substantially more employees WFH at least once a week (full day: 30.6%, partial

[4] The Atlanta–Sandy Springs–Alpharetta, Georgia Metropolitan Statistical Area (MSA).
[5] See Table 4 for the full list of 14 MSAs.

day: 14.7%) compared to other MSAs (full day: 15.8%, partial day: 10.3%) and non-MSA regions (full day: 11.6%, partial day: 8.0%).

- ***What percent of workdays are teleworked (Section 3.3.1)?*** In a typical week, Georgia employees work 4.07 full days on average, with 2.75 full days at their regular workplaces (RWs) (67.6%), 0.82 full days from home (20.1%), 0.11 full days at alternative telework locations (2.7%), and 0.39 full days at customer locations (9.6%). Hence, 22.8% (20.1% (home) + 2.7% (alternative telework locations)) of full workdays are teleworked. The share is largest for the ATL MSA (28.3% = 25.4% + 2.9%), with other MSAs (16.2% = 13.2% + 3.0%) and non-MSA regions (10.8% = 9.8% + 1.0%) following well behind.

- ***How often do employees in each worker type WFH (Section 3.3.2)?*** In an average week, NUTWers work 0.80 full days and 0.79 partial days from home, while (by definition) UTWers WFH much more often, especially for full days (4.15, plus 1.04 partial days).

- ***How does the distribution of worker types differ by region type (Section 3.4.1)?*** The share of UTWers is much higher for the ATL MSA (21.1%) than the shares for other MSAs (10.5%) and non-MSA regions (7.0%). Similarly, the ATL MSA has a much greater share of NUTWers (19.9%) than other regions (other MSAs: 12.3%, non-MSA: 13.9%).

- ***For what types of organizations do employees in each worker group work, and what are their employment types (Section 3.4.2)?*** Employees who WFH for full days often are less likely to work for education or health care organizations (NTWer: 17.1%, NUTWer: 14.4%, UTWer: 9.0%). On the other hand, the share of those who are self-employed or working for

family-owned businesses is larger for TWers (UTWer: 25.0%, NUTWer: 23.2%) than for non-TWers (14.6%).

- ***Does each worker type have distinct sociodemographic traits (Section 3.4.3)?*** TWers are more often highly educated, working full-time, racially diverse, living in the ATL MSA, having high household incomes, and belonging to a small-size household (with one or two adults). Between the two TWer groups, NUTWers are more often younger, male, not self-employed, and having (non-adult) children in the household but UTWers are more often older, female, self-employed, and having no children in the household.

- ***How do the three worker groups differ attitudinally (Section 3.4.4)?*** On average, TWers are more favorable toward non-car travel modes (transit, walking, and bicycling), and more pro-environment, urbanite, and life- and job-satisfied. With the most positive attitudes toward TWing, UTWers are the most tech-savvy but the least pro-car-owning and career-oriented. Consistent with being more often self-employed, they are more inclined to think they are autonomous at work and their performance at work is measurable, compared to the workers in other groups. NUTWers are concurrently the most travel-stressed and commute-positive. At the same time, they are the most pro-teamwork and most concerned about work/family interference (although on average, all worker groups disagree that the latter is a problem).

- ***How has the share of each worker type changed since before the COVID-19 pandemic (Section 3.5)?*** The pre-COVID (2019) UTWer shares are 6.94% in Georgia and 8.84% in the ATL MSA. The increase in UTWers during the pandemic was greater in the ATL MSA; the 2022 shares are 16.34% in Georgia (9.40 percentage point ↑) and 20.97% in the ATL MSA (12.13 percentage point ↑). The shares of NUTWers increased from 6.40% to 17.00% in

Georgia (10.60 percentage point ↑) and from 8.15% to 19.71% in the ATL MSA (11.56 percentage point ↑). Overall, between 2019 (pre-pandemic) and 2022, TWer shares increased by a factor of 2.5 (from 13.34% to 33.34%) in Georgia and by a factor of 2.4 (from 16.99% to 40.68%) in the ATL MSA.

- ***When do workers telework? (Section 3.6.1)?*** *Full-day* TWing occasions occur more on weekdays than weekend days and are more likely to be regularly scheduled and prearranged (compared to *partial-day* TWing occasions).

- ***What out-of-home activities are conducted on teleworking days (Section 3.6.3)?*** When respondents who telework at least once a month (whether from home or from an alternative location) were asked about their out-of-home activities on their last teleworking day, slightly more than a quarter (27.2%) of those who teleworked for a full day (on that day) stayed entirely at home, but only 13.6% of those who teleworked for a partial day did so. Interestingly, 9.7% of the former group still commuted on that day (which is more than expected; see Section 3.6.3 for potential explanations), while 26.6% of the latter group did so. The preference for out-of-home activities turned out to be rather similar between the two groups. However, the former group conducted "dropping off (or picking up) others" on the last teleworking day (14.7%) particularly more than the latter group (7.6%), which is within reason considering the better flexibility in time and location on a full-day teleworking day. Another activity that the former group (34.4%) conducted more than the latter group (28.5%) is "exercise".

- ***How does teleworking impact out-of-home activities (Section 3.6.4)?*** Respondents who reported a specific out-of-home activity conducted on the last teleworking day were asked

how teleworking affected the activity. We found that teleworking affects out-of-home activities in various ways for all activities to some extent. The activities that are relatively more likely than other non-commute out-of-home activities to have been conducted at a different time (within the same day) are "exercise" (34.3%) and "recreational activities" (32.3%). On the other hand, the activities that are relatively more likely to have been switched to the last teleworking day from another day are "visit family/friends" (39.0%), "personal business" (37.4%), and "general errands" (33.2%). Understandably, a higher share of those who reported "work-related travel" (19.2%) on their last teleworking day conducted the activity at a different place due to teleworking (compared to other non-commute activities).

- ***How does vehicle ownership[6] differ by region type (Section 3.7.1)?*** Statewide, 4.1% of respondents reported having zero household vehicles (ATL MSA: 5.0%, other MSAs: 3.1%, non-MSA: 2.6%). Controlling for the number of adults in the household, the distribution of vehicle sufficiency is somewhat similar in other MSAs and non-MSA regions. However, workers in the ATL MSA are less likely to belong to a vehicle-surplus household (vehicle count > adult count) than workers in the other region types.

- ***How does vehicle ownership differ by worker type (Section 3.7.2)?*** The share of respondents with zero household vehicles is largest for NTWers (4.8%), followed by UTWers (3.2%) and NUTWers (2.3%). At the same time, the NTWer group has a more varied vehicle count distribution (than TWers) and, in fact, also has the *highest* average vehicle count. UTWers

[6] For brevity, we use "ownership" or "having" vehicles to include owning or leasing vehicles, or having them provided by an employer.

have the highest shares belonging to a household with a sufficient or surplus number of vehicles (72.0%) (NUTWer: 66.0%, NTWer: 67.5%). On the other hand, NUTWers are most likely to be in vehicle-deficit households (31.7%) and least likely to be in vehicle-surplus households (13.2%) across all worker groups.

- ***Is teleworking associated with changes in vehicle ownership since the pandemic began (Section 3.7.3)?*** Statewide, more workers experienced an increase in the household vehicle count (15.6%) than a decrease (7.1%) since March 2020 (i.e., immediately before the COVID-19 pandemic). NUTWers experienced changes in both directions the most (increase: 19.6%, decrease: 8.2%). On the other hand, the share for "increase" is the lowest for UTWers (11.4%) and their share for "decrease" is on the lower side (7.1%, while the lowest is 6.9%, for NTWers). This implies that the impact of full-day WFH frequency on the household vehicle count is neither unidirectional nor monotonic.

- ***To what extent (if any) did the pandemic influence changes in household vehicle ownership (Section 3.7.4)?*** The respondents with any changes (i.e., increase, decrease, or replacement) in household vehicles compared to March 2020 were asked how much the COVID-19 pandemic influenced the household's decision to make the change. The share of those who responded that the pandemic had at least "somewhat" influenced the decision is much greater for "decrease" (51.4%), compared to "increase" (29.2%) and "replace" (21.9%), the order of which is true for all worker types.

- ***Who is more likely to have pandemic-related changes in household vehicles: non-TWers, or TWers (Section 3.7.4)?*** For all types of changes in household vehicles (i.e., increase, decrease, and replacement), TWers are more likely to associate their changes with the

pandemic than non-TWers are. Specifically, the shares of respondents who responded that the pandemic had at least "somewhat" influenced the household's decision to make a change is much smaller for the NTWer group (23.6%, 37.5%, and 17.8% of those who experienced an increase, a decrease, and replacement, respectively, gave that response) than for the NUTWer group (43.7%, 80.1%, and 31.1%) and UTWer group (34.2%, 71.2%, and 29.2%).

- ***Who drives more (Section 3.8)?*** The shares of respondents who do not drive even occasionally are the lowest for workers in non-MSA regions (5.8%) (ATL MSA: 6.9%, other MSAs: 7.7%) and for NUTWers (5.3%) (NTWers: 7.2%, UTWers: 7.3%). The statewide average weekly VMD of workers is 122.8 miles (ATL MSA: 117.1 miles, other MSAs: 116.5 miles, non-MSA: 157.1 miles). UTWers drive substantially fewer miles on average than other worker groups in all region types, which is most prominent in non-MSA regions with distinctively high average weekly VMD of NTWers.

- ***How does commute distance relate to teleworking status (Section 3.9.1)?*** Most NTWers (92.8%) and NUTWers (90.9%) go to the RW at least occasionally, while only less than half of UTWers (45.9%) do. Slightly less than four out of ten UTWers (37.7%) *cannot* work at a non-home RW (self-employed with home-based job: 21.2%, no RW: 16.5%), and around one out of ten (9.3%) do not go to their non-home RW (even though they have one) due to COVID-19. Among those who have a non-home RW, the median and mean distance to the RW is 10.0 miles and 14.1 miles for NTWers, but the values are much larger for TWers (NUTWers: 12.0 miles and 18.3 miles, UTWers: 15.1 miles and 44.3 miles). A large gap between the median and the mean for UTWers stems from the relatively high share of UTWers with a non-home RW who live at least 100 miles away from the RW (3.7%).

- ***How do TWers commute (Section 3.9.2)?*** In Georgia, driving alone is the prevailing commute mode (83.7%[7] of those working at the RW for full days at least once a week and 71.2% of those doing so less than once a week). Carpooling is the second most popular mode: 18.2% ("≥ once a week") and 8.5% ("< once a week"). The shares for ridehailing, bus/train, and walking range from 2.5% to 4.7%. Among the respondents who work at the RW for full days at least once a week, the primary commute mode is more likely to be driving alone and less likely to be carpooling or walking for TWers, than for non-TWers, conceivably due to their long commute distances. This is more so for UTWers because they live farther from the RW than NUTWers do.

- ***In what kinds of neighborhoods do teleworkers live (Section 3.10.1)?*** Proportionally, many more TWers define their neighborhoods as an urban or suburban area (NUTWers: 74.0%, UTWers: 79.9%) than non-TWers do (62.0%). Intriguingly, the shares of "urban" dwellers are larger for NUTWers (31.5%) than for UTWers (21.1%), while the shares of "suburban" dwellers are larger for UTWers (58.8%) than for NUTWers (42.5%). The high share of UTWers living in a suburban area may be related to their high shares of older workers and ATL MSA residents.

- ***Are teleworkers more residentially mobile than non-teleworkers (Section 3.10.2)?*** The share of respondents who moved to their current neighborhood in 2020 or after (≈ since the outbreak of the pandemic) is 20.9%, which is more than the share for 2017-2019 (≈ within five years but before the pandemic) (17.3%), indicating the increased mobility of workers

[7] The commute mode shares for those working at the RW for full days at least once a week add up to a value larger than 100%, because a worker can have more than one primary commute mode when two or more modes are tied for most frequently used.

since the outbreak of the pandemic. UTWers have the highest shares for both move periods (2020 or after: 23.9%, 2017-2019: 20.6%) across all worker types. This agrees with the fact that UTWers would have more flexibility in residential relocation due to their low frequency of commuting to the RW and small household sizes. In contrast, NUTWers have the lowest share of those who moved to their current neighborhood in 2020 or later (17.3%), potentially because they still go to the RW quite often and generally belong to larger households (with more constraints on residential relocation).

- ***Are teleworkers more likely than non-teleworkers to be planning to move (Section 3.11.1)?*** When asked how likely they were to change where they live over the next three years, 40.3% responded that a move within three years is unlikely for them, 38.5% said it is likely, and the rest (21.2%) were neutral (i.e., selected "somewhat") about it. The differences across worker types do not stand out, but UTWers are most inclined to think a move is likely (40.2%), while NUTWers are least likely to think so (35.1%), reflecting the flexibility in residential relocation revealed in Section 3.10.2.

- ***Where do TWers want to move, if they do move (Section 3.11.2)?*** Among respondents who think a move within three years is at least "somewhat" likely, TWers are more likely to have a firm idea about whether they are going to stay within the current city/region or not; the share of respondents with no idea is markedly higher for NTWers (27.4%) than for NUTWers (20.0%) and UTWers (21.2%). NUTWers (who think moving is at least somewhat likely) are more inclined to expect to stay within the current city/region (39.8%, compared to 33.7% for NTWers and 35.3% for UTWers), consistent with the earlier findings that NUTWers (in total) have lower mobility in terms of residential location. However, compared

to their current location, NUTWers who think moving is at least somewhat likely tend to want to live in a more urban place with more land-use variety (assuming that they move), even though many NUTWers (in total) are already living in urban neighborhoods (31.5%, compared to 21.1% for UTWers and 17.9% for NTWers) according to Section 3.10.1.

- ***How feasible did Georgia workers expect teleworking to be in about a year (March 2023) (Section 3.12.1)?*** Overall, Georgia workers expected to see enhanced TW feasibility in the future. At the time of data collection (Spring 2022), TWing was "never" feasible for 62.6% of workers, but only 50.1% expected it never to be feasible in March 2023. Among respondents expecting to work for pay in March 2023, 20.9% and 31.3% expected TWing to be feasible at least *three* times a week and at least *once* a week, respectively, whereas only 17.5% and 25.5% of them had such feasibility frequencies in Spring 2022.

- ***How often did workers expect (and prefer) to telework in about a year (March 2023) (Section 3.12.2)?*** At the time of data collection (Spring 2022), about four in ten workers in Georgia (40.5%) TWed in any form, *even if only occasionally*. However, 47.5% respondents *expected* to do so a year later, which seems to be *over-optimistic* considering that TW occasions have been slowly decreasing with slight fluctuations since 2022, and may have now roughly stabilized (Barrero et al., 2021). These expectations are driven in large part by the preference for TWing: 65.6% of respondents reported *preferring* to TW in March 2023.

The last chapter (Chapter 4) provides recommendations and policy implications. Three potential additional analyses of the data were suggested for further improvement in the understanding of work patterns and their impacts: (1) testing other ways of grouping workers with both partial-day and full-day WFH frequencies (or, even more elaborately, with all eight work pattern variables in

the dataset); (2) estimating disaggregate models of WFH, vehicle ownership, VMD, and/or residential location; and (3) cross-referencing the findings in the present study with the findings in GDOT RP 16-31 (Kim et al., 2019) and RP 18-24 (Kash et al., 2021). The latter two studies also involve statewide survey samples (both mostly collected in 2017), and comparison on a number of benchmark indicators would provide a detailed look at the changes over a five-year period that ended as the pandemic was winding down.

We also provided a few suggestions for future data collection activities. First, whenever possible, it is more than worthwhile to ask respondents about their willingness to be contacted for future surveys, and their preferred contact methods (if willing), which can bring a good number of high-quality responses to future surveys at relatively minimal cost. Second, for improved validity of descriptive analyses, it is imperative to prepare adequate measures (e.g., set proper quotas when collecting the data, develop rigorous sample weights afterwards) to deal with potential oversampling of specific segments of the population when administering an online survey. Third, moving from "specific" to "general" when measuring work patterns can likely improve data quality. Lastly, we suggested collecting information about the travel and activity patterns of household members other than the survey respondents themselves, to further investigate the impacts of the work patterns of one worker in a household on the "net" household-level travel/activity outcomes.

Key policy implications of this study are as follows:

- This study offers a snapshot of the teleworking amounts, and resulting travel and activity patterns, of Georgia workers in 2022. However, this study is limited to providing only first-

order insights into the key drivers of teleworkers' travel behavior, requiring further efforts to better understand the relationships between teleworking and travel/activity patterns.

- We recommend that transportation planners carefully monitor how teleworking evolves and proactively equip regional demand models with capabilities to incorporate teleworking and its transportation-related impacts into travel demand forecasting.

- We comment on the need for ubiquitous, reliable, broadband infrastructure throughout the state, not only to remove a constraint on the ability to telework, but also for the many other societal and personal benefits it brings. We recognize that the State of Georgia is already addressing this need.

1. INTRODUCTION

1.1 Research Background

Commuting remains the linchpin of daily travel patterns in most urbanized areas, with its diurnal peaks, its role as an anchor to other local business-related and non-work travel, and therefore its contribution to congestion, fuel consumption, pollution, greenhouse gas emissions, and safety. However, the COVID-19 pandemic has upended historical trends with respect to working and commuting, with the result that we no longer know (or, at least, are less sure about) things that used to be well established. Short-term behaviors have diverged in many ways from the pre-pandemic past, and first-order changes are being followed by second-order adjustments: an additional car may have been purchased to handle former transit trips, a job loss may have caused younger individuals to move back in with their family of origin, other families may have replaced an apartment in the central city with a suburban house with a yard for the children to safely play in and space for two adults to work from home (WFH[8]), and still other employees may now be living several hundred miles away from their employers, with only occasional "commutes".

But how long-lived are these changes? To what extent have the more easily reversible changes snapped back in the aftermath of the pandemic? To what extent have the "stickier" changes (such as in vehicle ownership and residential location) contributed to new travel patterns? The answers matter a great deal to state and local transportation planning, affecting issues such as gas tax and

[8] In this report, we will use the acronym "WFH" to mean either "work from home" or "working from home".

toll road revenues, traffic volumes, transit revenue and operations, business district retail, residential location trends, real estate development and future urban form, and many more.

What precedes answering such questions, in fact, is having a good picture of the current state. Hence, the objective of this research is to analyze (1) the post-COVID commute and work patterns of a representative sample of employed adults in Georgia and (2) the associations that the patterns have with other individual and household characteristics related to travel behavior and demand (e.g., sociodemographic characteristics, attitudes, vehicle ownership, residential location). Some specific research questions include, but are not limited to: (1) What are the adoption rates and frequencies of working from home in Spring 2022, representing a post-COVID new normal? (2) What demographic, geographic, and attitudinal characteristics are associated with adoption/non-adoption, higher or lower frequencies? (3) What out-of-home activities do workers conduct on teleworking days (i.e., days of working from home or at alternative telework locations; see the definitions in Section 2.1.2)? (4) What is the distribution of one-way commute lengths and commute modes? and (5) What is the relationship between the work-from-home frequency and household characteristics (e.g., household size and composition, vehicle ownership, and residential location)?

To answer these research questions, we designed a survey and administered it to a large sample of Georgia workers, weighted to be representative of the employed population. Passive forms of data collection (e.g., traffic and passenger counts) are ubiquitous in our digitized era, and there is no shortage of highly aggregated information about nearly real-time changes in many of the behaviors and traits described above. In addition, the Next Generation (2022) National Household Travel Survey (NextGen NHTS) will provide a disaggregate-level snapshot of travel

behavior once the data are initially cleaned and released. Neither source of data, however, provides insights into the preferences, constraints, motivations, and intentions that not only explain current behavior, but also help predict likely future behavior – a property that is essential if planning is to be proactive rather than merely reactive (see Mokhtarian (2018) for more details on the value of survey data in transportation research and planning).

This report focuses on the process of survey design and administration, data collection and cleaning, and descriptive statistics of key variables (by region and worker type), providing a snapshot of Spring 2022 in Georgia. Through a detailed examination of commute and work patterns and associated attitudes and behaviors (e.g., out-of-home activities, vehicle ownership, residential location), the results from this study are expected to contribute to improved forecasting of travel behavior and other outcomes using modeling tools of Georgia Department of Transportation (GDOT). Also, comparing the findings from this study with those from previous GDOT research projects that investigated similar topics (e.g., RP 16-31: *The Impact of Emerging Technologies and Trends on Travel Demand in Georgia* (Kim et al., 2019), RP 18-24: *Analysis of the Georgia Add-on to the 2016-2017 National Household Travel Survey* (Kash et al., 2021)) will enhance the understanding of the changes since the pandemic, therefore potentially benefiting transportation planning and policy-making in multifaceted ways. In addition, this report suggests some potential ways to make use of the data from this study in future research, provides suggestions for future data collection activities, and discusses some policy implications.

1.2 Structure of the Report

The remainder of this report consists of three chapters. Chapter 2, “Survey Design and Administration”, explains (1) the survey design, contents, and administration (2) quality checks

and data cleaning procedures including home address geocoding, and (3) development of sample weights. Chapter 3 (“Empirical Findings”) describes the key findings along a number of dimensions. Chapter 4 presents “Conclusions and Recommendations”, which highlight the main findings and provide suggestions for future studies.

2. SURVEY DESIGN AND ADMINISTRATION

This chapter outlines the survey design and administration process. Section 2.1 discusses the survey design and its contents; Section 2.2 describes the data collection activities; and Section 2.3 explains the cleaning and preparation processes that were undertaken to maximize the quality of the working sample to be analyzed in the remainder of this report.

2.1 Survey Design

This section discusses how the research team designed the survey. The first subsection describes the design process, the second subsection explains the key definitions used in the survey, and the last subsection sketches the survey structure and contents.

2.1.1 Survey Design Overview

As aforementioned, survey data can provide valuable information about respondents that cannot be obtained from other sources (e.g., attitudes/preferences, motivations/constraints related to choices they made, expected future behavior). Making the most out of these benefits, we designed a survey collecting information on current behavior with respect to WFH, commuting, vehicle ownership, and residential location as well as attitudes on various topics. For improved insight into what respondents *do*, we also explored what they *do not do* (such as why they do not go to the regular workplace if they do not), and whether teleworking *changed* what they do. At the same time, we asked about what respondents *expect to do* in the future (e.g., expected changes in their residential location). The last section of the survey obtains standard sociodemographic information (e.g., sex, birth year, race, ethnicity).

The survey was distributed online after being formatted in Qualtrics. Qualtrics is an online survey platform, to which the Georgia Institute of Technology (Georgia Tech) holds a site

license. An online survey was chosen mainly because of its rapidity in data collection. Considering the short timeline for this research project (March 1, 2022 – November 1, 2023), it was not practical to collect data through a paper survey because of the time required for printing, delivering, and retrieving questionnaires. For example, it took about a month for the research project team of GDOT RP 16-31 to obtain the first response after they ordered printing through Georgia Tech's Printing & Copying Services and delivery through the U.S. Postal Service (according to Section 4.2 of Kim, Mokhtarian, and Circella (2019)). In addition, implementing an online survey saves the time and cost of data entry.

Spring and fall are considered the best times to conduct travel behavior surveys, to avoid the unusual travel patterns (as well as the added difficulty in reaching respondents) associated with the summer vacation period and the winter holiday season. There was no flexibility in the project termination date of November 1, 2023. In view of that, collecting the data as late as fall 2022 would not leave the research team enough time for data quality checks, data cleaning, development of sample weights, analysis, and report writing. Accordingly, the team determined to start the data collection in late March 2022, balancing the time needed to design the survey against the need to minimize the impact of Easter (April 17, 2022) and school spring breaks. Working backward from that target, the survey and sampling design processes had to be launched several months before the official start date of the project (which was March 1, 2022). A number of tasks were completed during those early months: determining key definitions, designing the survey logic and questions, preparing the survey document (in Microsoft Word format), and creating the online survey reflecting the survey document. After the official project beginning, March was devoted to obtaining approval from the Georgia Tech Institutional Research Board (IRB) (protocol number H22091, approved on March 10, 2022) and pretesting

the survey (both internally and externally) to improve and finalize it. As discussed in Section 2.1.3, the survey was distributed to two different sources of respondents, which made it necessary to prepare two versions of the survey, albeit with only marginal differences.

2.1.2 Key Definitions in the Survey

Any survey of teleworking should pay careful attention to definitions, since a wide variety of work arrangements, differing substantially in their travel implications, could be considered to qualify for the term (Mokhtarian et al., 2005). Accordingly, it is important to try to ensure that the respondents' and analysts' concepts of what should be included are aligned. Other terms are in similar need of explicit definition. Therefore, we clarified a few terms regarding work location and work arrangement at the beginning of the survey section regarding current (tele-)work patterns (see Section C of the survey document in Appendix A). In addition, several more terms are explained multiple times in the survey.

The key definitions are as follows:

1) The **regular workplace** (also called "RW" hereafter in this report) indicates the main location of a respondent's employer. If the respondent usually works from home, but sometimes meets physically with other people at another location of his/her organization, that other location is the RW, even if it is far away. If the respondent is self-employed and his/her job is based at home (even if s/he often travels to customers or elsewhere), the respondent is told that home is considered the regular workplace, but to minimize confusion s/he is only shown responses labeled "home", not those labeled "regular workplace" in Q5 of Section C.

2) **Alternative telework locations** are places (other than home) where a respondent teleworks. They can be alternative offices in a different building of his/her organization, telework centers/coworking spaces (e.g., WeWork or Regus), coffee shops, parks, and/or libraries.

3) **Customer locations** are the places where a respondent *goes to the customer* (not the converse) to provide in-person services (e.g., housekeeping, caregiving, repairs).

4) **Teleworking** (also called "TWing"[9] hereafter in this report) refers to doing paid work from *home* or *alternative telework locations* instead of the *regular workplace* or *customer locations*. Even if home is the regular workplace, working from home is considered teleworking. However, teleworking does not include working overtime at home (e.g., after hours, during the weekend), moonlighting (working a side job) from home, or field visits.

5) Working for a **full day** means working at a certain location for the entire normal work schedule that day. A respondent's normal work schedule is the hours s/he typically works on a given day. For instance, if s/he normally works a 12-hour shift on Mondays, his/her *full day* would be 12 hours that day. However, if s/he is a part-time worker normally working 5 hours on a certain day, his/her *full day* would be 5 hours that day.

6) Working for a **partial day** means working at a certain location for only some of a respondent's normal work schedule that day. For example, if s/he goes to the RW in the

[9] "Telework" and "teleworker(s)" are abbreviated to "TW" and "TWer(s)" as appropriate hereafter in this report. Please see the formal definition of TWers in Section 2.3.3.

morning, comes back home at noon, and works the rest of the day at home, that counts as a *partial day* of work at the RW and a *partial day* of work at home).

7) The **primary job** indicates the job at which a respondent works the most hours if s/he has more than one job.

8) A **household** refers to people who live together and share some financial resources. Housemates/roommates are usually not considered members of the same household.

2.1.3 Contents of the Survey

Two versions of the survey were prepared, because we recruited respondents from two different sources: (1) an online opinion panel (OP) managed by Qualtrics, and (2) the Georgia respondents who agreed to be recontacted for a future survey when they participated in the 2017 National Household Travel Survey (NHTS) and/or the survey administered for GDOT RP 16-31 (*The Impact of Emerging Technologies and Trends on Travel Demand in Georgia*)[10]. The two versions of the survey (hereafter referred to as the "OP survey" for the first source and the "recontact survey" for the second source) have a few differences.

First, the OP survey respondents were incentivized via rewards offered through their membership in the opinion panel, whereas we directly incentivized respondents to the recontact survey by inviting them to enter a drawing for one of five $100 gift certificates (IRB guidance required that we extend this invitation to every prospective respondent, not only those who completed the survey). Accordingly, the recontact survey asked for respondents' name,

[10] Hereafter in this report, the surveys are referred to as the "NHTS Georgia add-on" (see https://www.nrel.gov/transportation/secure-transportation-data/tsdc-2017-national-household-travel-survey-georgia-add-on.html) and the "GDOT Emerging Technology survey".

telephone number, and email address at the beginning of the survey (before they saw the cover letter), but also allowed them to skip providing that information if they preferred to complete the survey anonymously, without being entered into the drawing.

Second, in the last section of the survey (Section G), the recontact survey asked whether respondents were interested in being contacted again ("for any questions about this survey" and/or "for a follow-up survey sometime in the future"), and if so, in what ways (i.e., name, telephone number, and/or email address)[11]. We were not allowed to ask for contact information from the OP respondents, for proprietary reasons.

Third, with only a few exceptions, the OP survey did not allow respondents to skip any questions applicable to them, on the principle that each respondent was receiving the same reward (via Qualtrics) whether the survey was complete or not, so we may as well have required it to be complete. However, aside from some key questions, the recontact survey did not require responses to a number of items, since only the few winners of the drawing would be receiving any tangible reward and we wished to allow the response burden to be somewhat lighter.

Lastly, we prepared and sent out recruitment messages to recontacted respondents, which was not needed for OP respondents. We recruited respondents to the recontact survey by sending invitations via email or postal mail based on the contact information we had. The invitations contained the link to the online survey and a unique five-letter access code (see Figure 1 and Figure 2). The recruitment message was slightly shorter for the *mailed* invitations to the

[11] Only nine of the 221 recontacted survey respondents initially did not provide any contact information, but six of those agreed to be contacted for future surveys when asked that question in Section G, presumably because their trust and/or interest increased over the course of the survey.

recontact survey, to fit the invitation on a 3-in × 5-in postcard. The recruitment message for the *emailed* recontact invitations was similar to the cover letter of the OP survey, with slightly different content reflecting our prior engagement with the recontact respondents. Recontact respondents who entered (if invited via a mailed postcard) or clicked on (if invited via an email message) the survey link and entered the access code first saw the opportunity to provide their contact information for the gift card drawing, and then (whether they provided any such information, or instead wanted to complete the survey anonymously) clicked through to the survey cover letter, which was again similar but not identical to the cover letter for the OP respondents (see Figure 3 in comparison with the cover letter in Appendix A), considering that the recontact respondents had already read the recruitment message before seeing the cover letter.

Recontact postcard recruitment message (separate from the survey)

Hello!

A few years ago, you completed a survey about your daily travel. Your information was extremely valuable to us, and if you are interested, you can find our final reports at https://rosap.ntl.bts.gov/view/dot/57499 and https://rosap.ntl.bts.gov/view/dot/56095.

At that time, you indicated that you could be contacted again for future surveys. We are writing to invite your participation in our newest survey, which will ask about your current travel patterns and opinions. Your response is very important to the success of our study.

If you are willing to complete the survey, we encourage you to do so at your earliest convenience. All those who visit the survey site will be eligible to enter a drawing for one of five $100 gift certificates.

You can take the survey online at **<Insert Link Here>,** using your five-letter access code:

<Access Code>

If you have any questions, please feel free to contact either the study team at travel4@ce.gatech.edu or me personally at patmokh@gatech.edu, or call toll-free (888) 404-4818. Thank you again for sharing your thoughts with us!

Figure 1. Postcard recruitment message for the recontact survey

Recontact email recruitment message (separate from the survey)

Dear [respondent name inserted],

A few years ago, you completed a survey about your daily travel. Your information was extremely valuable to us, and if you are interested, you can find our final reports here: https://tinyurl.com/4a69pv6m and https://tinyurl.com/3ayc3kzd. At that time, you indicated that you could be contacted again for future surveys. We are writing to invite your participation in our newest survey, which will ask about your current travel patterns and opinions. Your response is very important to the success of our study.

This subsequent research study seeks to track how work and commute patterns are evolving as the pandemic is winding down. Will you go back to the way things were, keep doing what you're doing now, or something in between or altogether different? This information will help transportation planners and providers to better prepare for the future.

Your participation is entirely voluntary, but your individual response is extremely important to us. Everyone who views the survey will be entered into a drawing to win one of five $100 gift cards (completing the survey is not required for entering the drawing). The survey should take about 30 minutes to complete, and we think you'll find it interesting and fun to do.

Click on the link to participate in the gift card drawing and/or take the survey: https://b.gatech.edu/34darve. Please enter your five-letter invitation code to access the online survey:

<Access Code>

If you have any questions, please feel free to contact the study team either at travel4@ce.gatech.edu or by calling them toll-free at (800) 341-1097. Thank you in advance for sharing your thoughts!

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Prof. Patricia Lyon Mokhtarian, Project Director
School of Civil and Environmental Engineering
Georgia Institute of Technology
790 Atlantic Drive
Atlanta, GA 30332-0355
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http://ce.gatech.edu/people/faculty/6251/overview
office: (404) 385-1443

Figure 2. Email recruitment message for the recontact survey

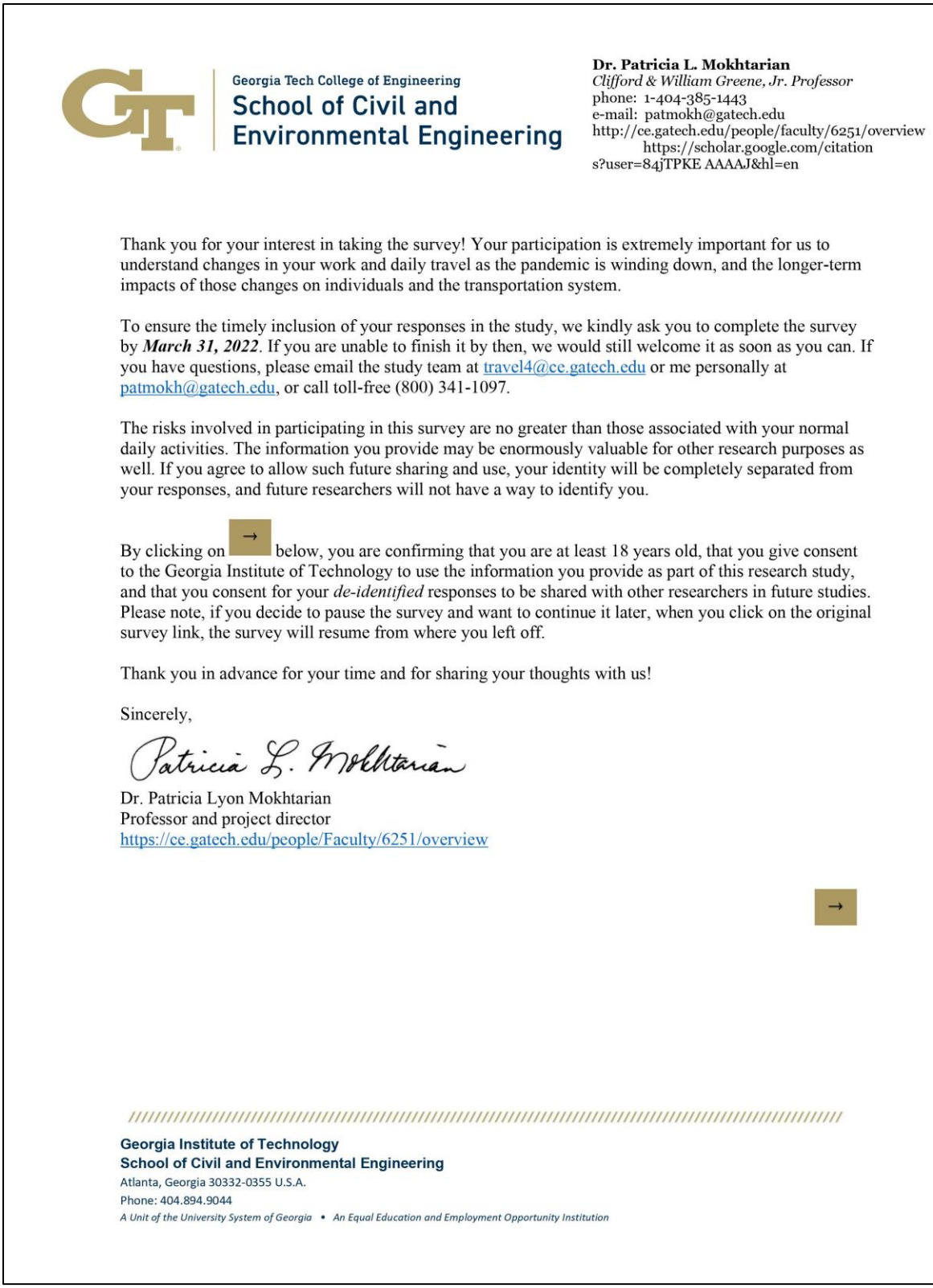


Figure 3. Cover letter in the recontact survey

The main part of the survey (following the cover letter) consists of eight sections, which is common to both versions of the survey except that the recontact survey has two additional questions in the last section (as described in the previous paragraph). The content of each section of the OP survey is as follows (please refer to Appendix A for more details):

1) The first section contained three **screening questions**, to check whether a respondent belonged to the study population. Respondents were eligible if they were an employed adult (i.e., age 18 and older), residing in the state of Georgia, and located outside of the European Union (EU) and the People's Republic of China (PRC) at the time they completed the survey. The latter condition was imposed to avoid the more stringent regulations associated with data collected from individuals in those regions (see http://www.policylibrary.gatech.edu/legal/eu-general-data-protection-regulation-compliance-policy and https://www.gatech.edu/privacy).

2) **Section A: Your opinions on various topics** asks respondents how much they agree or disagree with 25 statements, on a five-point ordinal scale with options "strongly disagree", "disagree", "neutral", "agree", and "strongly agree". We inserted one trap statement near the middle of the list ("To confirm you are still reading this, please select 'Disagree' here") to test respondents' attentiveness to survey questions and instructions. The remaining 24 statements were designed to measure 20 attitudinal constructs related to various topics (see Table 1 for the full list).

3) **Section B: Your job characteristics** pertains to respondents' work situation. Questions in this section deal with employment status, work schedule, work hours, job title, type/size of the employer organization, occupation, and work experience. Some of the

questions specifically request information about the "primary job" (see definition (7) in Section 2.1.2). This section ends with 17 attitudinal statements (with the same response format as in Section A) measuring respondents' opinions about their work and job(s) (see Table 1 for the full list of 12 attitudinal constructs).

4) **Section C: Your work and telework patterns** defines work locations (the regular workplace, alternative telework locations, and customer locations), teleworking, and work arrangements (i.e., full-day working and partial-day working), and then measures work/commute patterns, focusing on the primary job. The information of interest includes the feasible frequency of teleworking and the frequency of working at each work location. Especially, the frequency of full-day WFH is used to categorize respondents into three worker types (see Section 2.3.3). The section ends with 24 telework-related statements (associated with 14 attitudinal constructs; see Table 1) and a second trap statement (asking the respondent to select "Agree"). These items were presented to all respondents regardless of their experience in teleworking. Those who had never teleworked and whose job did not permit teleworking were still requested to respond to those statements with respect to what teleworking would be like if they were able to do it.

5) **Section D: Key aspects of your lifestyle** collects information about residential location and living arrangements (e.g., home address, neighborhood and housing characteristics, housing tenure status, household composition). The collected home addresses were processed to obtain the associated longitudes and latitudes, which were then utilized in the development of sample weights (see Section 2.3.3).

6) **Section E: How you travel** is designed to examine the travel and activity patterns of respondents in some detail. The section starts with questions about household vehicle(s). Whether respondents drive, how their household vehicle count changed since March 2020 (i.e., since the outbreak of the pandemic), and whether the pandemic influenced the changes in vehicle count (if any) are measured, in addition to some basic information regarding ownership status, vehicle count, and make/model/year of the vehicle most often driven by the respondent. Commute trip details (i.e., commute distance/time/mode to work, departure times from/to home, and address of the RW and most-often-visited alternative telework location) are requested in the following questions. Respondents are also asked about general telework patterns (i.e., which days of the week they telework and how they spend the time saved by not commuting to the RW) and their last teleworking day (focusing on out-of-home activities). This section ends with questions pertaining to the vehicle-miles driven (VMD) in a typical week.

7) **Section F: Your desire for future travel and telework** comprises two topics: (1) expected changes in residential location within the next three years and (2) expected employment, teleworking, and commuting situations in March 2023 (i.e., about a year after they responded to the survey). The information from this section can help us associate current situations and behavior (collected in the previous sections) with future expectations on where to live and how to work and commute.

8) **Section G: Some background about yourself** collects sociodemographic characteristics of the respondents (i.e., sex, age, ethnicity/race, educational attainment, and household income). Summary statistics of these characteristics are to be compared with those of the

study population (i.e., employed adults in Georgia), based on which sample weights are developed to make the sample representative of the study population with respect to those characteristics (see Section 2.3.3). At the same time, these traits usually play an important role in behavior and choice modeling (as control variables and/or key variables of interest).

Table 1. Attitudinal constructs measured in Sections A, B, and C

Section	Attitudinal constructs (statement count)	Section	Attitudinal constructs (statement count)
A	Life satisfaction (1)	B	Stressful work (1)
A	Residential location satisfaction (1)	B	Work autonomy - perception (1)
A	Career-oriented (2)	B	Work autonomy - preference (2)
A	Family/friend-oriented (1)	B	Self-disciplined (1)
A	Environmental concern (2)	B	Family-interferes-with-work (FIW) (2)
A	Tech savvy (2)	B	Work-interferes-with-family (WIF) (2)
A	Time pressured (1)	B	Measurable goals (2)
A	High value of time (VoT) (1)	B	Career establishment (1)
A	Travel-liking (1)	B	Job satisfaction (1)
A	Commute benefit (1)	C	Telework-supports-teamwork (1)
A	Commute stress (1)	C	Telework-supports-social (2)
A	Pro-biking (1)	C	Supportive-mentor/colleague (2)
A	Pro-driving (1)	C	Productive-when-teleworking (1)
A	Pro-transit (1)	C	Telework-reduces-stress (2)
A	Pro-walk (1)	C	Telework-increases-motivation (2)
A	Must-have-car (1)	C	Telework-increases-flexibility (3)
A	COVID health concern (1)	C	Telework-family synergy (2)
A	Long-term-urbanite (1)	C	Promotion-harming (1)
A	Mixed-use (1)	C	Pro-flexible-location (2)
A	Pro-large-house (2)	C	Telework-saves-money (2)
B	Pro-teamwork (2)	C	Pro-workplace-amenities (2)
B	Pro-social (1)	C	Pro-telework (1)
B	Productive-at-workplace (1)	C	Telework commitment (1)

2.2 Data Collection

2.2.1 OP Survey

We contracted with Qualtrics for 2,000 complete survey responses from its OP, which is the main source of respondents for this study. Qualtrics, in turn, partners with multiple vendors from which respondents can be recruited. The contract between Qualtrics and Georgia Tech also included data scrubbing during the collection process, using internal quality check algorithms, so that bad-quality cases could be filtered out in near real-time, and replaced with additional survey responses. The research service team on the Qualtrics side estimated that data collection would take 2-4 weeks. However, the process ended up taking more than three months, and we obtained one more round of data scrubbing after data collection concluded.

A confluence of factors resulted in the delay. First and most importantly, it was harder than expected (by the Qualtrics research service team) to obtain valid survey responses. The survey required responses specifically from adults "currently working for pay" (not from "all" adults), embedded two traps that filtered out inattentive respondents, and contained many demanding questions, all of which made it relatively difficult to obtain complete survey responses. In addition, we required rough quotas for some sociodemographic characteristics (sex, age, race, ethnicity, educational attainment, and income; refer to Table 5 for the quota categories for each characteristic). These quotas imposed lower and upper bounds on the number of cases in each category, where the bounds were centered on the number that would replicate the statewide share of employed people in that category based on the American Community Survey (ACS) 2015-

2019 5-year estimates[12] for Georgia. The goal of the quotas was to minimize sampling biases with respect to these variables to the extent possible, but they placed another layer of restriction on the recruitment of respondents. Second, more cases were scrubbed than anticipated. For example, based on their own internal algorithms the Qualtrics research service team suggested filtering out 247 of 1747 cases (i.e., 14.1%) in the first-round data scrub report (even though we declined to filter some of them out after we closely reviewed the report), which was much larger than the scrub rate that the research service team anticipated (5-10%).

The survey was soft-launched for one day (Tuesday, March 22, 2022). Based on the few dozen survey responses collected on that day, the speeding check threshold was set to 769 seconds (12.8 minutes), which was half the median survey completion time up to that point. After confirming that the survey was operating as intended, it reopened for full launch on Friday, March 25. The number of cases reached 1,000 on April 19.

The first data scrubbing was conducted on May 10 with 1,747 cases. After receiving the first data scrub report on the following day, we spent more than one week carefully reviewing suggestions in the report and communicating with the research service team of Qualtrics to finalize cases to filter out. On June 7, the second data scrubbing was implemented with 1,997 cases, followed by the same process of reviewing suggestions and then removing cases. We closed the survey on the last day of June with 2,037 cases and asked for one additional round of data scrubbing. We secured 1,952 cases after removing bad-quality cases following the final scrub report, added

[12] Although 2020 (but not 2021) estimates were available before the survey administration in March 2022, we opted not to include them in the 5-year window, in view of the lower quality of the ACS data collected during the first year of the pandemic (https://www.census.gov/newsroom/blogs/random-samplings/2021/10/pandemic-impact-on-2020-acs-1-year-data.html).

back 26 cases that were removed during the data scrubbing process, and ended up having 1,978 cases in the "raw" dataset for the OP survey. In the raw dataset, 55.7% of cases were collected in April, followed by 24.3% in May, 10.4% in March, and 9.7% in June (see Table 2).

2.2.2 Recontact Survey

As described in Section 2.1.3, we distributed invitations to the respondents who indicated willingness to be contacted for a future survey and provided their contact information in the NHTS Georgia add-on and/or the GDOT Emerging Technology survey. We sent out postcard and email invitations to 4,332 and 1,522 individuals, respectively (i.e., 5,854 individuals in total). Details on the invited individuals are illustrated in Figure 4 (refer to Section 3.2 of Kim, Mokhtarian, and Circella (2019) for more details on the NHTS Georgia add-on). Considering the online format of the survey for this study and the monetary and time costs of printing and sending postcards, we sent mail invitations only to those with no email address available.

The recruitment postcards were mailed on March 11, 2022 (11 days earlier than the soft launch date for the OP survey), considering the time required for mail delivery. Survey responses started to come in on March 14. On the week of the soft and full launch of the OP survey, we started to invite recontact respondents via email. As a precaution (in case of glitches in delivery or in the operation of the online survey), the first half of the email invitations were sent out on March 21, followed by the other half sent on March 28. We sent reminder emails on March 29 (for the first half) and April 1 (for the other half). For postcard recipients, reminder postcards were sent out on April 12. We closed the survey on the last day of May. The number of responses from the recontact survey is 493 (8.42% of 5,854 invited individuals). However, this number includes 208 cases filtered out by one of the screening questions (because they no longer resided in Georgia, were not employed for pay, or were currently located in the EU or PRC), 37 cases that failed one

or both of the trap questions (8 cases from Section A and 29 cases from Section C), and 20 cases that did not reach the end of the survey (i.e., the last question of Section G). After excluding those cases, we retained 228 valid cases, which constitute the "raw" dataset for the recontact survey. In contrast to the OP survey, for which most cases were collected in April (55.7%) and May (24.3%), the recontact survey collected the vast majority (68.9%) of cases in March, and data collection slowed down during the following two months (29.4% in April and 1.8% in May) (see Table 2).

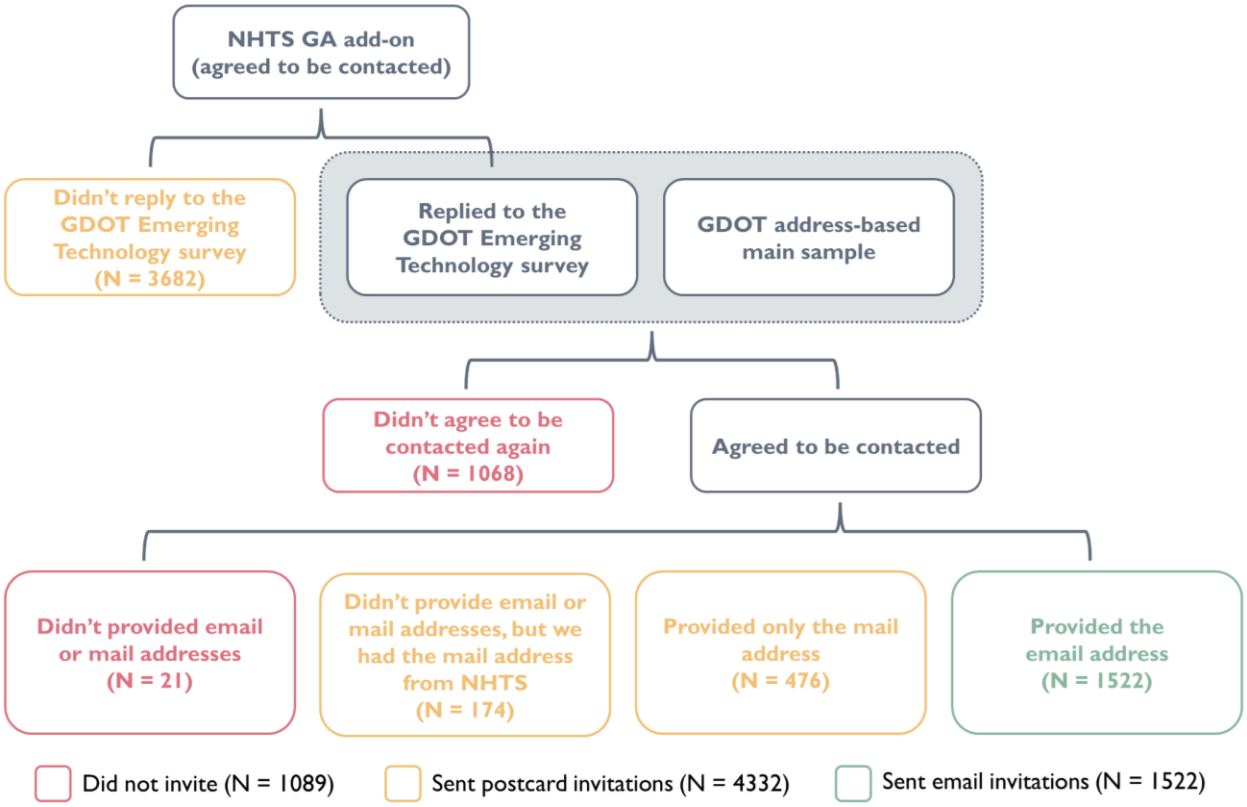


Figure 4. Distribution of the recontact survey

Table 2. "Raw" eligible survey responses completed by month

Month	Count (share)		
	OP survey	Recontact survey	Both surveys
March	205 (10.4%)	157 (68.9%)	362 (16.4%)
April	1,102 (55.7%)	67 (29.4%)	1,169 (53.0%)
May	480 (24.3%)	4 (1.8%)	484 (21.9%)
June	191 (9.7%)	- (0.0%)	191 (8.7%)
Total	1,978 (100%)	228 (100%)	2,206 (100%)

2.3 Data Preparation

2.3.1 Overview of Quality Checks and Data Cleaning

Having cases with invalid, inconsistent, questionable and/or missing responses in a survey dataset is almost inevitable, especially if the survey dataset holds many intercorrelated variables and complicated survey flow with many branches (just like the dataset of this study). Thoughtful and sophisticated survey design in conjunction with multiple rounds of pretest can reduce the severity of such data quality issues but does not eliminate the necessity of quality checks and data cleaning.

We took various measures to minimize data quality issues before and during data collection. First, we put response requirements to almost all questions for the OP survey and essential questions linked to the key survey logics for the recontact survey. Second, we set input validations in the online survey for some open-ended questions (e.g., a non-negative number for vehicle count, a number larger than equal to 1900 for birth year, a 5-digit (or 9-digit) number for zip code of home address). Third, three rounds of data scrubbing were conducted. The cases with potential issues (e.g., outliers in numeric responses, invalid responses for address questions, foreign Internet Protocol (IP) addresses, repeated text inputs for open-ended questions) detected

by the internal algorithms of the research service team of Qualtrics were carefully reviewed and some of them are filtered out. After obtaining the raw data (with 1978 cases (OP) + 228 cases (recontact)), we conducted in-dept quality checks and data cleaning.

The quality checks and data cleaning in this study had three main purposes. The first one was to remove cases with serious data quality issues (e.g., signs of answering the questions with lack of presence of mind, many inconsistent answers from related questions, invalid/missing values in important variables such as home address and the frequency of working at each location). The second one was to fix key variables of interest if their values were questionable (e.g., inconsistent or highly improbable) but could be imputed based on other related variables. Even when the perfect correction is impractical, we tried to alleviate observed inconsistencies across related variables to the extent possible. The last purpose was to review text inputs in the "Other (please specify)" option in some questions. We reclassified the answers to other existing categories when possible. These tasks were mainly carried out within a few months after data collection, but monitoring and improving the data quality is an ongoing process as we continue to analyze the data.

We also checked relatively minor data quality issues (e.g., potential data entry errors, minor inconsistencies that can be easily fixed with cross-checks with other variables). They do not constitute a "hard" fail that requires case removal, but were marked with "soft" flags so that we can be aware of them in the future. However, for brevity, this report focuses on describing hard fails and edits on key variables.

2.3.2 Process of Quality Checks and Data Cleaning

Table 3 exhibits the whole data cleaning process with the number of cases removed from the dataset at each step. The first step was meta-data checks. The minimum duration of survey (769 seconds = 12.8 minutes) set by the Qualtrics team for the OP survey was applied to the recontact survey responses, which makes cases with survey completion time shorter than 769 seconds marked as "speeders" and removed from the dataset (3 cases removed from recontact data). In addition, duplicates in IP address and home address were investigated separately for each dataset because this check was implemented before joining the two datasets (we did check the duplicates again after data join). The responses for home street address line 1 (from Section D) is used to check the same text inputs (ignoring case). After manually checking of the whole set of responses (especially responses to sociodemographic information questions) from each respondent detected for IP or home address duplicates, 13 cases were removed from OP data (and 0 cases from recontact data). The basic principle was that if one person seems to have participated in the survey more than once, we keep the first record and remove the other(s).

The following step was flat-lining checks. Respondents are given seven pages of attitudinal questions in total: Section A (3 pages, 25 statements), Section B (2 pages, 17 statements), and Section C (3 pages, 25 statements). A page is regarded to be flat-lined if all statements except trap statement or not-answered statements (if any) are marked with the same answer or the same answer except one statement. We excluded cases with three or more flat-lined pages[13] (OP data: 45 cases, recontact data: 3 cases).

[13] If a respondent has a primary job infeasible for teleworking (i.e., at least one the answers to Q1 in Section C is "never"), we did not count flat-lined pages in Section C towards the total flat-lined page count.

After joining the two datasets, a few relatively simple checks and cleaning followed. Duplicates in IP and home addresses were reviewed again and one case from the recontact data was removed. Then, we moved on to the steps for quality checks and data cleaning by survey section. We skipped the first two sections ("screening questions" and "Section A") because they did not require further cleaning. The respondents who were not qualified for this survey were already filtered out by screening questions and the cases in the dataset have an identical set of responses to the questions. Section A has only one question that was already reviewed for flat-lining checks. Resultingly, the section-by-section review started from Section G because the questions in the section are relatively simple, while not being connected to the questions in other sections with survey flow logic. The only task for Section G was reclassifying "prefer to self-describe" answers from Q1 (sex) and "other (please specify)" answers from Q3 (race).

On the other hand, more sophisticated consistency and quality checks were necessary for Sections B, C, and E, because the responses in Section B (job characteristics) determined what questions a respondent faced in Section C (work and telework patterns) and then, consequently, in Section E (travel patterns). This meant that many consistency checks within and across sections needed to be conducted and data edits had to be made with special caution. Also, because these sections contained many key variables that were to be analyzed, we spent most of the time assigned to data cleaning on this step. For example, Q4 and Q5 in Section C are about the types of locations at which a respondent works. Answers to these questions were not only of interest in their own right, but also determined what questions were given to the respondent in Section E (with respect to commute trips, telework patterns, and out-of-home activity patterns). The main strategy used to review a variable in these sections was to cross-check with other

responses in Sections B, C, and E when cleaning a variable so that inconsistencies could be reconciled as far as possible.

After thoroughly reviewing inconsistencies across variables in Sections B, C, and E as well as text inputs and outliers, we decided to remove 167 cases. The main reasons include (1) ineligible respondents (not working for pay), (2) random/invalid responses to Q5 of Section C (the frequency of working at each workplace) which led to faulty survey flow and bad-quality responses in Section E, and (3) inconsistent/missing inputs for more than a few key variables of interest (e.g., commute trip details, last week's work from home pattern and the last teleworking day).

The next set of variables reviewed are physical addresses. In the survey, respondents are asked to provide three addresses at maximum: home (for all respondents, in Section D), RW (for respondents who has a RW other than home, in Section E), and most-often visited alternative telework location (for respondents who work at alternative telework locations at least once a week either for partial or full days, in Section E). Home address is one of the most essential information because we need to geocode (i.e., get coordinates of) home addresses and use the results in developing sample weights. At the same time, home address can be used to confirm that they live in Georgia for real. Even though the other addresses do not need to be within Georgia, they enable implementing consistency checks of variables associated with commute trip details. After reviewing responses to the three address questions in conjunction with related variables, we filtered out 22 cases with invalid or inconsistent responses and edit addresses if they seem to have typos.

Section D excluding the home address question was examined for quality checks and data cleaning. The main task for this section was to check the consistency in answers to household compositions questions (Q6-10) (e.g., who they live with, how many people are in each age group, how many people are employed and can drive a car). The observed inconsistencies were mostly resolved by cross-checking and editing responses. However, 5 cases were removed because they turned out to contain many random responses that harm data quality.

The "working" data with 1,931 cases for analysis were obtained after revisiting Sections C and E to further clean the frequency of working at each location for partial days, reason for not going to the regular workplace, and primary commute mode to the RW. This step further improved the quality of partial day work patterns substantially. We skipped Section F cleaning because of time constraints while not compromising data quality much because the section contains relatively simple questions asking about "future" expectations that do not have many other variables to cross-check with.

One noteworthy fact is that the quality of data is much better for recontact data. According to Table 3, the sample size decreased much more for OP data (by 268 (13.5%)) than for recontact data (by 7 (3.1%)). This is somewhat anticipated because the OP respondents register themselves into opinion panels to get rewards and probably are more likely to be interested in quickly completing a survey. In contrast, the respondents in recontact data are those who indicated their willingness to be contacted for a future survey (even before they knew that we are going to enter them into a drawing if they complete this survey) and then successfully completed this survey when they received an invitation. This difference makes it more likely that the latter group of

respondents took the survey in a careful manner with high attentiveness, which makes collecting information from them valuable.

Table 3. Summary of quality checks and data cleaning

	Data source		Total	Key tasks
	OP	Recontact		
Raw data	**1,978**	**228**	**2,206**	-
Meta-data checks	-13	-3	-16	Speeder and duplicate checks
Flat-lining check	-45	-2	-47	Flat-liners check for attitude Qs
Duplicates check	-0	-1	-1	Duplicate check (after data join)
Section G	-0	-0	-0	Sex and race reclassifications
Section B	-10	-0	-10	Quality and consistency checks
Section C	-61	-0	-61	
Section E	-96	-0	-96	
Address checks	-22	**-0**	-22	Home, RW, and alternative TW location checks
Section D	-5	**-0**	-5	Household compositions check
Section C & E (revisited)	**-16**	-1	-17	Partial day work patterns check
Working data	**1,710**	**221**	**1,931**	-

2.3.3 Development of Sample Weights

The main purpose of developing sample weights is to obtain descriptive statistics representative of study population (i.e., adult workers in Georgia), which is essential for informed decision making. Sample weights adjust descriptive statistics (e.g., mean, median, standard deviation, share) by giving low weights to overrepresented groups and vice versa to underrepresented groups. We tried to minimize sampling biases by setting rough quotas for the sociodemographic traits measured in Section G. However, the quotas do not guarantee a satisfactory level of representativeness and a sizable portion of cases were removed in the process of obtaining working data with improved data quality (from raw data), making it necessary to further improve

the representativeness. In addition, because we wanted to make the sample representative with respect to a few additional variables, sample weights were developed for working data.

Variables selected for the development of sample weights are as follows: sex, age, race, ethnicity, education, annual household income, employment status (part- or full-time), self-employment, region, and teleworking status (see Table 5 for the list of associated categories for each variable). Developing sample weights is basically finding a combination of sample weights such that the weighted share of each category replicates the population share of the category.

Population margins (i.e., shares) for variables except region and teleworking status were directly obtained from 2022 ACS 1-year estimates[14] of Georgia. We utilized 1-year estimates (instead of 3-year or 5-year estimates) to better represent the study population after the outbreak of the COVID-19 pandemic. When ACS estimates were not available for the study population exactly, we used estimates for the population that was as close as possible to the study population (see Table 5 for more details). For example, the ACS estimates for the employed population are based on the workers 16 years old and older (not 18 years old and older, as in our study). However, this discrepancy would have little impact on the validity of population margins acquired from ACS estimates, because the share of workers who are 16 or 17 is relatively small.

For weighting purposes, three regions in Georgia were defined, and population margins for each region were mainly obtained from 2022 ACS 1-year estimates but with some help of 2021 5-year estimates[15]. Because ACS 1-year estimates are not provided for all 159 counties (and all

[14] These were the most recent ACS 1-year estimates available in October 2023 (release date: September 14, 2023).
[15] 2022 ACS 5-year estimates are scheduled to be released in December 2023. Therefore, 2021 ACS 5-year estimates were used instead of 2022 ACS 5-year estimates. See footnote 17 for more details regarding when and how 2021 ACS 5-year estimates were utilized.

Micropolitan Statistical Areas) in Georgia due to small sample sizes for less-populated counties (and Micropolitan Statistical Areas)[16], the smallest geographical unit with data availability is the Metropolitan Statistical Area (MSA). To ensure the statistical robustness of descriptive analysis comparing regions and to prevent producing extreme weights for cases from some regions, we grouped the 15 MSAs having at least one county in Georgia into two groups: the Atlanta–Sandy Springs–Alpharetta MSA (ATL MSA) and all other MSAs. As a result, counties in Georgia were classified into three groups including non-MSA regions (see Table 4 and Figure 5), having associated employed population shares of 60.5% (ATL MSA), 25.0% (other MSAs)[17], and 14.6% (non-MSA) (see Table 5). The region types of counties are mapped in Figure 6 with geocoded home locations of respondents.

[16] ACS 1-year estimates are available for geographical units with populations of 65,000 or more (see https://www.census.gov/data/developers/data-sets/acs-1year.html).

[17] Some MSAs contain one or more counties outside Georgia. In such cases, county-level 2021 ACS 5-year estimates of the employed population 16 years old and older (for all counties in an MSA) were used to obtain the *2021* share for the Georgia part of the MSA, which was then applied to the 2022 ACS 1-year estimate (of the employed population 16 years old and older in the MSA) to obtain the estimated *2022* share for the Georgia part of the MSA. In addition, 2022 ACS 1-year estimates for the Brunswick MSA were not provided, probably due to its small population size. Therefore, county-level ACS 2021 5-year estimates were summed up to obtain the estimate for the Brunswick MSA.

Table 4. Counties in Georgia

Region		County name
ATL MSA (29 counties)		Fulton, Gwinnett, Cobb, DeKalb, Clayton, Cherokee, Forsyth, Henry, Paulding, Coweta, Douglas, Carroll, Fayette, Newton, Bartow, Walton, Rockdale, Barrow, Spalding, Pickens, Haralson, Dawson, Butts, Meriwether, Morgan, Lamar, Pike, Jasper, Heard
Other MSAs (45 counties)	Athens-Clarke County MSA	Clarke, Oconee, Madison, Oglethorpe
	Gainesville MSA	Hall
	Rome MSA	Floyd
	Savannah MSA	Chatham, Effingham, Bryan
	Hinesville MSA	Liberty, Long
	Macon MSA	Bibb, Jones, Monroe, Crawford, Twiggs
	Warner Robins MSA	Houston, Peach
	Augusta-Richmond County MSA[1]	Richmond, Columbia, Burke, McDuffie, Lincoln
	Chattanooga MSA[2]	Walker, Catoosa, Dade,
	Dalton MSA	Whitfield, Murray
	Columbus MSA[3]	Muscogee, Harris, Chattahoochee, Marion, Stewart, Talbot
	Valdosta MSA	Lowndes, Brooks, Lanier, Echols
	Albany MSA	Dougherty, Lee, Worth, Terrell
	Brunswick MSA	Glynn, Brantley, McIntosh
Non-MSA (85 counties)		Troup, Jackson, Habersham, Polk, Upson, Stephens, Bulloch, Wayne, Gordon, Chattooga, Laurens, Johnson, Treutlen, Ware, Pierce, Camden, Baldwin, Hancock, Coffee, Atkinson, Colquitt, Thomas, Tift, Toombs, Montgomery, Sumter, Schley, Decatur, Crisp, Ben Hill, Quitman, Lumpkin, Gilmer, White, Hart, Fannin, Tattnall, Grady, Union, Franklin, Emanuel, Putnam, Mitchell, Dodge, Washington, Berrien, Banks, Elbert, Appling, Greene, Cook, Rabun, Telfair, Jefferson, Jeff Davis, Screven, Charlton, Dooly, Macon, Bleckley, Towns, Bacon, Pulaski, Candler, Evans, Early, Wilkes, Irwin, Wilkinson, Jenkins, Wilcox, Seminole, Taylor, Turner, Wheeler, Randolph, Clinch, Calhoun, Miller, Warren, Baker, Glascock, Clay, Webster, Taliaferro

Note:

1) Augusta-Richmond County MSA has two non-Georgia counties: Aiken (SC) and Edgefield (SC)
2) Chattanooga MSA has three non-Georgia counties: Hamilton (TN), Marion (TN), and Sequatchie (TN)
3) Columbus MSA has one non-Georgia county: Russell (AL)

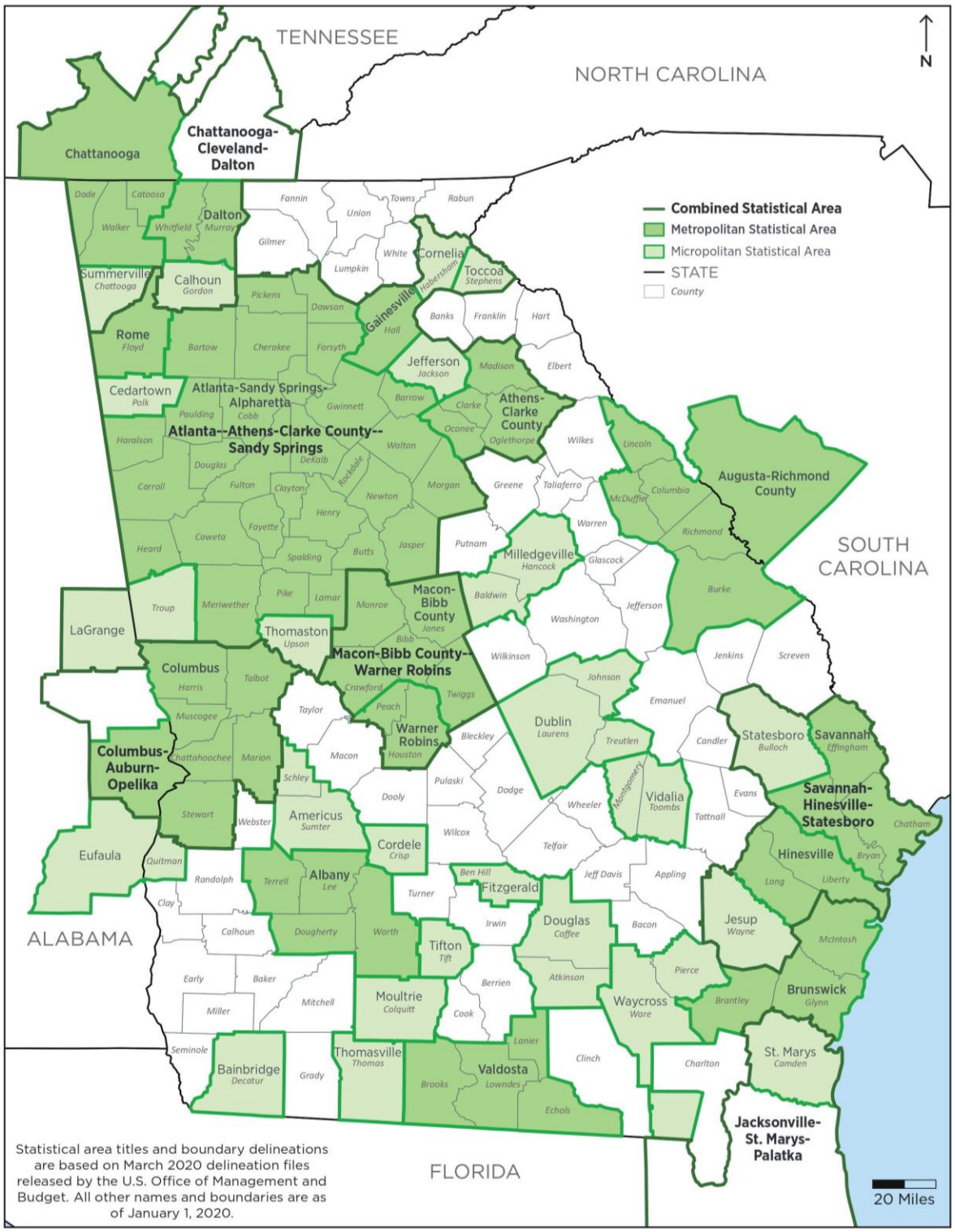


Figure 5. Core-based statistical areas in Georgia[18]

[18] Source: United States Census Bureau, Population Division (https://www2.census.gov/programs-surveys/metro-micro/reference-maps/2020/state-maps/13_Georgia_2020.pdf)

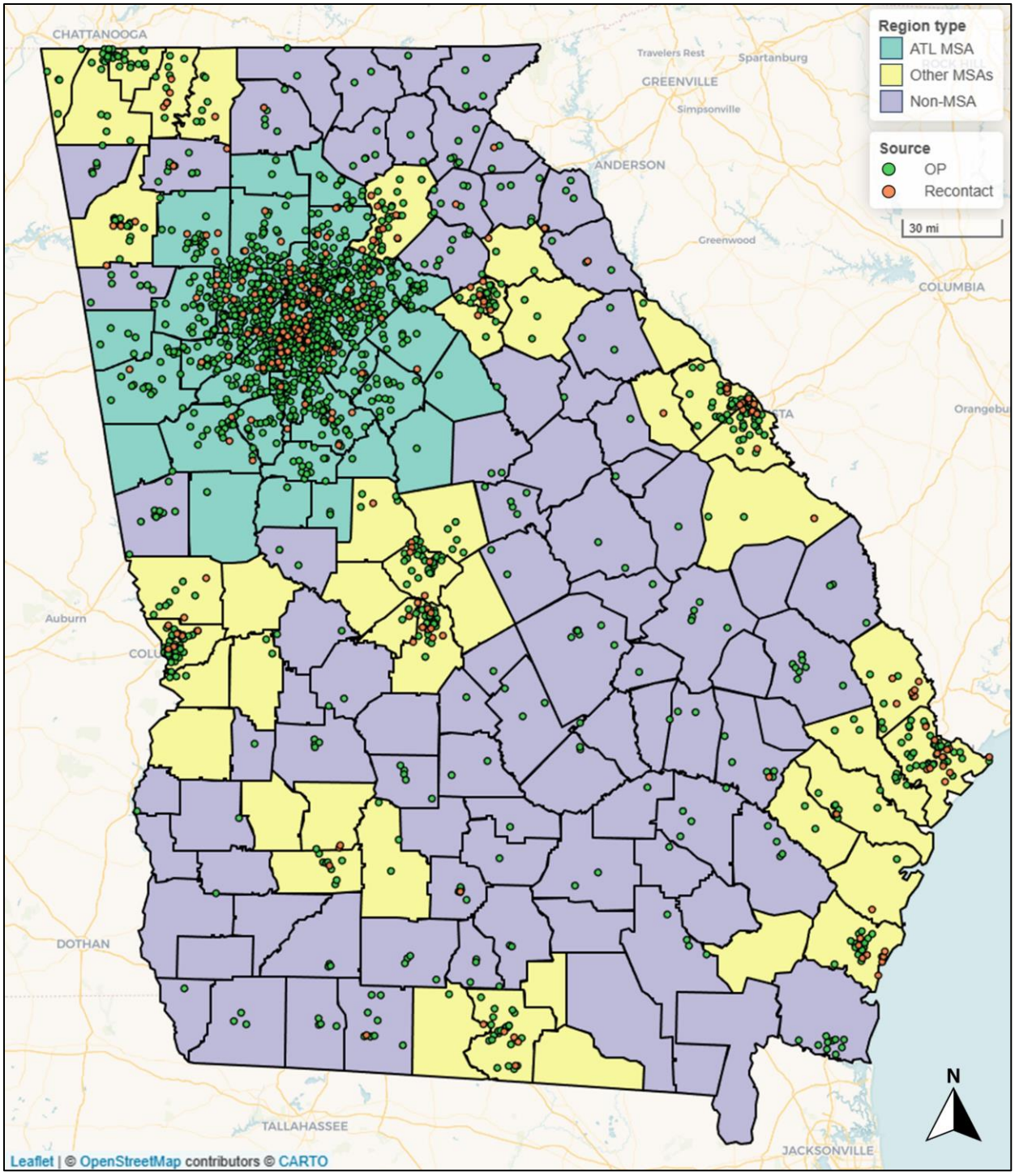


Figure 6. Geocoded home locations

The other variable used for sample weighting is teleworking status (i.e., worker type). Even though the process of acquiring relevant population margins entails making a few assumptions, the variable was included in sample weighting because "who teleworks" and "how often people telework" are of paramount interest to this study. Furthermore, in related research involving a very similar survey, we learned that weighting only with respect to standard sociodemographic variables – even if involving more of such variables than is commonly done – still left teleworker shares in the sample substantially higher than they were in the population. Hence, we devised a way to make the sample as representative of the study population as possible with respect to the adoption and frequency of teleworking.

First, we used 2022 ACS data (Table B08006) containing the summary of answers to question P31 (how workers usually got to work last week). We assumed that the workers who selected "worked from home" (instead of a transportation mode) (16.3%) correspond to our survey respondents who answered that they work from home three or more times a week for full days[19] (hereafter called "usual TWers" or "UTWers"). The other two worker types are "non-usual TWers" ("NUTWers"), who work from home for full days less than three times a week but more than never, and "non-TWers" ("NTWers"), who never work from home for full days at all. The term "TWers" is used to refer to both NUTWers and UTWers combined. Note that worker types are based on the frequency of working from "home" for "full days", which is the most prevalent type of teleworking (see Figure 9), even though teleworking is defined as "doing paid work from

[19] Even though not explicitly indicated, selecting "worked from home" (instead of a transportation mode) implies that the respondent worked from home without commuting to other work locations, which corresponds to working from home for full days in this study. Also, "usually" in question P31 of the ACS implies that workdays for "worked from home" outnumber workdays with commuting. Considering that the most common number of workdays per week is five, the threshold for "usually" is set to three.

home or *alternative telework locations*" in the survey (and in Chapter 3 (Empirical Findings)). This choice was inevitable, because the only available information on teleworking in the ACS comes from question P31.

Then, we estimated the share of NUTWers using the assumption that NUTWers and UTWers were over-sampled in the survey data to the same degree. Thus, we applied the ratio of NUTWers (25.4%) to UTWers (24.4%) in the unweighted OP data of our study[20] (1.04) to the share of UTWers, to obtain the share of NUTWers (16.3% *1.04 = 17.0%), which left a share of 66.7% (= 100.0% - 16.3% - 17.0%) NTWers, as shown in Table 5.

Using the obtained population margins, we devised a procedure[21] that produced sample weights by iterating nine rounds of cell weighting (see Figure 7)[22]. For the first three rounds of cell weighting, the margins for each of age, race, and ethnicity were cross-tabulated with the margins for sex. Another cell-weighting table with cross-tabulation is the eighth table of teleworking

[20] We used the ratio from the OP data only (rather than including the recontact sample as well) because the evidence indicated that the recontact sample overestimated UTWers, in particular, even more than the OP sample did. Given that the vast majority (88.6%) of the pooled unweighted sample was OP-based, and in view of the likely heterogeneity between the two samples, we considered it better to obtain the ratio from the main source of data. However, once obtaining the estimated population margins indicated in the text (66.7% NTWers, 17.0% NUTWers, and 16.3% UTWers), these margins were applied to the pooled OP+recontact sample in the weighting process.

[21] Similar procedures that combine cell weighting and iterative proportional fitting (IPF) are used by Kim et al. (2019) and Wang et al. (2023).

[22] Before applying this procedure to obtain sample weights, the responses that did not fall into the categories in Table 5 (i.e., sex = "prefer to self-describe", race = "other", and annual household income = "prefer not to answer") were considered as missing values and imputed using a random-forest-based non-parametric missing value imputation method (implemented in R (ver. 4.3.1) using the "missForest" package (ver. 1.5)). The variables used as inputs for the imputation were work situations (Q1, 2, 5, 6, and 7 of Section B), sex, age, ethnicity, race, education, and household income. This imputation was performed only for the purposes of weighting, so as not to exclude these cases from the sample altogether by not being able to weight them. Their original responses were retained as their responses to the questions proper.

status and region[23]. For each round of cell weighting, sample weights were updated such that the weighted share of cases falling into a cell matched the population margin of the cell. The nine rounds of cell weighting were repeated until the updates in sample weights converged. In this study, we terminated iterations when the nine rounds of cell weighting resulted in changes in sample weights less than 0.000001 for all cases. Resultingly, as depicted in Table 5, the weighted shares exactly replicate the population margins. The last step of the procedure was to trim extreme weights to preclude them from excessively inflating the variances of survey estimates (Chowdhury et al., 2007). In essence, we set the maximum sample weight to be the median plus six times the interquartile range (IQR), truncated sample weights larger than the maximum to that maximum[24], and then rescaled the sample weights so that they summed to the number of cases in the sample (i.e., the sample size).

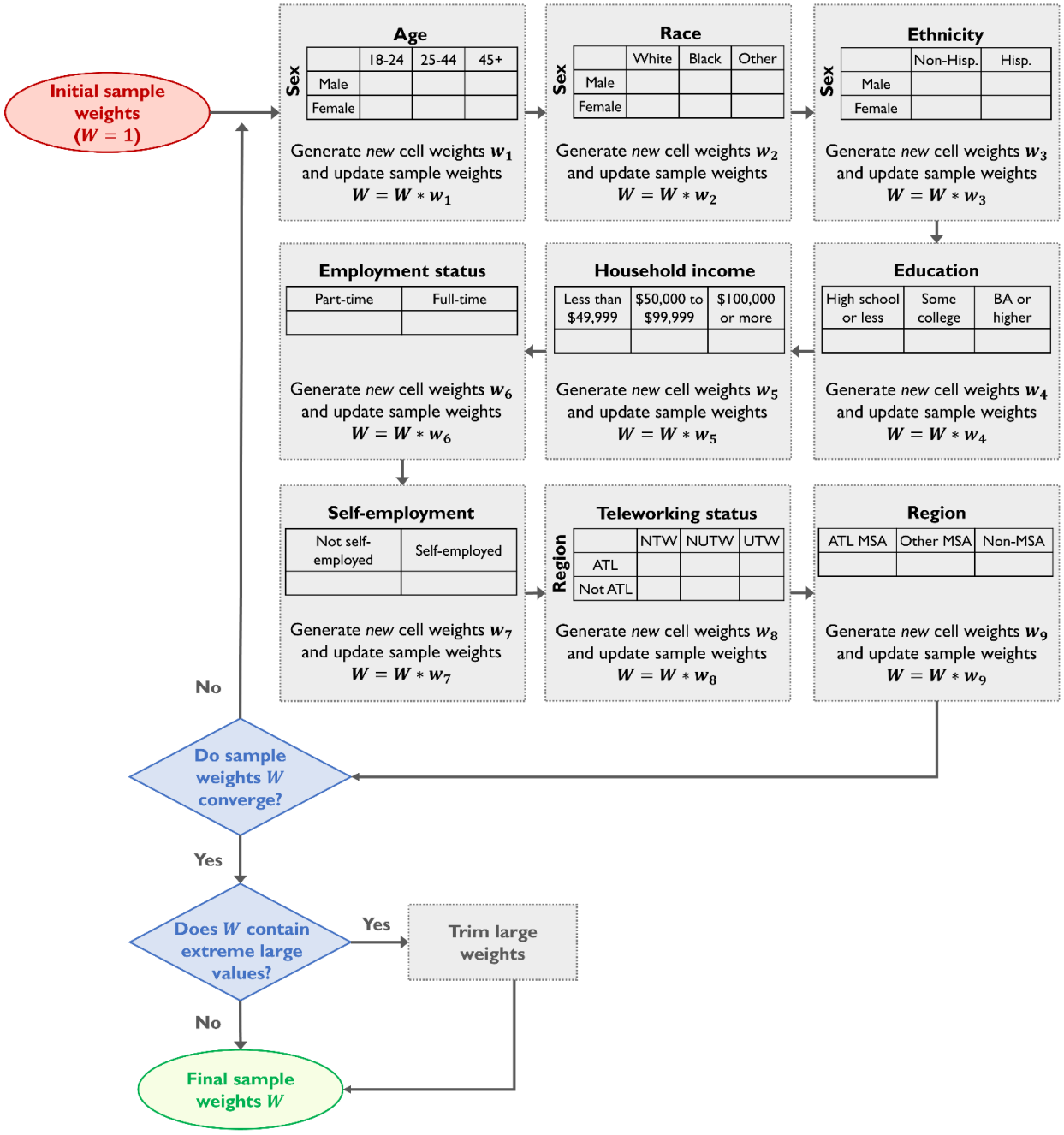
Table 5 exhibits descriptive statistics of the variables used to develop sample weights. The unweighted sample substantially overrepresented women and those who are 45 years old or older, white, non-Hispanic, better-educated (some college or higher), middle-income ($50,000/year to $99,999/year), working full time, living in MSAs other than the ATL MSA, and teleworking. Especially, the unweighted sample share of TWers (50.3%) is about 1.5 times the population share (33.3%), substantially overrepresenting TWers. We believe that this is partially

[23] For this cross-tabulation, the method of obtaining worker type shares described in the text for the statewide sample was then applied to the ATL MSA. After obtaining the 2022 UTWer share for the ATL MSA (21.0%), the ratio of NUTWers to UTWers living in the ATL MSA in the current (unweighted) OP data (0.9400) was applied to obtain the share of NUTWers (19.7% = 21.0% * 0.9400). The (estimated) 2022 worker type shares for the ATL MSA are presented in Table 10 (NTWer: 59.31%, NUTWer: 19.71%, and UTWer: 20.97%).

Applying the obtained worker type shares for Georgia and the ATL MSA to their total employed adult counts (in fact, employed ages 16+) in Georgia and the ATL MSA from 2022 ACS 1-year estimates, we were able to have counts for all worker types in GA and in the ATL MSA. By subtracting the count of a worker type in the ATL MSA from the count of the same worker type in GA, we obtained the count for "not ATL". We could only use the two region types (instead of the three region types in Table 5) in this case, due to the data limitations.

[24] Refer to Potter and Zheng (2015) for more details on various methods for extreme weight trimming.

because TWers are more likely to be tech-savvy (which turned out to be true, on average, according to Table 9) and willing to join opinion panels. The weighted sample replicates population shares in Table 5 to three decimal places. Even after trimming the weights using the threshold of median plus 6 times IQR of sample weights, the trimmed-weighted sample closely represent the population shares; the maximum difference is 0.4 percentage points for the share of "other" race. All statistics in Chapter 3 (Empirical Findings) are based on the *trimmed-weighted* sample, unless stated otherwise.



Note:

1) W, w_1, w_2, w_3, w_4, w_5, w_6, w_7, w_8 and w_9 are vectors with the number of cases in the sample as their length
2) Multiplying two of them (*) indicates "element-wise" multiplication of two vectors
3) NTW: non-TWer, NUTW: non-usual TWer, UTW: usual TWer

Figure 7. Flow chart of the weighting process[25]

[25] Adapted to the present context from Wang et al. (2023).

Table 5. Sample weighting result (N=1931)

Variable		Share			
		Population[1]	Sample		
			Unweighted[1]	Weighted	Trimmed-weighted
Sex[2]	Female	48.0%	**55.0%**	48.0%	48.0%
	Male	**52.0%**	45.0%	52.0%	52.0%
Age[2]	18-24 years	**13.4%**	10.4%	13.4%	13.5%
	25-44 years	**44.4%**	43.0%	44.4%	44.4%
	45+ years	42.1%	**46.6%**	42.1%	42.1%
Race[2]	White only	52.0%	**60.4%**	52.0%	52.2%
	Black only	30.4%	**31.1%**	30.4%	30.5%
	Other	**17.7%**	8.5%	17.7%	17.3%
Ethnicity[2]	Hispanic	**10.4%**	6.3%	10.4%	10.1%
	Not Hispanic	89.6%	**93.7%**	89.6%	89.9%
Education[2]	High school or less	**30.7%**	18.9%	30.7%	30.5%
	Some college	28.3%	**31.7%**	28.3%	28.4%
	Bachelor's or more	41.1%	**49.4%**	41.1%	41.1%
Annual household income[2]	Up to $49,999	**34.6%**	34.2%	34.6%	34.5%
	$50,000 to $99,999	30.1%	**34.2%**	30.1%	30.3%
	$100,000 or more	**35.3%**	31.6%	35.3%	35.2%
Employment status[2]	Part-time	**31.0%**	23.3%	31.0%	31.0%
	Full-time	69.0%	**76.7%**	69.0%	69.0%
Self-employment[2]	Not self-employed	**89.9%**	89.8%	89.9%	89.9%
	Self-employed	10.1%	**10.2%**	10.1%	10.1%
Region[2]	ATL MSA	**60.5%**	58.5%	60.5%	60.3%
	Other MSAs	25.0%	**28.7%**	25.0%	25.1%
	Non-MSA	**14.6%**	12.8%	14.6%	14.6%
Teleworking status[2] (estimated)	Non-TWer[3]	**66.7%**	49.7%	66.7%	66.5%
	Non-usual TWer[3]	17.0%	**24.6%**	17.0%	17.1%
	Usual TWer[3]	16.3%	**25.7%**	16.3%	16.4%

Note:

1) A bolded number is the larger value of the population and unweighted-sample shares for that category.
2) Population margins are based on the ACS estimates for the employed population 16 years old and older (sex, age, race, ethnicity, region, teleworking status), employed population 25-64 years old (education), all households (annual household income), population 16 years old and older who worked in the past 12 months (employment status), and civilian employed population 16 years old and older (self-employment).
3) The frequency of working from home for full days on a typical week determines teleworking status (i.e., worker type): non-TWer (never), non-usual TWers (more than never but less than three times), and usual TWers (at least three times).

3. EMPIRICAL FINDINGS

3.1 Feasible Telework Frequency

What share of workers can telework? Not all workers can telework; telework feasibility differs by worker. The maximum telework frequency of a worker is (theoretically) restricted by the permission of his/her supervisor(s) and the nature of his/her job. Therefore, in this report, the *(maximum) feasible telework frequency* is defined as the minimum of the (maximum) telework frequencies[26] allowed by each of these two factors.

Figure 8 illustrates the feasible telework frequency of workers in Georgia by region type. Overall, 25.6% of workers in Georgia are able to telework at least once a week. However, the share largely varies with region; the ATL MSA has the highest share by far, with teleworking (at least once a week) being feasible for 31.9% of all employees, followed by other MSAs (18.7%) and non-MSA regions (10.8%). The same trend holds for the share of workers with feasible telework frequency of at least three times a week: Georgia (17.6%), the ATL MSA (21.7%), other MSAs (13.4%), and non-MSA regions (7.4%). This indicates that the apparent differences in *observed* telework frequencies across regions (which are presented in Section 3.2) are partially, at least, attributable to the differences in *feasible* telework frequencies.

[26] The pertinent survey question (Q1 of Section C) does not distinguish between full and partial days of teleworking.

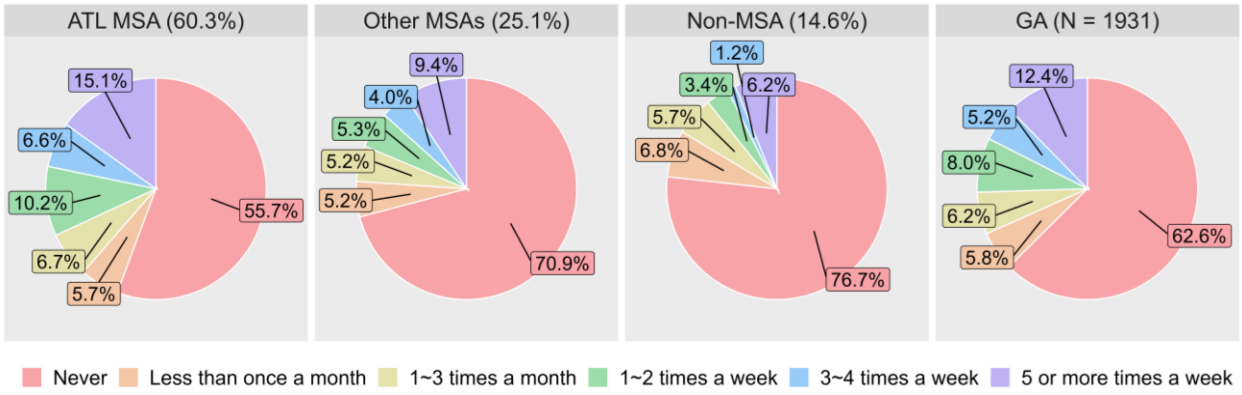


Figure 8. Feasible telework frequency by region type

3.2 Telework Frequency

How often do people telework, at various kinds of locations and amounts of the workday? In this study, *teleworking* is defined as *working from home* or at *alternative telework locations* (see definitions in Section 2.1.2). According to Figure 9, showing the frequencies of teleworking in Georgia in spring 2022 by work location and type, home is the dominant location for both full- and partial-day teleworking, even though the shares of employees teleworking at alternative telework locations (e.g., alternative offices, cafes) are not negligible. For instance, 33.4% of employees work from home for full days at least occasionally (28.5% for partial days), whereas only 15.5% of workers do so at alternative telework locations (14.5% for partial days). At the same time, those who work from home at all are more likely to do so at least once a week (full days: 24.1% of 33.4%, partial days: 12.6% of 28.5%) than those working at alternative telework locations (full days: 4.6% of 15.5%, partial day: 4.1% of 14.5%). These observations indicate that teleworking occurs in the form of WFH much more often than working at alternative telework locations. Another point to note is that *full-day* WFH is much more prevalent than *partial-day* WFH (at least *three* times a week: 16.4% for full days and 5.6% for partial days) (at

least *once* a week: 24.1% for full days and 12.6% for partial days), although the difference between the shares for "never" (66.5% and 71.5%) is less prominent.

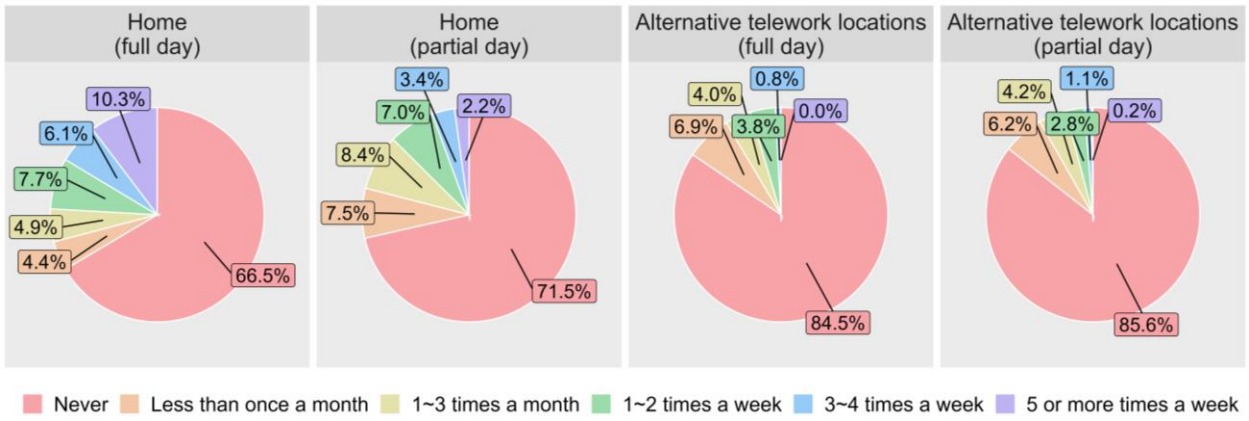


Figure 9. Telework frequencies of Georgia workers (N=1931)

Table 6 presents telework frequencies by region for each telework location and type. Aligning with the observed differences in feasible telework frequency across regions (Section 3.1), workers residing in the ATL MSA are much more likely to work from home at least once a week (full day: 30.6%, partial day: 14.7%) than those in other MSAs (full day: 15.8%, partial day: 10.3%) and in non-MSA regions (full day: 11.6%, partial day: 8.0%). However, the difference between the first two regions becomes negligible for alternative telework locations: the ATL MSA (full day: 5.2%, partial day: 4.5%) and other MSAs (full day: 5.2%, partial day: 4.4%). In fact, the shares for "at least three times a week" are higher for other MSAs (full day: 1.4%, partial day: 1.8%) than for the ATL MSA (full day: 0.6%, partial day: 1.2%). Considering that the shares of those who use alternative telework locations at all are substantially higher for the ATL MSA (full day: 18.5%, partial day: 17.1%) than for other MSAs (full day: 12.5%, partial day: 12.1%), workers in the ATL MSA are considerably less likely to use alternative telework locations frequently, if at all, than workers in other MSAs. In non-MSA areas of Georgia, using

alternative telework locations is extremely rare; 1.0% of workers use alternative telework locations at least once a week for full days and 1.8% do so for partial days.

Table 6. Telework frequencies of Georgia workers by region (N=1931)

Work location		Region	Share					
			Never	Less than once a month	1-3 times a month	1-2 times a week	3-4 times a week	5 or more times a week
Full day	Home	ATL MSA	59.0%	4.7%	5.7%	9.5%	7.9%	13.2%
		Other MSAs	77.2%	3.8%	3.1%	5.3%	3.9%	6.6%
		Non-MSA	79.1%	4.4%	4.9%	4.5%	2.3%	4.8%
		GA	66.5%	4.4%	4.9%	7.7%	6.1%	10.3%
	Alternative telework locations	ATL MSA	81.5%	8.1%	5.2%	4.6%	0.6%	0.0%
		Other MSAs	87.4%	4.9%	2.4%	3.8%	1.3%	0.1%
		Non-MSA	91.8%	5.7%	1.5%	0.3%	0.7%	0.0%
		GA	84.5%	6.9%	4.0%	3.8%	0.8%	0.0%
Partial day	Home	ATL MSA	66.0%	8.3%	11.1%	8.0%	4.1%	2.6%
		Other MSAs	79.1%	6.3%	4.3%	6.1%	2.7%	1.5%
		Non-MSA	81.2%	6.4%	4.5%	4.5%	1.7%	1.8%
		GA	71.5%	7.5%	8.4%	7.0%	3.4%	2.2%
	Alternative telework locations	ATL MSA	82.9%	7.6%	5.0%	3.3%	1.1%	0.1%
		Other MSAs	87.8%	4.5%	3.2%	2.6%	1.5%	0.3%
		Non-MSA	92.5%	3.2%	2.6%	1.0%	0.2%	0.6%
		GA	85.6%	6.2%	4.2%	2.8%	1.1%	0.2%

Note: Each row-sum of shares is 100.0%.

3.3 Work Location Distribution

The survey asked how often respondents generally go to each of the four work location types for full-day and partial-day work. This section examines the distribution of Georgia workers across the four types of work locations. First, we are going to look at the (trimmed-weighted) average frequency of use of each work location by region type. Second, the same values are investigated

by worker type. To calculate the average values, answers to the work location distribution question are transformed to numeric values representing per-month frequencies: never (0), less than once a month (0.5), 1-3 times a month (2), 1-2 times a week (1.5 times a week * 4 weeks per month = 6), 3-4 times a week (3.5 times a week * 4 weeks per month = 14), and 5 or more times a week (5 times a week * 4 weeks per month = 20). The midpoint of each frequency category is used, except that "5 or more times a week" is transformed to 5 because it is expected that the majority of those who selected it for a work location would go to the location 5 times a week. For the average frequency of working at each work location (in Figure 10 and Figure 11), we multiply an obtained average by "(7 days per week)/(30 days per week)" to convert it to a weekly frequency.[27]

3.3.1 Work Location Distributions by Region Type

What percent of workdays are teleworked? Figure 10 summarizes average work location frequencies by region type (and statewide). In Georgia, working at a location for full days (4.07 times a week) is much more common than partial-day working (1.61 times a week). In a typical week, Georgia employees work 2.75 full days at their regular workplaces (67.6%), 0.82 full days

[27] The attentive reader will note that we first assume 4 weeks per month to convert the weekly frequencies to monthly, and then assume 30/7 = 4.286 weeks per month to convert all frequencies back to weekly. This dampens the categories that are originally week-based (1-2, 3-4, and 5+ times/week) to lower values (4/4.286 → 93% of their initial values) when converting back to weekly: 1-2 days/week becomes 1.4 instead of 1.5, and so on. One rationale for doing that is that when individuals respond, say, 1-2 times/week, they may occasionally (e.g. 7% of the time...) miss a regular TWing day (because of an important event requiring their presence at the regular workplace, or other factors -- not to mention personal leave days), and thus their actual frequency is lower than the rigid 1-2 times/week response would indicate. Of course, they may "make up" for that missed TWing day by doing it 3 times the next week, so we could also view the 7% discount as the net of {missed TW occasions + make-up TW occasions}, i.e. that they don't quite make up as many TW occasions as they miss.

We also suspect (but cannot prove) that frequencies are not uniformly distributed across the interval but are more concentrated in the lower half of the interval. E.g. we conjecture that among those responding 1-2 days/week, more people TW 1 day/week on average than do so 2 days/week. Applying the "conversion discount" also accounts for that effect. Thus, in sum, this approach gives a slightly more conservative estimate than people's self-reported frequency categories, which has a plausible behavioral basis.

from home (20.1%), 0.11 full days at alternative telework locations (2.7%), and 0.39 full days at customer locations (9.6%), on average. Therefore, *22.8% (20.1% + 2.7%) of full workdays are teleworked*. Partial-day working is more distributed across work locations than concentrated at the regular workplace. Georgia employees report working part of their day's work schedule 0.71 times a week at their regular workplaces (44.1%), 0.36 times from home (22.4%), 0.11 times at alternative telework locations (6.8%), and 0.43 times at customer locations (26.7%), on average. Hence, more partial-day working is from working at customer locations (26.7%) than working from home (22.4%), which is the opposite case for full-day working (9.6% at customer locations and 20.1% from home).

Teleworking patterns vary a great deal by region type. The ATL MSA has the highest share of full days being teleworked (28.3% = 25.4% (home) + 2.9% (alternative telework locations)), with other MSAs (16.2% = 13.2% + 3.0%) and non-MSA areas (10.8% = 9.8% + 1.0%) following well behind. On closer inspection of full-day telework patterns, it is possible to see that WFH is much more frequent (2.0 times = 1.04 / 0.53) for workers in the ATL MSA than for those in other MSAs, while the frequencies of using alternative telework locations are the same in the two regions (0.12). On the other hand, workers in non-MSA areas go to alternative telework locations for full days (0.04) much less often. Similar to full-day telework patterns, partial-day WFH is more common in the ATL MSA (0.43) than in other regions (0.27 and 0.23), and partial-day working at alternative telework locations is much less common in non-MSA areas (0.06, compared to 0.12).

The WFH frequencies observed in our study are substantially lower than those found in another, often referenced, report (Barrero et al., 2021)[28]. These authors estimated that the share of paid full days worked from home in the US for March-June 2022 was 30-32%, using the answers to a question asking "[f]or each day last week, did you work a full day (6 or more hours), and if so where?"[29] On the other hand, the corresponding share for March-June 2022 in Georgia from our study is 20.1%. Several factors likely contribute to the sizable difference in these two estimates. First, the definitions of "full day" differ between the two studies: "6 or more hours" for Barrero et al., and "the entire normal work schedule" in our study (thus, if someone were only scheduled to work five hours one day, and worked all five hours at home, in our survey he/she should report working a full day at home). Second, the study populations differ. Our study examines the work patterns of employed Georgia residents who are 18 years old or older, but Barrero et al. (2021) set their study population to be US residents ages 20 to 64 and earning at least $10,000 in the previous year. Third, and probably most importantly, our weighting methods differ. Our study used population margins for ten variables (from ACS 2022 1-year estimates with some assumptions and adjustments for region type and TWing status) for sample weighting, while Barrero et al. (2021) used margins for four variables (sex, age, education, and income) from 2010-2019 Current Population Survey (CPS) data. As mentioned earlier, we found in previous related work that TWers were substantially over-represented in our samples, *even after* weighting for representativeness on the other variables. This is not particularly surprising in view of the purely online distribution of the survey, which would logically be biased toward

[28] This report is updated monthly, but the authors have requested that researchers use a consistent citation dated 2021. We accessed the report on July 24, 2023, at which time it had been updated on July 5, 2023 with statistics until July 2023.
[29] See page 5 of https://wfhresearch.com/wp-content/uploads/2023/07/WFHResearch_updates_July2023.pdf.

computer-literate, internet-savvy individuals who would also be more likely to have TW feasible jobs. Considering that the share of TWers in our unweighted sample (50.3%) decreased by 33% in the trimmed-weighted sample (to 33.5%), the inclusion of (estimated) TWing status margins in the weighting process certainly contributed to finding a smaller share of full days being worked from home in our study (20.1%, which happens to be smaller by a similar proportion – 33 to 37% – compared to the 30-32% from Barrero et al. (2021)).

Figure 10. Work location distributions by region type

3.3.2 Work Location Distributions by Worker Type

How often do employees in each worker type WFH? Work location distributions (not just full-day WFH frequencies) in a typical week differ by worker group as illustrated in Figure 11. NTWers do not work from home for full days (by definition) and barely do other types of teleworking. However, they do occasionally go to customer locations (0.84 times/week = 0.37 full days + 0.47 partial days) and work for partial days at the regular workplace (0.77 times/week). The average work schedule of NUTWers is more dispersed across work locations than other groups — this group has the highest frequencies of working at alternative telework

locations and customer locations (for full and partial days), both of which are the least popular work locations for Georgia workers in total. On average, they WFH slightly less than once a week for both full days (0.80) and partial days (0.79). UTWers spend the vast majority of their work hours at home. They work from home for 4.15 full days (83.8% of full workdays) and 1.04 partial days (63.4% of partial workdays) a week. They visit other work locations much less often; the second-most-visited work location is their regular workplace, at which they work for 0.44 full days (8.9% of full workdays) and 0.24 partial days (14.6% of partial workdays) per week.

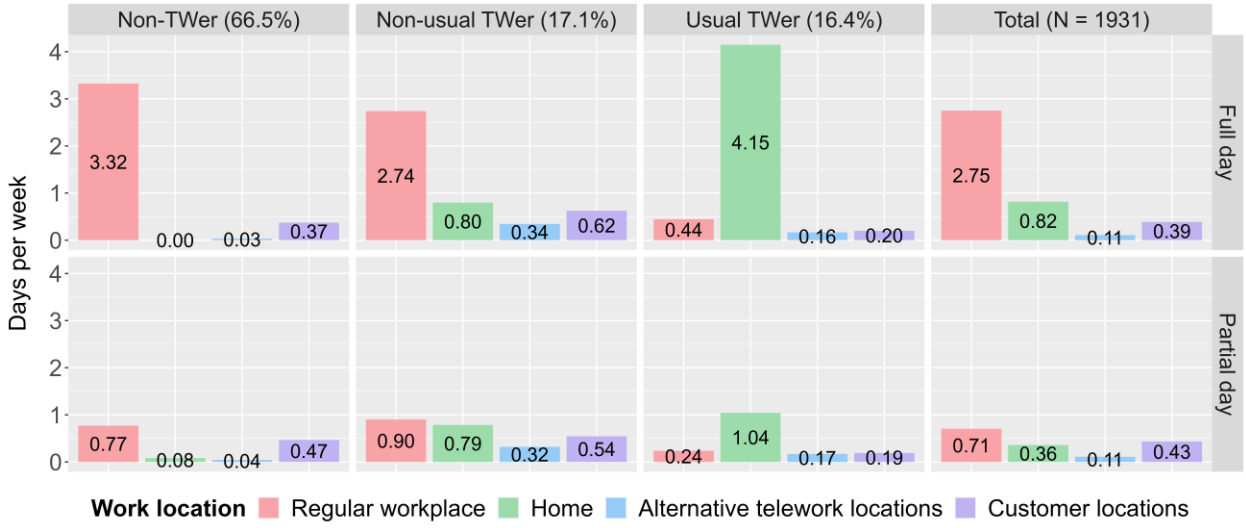


Figure 11. Work location distributions by worker type

3.4 Characteristics of Teleworkers

Who works from home for full days? The main reason for focusing on this specific type of teleworking is that home is the main location of teleworking and WFH is more likely to be for full days than partial days (as we learned from Figure 9 and Table 6). Another reason is that we noticed, during quality checks and data cleaning, that respondents are better at reporting full-day work patterns in general, which implies higher data quality for the full-day variables. However,

we are not implying that the impacts of other types of teleworking (especially partial-day WFH) are only negligible. More in-depth investigations would be necessary to reveal which type of WFH has broader and heavier impacts on travel and activity patterns in daily lives and how the impacts would differ[30]. Nevertheless, in this section (and many of the following sections), the main focus lies on the distribution of worker type (defined using the frequency of *full-day working from home*), and comparisons across worker types. The following subsections look at the distributions of worker type by region (Section 3.4.1), and then examine how worker types (and full-day WFH) are related to work organization type and self-employment (Section 3.4.2), sociodemographic and household characteristics (Section 3.4.3), and attitudes (Section 3.4.4).

3.4.1 Region Types

How does the distribution of worker type differ by region type? According to Figure 12, the ATL MSA has a much higher UTWer share (21.1%) than other MSAs (10.5%) and non-MSA regions (7.0%), the ranking of which aligns with feasible telework frequency. Similarly, the share of NUTWers (19.9%) is much higher for the ATL MSA than for other regions. However, the share is slightly larger for non-MSA areas (13.9%) than for other MSAs (12.3%). This does not indicate that WFH is more prevalent in non-MSA areas considering (1) the share of UTWers is higher for other MSAs and (2) average frequencies of working from home (for both partial and full days) are higher for other MSAs (see Figure 10).

[30] For example, full-day working from home presumably eliminates both commute trips (and so probably has the greatest potential for reducing travel on net), which frees up the most time for other activities (some of which, however, may involve the generation of travel). But on the other hand, while full-day working from home may lead to simply staying at home all day, partial-day working from home will generally still entail a round-trip commute, but at a different time (in at least one direction if not both), perhaps using a different mode and/or route, and with potential changes in activity patterns. Thus, the travel/activity patterns on the day of partial-day working from home may be more unpredictable, and are probably more likely to generate travel.

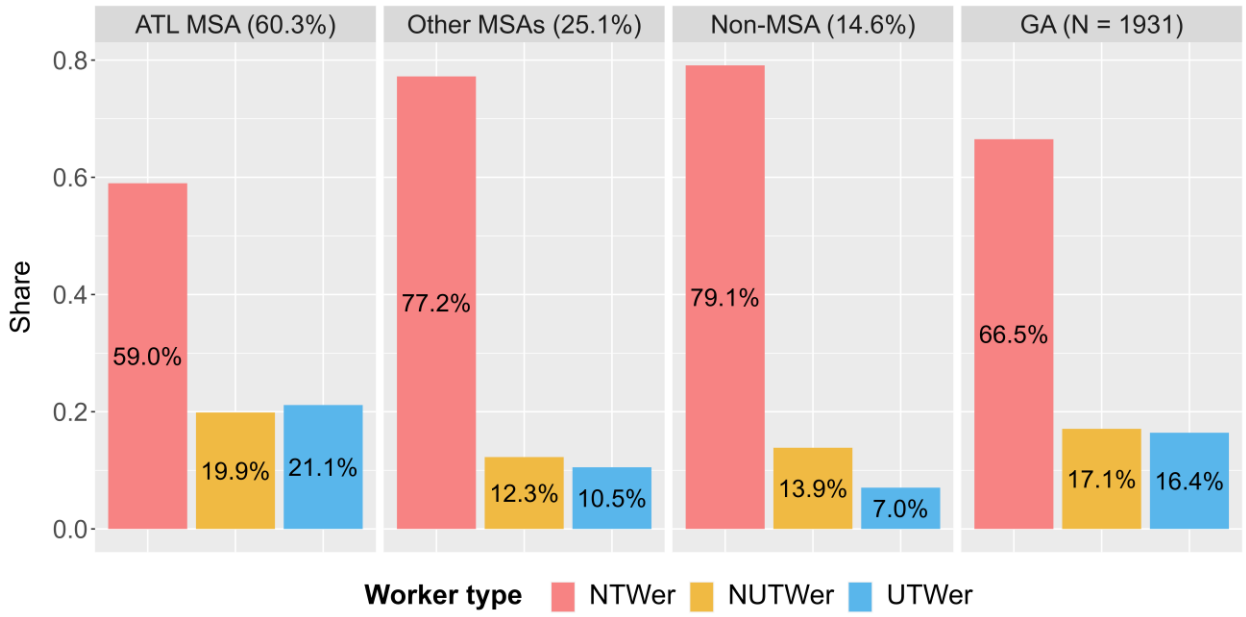


Figure 12. Worker type distributions by region type

Among those who* can *TW, how many actually* do *so? Table 7 compares feasible TW frequency and the frequency of full-day WFH in parallel. The gaps between non-zero full-day *actual* WFH frequencies and the corresponding *feasible* TW frequencies are the smallest for the ATL MSA (i.e., the ratio is 0.97 for "3 or more times a week", meaning that 97% of those who *can* TW 3+ times/week *do* WFH full days that often, and 0.93 for "some") and the largest for other MSAs (i.e., the ratio is 0.79 for "3 or more times a week" and 0.78 for "some"). This implies that the degree to which feasible TW frequency leads to full-day WFH is the strongest for the ATL MSA (closely followed by non-MSA regions) and the weakest for other MSAs. Together with the fact that TW feasibility is highest for ATL MSA workers (Section 3.1), it is not surprising that the ATL MSA has the highest NUTWer and UTWer shares across all region types. However, somewhat counterintuitively, feasible TW frequency is least likely to lead to full-day WFH for other MSAs. Instead, according to Figure 10, teleworking is more evenly distributed across various types of teleworking in other MSAs compared to the other two regions. The underlying

reasons for the telework patterns in other MSAs are not clear, but many factors including job and worker characteristics may be associated with the patterns. For all regions, the vast majority (92-97%) of those who never work from home do not meet the feasibility criterion. In other words, relatively few of those who do not currently work from home could be converted to TWers without changing their type of job, their manager, or both.

Table 7. Feasible telework frequency and full-day WFH frequency (N=1931)

MSA	Frequency[1]	Share		Ratio[2]
		Full-day WFH	Feasible TW	
ATL MSA	Never	59.0%	55.7%	1.06
	Some	41.0%	44.3%	0.93
	< 3 times a week	19.9%	22.6%	0.88
	≥ 3 times a week	21.1%	21.7%	0.97
Other MSAs	Never	77.2%	70.9%	1.09
	Some	22.8%	29.1%	0.78
	< 3 times a week	12.3%	15.7%	0.78
	≥ 3 times a week	10.5%	13.4%	0.79
Non-MSA	Never	79.1%	76.7%	1.03
	Some	20.9%	23.3%	0.90
	< 3 times a week	13.9%	15.9%	0.87
	≥ 3 times a week	7.0%	7.4%	0.95
GA	Never	66.5%	62.6%	1.06
	Some	33.5%	37.4%	0.90
	< 3 times a week	17.1%	19.9%	0.86
	≥ 3 times a week	16.4%	17.5%	0.94

Note:

1) For full-day WFH, "Never", "< 3 times a week", and "≥ 3 times a week" correspond to "NTWer", "NUTWer", and "UTWer", respectively.
2) The ratio of the full-day WFH share to the feasible TW frequency share, for the given frequency category. For the non-never frequency categories, this provides an estimate of the share of workers who actually *can* WFH that amount, that *do* WFH that amount. One exception is "< 3 times a week", because someone who *does* WFH less than 3 times a week may *be able* to WFH either less than or at least three times a week. For the "Never" category, the ratio is probably best interpreted in its inverse. For example, in the ATL MSA, 55.7%/59.0% = 0.944 means that WFH is not feasible for 94.4% of those who never WFH.

3.4.2 Organization and Employment Types

For what types of organizations do employees in each worker group work, and what are their employment types? Figure 13 illustrates the organization type distributions statewide and by worker type, based on the respondent's primary job. Less than a fifth (17.8%) of Georgia workers are self-employed or working for a family-owned business. Around half (48.8%) work at private companies other than education or health care organizations (15.3%), government or public agencies (11.4%), and other non-profit organizations (6.5%). One observation is that the share of those working for education or health care organizations gets smaller (17.1%, 14.4%, and 9.0%) as the full-day WFH frequency increases. This trend is reasonable, considering that many workers in these fields need to interact with customers in person. In contrast, TWers are more likely to be self-employed or working for family-owned businesses (usual TWers: 25.0%, non-usual TWers: 23.2%) than non-TWers (14.6%) are, conceivably because self-employed jobs and family-owned businesses are more likely to be home-based and TWers are defined to be those working from *home* for full days in this context. Looking at the self-employed workers in more detail (Figure 14), 10.1% of Georgia workers are self-employed for their primary job and the share of those WFH full days for 5 or more days a week is appreciably larger for self-employed workers (26.9%) compared to not-self-employed workers (8.5%). Therefore, we can say that self-employed are much more likely to work *only* from home than workers who are not self-employed. On the other hand, even though the share of usual TWers is considerably larger for self-employed workers (self-employed: 36.5%, not self-employed: 14.2%), the share of non-usual TWers is slightly smaller (self-employed: 14.3%, not self-employed: 17.3%).

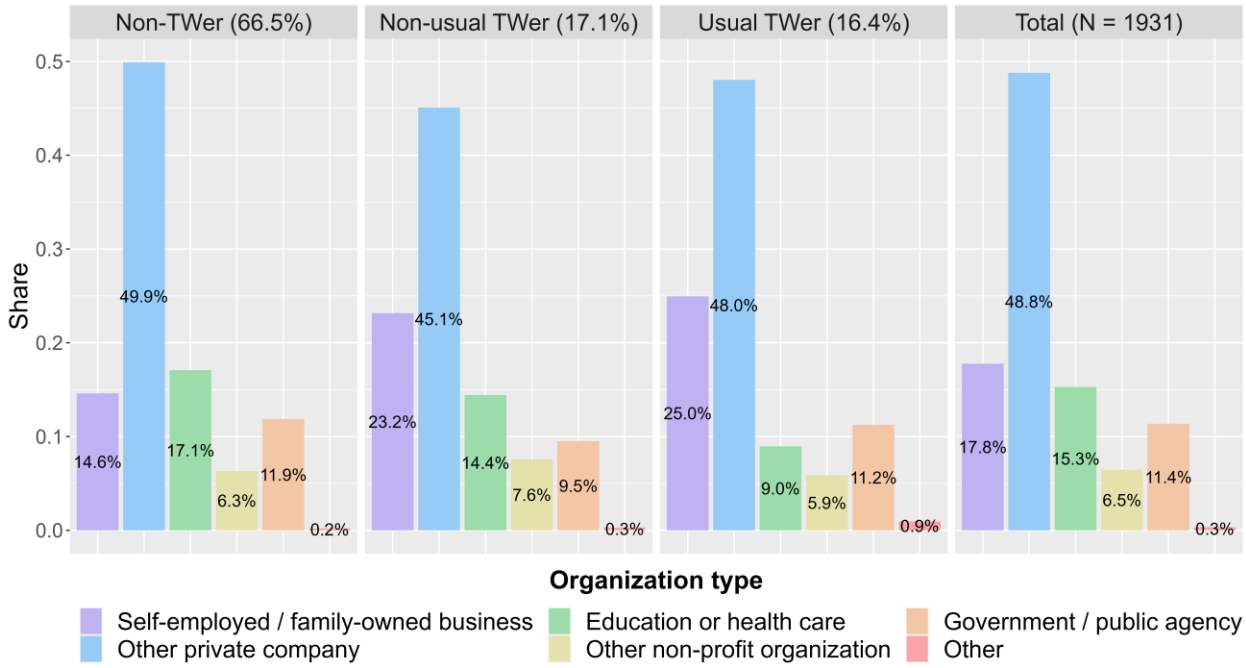


Figure 13. Organization type distributions by worker type

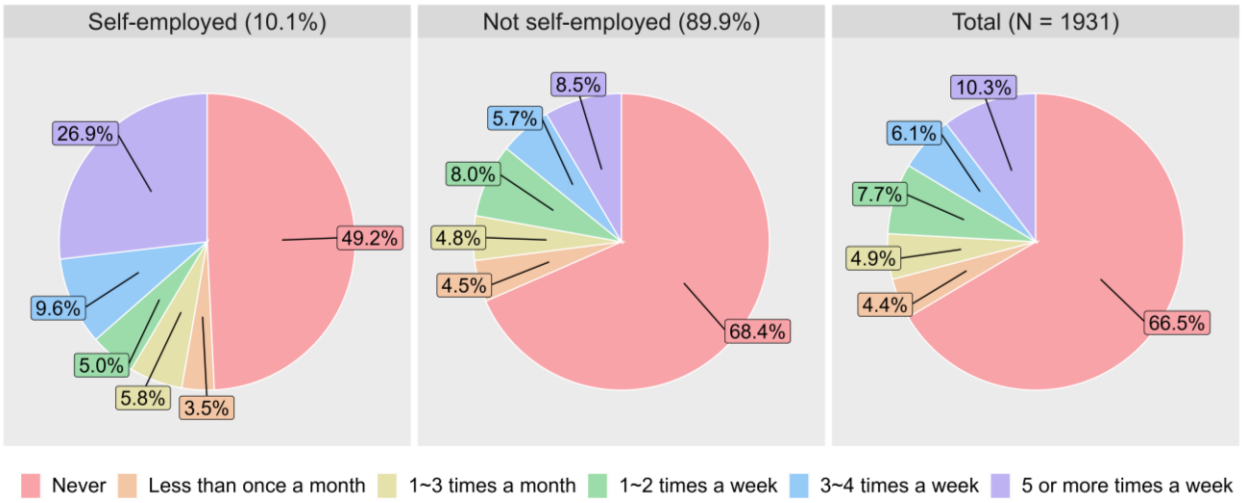


Figure 14. Full-day WFH frequencies by self-employment

3.4.3 Sociodemographic Characteristics

Does each worker type have distinct sociodemographic traits? Table 8 shows the summary statistics for various sociodemographic characteristics. Both TWer groups are more often highly educated (bachelor's degree or higher), working full-time, or living in the ATL MSA with high

household incomes ($100,000/year or more). At the same time, TWers are somewhat more diverse with respect to race/ethnicity (more so for UTWers). Comparing the two TWer groups, NUTWers are more often male and younger (age 44 or below) while UTWers are more often female and older (age 45 or over). Agreeing with previous observations (from Figure 14), UTWers are much more likely to be self-employed (22.5%) than NUTWers (8.5%) and NTWers (7.5%) are. Household composition differs by worker group. TWers are more likely to belong to a household with one adult (UTWers) or two (NUTWers), while the NTWer group has relatively high shares of those from a household with three or more adults. Moreover, NUTWers are more likely to have children in the household. This may be linked to the fact that NUTWers are more likely to be younger (age 44 or below) and have another adult in the household (i.e., the adult count is two), which makes it more probable for them to have non-adult children living with them.

Table 8. Sociodemographic characteristics by worker type (N=1931)

Variable		Share (trimmed-weighted)			
		Sample	NTWer	NUTWer	UTWer
Sex	Female	48.0%	50.3%	36.4%	**51.0%**
	Male	52.0%	49.7%	**63.6%**	49.0%
Age	18-24	13.5%	14.6%	**16.0%**	6.4%
	25-44	44.4%	42.8%	**49.5%**	45.5%
	45+	42.1%	42.6%	34.5%	**48.1%**
Race	White only	52.2%	**54.6%**	49.0%	46.2%
	Black only	30.5%	29.7%	30.8%	**33.5%**
	Other	17.3%	15.8%	**20.2%**	**20.2%**
Ethnicity	Hispanic	10.1%	9.2%	11.0%	**13.0%**
	Not Hispanic	89.9%	**90.8%**	89.0%	87.0%
Education	High school or less	30.5%	**37.2%**	20.3%	14.3%
	Some college	28.4%	**30.7%**	23.9%	23.7%
	Bachelor or higher	41.1%	32.1%	55.8%	**62.0%**
Employment status	Part-time	31.0%	**33.5%**	24.1%	27.9%
	Full-time	69.0%	66.5%	**75.9%**	72.1%
Self-employment	Not self-employed	89.9%	**92.5%**	91.5%	77.5%
	Self-employed	10.1%	7.5%	8.5%	**22.5%**
Region	ATL MSA	60.3%	53.5%	70.1%	**77.6%**
	Other MSAs	25.1%	**29.1%**	18.0%	16.1%
	Non-MSA	14.6%	**17.4%**	11.9%	6.3%
Annual household income	Up to $49,999	34.5%	**41.8%**	22.6%	17.3%
	$50,000 to $99,999	30.3%	**31.6%**	27.5%	28.0%
	$100,000 or more	35.2%	26.6%	49.9%	**54.7%**
Household adult count	1	19.9%	19.5%	18.8%	**22.8%**
	2	51.6%	49.9%	**56.0%**	54.0%
	3	15.9%	**17.0%**	12.4%	15.4%
	4+	12.5%	**13.6%**	12.9%	7.8%
Household children count	0	59.9%	**61.8%**	50.9%	61.2%
	1	19.1%	18.9%	**19.9%**	19.1%
	2+	21.1%	19.3%	**29.1%**	19.7%

Note: Bolded numbers indicate **the highest value** of each row.

3.4.4 Attitudes

How do the three worker groups differ attitudinally? In this section, we first briefly explain how attitudes are quantified, and then compare average attitude scores across worker groups.

One popular way to empirically reveal and quantify underlying attitudinal constructs (i.e., factors) is exploratory factor analysis (EFA) (Rummel, 1970). The answers to the attitude questions in Sections A, B, and C of the survey can be used as inputs for EFA. For consistency across similar surveys, we adopted the EFA solutions developed (by a research team led by Dr. Patricia Mokhtarian at Georgia Tech) using two Cintra survey datasets[31]. The two Cintra surveys and the survey for this study measured attitudes in the same format (i.e., 5-point Likert-type scale) using almost-identical sets of attitudinal statements. EFA solutions were developed for each survey section (A, B, and C) with one statement in Section A ("Family/friends play a big role in how I schedule my time") grouped with the statements in Section B (after some experiment). In all, 24 attitudinal constructs were revealed (Section A: 10, Section B: 7, Section C: 7) (see Appendix B for the statements with large factor loadings (in magnitude) for each factor and the methods used to obtain factor solutions).

The factor solutions generate coefficients used to weight and combine an individual's responses to the attitudinal statements, to produce a score for each person on each factor, representing the intensity (magnitude) and direction (positive or negative) of the person's position with respect to that attitude. There are a number of ways to compute factor scores; we calculated *Bartlett scores.*

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[31] Cintra (https://www.ferrovial.com/en-us/cintra/) is an international private developer of transport infrastructure. Funded by Cintra, a research team led by Dr. Patricia Mokhtarian administered a series of surveys focused on understanding telework patterns and associated transportation-related outcomes, with many questions overlapping with the questions in the survey designed for this study. The first survey was administered in Spring 2021 in the Dallas–Fort Worth–Arlington (DFA) and Washington–Arlington–Alexandria (WAA) MSAs. The second survey was administered in Spring 2022 in the same two MSAs plus the Toronto (Canada) Census Metropolitan Area.

We added two more steps to acquire the final factor scores. The first step was to standardize the scores on each factor such that the (trimmed-weighted) mean and standard deviation scores on that factor became zero and one, respectively. The following step was to adjust the scores of each factor by subtracting the score that a person who responded to all relevant statements with "neutral" would have, which basically re-centered the scores so that the factor scores of a "neutral" person became 0. Hence, a factor score represents how much the attitude associated with the factor deviates from the attitude of a neutral person. In other words, positive scores indicate agreement with the associated attitude while negative scores indicate disagreement. Factor scores (without the two steps) generally lie between -3 and 3, but neutral-centered factor scores in this study range from -3.9 to 5.2 (with the trimmed-weighted standard deviation of scores of each factor being one). Georgia workers, on average, are fairly pro-car-owning (2.11) and regard themselves well-established in their field and good at time management at work (1.78, "experienced") (see Table 9). At the same time, they are more tech-savvy (1.15) and satisfied with their job (1.10) than a "neutral" person is.

Table 9 presents analysis of variance (ANOVA) tests to evaluate whether attitudes differ, on average, across worker types. The results indicate that they do differ, at the 5% significance level, for all factors except one: "pro-large house" ($p = 0.150$).

Naturally enough, F-statistic values, as well as gaps between highest and lowest scores across groups, tend to be larger for the telework-related attitudes. For example, five out of seven attitudes with an F-statistic larger than 20 are telework-related attitudes. Looking at each worker type in more detail, UTWers hold the most positive attitudes toward TWing. Even though NTWers have the least positive attitudes toward teleworking in general (in terms of the level of

dedication to work and productivity ("TW enthusiasm"), time and locational flexibility, and effectiveness of teamwork), NUTWers see the negative aspects of TWing as well. Compared to other worker types, NUTWers are more likely to think that TWing would bring only limited (or no) cost savings, blur the boundary between work and personal lives ("TW negatives"), and reduce social interactions with colleagues ("TW lost workplace benefits").

In terms of general attitudes, TWers are more favorable toward active modes and transit, pro-environment, urbanite, and life-satisfied on average. In addition, UTWers are the least pro-car-owning and career-oriented but the most tech-savvy, while NUTWers are the most travel-stressed but the most commute-positive at the same time. The latter result hints at a possible motivation for adopting NUTWing rather than UTWing or NTWing: UTWing may largely reduce the travel stress but would also decimate the benefits of commuting, while NTWing would increase commuting occasions and therefore *potentially* its benefits (although the positive attitude toward commuting that is reported by this group may partially be a consequence of not having to do it every day), but would also increase travel stress. In other words, for many people in this group, NUTWing may represent the optimal balance between the pros and cons of commuting. Taking a look at work-related attitudes, TWers are more satisfied with their job than NTWers are. UTWers tend to think that their performance at work is measurable, while also being autonomous in working. NUTWers are most likely to be pro-teamwork and most concerned about work/family interference, though all three groups, on average, disagree that it is a problem.

Table 9. Attitudes by worker type

Attitude/preference		Mean (trimmed-weighted)				One-way ANOVA	
		Sample	NTWer	NUTWer	UTWer	F-stat	P-value
General	Pro-active modes and transit	0.00	-0.09	**0.21**	0.18	18.13	0.000
	Tech savvy	1.15	1.10	1.19	**1.29**	4.73	0.009
	Pro-large house	0.70	0.72	0.61	**0.74**	1.90	0.150
	Satisfied	0.97	0.92	1.07	**1.11**	6.25	0.002
	Pro-car-owning	2.11	**2.16**	2.14	1.87	11.13	0.000
	Pro-environment	0.36	0.27	**0.57**	0.52	16.52	0.000
	Travel stressed	0.15	0.04	**0.50**	0.20	29.62	0.000
	Commute positive	0.83	0.82	**1.11**	0.58	23.41	0.000
	Career oriented	0.56	**0.64**	0.48	0.32	14.53	0.000
	Urbanite	0.34	0.26	0.45	**0.55**	13.05	0.000
Work-related	Work interferes with family	-0.34	-0.38	**-0.08**	-0.45	14.33	0.000
	Pro-teamwork	0.03	0.00	**0.20**	-0.02	5.73	0.003
	Family interferes with work	-0.24	-0.28	**-0.01**	-0.27	9.80	0.000
	Performance is measurable	0.52	0.54	0.35	**0.58**	5.52	0.004
	Job-satisfied	1.10	1.06	1.19	**1.20**	4.01	0.018
	Autonomous	0.34	0.33	0.25	**0.47**	4.32	0.013
	Experienced	1.78	**1.82**	1.78	1.63	4.53	0.011
Telework-related	TW enthusiasm	-0.10	-0.27	0.13	**0.36**	63.02	0.000
	TW location flexibility	0.21	0.08	0.32	**0.65**	45.07	0.000
	TW cost-saving	0.53	0.46	0.39	**0.97**	38.44	0.000
	TW negatives	-0.15	-0.17	**0.09**	-0.34	15.45	0.000
	TW lost workplace benefits	-0.08	-0.08	**0.07**	-0.28	10.06	0.000
	TW effective teamwork	0.13	-0.11	0.41	**0.77**	130.33	0.000
	TW time flexibility	0.69	0.56	0.86	**1.01**	32.09	0.000

Note: Bolded numbers indicate **the highest mean value** of each row.

3.5 Growth in the Number of Teleworkers

How has the share of each worker type changed since before the COVID-19 pandemic? To answer this question, we needed to estimate the worker type shares for Georgia in 2019. The share of UTWers was acquired with the same method we employed to obtain the 2022 UTWer share in Section 2.3.3 (i.e., using ACS 1-year estimates in Table B08006), only this time using

2019 data (UTWer share: 6.94%). Subsequently, we calculated the ratio of NUTWers to UTWers from the 2017 NHTS (nationwide) data and applied it to the UTWer share to obtain the share of NUTWers (6.40% = 6.94%* 0.92174), leaving 86.66% as the share of NTWers. The same process was applied to obtain worker type shares for the ATL MSA in 2019, starting from the UTWer share acquired from the ACS (8.84%) and proceeding to estimate the shares of NUTWers (8.15% = 8.84%* 0.92174) and NTWers (83.01%).

Table 10 shows how TWer shares changed from 2019 (pre-COVID) to 2022 (post-COVID). Pre-COVID ***UTWer*** shares were 8.84% in the ATL MSA and 6.94% in Georgia. During the pandemic, the ATL MSA experienced a steeper (absolute) rise in UTWer share than Georgia as a whole; the share increased to 20.97% (12.13 percentage points higher than the pre-COVID share) in the ATL MSA and to 16.34% (9.40 percentage points higher than pre-COVID) in Georgia, while the relative rise in UTWer share was similar (ATL MSA: 137.2%↑, Georgia: 135.4%↑). One the other hand, the absolute increase in ***NUTWer*** share was slightly larger for the ATL MSA (11.56 percentage points) than for Georgia (10.60 percentage points), but the relative increase was higher for Georgia; the share increased by 165.6% (from 6.40% to 17.00%) in Georgia and by 141.8% (from 8.15% to 19.71%) in the ATL MSA. Taking TWers as a whole, they increased by 139.4% (from 16.99% to 40.68%) in the ATL MSA and by 149.9% (from 13.34% to 33.34%) in Georgia overall, from 2019 to 2022.

Table 10. Worker type shares in Georgia and the ATL MSA (2019 vs 2022)

	ATL MSA		GA	
	2019	2022	2019	2022
NTWer	83.01%	59.31%	86.66%	66.66%
NUTWer	8.15%	19.71% (141.8%↑)	6.40%	17.00% (165.6%↑)
UTWer	8.84%	20.97% (137.2%↑)	6.94%	16.34% (135.4%↑)

3.6 Activity Patterns on Teleworking Days

When do people telework, and what do they do differently on the days they telework? In the following subsections, we analyze the distribution of teleworking days across the week (Section 3.6.1), examine what the workers who TW for full days do with the time they save by not commuting (Section 3.6.2), tabulate the out-of-home activities conducted on the most recent teleworking day (Section 3.6.3), and investigate how teleworking impacted the out-of-home activities on the most recent teleworking day (Section 3.6.4).

3.6.1 Days of Week for Teleworking

When do workers telework? Figure 15 presents the shares of respondents teleworking on each day of the week. The respondents who reported that they work from home or at alternative telework locations at least once a month for full days (30.5% of the total respondents; trimmed-weighted N=589.9)[32] were asked on which days they typically telework for full days; the answers are summarized in the left pane of Figure 15. In a similar way, the question about partial-day teleworking was presented to those who work from home or at alternative telework locations at least once a month for partial days (23.2% of the total respondents; N=448.2). Based on their work patterns, some respondents faced both, one, or neither of these questions. The shares in each pane do not add up to 100% because multiple answers were allowed.

One notable pattern is that partial-day teleworking days vary more than full-day teleworking days. This indicates that full-day teleworking occasions are more likely to be regularly scheduled and prearranged. This argument is also supported by the fact that full-day teleworking occasions

[32] In fact, 602.9 cases (31.2%) were supposed to face the question but 13.0 of them did not due to a coding error made by the research team when creating surveys in the Qualtrics format.

are concentrated on weekdays but partial-day occasions are more evenly distributed across weekdays and weekend days. Monday, Tuesday, and Wednesday are slightly more popular for full-day teleworking than other weekdays. On the other hand, Wednesday and Friday are the most popular weekdays for partial-day teleworking.

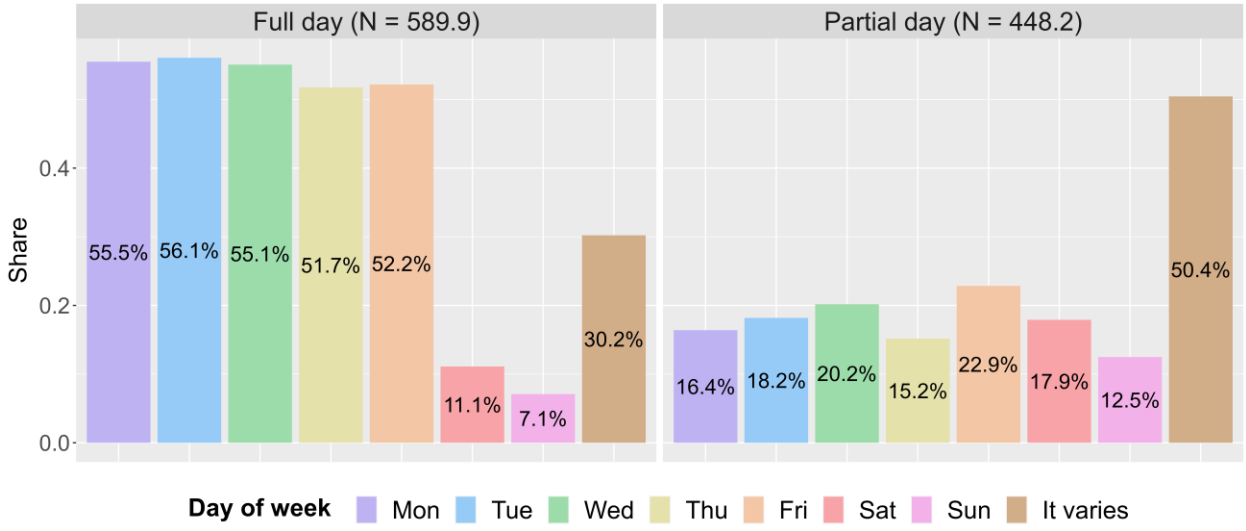

Figure 15. Days of week on which teleworking occurred, by full and partial day

3.6.2 Activities Conducted with the Time Saved by not Commuting to the RW

How is the time saved by teleworking for full days utilized? Table 11 summarizes how respondents who work from home or at alternative telework locations at least once a month for full days use the time saved from not commuting to the regular workplace. About a fifth (18.9%) did not select any of the listed activities for various reasons: no time saving is perceived (7.1%), no difference is noticed in terms of what they do (5.5%), and the saved time is too short to do something in particular (6.3%). On the other hand, around four fifths (81.1%) selected at least one activity listed (including "other"). Having "family time" is the most preferred activity (reported by 48.2% of those who selected at least one activity). Other listed activities are preferred to a rather similar degree (reported by 39 – 44% of those who selected at least one

activity), except that working (33.5%) and spending time on leisure or recreational activities (29.7%) are less preferred.

Table 11. Activities conducted with the time saved by not commuting to the RW (N=602.5)[1]

Answer	Share[2]	Activity	Share[3]	Share[4]
No time saving perceived	7.1%			
No difference	5.5%			
Time saving is too short	6.3%			
At least one activity selected (multiple answers allowed)	81.1%	Sleep	35.0%	43.1%
		Exercise	34.6%	42.7%
		Work	27.2%	33.5%
		Meal preparation	35.5%	43.8%
		Family time	39.1%	48.2%
		Hobbies or other personal activities	31.3%	38.6%
		Leisure or recreational activities	24.1%	29.7%
		Other	2.3%	2.8%

Note:
1) Among 602.9 cases that faced the question because they reported working from home or at alternative telework locations at least once a month for full days, 602.5 cases provided valid answers.
2) The universe is the respondents who answered this question (N=602.5). The sum of shares is 100%.
3) The universe is the respondents who answered this question (N=602.5). The sum of shares is more than 81.1% because multiple answers are allowed for the listed activities.
4) The universe is the respondents who selected at least one activity for this question (N=488.5). The sum of shares is more than 100% because multiple answers are allowed for the listed activities.

3.6.3 Out-of-home Activities on the Most Recent Teleworking Day

What out-of-home activities are conducted on teleworking days? It is desirable to obtain a more precise indication of activity patterns (of all workers who TW in any form) on their teleworking days than is discoverable from the very general question (asked only to workers who TW for full days at least once a month) that was analyzed in Section 3.6.2, because those activity patterns translate to travel patterns, and we urgently need more insight into the factors behind the changing travel patterns seen at the aggregate level. The ideal way to obtain such a precise

picture would be by capturing real-time information from workers over a period of several weeks. However, since the project time and monetary constraints precluded this option, we instead adopted the common practice of asking about the out-of-home activities performed on the most recent teleworking day. This question was presented to those who teleworked at least once a month regardless of the location (home or alternative telework locations) and duration (partial or full day), after asking them whether their last teleworking day was partial day or full day. Excluding those who did not remember whether the last telework occasion was for a partial or full day, the answers to the out-of-home activity question are summarized in Table 12. Note that the reliance on the most recent teleworking day means that at the individual level, the day may not be typical. Over a very large sample, however, we could expect the results to accurately portray patterns in the aggregate. Our own sample is not as large as would be desired for this purpose, especially when subdivided in any way (e.g., by full-day vs partial-day teleworking), but we can consider it to provide a rough sense of the reality on the ground.

The share of those who stayed entirely at home on the most recent teleworking day is a little larger than a quarter (27.2%) for full-day teleworking, which is double the share for partial-day teleworking (13.6%). About a quarter of those whose most recent teleworking day was a partial day (26.6%) still commuted, which is not surprising because it would be common for such a worker to (for example) work from home in the morning and go to the regular workplace for a meeting after lunch. However, it is interesting that about a tenth of those whose most recent teleworking day was a full day (9.7%) commuted as well. This share is higher than expected, but several reasons are possible, including working at an alternative telework location, holding a second job for which a commute occurred on that day, and going to the workplace for a non-

work reason, such as to drop off/pick up a child in the onsite childcare center or to visit the onsite gym.

Looking at other out-of-home activities, the preferences for out-of-home activities are somewhat similar for both full-day and partial-day TWing. For example, the three most selected activities are the same for both groups (although the order of the three activities differs): exercising, doing general errands, and eating out or getting take-out. At the same time, the two least popular activities on full-day teleworking days are also less preferred on partial-day teleworking days: work-related travel and recreational activities.

In general, the shares in the partial-day teleworking column are similar to or (usually) larger than their counterparts in the full-day teleworking column, which is at least partially attributable to the larger share of partial-day TWers going out at all on that day. However, "dropping off (or picking up) others" is conducted particularly more on full-day (14.7%) than on partial-day (7.6%) teleworking days. This observation is reasonable, given the better flexibility in time and location on a full-day teleworking day. Another exception is "exercise": a slightly larger share of workers who teleworked for a full day (34.4%) exercised (compared to 28.5% for workers who teleworked for a partial day).

Table 12. Out-of-home activities on the most recent teleworking day (N=633.4)

Answer		Full day[1]	Partial day[1]
No, I did not go out on that day		27.2%	13.6%
At least one activity selected (multiple answers allowed)	Commute	9.7%	26.6%
	Work-related travel (other than commuting)	6.8%	7.6%
	Visit family/friends	12.6%	12.2%
	Drop off/pick up someone	14.7%	7.6%
	General errands (e.g., shopping, dry cleaners)	27.0%	31.0%
	Personal business (e.g., medical appointment)	15.2%	20.7%
	Go out to eat / get take-out	23.8%	33.5%
	Recreational activities (e.g., visit parks, movies)	8.5%	8.4%
	Exercise (e.g., jog, walk the dog, work out at the gym)	34.4%	28.5%
	Other	0.8%	0.7%

Note:
1) Among 673.2 cases who faced the question, 369.5 (54.9%) answered that their most recent teleworking occasion was for a full day, 263.8 (39.2%) answered that the most recent teleworking occasion was for a partial day, and 39.8 (5.9%) did not remember.

3.6.4 Impacts of TWing on the Out-of-home Activities on the Most Recent TWing day

How does teleworking impact out-of-home activities? Following the question asking for the out-of-home activities conducted on the most recent TWing day (Section 3.6.3), respondents were asked how teleworking affected the specific activities they reported in the previous question. Those who did not telework at least once a month or responded "no, I did not go out on that day" to the previous question (see Table 12) did not see this question. Table 13 summarizes the answers. Again, respondents who did not remember whether the last telework occasion was for a partial or full day were excluded.

The reported impacts of teleworking on the commute are somewhat puzzling, even though a few potential explanations can be presented. The top two choices were "teleworking did not affect how I did this activity" (35.3%) and it was "a newly added activity" (25.2%), even though the

other answers seem more appropriate since we were asking about a teleworking day. With respect to the top choice, it helps to consider the possible reasons, discussed in Section 3.6.3, for reporting the commute as a teleworking day activity in the first place: working at an alternative telework location, holding a second job for which a commute occurred on that day, and going to the workplace for a non-work reason, such as to drop off/pick up a child in the onsite child care center or to visit the onsite gym. For at least the latter two of these reasons, it is plausible that indeed, the commute occurred despite teleworking, not because of it. For the first reason, if the respondent *routinely* commuted to an alternative telework location, s/he may have considered it more a regular commute than something affected by teleworking per se.

With respect to the second-most common answer for impacts on commuting (it was "a newly added activity"), one possibility is that the commute, although theoretically not necessary on that day, was spontaneously generated for one of the reasons mentioned above (or, to pick up a needed item that was left at the regular workplace), and therefore the respondent considered it "newly added". Another possibility is that some individuals compared their activity patterns to those performed on their *non-work* days. The question says "[w]e are interested in whether any of the out-of-home activities you did that day were different in some way because you teleworked", implying that we wanted them to compare with what they did on other *workdays*. However, that might have not been clear to some respondents, for whom "a newly added activity" could look like a more proper answer than other answers. To minimize these sources of confusion, improved question wording should be explored for future surveys.

The share for "because I teleworked, I did the activity on this day instead of another day" is the largest for those who "visit[ed] family/friends" (39.0%). At the same time, the share for

"teleworking did not affect how I did this activity" (23.3%) is the lowest for them. Interestingly, "visit family/friends" is among the less-popular out-of-home activities performed on teleworking days (see Table 12), reported by only about 12-13%. This can be interpreted that workers are not likely to visit family or friends on a teleworking day (because it is a "workday") but if they do, it is quite likely that they shifted their visit from another day (e.g., a non-workday).

Overall, "teleworking did not affect how I did this activity" is a popular answer, the share for which is the largest across all answers for many activities. The share of those who selected this answer is the largest for "drop off/pick up someone" (43.4%), followed by "general errands" (38.5%)[33]. These activities are often chained to the commute, and (for example, taking children to school) may have needed to take place regardless of whether the respondent actually commuted that day or not.

Nevertheless, for the majority of respondents and all activities, teleworking had some effect. Among all non-commute out-of-home activities, the share of those who changed the time (but not the day) of an activity is relatively higher for "exercise" (34.3%) and "recreational activities" (32.3%). On the other hand, "visit family/friends" (39.0%), "personal business" (37.4%), and "general errands" (33.2%) are more likely than other activities to have been switched to a teleworking day from another day. Lastly, "work-related travel" (19.2%) is much more likely than other activities to be conducted at a different *place* because of teleworking.

[33] "Other" is excluded from this discussion (and the discussion in the following paragraph) because it was selected by only 4.9 respondents.

Table 13. How teleworking affected the activities conducted on the last teleworking day

Activity	Count	***Because I TWed**, I did the activity…*				*TWing **did not** affect how I did this activity*	No response
		…as a newly added activity	*…on this day instead of another day*	*…on the same day, but at a different time*	*…at a different place*		
Commute	106.0	25.2%	21.2%	20.3%	8.7%	**35.3%**	3.1%
Work-related travel	45.4	23.8%	15.2%	29.9%	19.2%	**33.2%**	1.1%
Visit family/friends	78.9	22.1%	**39.0%**	21.5%	2.2%	23.3%	0.5%
Drop off/pick up someone	74.3	17.6%	17.3%	22.3%	2.9%	**43.4%**	1.6%
General errands	181.5	9.9%	33.2%	21.3%	4.3%	**38.5%**	1.6%
Personal business	110.9	15.9%	**37.4%**	15.6%	5.6%	33.1%	0.4%
Go out to eat / get take-out	176.2	19.5%	21.5%	22.0%	9.7%	**33.3%**	2.6%
Recreational activities	53.5	11.9%	27.1%	**32.3%**	9.3%	28.7%	0.0%
Exercise	202.2	10.7%	23.2%	**34.3%**	5.4%	32.0%	1.1%
Other	4.9	15.7%	27.7%	13.8%	6.7%	**51.0%**	0.0%

Note:

1) The shares in a row do not add up to 100% because multiple answers are allowed. For example, it is possible that a respondent selected both "…on the same day, but at a different time" and "…at a different place".
2) Bolded numbers are the **row-wise largest** shares.

3.7 Vehicle Ownership

The vehicle ownership status (e.g., count, sufficiency, type(s)) of a household is one of the main indicators of the travel and activity needs of the household, affecting travel and activity patterns of household members at the same time. In this section, the household vehicle ownership status of Georgia workers is examined, focusing on vehicle counts and sufficiency. Among other analyses, we will examine the relationship of worker type to vehicle ownership, as well as the impact of the pandemic on changes in vehicle ownership.

3.7.1 Household Vehicle Counts and Sufficiency by Region Type

How does vehicle ownership differ by region type? The statewide average vehicle count (among households with at least one worker) is 2.03, only slightly less than the average number of adults (2.26) (see Table 14). In other words, on average there is nearly one vehicle for each adult in the household (however, as we will see below in Figure 17, that average masks the fact that more than a quarter (27.9%) of individuals live in a household with fewer vehicles than adults and 4.1% live in a zero-vehicle household). Non-MSA regions have a higher average vehicle count (2.24) than other regions do (2.00). Many factors, including land-use characteristics (e.g., land-use type, density, mixture) and socio-economic traits, might be associated with the observed difference. However, the difference can also be partially explained by the larger average numbers of adults and household members in non-MSA regions. Figure 16 and Figure 17 present the vehicle ownership status by region type in detail.

According to Figure 16, illustrating vehicle counts by region type, 4.1% of the respondents reported zero household vehicles, 30.8% reported one, 38.8% reported two, 15.5% reported three, and 10.7% reported four or more. Although the average vehicle count is the same for the ATL MSA and other MSAs, the ATL MSA has higher shares of respondents with zero vehicles (5.0%, compared to 3.1%) and with four or more vehicles (10.4%, compared to 8.2%) at the same time. Non-MSA regions have the smallest share of respondents with zero vehicles available (2.6%) and the share having four or more vehicles (16.5%) is much larger than for other regions, contributing to the larger average vehicle count for non-MSA regions.

Taking the number of adults (i.e., who are 18 years old or older) into consideration, Figure 17 summarizes ***household vehicle sufficiency*** by region type. “Deficit”, “sufficient”, and “surplus” indicate that the number of household vehicles (if non-zero) is less than, equal to, and larger than

the adult count, respectively, while “zero” means no household vehicle. Statewide, 27.9%, 51.9%, and 16.1% of individuals fall into “deficit”, “sufficient”, and “surplus” groups. Figure 17 reveals that the adult count is one of the main factors explaining the household vehicle count, but regional differences still remain after controlling for the adult count, especially between the ATL MSA and other regions. For example, the regional differences are less prominent for vehicle sufficiency than for vehicle counts, especially for other MSAs and non-MSA regions. They have rather similar shares for “sufficient” (51.2% and 50.0%) and “surplus” (17.2% and 19.2%), even though the distributions of vehicle count differ substantially (e.g., non-MSA regions have a lower share for two-vehicle households and a higher share for four-or-more-vehicle households). On the other hand, the ATL MSA has a lower share of respondents in “surplus” households (14.9%) than other regions do.

Table 14. Average household vehicle and member counts by region type

		ATL MSA (60.3%)	Other MSAs (25.1%)	Non-MSA (14.6%)	GA (N=1931)
Average	Vehicle count	2.00	2.00	2.24	2.03
	Adult count	2.24	2.26	2.31	2.26
	Non-adult count	0.67	0.76	0.77	0.71
	Household member count	2.92	3.02	3.08	2.97

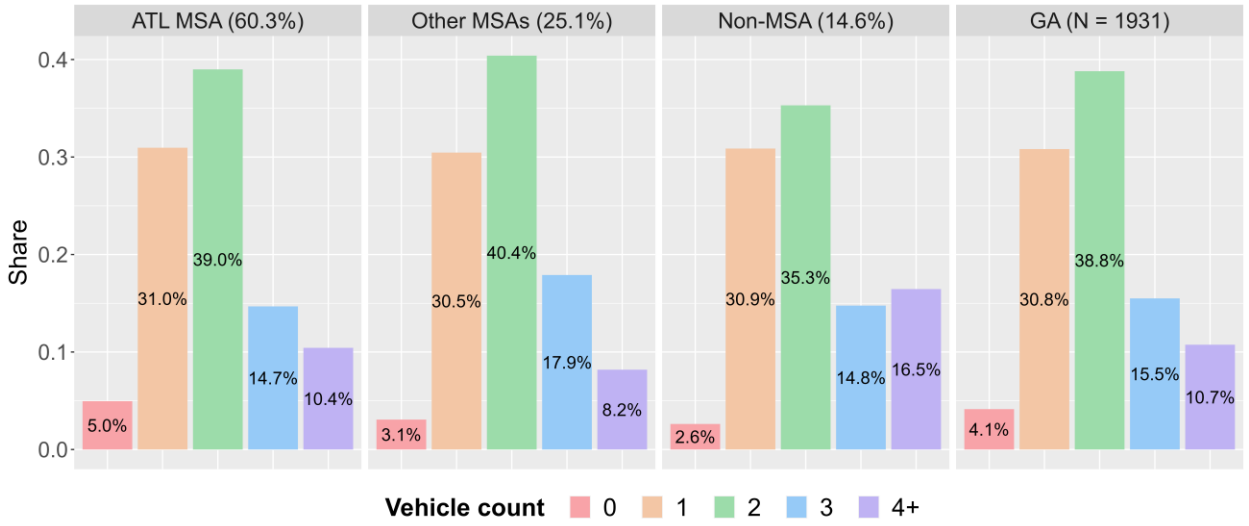

Figure 16. Household vehicle counts by region type

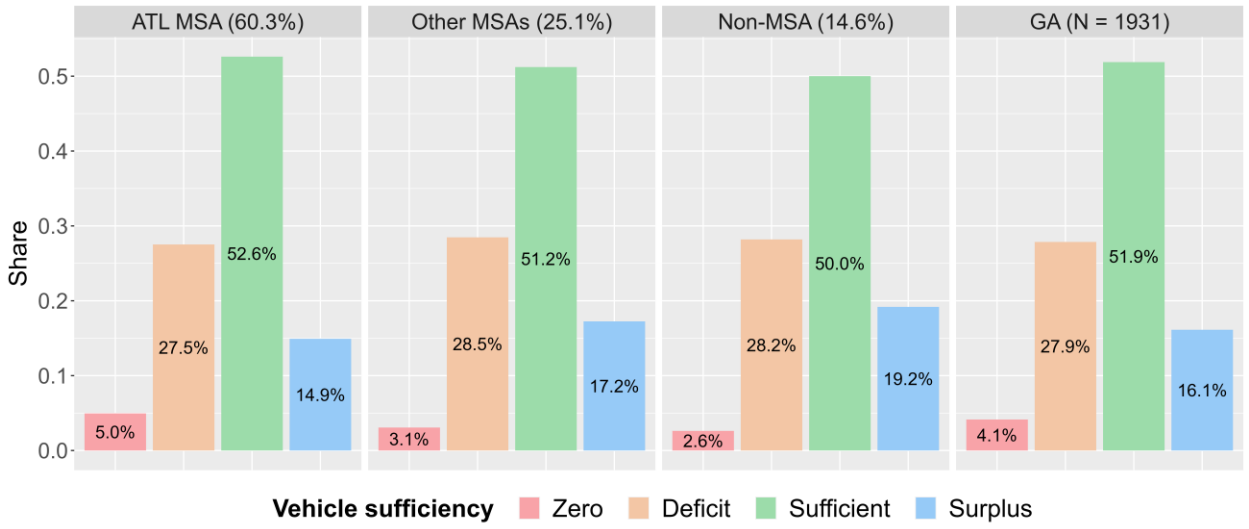

Figure 17. Household vehicle sufficiency by region type

3.7.2 Household Vehicle Counts and Sufficiency by Worker Type

How does vehicle ownership differ by worker type? Average counts of household vehicles, adults, and members vary with worker type as well (see Table 15). On average, NTWers have the largest household vehicle count (2.06) and adult count (2.30). NUTWers have the smallest number of household vehicles (1.94) and the largest number of household members (3.12) at the same time. UTWers have the smallest adult count (2.11) but the average household vehicle count is in the middle (2.02).

The patterns shown in Table 15 are not solely attributable to WFH frequencies and thus can be better understood when combined with the findings from Table 8. For instance, the UTWer group has more respondents age 45 and older (compared to other worker groups). This makes it more probable that the households of UTWers have fewer children or young-adult members (if any) and leads to small average adult and children counts, which is the exact opposite of the case for NUTWers (with many respondents ages 18 to 44). In addition, the NTWer group has a higher share of respondents in non-ATL regions, which have relatively large household vehicle and adult counts, accounting for the high average vehicle and adult counts of the group (even though the children count is on the smaller side).

Figure 18 and Figure 19 (similar to Figure 16 and Figure 17) provide information helpful in producing a better understanding of the association of worker type and household vehicle ownership. As indicated in the previous paragraph, the relationship between full-day WFH frequencies and vehicle counts is rather intertwined with many sociodemographic and household characteristics (and, of course, with various aspects of work/travel patterns other than WFH for full days). Therefore, it would be necessary to develop and test sophisticated statistical models for an in-depth understanding of the relationship. However, this report focuses on the

distributions of vehicle count and sufficiency, interpreting them in conjunction with various sociodemographic and household characteristics.

NTWers have the largest average vehicle count (2.06) and the most dispersed vehicle count distribution compared to other types of workers (see Figure 18); they have the highest shares of respondents in zero-vehicle (4.8%), three-vehicle (15.8%), and four-or-more-vehicle (11.9%) households across all worker types. This pattern is probably linked with two factors working in opposite directions. A relatively low household income and high share of non-ATL-MSA residents (with a large household size on average) among NTWers may be connected to high shares of respondents in zero-vehicle households and in three-or-more-vehicle households, respectively.

Comparing the two TWer groups, UTWers have slightly larger shares for three-vehicle (15.7%, compared to 14.1%) and four-or-more-vehicle (9.0%, compared to 7.9%) households (see Figure 18), even though the average adult count is smaller (2.11, compared to 2.22 from Table 15) and the share of ATL MSA residents is larger (77.6%, compared to 70.1% from Table 8). The high household income and high share of self-employed workers of UTWers may be the main factors contributing to the difference.

According to Figure 19, the UTWer group has the highest shares living in "sufficient" or "surplus" households (72.0% = 55.6% + 16.4%) across all worker groups (compared to 66.0% of NUTWers and 67.5% of NTWers), aligning with the fact that the average vehicle count (2.02) and adult count (2.11) are closest for that group (see Table 15). In contrast, the NUTWer group has the lowest share living in "surplus" households (13.2%) and the highest share in "deficit" households (31.7%) across all worker groups, resulting in the smallest average vehicle count

(1.94) and the largest gap between average vehicle count (1.94) and adult count (2.22) despite having the lowest share of respondents in living in zero-vehicle households (2.3%).

In summary, the average household vehicle count is the largest for NTWers. However, after controlling for household adult counts, UTWers are more likely than other worker groups to live in a household with at least one vehicle per adult, presumably linked to their high household income. Considering that this observation is at odds with the fact that NTWers are more likely to reside in non-ATL-MSA areas with more potential needs for driving in their daily lives, the relatively low household income of NTWers would be the main factor contributing to the high share of NTWers with zero household vehicles. Another point to note is that the average household vehicle count is the smallest for NUTWers, which is linked to the fact that having a surplus vehicle is least common, and having fewer vehicles than "sufficient" is most common, for NUTWers.

Table 15. Average vehicle, adult, and member counts by worker type

		NTWer (66.5%)	NUTWer (17.1%)	UTWer (16.4%)	GA (N=1931)
Average	Vehicle count	2.06	1.94	2.02	2.03
	Adult count	2.30	2.22	2.11	2.26
	Non-adult count	0.67	0.90	0.66	0.71
	Household member count	2.98	3.12	2.77	2.97

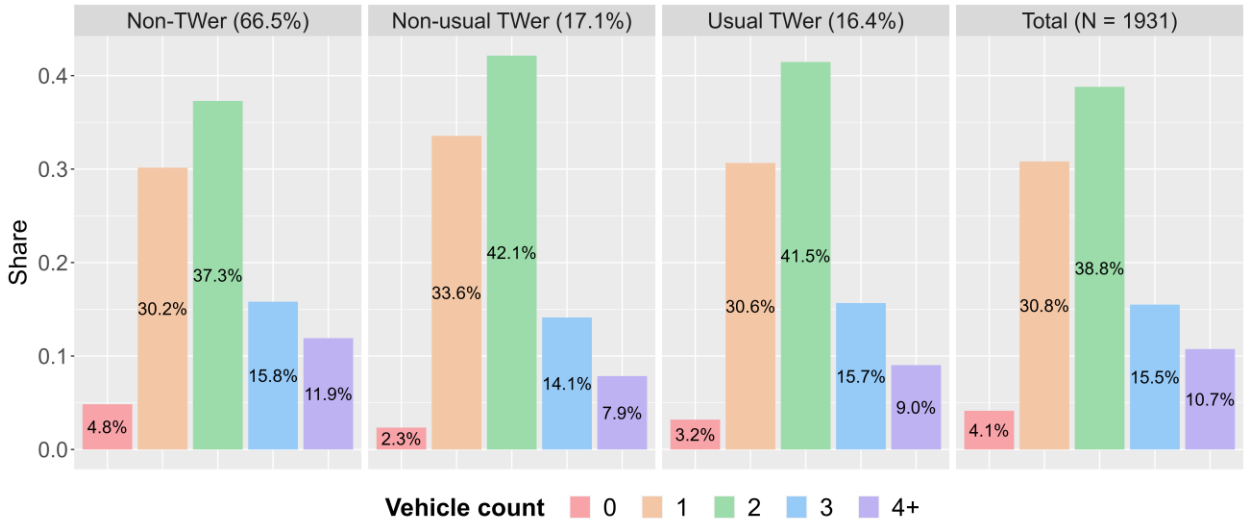

Figure 18. Household vehicle counts by worker type

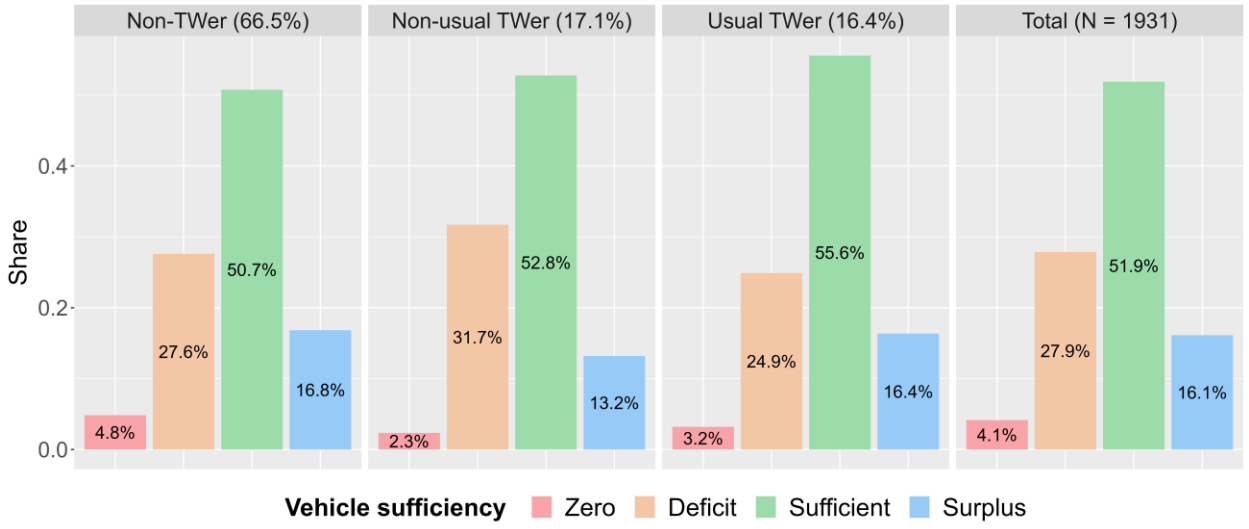

Figure 19. Household vehicle sufficiency by worker type

3.7.3 Changes in Household Vehicle Count

Is teleworking associated with changes in vehicle ownership since the pandemic began? In the survey, respondents were asked how their household vehicle count changed compared to March 2020 (i.e., immediately before the COVID-19 pandemic) and the answers are summarized in Figure 20. Note that the exact number of vehicles added, disposed of, or replaced, as well as other relevant changes (such as changes in household size and composition), were not measured. While more than three-quarters (77.3%) of respondents did not experience a change in the number of vehicles (25.4% replaced one or more vehicles without changing the total count, while 51.9% did nothing), the share who experienced an increase in the household vehicle count (15.6%) is more than double the share that experienced a decrease (7.1%).

Similar trends hold for all worker types (see Figure 20). Interestingly, however, NUTWers are most likely to have experienced changes in their household vehicle counts, in both directions: the shares of respondents who experienced an increase (19.6%) and who experienced a decrease (8.2%) are both highest for NUTWers. On the other hand, the share for "increase" is the lowest for UTWers (11.4%) and their share for "decrease" is on the lower side (7.1%, while the lowest is 6.9%, for NTWers). Although the lack of information on changes in WFH frequencies in the household since March 2020 prevents us from precisely ascertaining the impact of full-day WFH frequency on the household vehicle count, the findings from Figure 20 imply that the full-day WFH of a household member has neither a unidirectional nor monotonic impact on household vehicle ownership. More in-depth investigations using detailed information about the residential location, work locations of all household members, household composition, and vehicle ownership status would be required for an improved understanding.

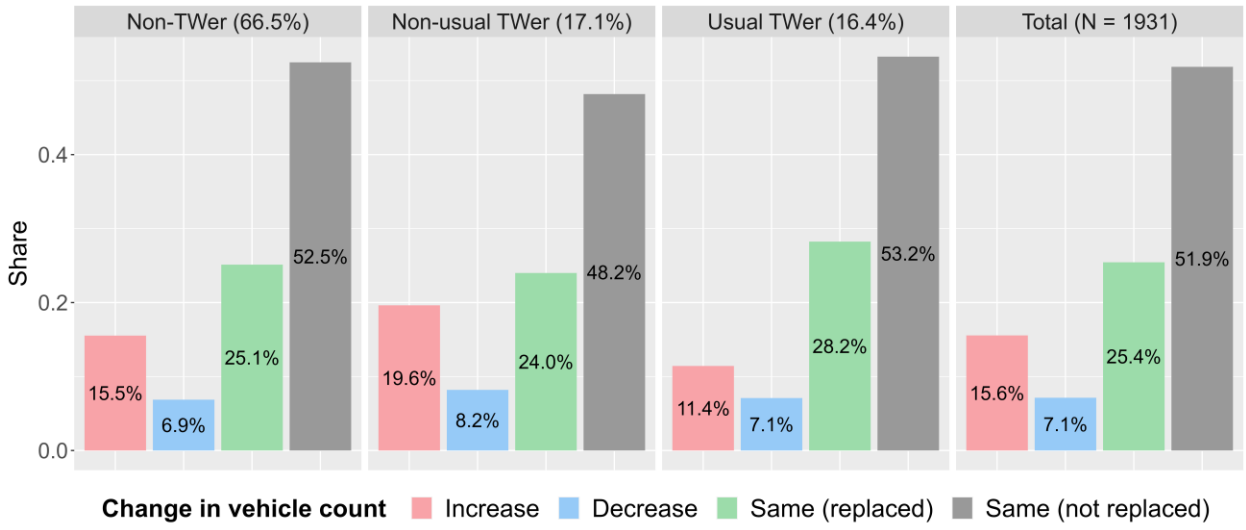

Figure 20. Vehicle count changes by worker type (compared to March 2020)

3.7.4 Role of Pandemic in Vehicle Ownership Changes

To what extent (if any) did the pandemic influence changes in household vehicle ownership? The respondents reporting any changes (i.e., increase, decrease, or replacement) in their household vehicles within the two years since March 2020 were asked about the influence of the COVID-19 pandemic on the household's decision to make the change (N=929.5, see Figure 21). Among all worker types combined, the share of respondents who think that the pandemic influenced (at least "somewhat") the household's decision to make a change is the highest for "decrease" (51.4%), followed by "increase" (29.2%) and "replace" (21.9%). This order holds for each of the worker types as well. This indicates that, although more workers experienced an increase in household vehicles than a decrease (according to Figure 20), a decrease is more likely to be associated with the pandemic than an increase is.

Who is more likely to have pandemic-related changes in household vehicles: non-TWers, or TWers? The vehicle ownership of both groups could be affected by the pandemic, potentially in opposite directions. On the one hand, TWers are much more often those who have changed their

work location (especially given the frequency of WFH for full days) since the outbreak of the pandemic, which may *reduce* household vehicle demands. Alternatively, if they have moved to a larger home in the suburbs because they don't need to commute as often (but do need home office space, and want a yard for the children to play in or for relaxing outside of work), they may need an *additional* vehicle since they are now less well-served by transit. On the other hand, non-TWers, though continuing to commute following the outbreak, may wish to avoid transit or ridehailing options, which could *increase* household vehicle demands. Alternatively, they are more likely to be in jobs that were cut back due to the pandemic, and accordingly a lower income could *reduce* their vehicle demands.

Figure 21 provides the answers. Although it would be inadvisable to compare NUTWers and UTWers considering the small sample sizes (e.g., the sample sizes for those who experienced a decrease in household vehicles are 27.0 (NUTWers) and 22.5 (UTWers)), when combining those two categories it is evident that TWers as a whole tend to link their changes in household vehicles with the pandemic more than non-TWers do, for all types of changes (i.e., increase, decrease, and replacement).

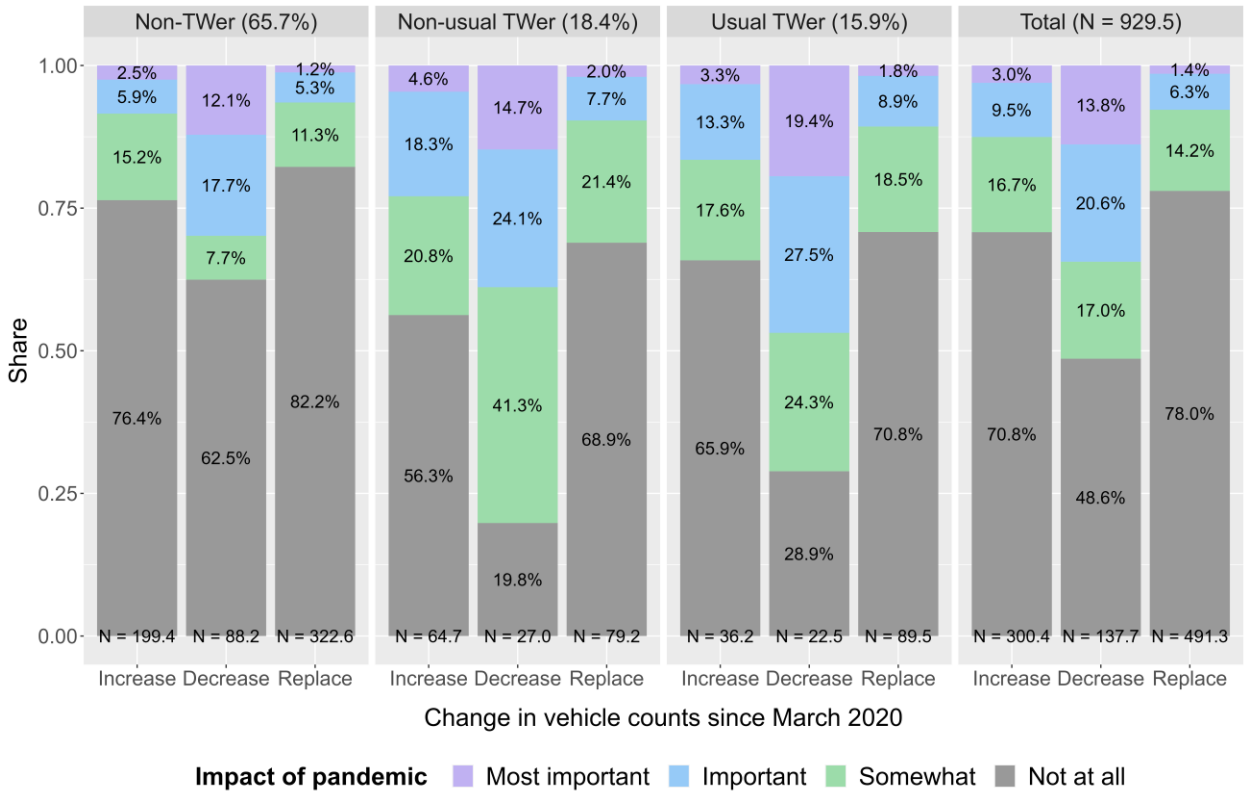

Figure 21. Impact of pandemic on the changes in household vehicles by worker type

3.8 Vehicle Miles Driven (VMD)

3.8.1 Share of Respondents Who Do not Drive

Who drives more? Respondents were asked whether they drive a vehicle (***even if only occasionally***). Those who answered "yes" to the question were asked how many miles they personally drive ***in a typical week*** for all purposes, excluding the distance driven as a professional driver[34] (if applicable). We refer to the response to this question as vehicle-miles driven, or VMD. Table 16 presents the shares of respondents who answered "no" to the former question or "0" to the latter question, by region and worker type. The vast majority of respondents drive (i.e., only 6.8% do not drive). The non-MSA regions have a lower share of

[34] Respondents were given "bus, truck, taxi, or Uber/Lyft driver" as examples.

respondents who do not drive (5.8%) than other regions do (ATL MSA: 6.9%, other MSAs: 7.7%), likely following from the lower land-use density and transit accessibility of non-MSA regions, which encourages driving. Interestingly, NUTWers have fewer respondents who do not drive (5.3%) than other worker types do (NTWers: 7.2%, usual TWers: 7.3%). This observation agrees with most of the characteristics of NUTWers found in previous sections (e.g., they more often are male (Table 8) and belong to a household with at least one vehicle (Figure 18), household income is on the higher side (Table 8), and work schedule is distributed across various work locations (Figure 11)), except that they are more likely to live in the ATL MSA than non-TWers are (Table 8). It seems that the relatively high non-driving shares of respondents among other worker types can be at least partially attributed to the high share of NTWers belonging to a zero-vehicle household (Figure 18), and work patterns mostly concentrated in the home for UTWers (Figure 11).

Table 16. Share of respondents who do not drive

Type			Share
Region type	ATL MSA	(N = 1161.7)	6.9%
	Other MSAs	(N = 484.5)	7.7%
	Non-MSA	(N = 281.2)	5.8%
Worker type	Non-TWer	(N = 1280.9)	7.2%
	Non-usual TWer	(N = 329.4)	5.3%
	Usual TWer	(N = 317.0)	7.3%
Total (N = 1927.4)			6.8%

Note: we excluded 3 cases (weighted count = 3.6) with no response to the VMD question.

3.8.2 VMD by Region and Worker Type

Figure 22 illustrates the average weekly VMD of respondents including both those who do and do not drive (but excluding cases with no response) (N=1927.4, the same as the sample size for Table 16). Respondents who do not drive are considered to have 0 miles as their typical weekly

driving distance. Note that the sample is supposed to represent *Georgia workers age 18 or older*, not adults, workers, or driving-age people (16 or over) in Georgia per se. Statewide, the average weekly VMD of workers (excluding the work-related VMD of professional drivers) is 122.8 miles. Also, the more a respondent works from home for full days, the lower the VMD; the statewide average weekly VMD is 134.9 miles for NTWers, 120.0 miles for NUTWers, and 76.6 miles for UTWers. UTWers have a distinctively lower VMD than others, which is assumed to be associated with higher full-day WFH frequencies (4.15 full days of WFH on average per week, according to Figure 11) compared to those of NUTWers (0.80) and NTWers (0.00). The same patterns exist for the ATL MSA and other MSAs, but non-MSA regions have a notably higher VMD for NTWers compared to other worker types. The high VMD of NTWers in non-MSA regions leads to a substantially longer VMD for non-MSA regions (157.1 miles) than for other regions (ATL MSA: 117.1 miles, other MSAs: 116.5 miles).

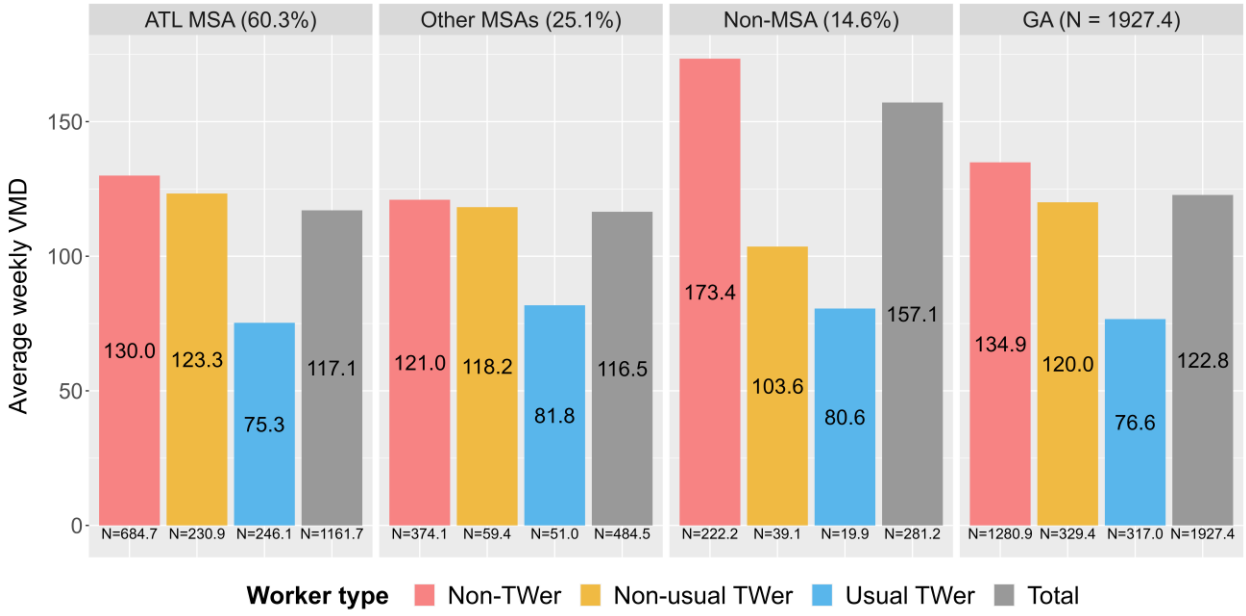

Figure 22 Average weekly VMD by region and worker type

3.9 Commute Patterns

3.9.1 Commute Distance to the RW

How does commute distance relate to region type? The survey inquires about how often respondents work at the RW if they have a non-home RW (i.e., if they have a primary job other than a home-based self-employed job[35]), and then asks the main reason for not going to the RW if they "never" go to a non-home RW (for both full and partial days) *in a typical week* even though they are not home-based self-employed workers for their primary job. According to Table 17, which categorizes workers based on the answers to those two questions, 15.2% of respondents in the sample ***never*** work at a (non-home) RW for various reasons. While COVID-19 is the reason for relatively few of them (1.7%), many are self-employed with a home-based job (6.9%), or do not have a RW (5.0%) (e.g., no fixed location, all employees working remotely).

More workers do not go to a non-home RW in the ATL MSA (17.5%) than in other regions (other MSAs: 12.3%, non-MSA regions: 10.4%). The ATL MSA has the highest shares for "self-employed, home-based job" (8.0%), "no RW" (5.9%), and "COVID-19" (2.1%) across all regions. The more populated and urbanized a region is, the more likely it is for workers not to go to a non-home RW because of COVID, although the share is quite low (2.1%) even for the ATL MSA. Especially in non-MSA regions, it is quite rare not to go to a non-home RW because of COVID-19 (0.4%). Other MSAs have a slightly higher shares for "self-employed, home-based

[35] For a worker with a home-based self-employed job as his/her primary job, home is the RW.

job" (5.3%, compared to 5.1%) and for "No RW" (3.8%, compared to 3.4%) than non-MSA regions do.

Table 17. Reasons for not commuting to the RW by region type

Commute to the RW		Share			
Answer	Reason	ATL MSA (N=1164.1)	Other MSAs (N=484.5)	Non-MSA (N=282.5)	GA (N=1931)
Yes	-	82.5%	87.7%	89.6%	84.8%
No	All combined	17.5%	12.3%	10.4%	15.2%
	Self-employed, home-based job	8.0%	5.3%	5.1%	6.9%
	No RW	5.9%	3.8%	3.4%	5.0%
	COVID-19	2.1%	1.3%	0.4%	1.7%
	Other reasons	1.0%	0.6%	0.2%	0.8%
	No response	0.6%	1.3%	1.3%	0.9%

The distance from home to the RW is asked of the respondents who have a non-home RW, regardless of whether they go to the RW or not (i.e., including those who go to the RW (84.8%) and those who do not go to the RW because of "COVID-19" (1.7%) and "other reasons" (0.8%) in Table 17). The overall distribution of distance to the RW (in Table 18) is right-skewed; 41.8% live less than 10 miles away from their RW (and 71.0% less than 20 miles) but 3.9% live at least 50 miles away from the RW, which makes the mean one-way commute distance (17.9 miles) substantially larger than the median (10.0 miles).

Workers in non-MSA regions reside farther from their RW in general. Across all region types, non-MSA regions have the highest shares for most of the distance intervals farther than 10 miles (except for 30-40 miles and 100+ miles). Also, non-MSA regions have a larger median distance (12.0 miles) than other regions (10.0 miles) because of a relatively lower share of workers living within 10 miles of their RW (36.2%). That share is the largest for other MSAs (47.2%, ATL MSA: 40.8%), resulting in the smallest mean commute distance (14.9 miles). Note that the mean

distance is larger for the ATL MSA (19.4 miles) than for non-MSA regions (17.5 miles), which is attributed to more outliers in the ATL MSA living 100 miles or more away from their RW (0.9%, compared to 0.1% for non-MSA regions). This observation is closely linked with the fact that 77.6% of UTWers are in the ATL MSA (see Table 8) and UTWers (with a non-home RW) are most likely to live 100+ miles away from the RW (3.7%) across all worker types (see Table 20).

Table 18. Distance to the RW for respondents with a RW (by region type)

		Region			
		ATL MSA (N=996.2)	Other MSAs (N=434.1)	Non-MSA (N=254.8)	GA[1] (N=1685.1)
Share	No response	**1.5%**	1.2%	0.6%	1.3%
	0 - 5 mi[2]	16.6%	**20.3%**	19.5%	18.0%
	5 - 10 mi	24.2%	**26.9%**	16.7%	23.8%
	10 - 20 mi	28.3%	29.8%	**31.8%**	29.2%
	20 - 30 mi	13.4%	10.7%	**16.4%**	13.1%
	30 - 40 mi	**9.3%**	6.3%	4.1%	7.7%
	40 - 50 mi	2.9%	2.3%	**3.8%**	2.9%
	50 - 70 mi	2.1%	1.8%	**5.4%**	2.5%
	70 - 100 mi	0.7%	0.3%	**1.5%**	0.8%
	100+ mi	**0.9%**	0.4%	0.1%	0.6%
Median[3]		10.0	10.0	12.0	10.0
Mean[3]		19.4	14.9	17.5	17.9

Note:
1) Respondents who have a non-home RW are used (N=1685.1).
2) Intervals are closed on the left side and open on the right side. For example, "0 - 5 mi" indicates equal to or larger than 0 miles and smaller than 5 miles.
3) Medians and means are calculated after excluding cases with "no response".
4) Bolded numbers are the row-wise largest numbers.

How does commute distance relate to teleworking status? Worker groups differ a great deal with respect to whether they work at a RW and how far they live from the RW (see Table 19). More than nine out of ten NTWers (92.8%) and NUTWers (90.9%) work at the RW even

occasionally, but less than half of UTWers (45.9%) do. In fact, working at a non-home RW is impossible for 37.7% of UTWers (21.2% (self-employed, home-based job) + 16.5% (no RW)), and slightly less than a tenth (9.3%) do not go to their RW because of COVID-19. Comparing the other two worker types, NUTWers have more respondents with a home-based self-employed job (6.5%, compared to 3.4% for NTWers) but slightly fewer with no RW (2.3%, compared to 2.8%). For both groups, COVID-19 is seldom the reason for not going to the RW. Of course, the COVID-19 results are not surprising, since not going to a RW because of COVID-19 would be one reason for being classified as a UTWer, and conversely. In other words, staying away from the RW because of the pandemic (or not doing so) would tend to be a *cause* of one's worker classification rather than an *effect* of it.

Table 19. Reasons for not commuting to the RW by worker type

Commute to the RW		Share			
Answer	Reason	NTWer (N=1284.1)	NUTWer (N=329.9)	UTWer (N=317.0)	Total (N=1931)
Yes	-	92.8%	90.9%	45.9%	84.8%
No	All combined	7.2%	9.1%	54.1%	15.2%
	Self-employed, home-based job	3.4%	6.5%	21.2%	6.9%
	No RW	2.8%	2.3%	16.5%	5.0%
	COVID-19	0.2%	0.0%	9.3%	1.7%
	Other reasons	0.0%	0.2%	4.5%	0.8%
	No response	0.7%	0.1%	2.6%	0.9%

Table 20 shows the distribution of distance to the RW in a similar way as Table 18 but by worker type. We do not have a valid distance value for a sizable share of usual TWers (9.6%), because they often misunderstood the definition of the RW (i.e., the main location of the employer) and regarded their home as their regular (since it was their "usual") workplace even if they were not self-employed and thus reported to an employer in a main location elsewhere. In such cases, the

information about the distance to the RW is recoded as “missing” (i.e., no response) because using the information would affect related summary statistics in a misleading way. Table 20 shows that TWers live farther away from the RW, and more so for UTWers, with substantially lower frequencies of working at the RW, than NUTWers. The distribution of distance to the RW for NTWers peaks at the 10-20 mile interval and three quarters of them live less than 20 miles away from their RW (75.4%). On the other hand, although the distributions for NUTWers and UTWers also peak at the 10-20 mile interval, TWers (especially UTWers) have higher shares for longer-distance intervals than NTWers do. Accordingly, high full-day WFH frequencies are associated with high mean and median values. Especially, UTWers have a huge gap between the median (15.1 miles) and the mean (44.3 miles) because the distance distribution is heavily right-skewed and the share for “100+ mi” is relatively high (3.7%). These “long-distance TWers” are of particular interest from an energy and emissions standpoint, since 2-3 round-trip flights a year of, say, 800 miles to the RW could consume more fuel than 300 local round-trip commutes by car. Unfortunately, however, the sample size of this important group is too small for further analysis with the present data.

Table 20. Distance to the RW for respondents with a RW (by worker type)

		Region			
		NTWer (N=1195.1)	NUTWer (N=300.7)	UTWer (N=189.3)	GA[1] (N=1685.1)
Share	No response	0.1%	0.6%	**9.6%**	1.3%
	0 - 5 mi[2]	**19.9%**	15.7%	10.2%	18.0%
	5 - 10 mi	**25.5%**	21.0%	17.0%	23.8%
	10 - 20 mi	30.0%	**30.2%**	22.8%	29.2%
	20 - 30 mi	11.7%	16.1%	**17.6%**	13.1%
	30 - 40 mi	6.9%	9.3%	**10.5%**	7.7%
	40 - 50 mi	2.5%	3.7%	**3.8%**	2.9%
	50 - 70 mi	2.6%	1.9%	**3.2%**	2.5%
	70 - 100 mi	0.7%	0.5%	**1.6%**	0.8%
	100+ mi	0.1%	1.0%	**3.7%**	0.6%
Median[3]		10.0	12.0	15.1	10.0
Mean[3]		14.1	18.3	44.3	17.9

Note:
1) Respondents who have a non-home RW are used (N=1685.1).
2) Intervals are closed on the left side and open on the right side. For example, "0 - 5 mi" indicates larger than equal to 0 miles and smaller than 5 miles.
3) Medians and means are calculated after excluding cases with "no response".
4) Bolded numbers are the row-wise largest numbers.

3.9.2 Commute Mode Used for Full Days at the RW

This section investigates the primary commute mode that Georgia workers use when they commute to the RW for full days of work[36]. Respondents who work at their (non-home) RW for full days ***less than*** once a week were asked to select the primary means of transportation (i.e., the means used for the longest distance, because multiple means can be used for a commute trip). Respondents who work at the RW for full days ***at least*** once a week were asked how often they use various means of transportation (from "never" to "5 or more times a week"), for which the most often used means become(s) the primary commute mode(s). Table 21 and Table 22

[36] I.e., working at the RW for the entire work schedule of that day, however many hours that may be.

summarize the responses in two parts. The first part, on the left side, categorizes workers by region type (or worker type) and frequency of full-day work at the RW ("Never", "< Once a week", "≥ Once a week") and shows the share of each category. The second part, on the right side, describes the primary commute mode for each category. Comparison of region types (and worker types) will be focused on the "≥ Once a week" respondents because (1) the small sample sizes of "< Once a week" (especially for other MSAs and non-MSA regions, with 32.8 cases and 17.0 cases, respectively) prevent precise representation of the associated types of workers and (2) a non-negligible share of respondents in the "< Once a week" category did not answer the primary commute mode question.

How do workers commute in each region type? According to Table 21, statewide, 19.8% of respondents do not go to the RW for full days of work,[37] while 8.7% and 71.5% commute to the RW for full-day work *less than* once a week and *at least* once a week, respectively. The ATL MSA has fewer workers commuting to the RW at least once a week (67.0%) than other regions do (other MSAs: 77.6%, non-MSA regions: 79.3%).

Looking at the statewide primary commute mode, driving alone is the dominant way to commute, and more so for those who commute on *at least* a weekly basis (83.7%, compared to 71.2% of those commuting "< once a week"). Carpooling ("driving w/ pax" + "carpool pax") is the second most popular mode: 18.2% ("≥ once a week") and 8.5% ("< once a week"). The shares for ridehailing, bus/train, and walking range only from 2.5% to 4.7%. Among respondents

[37] Since Table 17 reports that 15.2% never go to the RW for full or partial days of work, subtraction indicates that 4.6% go to the RW only for partial days.

commuting to the RW for full days of work *less than* once a week, 2.0% take an airplane to get to the RW, which is understandably rarer for those with higher commute frequencies (0.3%).

Looking at the respondents commuting to the RW for full days of work *at least* once a week, both driving alone and carpooling are more often used to commute in non-MSA regions (88.0% and 26.2%) than in other MSAs (81.9% and 18.9%) and the ATL MSA (83.3% and 15.4%). On the other hand, the ATL MSA has the highest shares for ridehailing (4.3%) and bus/train (3.6%) and non-MSA regions have the lowest (0.4% and 0.0%). Walking is relatively more often used in the ATL MSA (4.4%) and other MSAs (5.2%) than in non-MSA regions (1.4%), but bicycles are more often used in non-MSA regions (1.5%) than in the ATL MSA (0.5%) and other MSAs (0.3%). All these observations are within reason considering the distribution of distances to the RW shown in Table 18 (e.g., generally longer distances to the RW for non-MSA workers, with a high share of other MSAs' workers living close to the RW), and better accessibility to public transit and ridehailing services in the ATL MSA.

How do TWers commute? Aligning with the average weekly frequencies of full-day work at the RW in Figure 11 (UTWer: 0.44 days, NUTWer: 2.74 days, NTWer: 3.32 days), many UTWers never (56.7%) or sporadically (20.5%, *less than* once a week) work at the RW for full days (see Table 22), while around a fifth (22.8%) of UTWers do so *at least* once a week. NUTWers have a smaller share for "≥ Once a week" (75.4%) but a larger share for "< Once a week" (13.8%) than NTWers do (82.4% and 4.5%). Despite the high share of TWers living in the ATL MSA, with relatively better availability of ridehailing and public transit services, the longer commute distances (to the RW) of TWers seem to lead them to drive alone more (and carpool or walk less) for commuting (see primary commute mode shares of each worker type for "≥ Once a week" in

Table 22). This pattern stands out more for UTWers because they live farther from the RW than NUTWers.

Table 21. The primary commute mode to the RW (for full days of work) by region type

Region type	Commute frequency	Count	Share[1]	Mode									
				Driving alone	Driving w/ pax[3]	Carpool pax[3]	Ride-hailing	Bus/ train	Walking	Bicycle	Airplane	Other	No response
ATL MSA (N =1164.1)	Never	265.9	22.8%	-	-	-	-	-	-	-	-	-	-
	< Once a week	118.2	10.2%	71.3%	7.2%	1.8%	4.4%	5.9%	2.5%	0.0%	2.6%	1.2%	3.0%
	≥ Once a week[2]	779.9	67.0%	83.3%	11.1%	4.3%	4.3%	3.6%	4.4%	0.5%	0.5%	0.9%	0.3%
Other MSAs (N=484.5)	Never	75.8	15.6%	-	-	-	-	-	-	-	-	-	-
	< Once a week	32.8	6.8%	69.2%	6.8%	0.0%	0.0%	2.8%	4.4%	0.0%	1.0%	2.4%	13.4%
	≥ Once a week[2]	375.9	77.6%	81.9%	14.8%	4.1%	1.8%	1.8%	5.2%	0.3%	0.0%	0.0%	1.0%
Non-MSA (N=282.5)	Never	41.5	14.7%	-	-	-	-	-	-	-	-	-	-
	< Once a week	17.0	6.0%	74.6%	8.8%	0.0%	0.0%	0.0%	10.7%	0.0%	0.0%	0.0%	5.9%
	≥ Once a week[2]	223.9	79.3%	88.0%	16.4%	9.8%	0.4%	0.0%	1.4%	1.5%	0.0%	0.5%	1.0%
GA (N=1931)	Never	383.2	19.8%	-	-	-	-	-	-	-	-	-	-
	< Once a week	168.0	8.7%	71.2%	7.3%	1.2%	3.1%	4.7%	3.7%	0.0%	2.0%	1.3%	5.3%
	≥ Once a week[2]	1379.8	71.5%	83.7%	13.0%	5.2%	3.0%	2.5%	4.1%	0.6%	0.3%	0.6%	0.6%

Note:

1) Shares of the three commute frequency categories for each region type
2) Commute mode shares add up to a value larger than 100%, because a worker can have more than one primary commute mode when two or more modes are tied for most frequently used
3) Pax = passenger(s)

Table 22. The primary commute mode to the RW (for full days of work) by worker type

Worker type	Commute frequency	Count	Share[1]	Mode									
				Driving alone	Driving w/ pax[3]	Carpool pax[3]	Ride-hailing	Bus/ train	Walking	Bicycle	Airplane	Other	No response
NTWer (N=1284.1)	Never	168.1	13.1%	-	-	-	-	-	-	-	-	-	-
	< Once a week	57.6	4.5%	69.1%	14.0%	0.0%	5.4%	0.0%	5.2%	0.0%	0.0%	0.0%	6.3%
	≥ Once a week[2]	1058.5	82.4%	82.4%	13.4%	5.3%	3.1%	2.2%	4.6%	0.6%	0.3%	0.5%	0.7%
NUTWer (N=329.9)	Never	35.4	10.7%	-	-	-	-	-	-	-	-	-	-
	< Once a week	45.6	13.8%	77.0%	5.6%	0.0%	1.6%	7.6%	4.2%	0.0%	4.1%	0.0%	0.0%
	≥ Once a week[2]	248.9	75.4%	87.0%	12.4%	5.0%	2.1%	3.5%	2.9%	0.4%	0.0%	0.4%	0.0%
UTWer (N=317.0)	Never	179.7	56.7%	-	-	-	-	-	-	-	-	-	-
	< Once a week	64.9	20.5%	69.0%	2.6%	3.2%	2.2%	6.9%	2.0%	0.0%	2.4%	3.4%	8.2%
	≥ Once a week[2]	72.4	22.8%	90.6%	8.6%	4.2%	3.5%	3.9%	1.6%	0.5%	0.0%	2.0%	1.5%
Total (N=1931)	Never	383.2	19.8%	-	-	-	-	-	-	-	-	-	-
	< Once a week	168.0	8.7%	71.2%	7.3%	1.2%	3.1%	4.7%	3.7%	0.0%	2.0%	1.3%	5.3%
	≥ Once a week[2]	1379.8	71.5%	83.7%	13.0%	5.2%	3.0%	2.5%	4.1%	0.6%	0.3%	0.6%	0.6%

Note:

1) Shares of the three commute frequency categories for each worker type
2) Commute mode shares add up to a value larger than 100%, because a worker can have more than one primary commute mode when two or more modes are tied for most frequently used.
3) Pax = passenger(s)

3.10 Residential Location

One of the questions in the survey asks how respondents would characterize the area where they live. The response options ("urban", "suburban", "small/medium-size", and "rural") are admittedly subjective measures, but this question, in combination with some associated questions regarding how respondents changed and expect to change their residential location, helps further improve the understanding of various worker types in Georgia.

3.10.1 Current Neighborhood

About a fifth of respondents regard where they live as "urban" (20.7%) and close to a half (46.2%) characterize the area they reside in as "suburban", while the rest selected "small/medium-size town" (17.8%) and "rural" (15.3%) (see Figure 23). Not unexpectedly, most ATL MSA workers live in an urban or suburban area (82.1% = 24.9% + 57.2%) and a similar share of non-MSA workers live in a small/medium-size town or a rural area (79.3% = 34.7% + 44.6%). Workers in other MSAs are somewhat more distributed across the four neighborhood types, but a plurality of them characterize their neighborhoods as "suburban" (39.8%), followed by "small/medium-size town" (25.4%), "urban" (17.9%), and "rural" (16.9%).

In what kinds of neighborhoods do teleworkers live? According to Figure 24, teleworkers are more likely to be located in an urban or suburban area (74.0% for NUTWers and 79.9% for UTWers), which is consistent with their concentration in the ATL MSA. One intriguing difference between the two TWer groups is that the share of "urban" dwellers is larger for NUTWers (31.5% > 21.1%) while the share of "suburban" dwellers is larger for UTWers (58.8% > 42.5%). This pattern is perhaps connected to the UTWer group's high shares of older workers and ATL MSA residents. Since various personal and household characteristics are interrelated

with residential location choices, a further examination (with such intercorrelations taken into consideration and objective definitions of neighborhood types) would be necessary to more fully comprehend the residential location choice patterns of workers in Georgia.

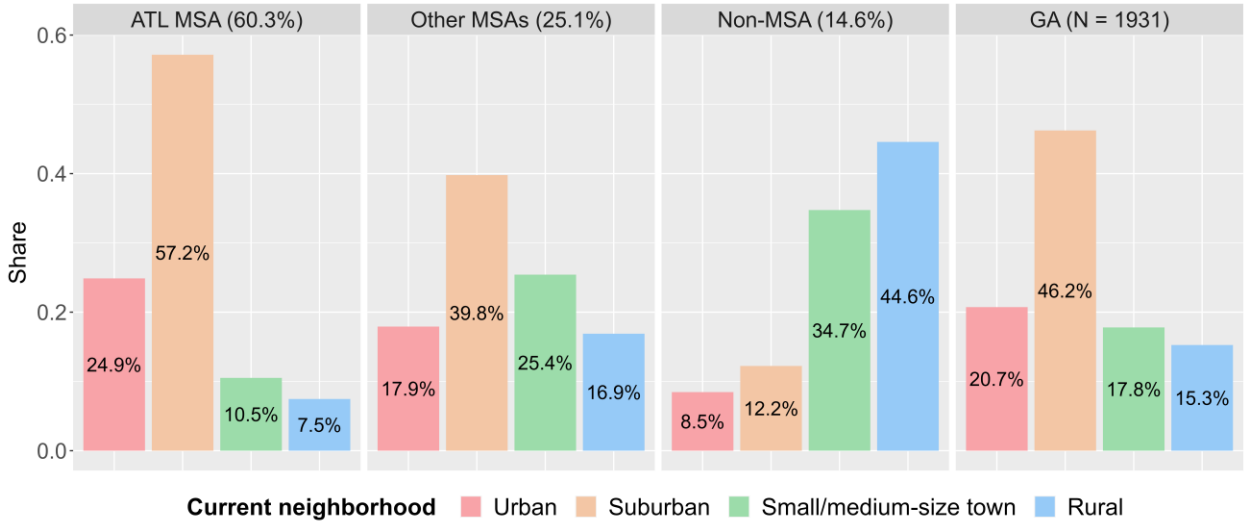

Figure 23. Current neighborhood of workers by region type

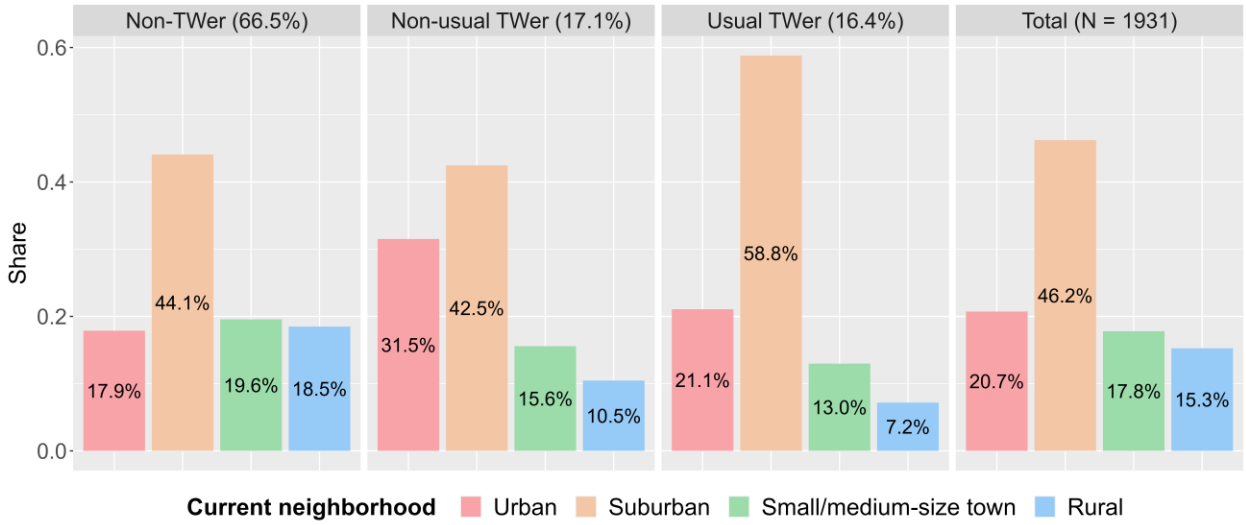

Figure 24. Current neighborhood of workers by worker type

3.10.2 Timing of the Move to the Current Residential Neighborhood

Figure 25 and Figure 26 illustrate when respondents moved to their specific current neighborhoods (not just their current regions or neighborhood types) using 1928.9 cases with valid answers to the question (excluding 2.1 cases with no response, out of 1931 cases in the sample). 20.9% of respondents moved to their current neighborhood in 2020 or after (≈ since the outbreak of pandemic) and 17.3% in 2017-2019 (≈ within five years but before the pandemic). Given that the former period (2 to 2.5 years, depending on when a respondent responded to the survey) is shorter than the latter (3 years), it is possible to say that residential relocations of Georgia workers became more active since the pandemic.

Comparing the residential relocation timing distribution across region types (Figure 25), we can see modest increases in the share of moves that occurred during the pandemic era, as the region type becomes smaller and more rural. Especially, the difference between "2017-2019" (12.0%) and "2020 or after" (24.3%) is much larger for non-MSA regions (compared to other regions). This may be a consequence of (1) the desire to increase "social distancing" when it came to residential location (including the desire/need for a larger yard for outdoor recreation and/or a larger home to include office space), and (2) the ability to work from home making it possible to buy a home near recreational areas or other lifestyle amenities.

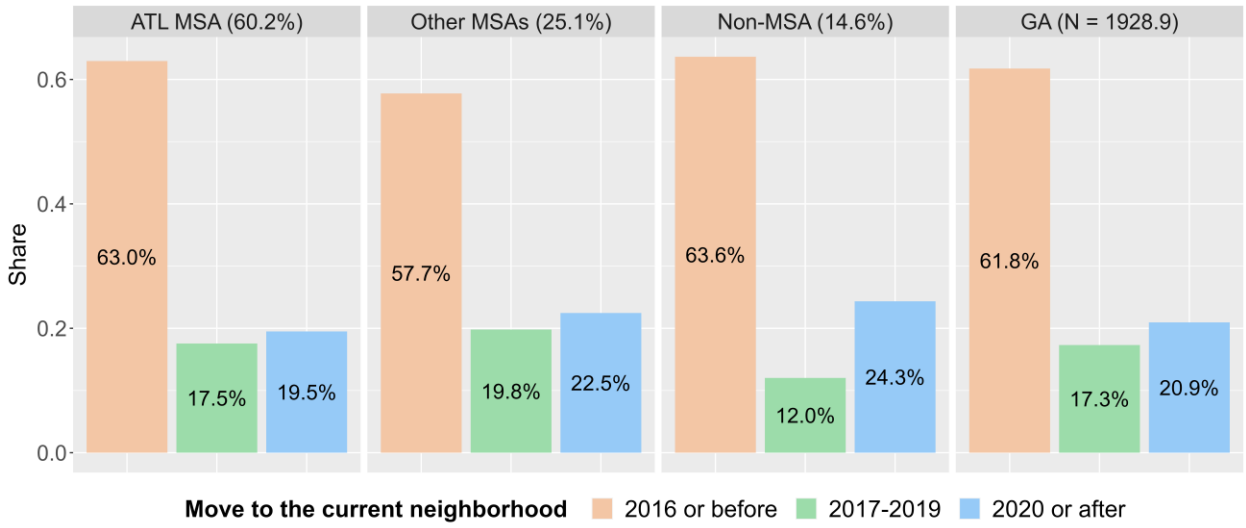

Figure 25. Year of move to the current neighborhood by region type

Are teleworkers more residentially mobile than non-teleworkers? In keeping with the preceding observations, Figure 26 shows that the worker type most likely to have moved during the pandemic is the UTWer. UTWers are also most likely to have moved in the three years before the start of the pandemic, both observations together pointing to the fact that UTWers are more flexible in changing location because of their low frequency of commuting to the RW (0.44 times/week for full days and 0.24 times/week for partial days on average, per Figure 11) and small household sizes (Table 8 and Table 15). By contrast, NUTWers work from home only infrequently (0.80 times/week for full days and 0.79 times/week for partial days on average, per Figure 11), still go to the RW quite often (2.74 times/week for full days and 0.90 times/week for partial days on average, per Figure 11), and generally are in larger households (Table 8 and Table 15), which can limit their residential location to areas close to their own jobs, and to the schools/jobs of household members. Thus, it is perhaps not surprising that the distribution of their year of move to their current neighborhood is more similar to that of NTWers than that of

UTWers. Notably, NUTWers were the *least* likely of the three worker groups to have moved since the pandemic began (17.3%, compared to NTWers (21.1%) and UTWers (23.9%)).

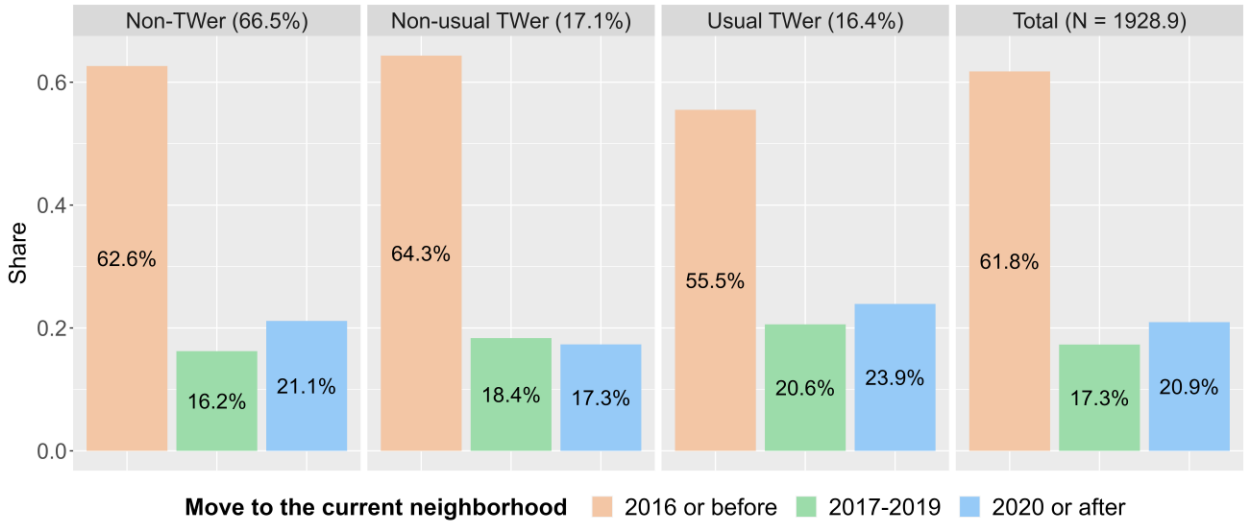

Figure 26. Year of move to the current neighborhood by worker type

3.11 Expected Change in Residential Location

3.11.1 Intention to Move

Are teleworkers more likely than non-teleworkers to be planning to move? Respondents were asked how likely, over the next three years, they were to change where they live. The response options are "very unlikely", "likely", "somewhat", "likely", and "very likely". The answers are summarized in Figure 27 after combining the answers into three categories: "(very) unlikely", "somewhat", and "(very) likely". In the sample, 40.3% think a move within three years is unlikely for them, 38.5% think it is likely, and the rest (21.2%) are rather neutral (i.e., selected "somewhat") about it.

The responses do not differ much across worker type, especially for "(very) unlikely" (40.0% - 41.8%). However, UTWers are most inclined to report that moving is likely (40.2%), while

NUTWers are least likely to do so (35.1%). This is consistent with the observation from the previous Section 3.10.2, that a larger share of UTWers (than NUTWers) has moved to their current neighborhood within the past two years and the past five years, pointing to greater residential mobility for UTWers.

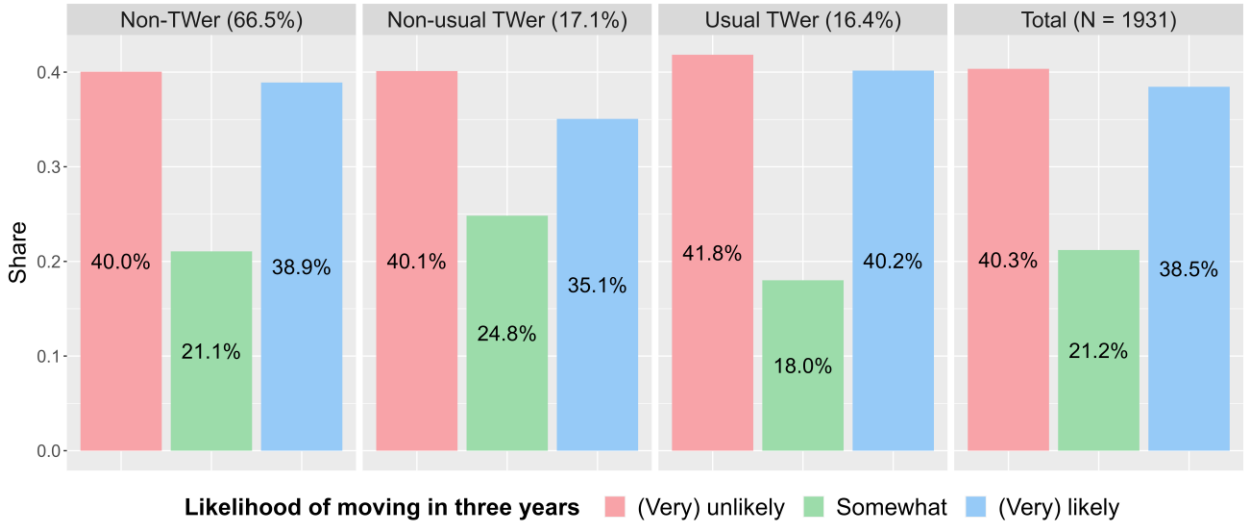

Figure 27. Likelihood of moving in three years by worker type

3.11.2 Expected Characteristics of New Residential Locations

Respondents who reported being at least "somewhat" likely to move within three years were asked two questions about where they were likely to move (if they do so). The first question was whether they planned to move out of the city/region they currently live in (see Figure 28). Of 1148.5 respondents who answered the question (excluding 3.4 respondents who did not respond to the question, from N=1151.9), 35.0% plan to move within the city/region they currently live

in, 39.9% plan to move out of their current city/region, and the rest (25.1%) do not have a specific plan.

Where do TWers want to move, if they do move? Among the respondents who are at least somewhat likely to move within three years, TWers are more likely to have an idea about where they want to move than NTWers. For example, the share of respondents who answered "not sure" is markedly higher for NTWers (27.4%) than for NUTWers (20.0%) and UTWers (21.2%). Again among the respondents who are at least somewhat likely to move within three years, NUTWers are the most likely (39.8%) to expect to stay within the current city/region (compared to 33.7% for NTWers and 35.3% for UTWers). In addition, the share of NUTWers expecting to move within the region (39.8%) is almost the same as the share expecting to move outside the region (40.2%), whereas the share for "outside of city/region" is rather higher than the share for "within city/region" for the other two worker types. This is additional evidence of the greater residential location "stickiness" of NUTWers.

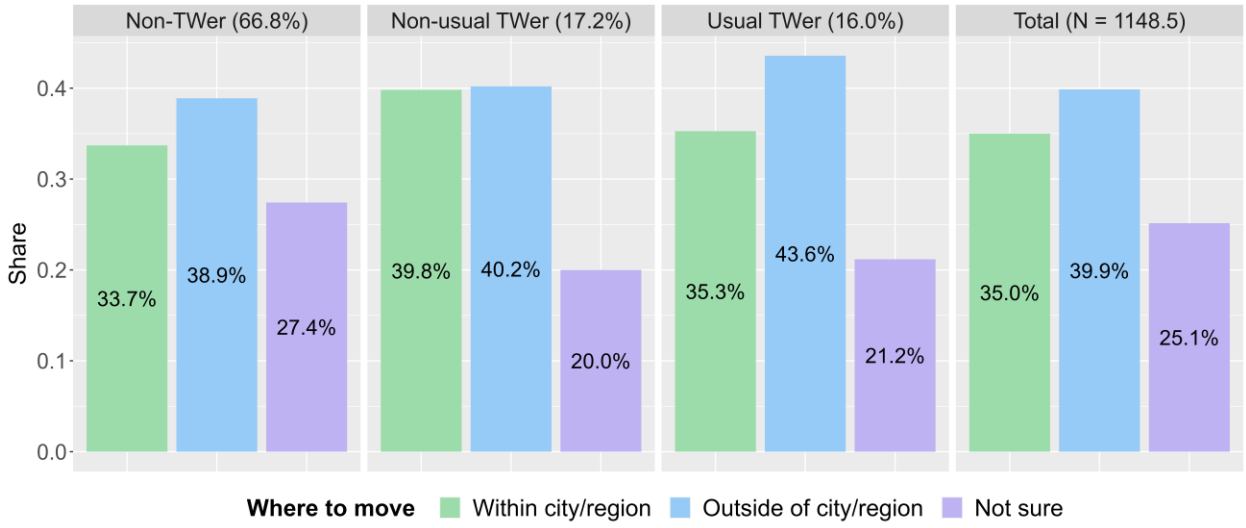

Figure 28. Expected move destination type by worker type

The second question asked of respondents who are at least somewhat likely to move within three years has two parts, respectively pertaining to the urbanness and land use of the location to which they expected to move (if they move) (see Figure 29 and Figure 30). Among 1151.9 respondents who faced the question, 2.1 respondents did not answer, which gives a sample size of N=1149.8 for these two figures. The respondents have a firmer idea about the urbanness and land use of their preferred location than they do about whether it should be in the same region or not: the shares of those who answered "not sure" to both parts of this second question are slightly above half of what it was for the first question (13.7% < 25.1%).

This question asks respondents to choose the urbanness and land-use characteristics of their prospective new location *relative to their current one*. With respect to urbanness, the responses are roughly evenly distributed across "less urban" (29.2%), "similarly urban" (26.3%), and "more urban" (30.7%) than their current location, but with respect to land uses in the neighborhood, respondents are slightly more inclined toward "more variety" (33.1%) than toward "similar" (26.2%) or "more residential" (26.9%) land uses. One notable pattern is that NUTWers (who think that moving within three years is at least somewhat likely) are more likely to want to live in a more urban place with more land-use variety even though NUTWers (in total) are already more concentrated in urban neighborhoods (31.5%) than other worker types (UTWers: 21.1%, NTWers: 17.9%) (see Figure 24).

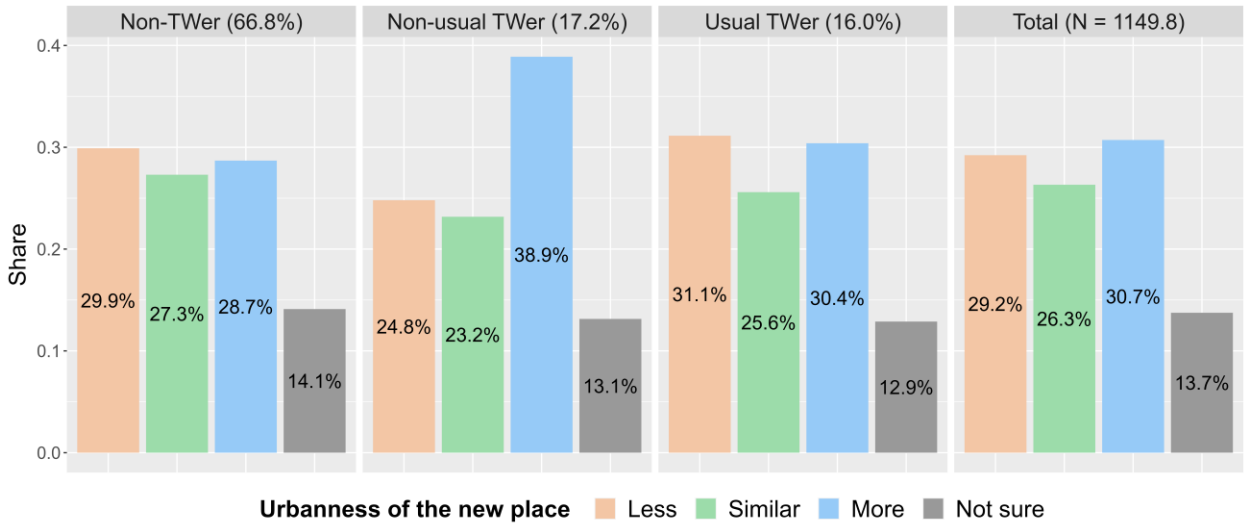

Figure 29. Expected urbanness of the expected new residential location (vs current)

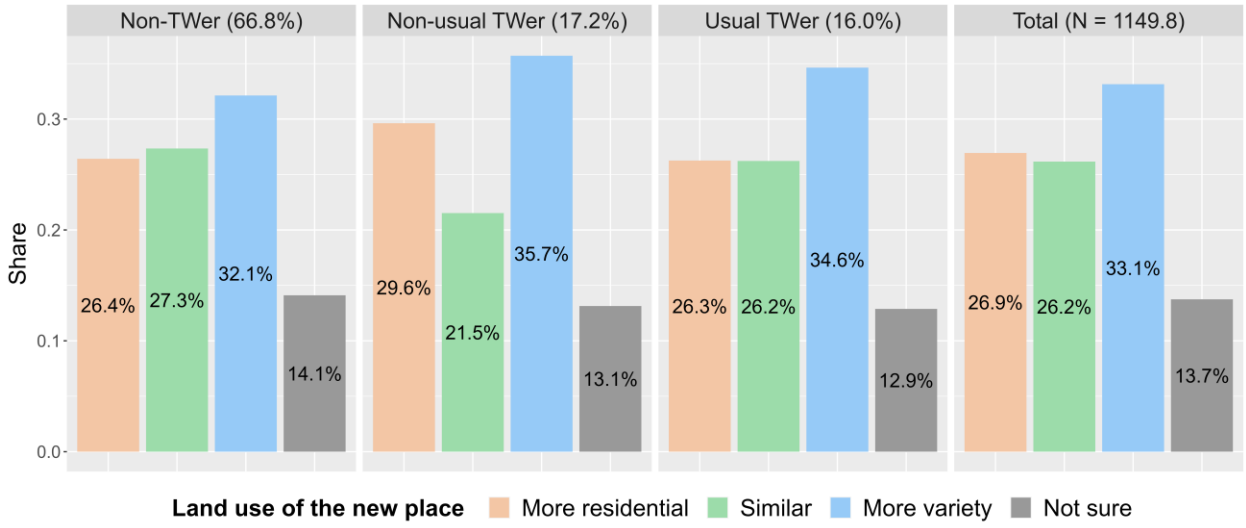

Figure 30. Expected land use of the expected new residential location (vs current)

3.12 Future Telework Patterns

Respondents were asked about their expected employment situations in March 2023 (about a year from when they responded to the survey). In the sample, 96.0% (N = 1853.7, out of N=1931) indicated that they expected to work for pay, and questions regarding expected TW feasibility as well as expected and preferred TW frequencies were presented to those

respondents. The following two subsections analyze (1) the expected TW feasibility and (2) expected and preferred TW frequencies, respectively.

3.12.1 Expected Telework Feasibility

How feasible did Georgia workers expect teleworking to be for them in about a year (March 2023)? Overall, Georgia workers were *optimistic* about the future of TW feasibility for themselves. According to a Sankey plot illustrating how then-current and expected future TW feasibility frequencies were associated (Figure 31, N=1930.4 excluding from the sample a 0.6-weighted case with a missing value for future TW feasibility frequency), a fair share of respondents with no TW feasibility in Spring 2022 *expected* to have *some level* of TW feasibility a year later. Considerably fewer respondents *expected* to have no TW feasibility ("never": 50.1%) a year later than had no TW feasibility at the time of data collection ("never": 62.6%). One pronounced pattern is that respondents with no then-current TW feasibility who *expected* to have *some level* of TW feasibility in the future are well distributed across the non-zero-feasibility frequency categories, although lower frequency levels ("less than once/month" and "1~3 times/month") are more popular choices for them. This leads each of the shares for non-zero-feasibility frequency categories (except "5+ times/week") in the "expect" column to be larger than its corresponding share in the "current" column (see Figure 31), which, in fact, is an even stronger trend given that 4.0% of respondents in the sample answered that they were not going to work for pay in March 2023.

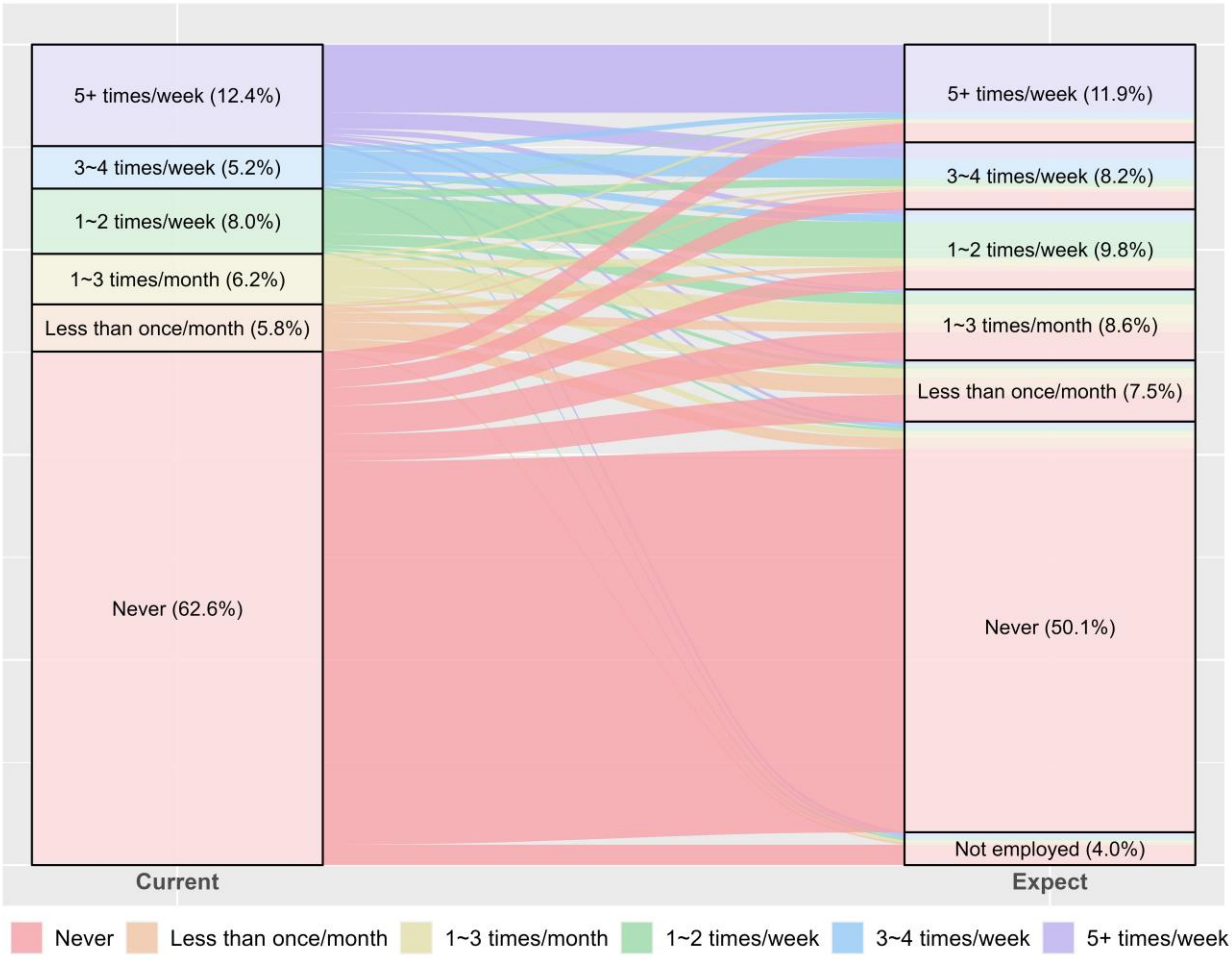

Figure 31. Current and expected TW feasibility frequencies (N=1930.4)

Figure 32 presents then-current and expected TW feasibility by region type after excluding respondents not planning to work for pay in March 2023 (N=1853.1, excluding from N = 1853.7 (those planning to work for pay in March 2023) a 0.6-weighted case with a missing value for future TW feasibility frequency). The statewide distribution of *current* TW feasibility frequency does not change much after the exclusion (see Figure 31 and Figure 32), whereas the shares for all expected TW feasibility frequency categories increase (by a factor of 1.041 = the ratio of sample sizes of Figure 31 and Figure 32). Among respondents planning to work for pay in March 2023, 20.9% and 31.1% expected to have feasible TW frequencies of at least *three times* a week

and at least *once* a week, respectively, while only 17.5% and 25.5% of them *currently* had such TW feasibilities. Agreeing with what we can observe for Georgia statewide, the shares for non-never-frequency categories in the *expected* panels are larger than their corresponding shares in the *current* panels (except "5 or more times a week", which has similar shares in the *current* and *expected* panels) (see Figure 32).

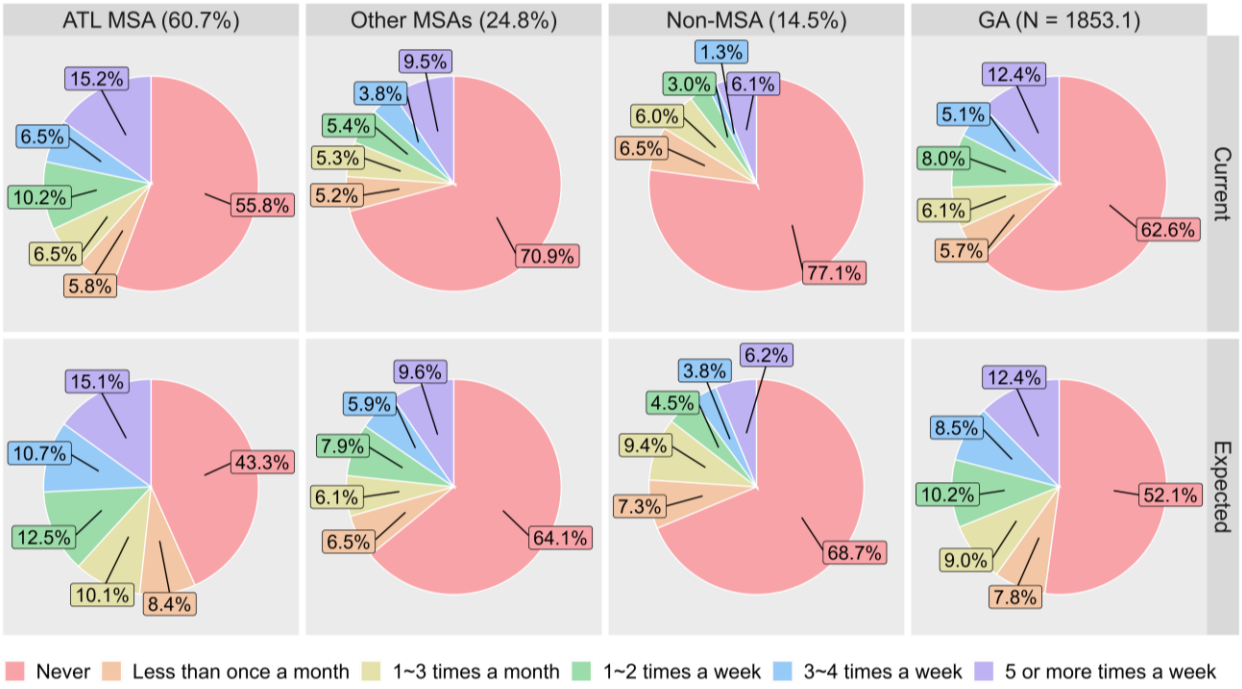

Figure 32. Current and expected TW feasibility frequencies by region type (N=1853.1)

3.12.2 Expected and Preferred Telework Frequencies

How often did workers expect (and prefer) to telework in about a year (March 2023)?

Acknowledging the potential difficulty in thinking about future work patterns in detail, we asked respondents who expected to work for pay in March 2023 (N=1853.7, out of N=1931) how often they *expected* and *preferred* to telework in March 2023, without distinguishing locations (i.e., home and alternative telework locations) and types (i.e., full- and partial-day TWing).

Figure 33 compares the answers with *then-current* full-day WFH frequencies (the most prevalent form of TWing, compared to partial-day WFH and working from alternative TW locations), separately for *expected* and *preferred* TW frequencies after excluding 6 cases (with a collective weight of 4.2) with no response (N=1926.8, out of N=1931). In line with the overall *optimism* about future TW feasibility that we found in Section 3.12.1, TWing was *expected* to be more prevalent in March 2023 compared to the *then-current* full-day WFH. Although we cannot ascertain the distribution of *expected* TWing across locations and types, 47.5% respondents *expected* to TW in any form, ***even if only occasionally***, which is higher than the share of those who *currently* did so at the time of data collection (40.5%, not shown in Figure 33). However, such an expectation looks somewhat *over-optimistic* considering that the nationwide share of paid full days worked from home has been slowly decreasing with slight fluctuations since 2022, and may have now roughly stabilized (Barrero et al., 2021).

This *over-optimism* might stem, at least in part, from the fact that workers *wanted* to TW much more than they *currently* did. According to the bottom plot of Figure 33, nearly two-thirds (65.6%) of respondents *preferred* to TW in March 2023, with less than one-third (only 30.5%) *preferring* not to TW at all. Interestingly, among those who did not WFH full days at all in Spring 2022 but preferred to TW a non-zero amount in March 2023, more people indicated wanting to TW the maximum amount ("5+ times/week") than any other non-zero frequency category (as shown by the widths of the pink bands in the bottom plot of Figure 33).

Figure 33. Expected/preferred TW frequencies (vs current full-day WFH) (N=1926.8)

4. CONCLUSIONS AND RECOMMENDATIONS

This study investigated the post-COVID work and commute patterns of Georgia workers (in spring 2022) and how those patterns are connected to their overall travel and activity patterns (e.g., VMD, commute mode/distance, impacts of teleworking on out-of-home activities) as well as other relevant features (e.g., attitudes, sociodemographic and household characteristics, vehicle ownership, current and expected residential location). An online survey was administered to collect data on the post-COVID "new normal" in Georgia. Subsequently, the data were weighted to represent Georgia workers, aiming to secure the validity of statistics generated from the sample.

The analysis primarily relied on comparisons across worker types (defined with respect to the frequency of full-day working from home, WFH) and region types. From these comparisons, we identified multifaceted differences among non-teleworkers (NTWers), non-usual TWers (NUTWers, who WFH fewer than three days a week), and usual TWers (UTWers, who WFH three or more days a week) with respect to many variables (i.e., travel/activity patterns and other relevant features listed in the previous paragraph) (see Executive Summary for the list of key findings). The findings from this study will be beneficial to many state and local agencies, providing various behavioral and policy implications, considering that (1) this study deals with many variables that are of great interest to transportation/urban planners and policy-makers and (2) comparisons across region types on multifarious topics makes it possible for entities interested in a specific region type to acquire tailored information.

4.1 Potential Additional Analyses of the Data

A few potential ways to make additional use of the collected survey data can be suggested to further improve the understanding of topics covered in the present study. First, more sophisticated ways of grouping workers should be tested to better comprehend work and commute patterns and the relationships they have with other variables relevant to travel outcomes. For example, workers can be grouped based on the distributions of both partial-day and full-day WFH frequencies. Also, we might want to try clustering workers using the frequencies associated with all four work location types and two work types (full and partial day), taking full advantage of the detailed work pattern information available. The use of a richer texture of work patterns (instead of focusing only on full-day WFH) will enhance the current understanding of work patterns and their impacts, especially considering that partial-day working has been much less studied.

Second, disaggregate models of WFH, vehicle ownership, VMD, and/or residential location can be estimated, which can help reveal whether and how the dependent variable of interest is associated with a rich set of potential explanatory variables (e.g., attitudes, work and commute patterns, household composition) considered all at once (instead of one by one). Such statistical modeling efforts can contribute to disclosing the mechanisms underlying many observations and guide future survey data collection as to what information should be measured.

Lastly, as stated in Chapter 1 (Introduction), the findings in the present study can be cross-referenced with the findings in GDOT RP 16-31 (Kim et al., 2019) and RP 18-24 (Kash et al., 2021) to provide a glimpse of recent changes in Georgia, especially since the pandemic. One

thing to bear in mind when comparing the findings is that the two earlier studies used a survey administered to a sample of "adults" (the former) or "households" (the latter) in Georgia, while the present study explored data collected from "employed adults" in Georgia. Nevertheless, many findings (notably those pertaining to workers, including teleworkers) will be roughly commensurable across the studies, and it is also possible to selectively reanalyze the datasets used in those prior studies, by filtering out non-workers and children.

4.2 Recommendations for Future Data Collection Activities

Here, we offer some recommendations for future studies, based on lessons we learned in the process of conducting the current study.

- For almost any survey, and independent of any specific plans for future data collection, we strongly recommend adding one or two question(s) asking about the willingness to be contacted for future surveys, and (if willing) preferred contact methods. Recruiting respondents from among the respondents to previous surveys who agreed to be contacted again for future surveys turned out to be a highly efficient way to add a nontrivial number (221 cases in this study) of survey responses to the dataset. We observed high quality of recontact survey responses while cleaning the data (see Section 2.3.2 and Table 3) and the administration of recontact survey only entailed preparing a slightly different version of survey and sending out mail and email invitations and reminders.

  Two caveats are in order, however. First, the two surveys that served as a source for recontact respondents in the present study both shared the feature that the recruitment of respondents was fully under the control of the researchers. If, instead, respondents are recruited through a commercial online opinion panel vendor, as we did in this study for our

main source, the vendor is likely to consider the contact information of its panel members to be proprietary, and not allow it to be collected by outside parties. Indeed, in the present study we could only ask for the willingness to respond to future surveys among those who had already expressed such willingness in either or both of the preceding surveys. This only reinforces the second caveat, which is that analysts need to be aware that the conventional non-response biases (e.g., respondents being disproportionately higher-educated, white, older, in smaller households) common to most voluntary surveys will likely become amplified with each level of filtering (Wang et al., 2022). Thus, researchers should be especially careful about weighting for representativeness when the sample includes a nontrivial number of respondents who will be completing their third or fourth travel behavior survey, even if months or even years will have elapsed between surveys.

- It is imperative to be aware that online surveys can be susceptible to oversampling specific segments of the population, which makes it essential to set proper quotas (when collecting the data) and develop rigorous sample weights (afterwards), especially for improved validity of descriptive analyses. For instance, the unweighted sample of the present study oversampled TWers by an estimated factor of 1.5 (see Table 5), even though we set quotas for basic sociodemographic variables. This underlines the importance of proactively contemplating various ways in which the data obtained from online panels can be biased, and preparing adequate measures to deal with the biases.

- The quality of work pattern measurements can likely be improved by moving from "specific" to "general". In the present study, we asked about work patterns ***in a typical week*** (i.e., how often respondents work at each work location for full and partial days) in Section C, soon

after providing key definitions. Even though we put pop-up definitions for key terms in the question (Q5) to remind respondents, we found during quality checks that some respondents did not grasp the distinction between working for partial and full days as completely as we desired, which harmed data quality (especially for partial-day work patterns) and required spending far more time and effort on cleaning the answers than expected. One way to handle this issue is to give respondents a sequence of questions that leads them to better comprehend what they are being asked. For example, a similar survey funded by Cintra and designed and administered by a research team (led by Dr. Patricia Mokhtarian) at Georgia Tech in Spring 2023 (the "Cintra Wave 3 TW survey") adopted the strategy of: (1) first asking how many days respondents worked from home for full days ***in the past 7 days***, followed by another question requesting the specific days of the week on which the full-day WFH occurred, with a validation requiring the number of specifically-identified days to be the same as the previously reported total number of days; (2) asking the same set of questions for partial-day WFH, but with another validation making sure that the sum of full and partial days of WFH did not exceed 7; and only then (3) asking about the work patterns for ***a typical week***. We expect that such strategies can substantially improve data quality.

- An interesting topic for future research would be how the work and commute patterns of one worker in a household influences *other household members* with respect to travel and activity patterns (e.g., VMD, travel modes). This approach will help better explain some transportation-related outcomes being observed these days, by capturing the overall "net" impacts of working from home.

4.3 Policy Implications

There is no question that teleworking continues to occur in amounts far greater than pre-pandemic levels. As noted in Section 3.5 (Table 10), statewide the share of teleworkers has increased by a factor of 2.5 between 2019 and 2022, from 13% of the workforce to 33%. While teleworking levels may continue to erode somewhat over the post-pandemic short term, we believe that a new equilibrium (likely involving gradual growth going forward) will have emerged by 2024 or before.

If trends in teleworking amounts are likely to clarify in the near-term, however, we believe that the resulting travel and activity patterns will remain much less well understood. The present study has only been able to provide first-order insights into key drivers of teleworkers' travel behavior. Obtaining a clearer understanding would require finer-grained travel data (e.g., multi-day location traces) for large samples of each of our three worker groups (non-TWers, non-usual TWers, and usual TWers), married to rich attitudinal and socioeconomic data such as that which is measured by our survey. Until then, we see changes in travel patterns in the aggregate, but remain largely uninformed about the shifting networks of relationships that are producing those patterns "behind the scenes". Improving our understanding of those relationships is critical to refining our regional travel demand forecasting models to keep pace with those shifts.

Is teleworking good, or bad? Should the public sector encourage it, discourage it, or remain neutral? The present study had to defer the question of whether TWing tends to increase or decrease car travel to a later analysis, but the scholarly literature is divided on this question, with different studies apparently finding opposing answers. Recent work on a related project directed by Patricia Mokhtarian is offering a rigorous methodology for answering the question

(specifically, illuminating when TWing tends to *increase* travel, and when it tends to *decrease* it), and the same approach (Wang and Mokhtarian, 2023) can be applied to the data collected here.

Even if teleworking decreases travel on net (which appears to be its dominant impact on travel), however, it is not unequivocally beneficial. Much has been written, for example, about its deleterious effects on transit ridership, commercial real estate, and business district retail, and the inequity inherent in the fact that it is disproportionately available to higher-income, higher-educated employees having greater bargaining power. Furthermore, if it is as attractive to *employers* as its proponents argue that it should be, one could legitimately question whether public sector funding should be required to promote it. Accordingly, we do not advocate either way with respect to the promotion of teleworking by the public sector. We do recommend, however, that the continued evolution of teleworking be carefully monitored by transportation planners, and that the ability of regional travel demand forecasting models to properly reflect teleworking and its transportation-related impacts be supported.

Finally, we also call attention to the need for ubiquitous, reliable, broadband infrastructure, the lack of which is sometimes a binding constraint on the ability to telework, and the presence of which offers benefits far beyond enabling teleworking. Fortunately, the State of Georgia is already vigorously pursuing the provision of broadband internet to underserved areas of the state (https://gta.georgia.gov/broadband/funding, accessed July 29, 2023).

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APPENDIX A: QUESTIONNAIRE FOR THE QUALTRICS OPINION PANEL

GDOT Telework Survey

Online Survey Draft (Opinion Panel)

2022-03-31

Survey outline

Section	Topic	No. of pages (approx.)	No. of questions/topics
Screening	What is your employment status?	0.5	3
A	Your opinions on various topics	1.5	1
B	Your job characteristics	2	9
C	Your work and telework patterns	4	10
D	Key aspects of your lifestyle	2	10
E	How you travel	10.5	41
F	Your desire for future travel and telework	2.5	12
G	Some background about yourself	0.5	7
	Total	**23.5**	**93**

Color codes

	Display logic
	Survey flow logic

Symbol codes

⊗	Exclusive option
[*]	Forced response
[#]	Number validation (zero or positive)
[Y]	Year validation (1900-2022)
[Z]	US zip code validation
[$q#]	Piped text from question #
[Timing]	Record the time that respondents spend on the page
-- Page Break --	Qualtrics page break
Font Georgia	Terms that have pop-up definitions in Qualtrics

Pop-up definitions

Primary job	The job at which you work the most hours.
Teleworking	Doing paid work from home or alternative telework locations *instead of* the regular workplace or customer locations. It does **NOT** include: • working overtime at home, • working at customer locations, • working a side job from home, or • field visits.
Regular workplace	The main location of your employer. • If you usually work from home, but sometimes meet physically with other people at another location of your organization, please consider that ***other location*** as your *regular workplace*, even if it is far away. • If self-employed and your job is based at home (even if you often travel to customers or elsewhere), your ***home*** is your regular workplace.

Georgia Institute of Technology, Atlanta, GA 30332

Alternative telework locations	Places (***other than home***) where you telework, such as: • Alternative offices in a different building of your organization, or telework centers/coworking spaces (like WeWork or Regus). • Other places such as coffee shops, parks, or libraries.
Customer locations	Places where you ***go to the customer*** to provide in-person services (e.g. housekeeping, caregiving, repairs).
Household	People who live together and share some financial resources. Housemates/ roommates are usually not considered members of the same household.
Partial day	Working at a certain location for only *some of your normal work schedule* that day. For example, you may go to the regular workplace in the morning, come back home at noon, and work the rest of the day at home (counting as a ***partial day*** at the regular workplace and a ***partial teleworking day*** at home).
Full day	Working at a certain location for your ***full*** normal work schedule that day. • If you are a part-time worker normally working 5 hours on a certain day, your ***full day*** would be 5 hours. If you work a 12-hour shift, your ***full day*** would be 12 hours. • However, if you normally work 8 hours a day, but one day you work 5 hours and take sick leave for a doctor's appointment for 3 hours, that counts as a ***partial day*** of working.

Georgia Tech College of Engineering
School of Civil and Environmental Engineering

Dr. Patricia L. Mokhtarian
Clifford & William Greene, Jr. Professor
phone: 1-404-385-1443
e-mail: patmokh@gatech.edu
http://ce.gatech.edu/people/faculty/6251/overview
https://scholar.google.com/citation?user=84jTPKE AAAAJ&hl=en

Dear Georgia Resident:

How have your work and daily travel patterns changed over the past two years? As the COVID-19 pandemic is winding down, will you go back to the way things were, keep doing what you're doing now, or something in between or altogether different?

This research study, conducted by the Georgia Institute of Technology (Georgia Tech), focuses on learning how work and commute patterns are evolving in view of the pandemic. The information you give us will help transportation planners and providers to better prepare for the future.

Your participation is entirely voluntary, but your individual response is extremely important to us. The survey should take about 30 minutes to complete, and we think you'll find it interesting and fun to do. To ensure the timely inclusion of your responses in the study, we kindly ask you to complete the survey by ***April 4, 2022***. If you are unable to finish it by then, we would still welcome it as soon as you can. If you have questions, please email the study team at travel4@ce.gatech.edu or me personally at patmokh@gatech.edu, or call toll-free (800) 341-1097.

The risks involved in participating in this survey are no greater than those associated with your normal daily activities. The information you provide may be enormously valuable for other research purposes as well. If you agree to allow such future sharing and use, your identity will be completely separated from your responses, and future researchers will not have a way to identify you.

By clicking on → below, you are confirming that you are at least 18 years old, that you give consent to the Georgia Institute of Technology to use the information you provide as part of this research study, and that you consent for your *de-identified* responses to be shared with other researchers in future studies. Please note, if you decide to pause the survey and want to continue it later, when you click on the original survey link, the survey will resume from where you left off.

Thank you in advance for your time and for sharing your thoughts with us!

Sincerely,

Patricia L. Mokhtarian

Dr. Patricia Lyon Mokhtarian
Professor and project director
https://ce.gatech.edu/people/Faculty/6251/overview

→

Georgia Institute of Technology
School of Civil and Environmental Engineering
Atlanta, Georgia 30332-0355 U.S.A.
Phone: 404.894.9044

Screening Questions:

1. [*] Are you currently working for pay? ☐1 Yes ☐2 No
2. [*] Do you currently reside in the state of Georgia? ☐1 Yes ☐2 No
3. [*] Are you currently located in the European Union (EU) or the People's Republic of China (PRC)?
   ☐1 Yes ☐2No

Logic:
If S1=2, S2=2, or S3=1, skip the whole survey. Otherwise, proceed to Section A.

When the whole survey is skipped, show "*This survey is designed for Georgia residents who are currently working for pay and are physically outside of the EU and the PRC. However, we appreciate your willingness to participate! Please click on -> to be redirected for the appropriate credit.*"

---------- Page Break ----------

Section A: Your opinions on various topics

This section asks for your opinions about a number of subjects related to transportation and everyday life. Please react to the following statements by ***thinking about the time when the pandemic is no longer a threat and life has returned to normal***. ***There are no right or wrong answers*** – we want only your true feelings.

---------- Page Break ----------
[Timing]

1. [*] For each of the following statements, please choose the response that most closely fits your reaction.

	Strongly disagree	*Disagree*	*Neutral*	*Agree*	*Strongly agree*
a. At this stage of my life, having fun is more important to me than working hard.	☐1	☐2	☐3	☐4	☐5
b. I like the idea of bicycling as a means of travel for me.	☐1	☐2	☐3	☐4	☐5
c. Environmental issues are emphasized too much in this country.	☐1	☐2	☐3	☐4	☐5
d. Family/friends play a big role in how I schedule my time.	☐1	☐2	☐3	☐4	☐5
e. Learning how to use new technologies is often frustrating for me.	☐1	☐2	☐3	☐4	☐5
f. My commute is a useful transition between home and work.	☐1	☐2	☐3	☐4	☐5
g. I'm too busy to do many things I'd like to do.	☐1	☐2	☐3	☐4	☐5
h. I prefer to live in a smaller home like an apartment or condo for its amenities and/or convenient location, even if it means more noise and less privacy due to close neighbors.	☐1	☐2	☐3	☐4	☐5

---------- Page Break ----------
[Timing]

	Strongly disagree	*Disagree*	*Neutral*	*Agree*	*Strongly agree*
i. I like the idea of driving as a means of travel for me.	☐1	☐2	☐3	☐4	☐5
j. I would pay extra to reduce the time I spend in daily traveling.	☐1	☐2	☐3	☐4	☐5

k.	I am confident in my ability to use modern technologies.	☐1	☐2	☐3	☐4	☐5
l.	I am committed to an environmentally-friendly lifestyle, even if it requires some extra cost or inconvenience.	☐1	☐2	☐3	☐4	☐5
m.	I see myself living long-term in a lower-density setting (suburban / small town / rural).	☐1	☐2	☐3	☐4	☐5
n.	It's very important to me to achieve success in my work.	☐1	☐2	☐3	☐4	☐5
o.	I generally enjoy the act of traveling itself.	☐1	☐2	☐3	☐4	☐5
p.	To confirm you are still reading this, please select "Disagree" here. Logic: if A1p!=2, terminate survey	☐1	☐2	☐3	☐4	☐5
q.	I like the idea of having stores, restaurants, and offices mixed among the homes in my neighborhood.	☐1	☐2	☐3	☐4	☐5

---------- Page Break ----------

[Timing]

		Strongly disagree	*Disagree*	*Neutral*	*Agree*	*Strongly agree*
r.	I like the idea of walking as a means of travel for me.	☐1	☐2	☐3	☐4	☐5
s.	I prefer to live in a larger home, even if it's farther from public transportation or many places I go.	☐1	☐2	☐3	☐4	☐5
t.	My commute is stressful.	☐1	☐2	☐3	☐4	☐5
u.	I definitely want to own a car.	☐1	☐2	☐3	☐4	☐5
v.	I like the idea of public transit as a means of travel for me.	☐1	☐2	☐3	☐4	☐5
w.	I am generally satisfied with where I am living right now.	☐1	☐2	☐3	☐4	☐5
x.	Right now, I think there is a serious threat of infection from the coronavirus in Georgia.	☐1	☐2	☐3	☐4	☐5
y.	I am generally satisfied with my life.	☐1	☐2	☐3	☐4	☐5

---------- Page Break ----------

Section B: Your job characteristics

In this section, we ask about your work situation.

---------- Page Break ----------

1. [*] Please describe your current employment situation. ***Select all that apply***.

☐1 I work full-time for pay
☐2 I work part-time for pay
☐3 I am self-employed for pay
☐4 I have two or more paying jobs
☐5 I do unpaid work
☐6 I am a homemaker / caregiver
☐7 I am retired
☐8 I am looking for a job
☐9 Other (please specify): _____

---------- Page Break ----------

2. [*] Which one of the following options *most closely* characterizes your **work schedule**? If you have *more than one job*, please refer to the work schedule of your ***primary job***. Your ***primary job*** is defined as the one at which you work the most hours.

☐1 Fixed ***daytime*** shift
☐2 Fixed ***evening (swing)*** shift
☐3 Fixed ***night (graveyard)*** shift
☐4 ***Variable start time / rotating shift***
☐5 ***Compressed work week*** (e.g. 40 hrs. in 4 days, or 80 hrs. in 9 days, with the other days off)
☐6 ***Flexible schedule*** (e.g. organizing my own work hours)
☐7 Other (please specify): _____

---------- Page Break ----------

3. [*] On average, **how many hours** do you perform ***paid work*** in a typical week? Recall that your ***primary job*** is defined as the one at which you work the most hours. Please enter "0" if your answer is "none" for a given type of job.

I work:
_____ hours ***per week*** for my paid *primary* job,
_____ hours ***per week*** for *other* paid jobs.

---------- Page Break ----------

NOTE: *Please refer to your* **current primary job** *for the following questions.* Again, your **primary job** is defined as the one at which you work the most hours.

4. [*] What is your job title? _____

5. [*] What kind of organization do you work for? Please check the ***single*** most appropriate type.
☐1 Self-employed / family-owned business
☐2 Other private company
☐3 Education or health care
☐4 Other non-profit organization
☐5 Government/public agency
☐6 Other (please specify):_____

6. [*] What is the ***total size*** of your organization (at all locations)? *Your best guess is fine!*
☐1 5 or fewer people
☐2 6-25 people
☐3 26-100 people
☐4 101-1000 people
☐5 1001-5000 people
☐6 More than 5000 people

7. [*] Which option best describes your main **occupation**?
☐1 Professional / technical
☐2 Manager / administrator
☐3 Arts / crafts
☐4 Sales / marketing
☐5 Production / construction
☐6 Service / repair
☐7 Clerical / administrative support
☐8 Other (please specify): _____

---------- Page Break ----------

8.
a. [*][#] How long have you worked for your ***present employer***?
_____ years ☐1 Less than 1 year

b. [*][#] How long have you worked in your ***present occupation***, including for previous employers?
_____ years ☐1 Less than 1 year

---------- Page Break ----------
[Timing]

9. [*] Please choose the response that most closely fits your reaction to each of the following statements.

		Strongly disagree	*Disagree*	*Neutral*	*Agree*	*Strongly agree*
a.	I'd rather work on my own than with a team.	☐1	☐2	☐3	☐4	☐5
b.	My job has an easily measurable output.	☐1	☐2	☐3	☐4	☐5
c.	Just tell me what needs to be done, and let me decide how to do it.	☐1	☐2	☐3	☐4	☐5
d.	I would prefer to have step-by-step guidance on how to do my job.	☐1	☐2	☐3	☐4	☐5
e.	I have to miss some work activities due to the time I must spend on family responsibilities.	☐1	☐2	☐3	☐4	☐5
f.	My boss tends to overmanage me.	☐1	☐2	☐3	☐4	☐5
g.	I'm already well-established in my field of work.	☐1	☐2	☐3	☐4	☐5
h.	After work, I am often so stressed out that it interferes with the (quality of) interactions I have with my family.	☐1	☐2	☐3	☐4	☐5

---------- Page Break ----------

[Timing]

		Strongly disagree	*Disagree*	*Neutral*	*Agree*	*Strongly agree*
i.	I enjoy the social interaction found at my regular workplace.	☐1	☐2	☐3	☐4	☐5
j.	Family responsibilities often make it hard for me to concentrate on my work.	☐1	☐2	☐3	☐4	☐5
k.	I'd rather work with a team than on my own.	☐1	☐2	☐3	☐4	☐5
l.	I feel quite a bit of pressure from my job.	☐1	☐2	☐3	☐4	☐5
m.	The standards for measuring my work performance are vague.	☐1	☐2	☐3	☐4	☐5
n.	I am good at managing my work time.	☐1	☐2	☐3	☐4	☐5
o.	I have to miss some family activities due to the time I must spend on work responsibilities.	☐1	☐2	☐3	☐4	☐5
p.	Conditions at my regular workplace prevent me from being as productive as I could be.	☐1	☐2	☐3	☐4	☐5
q.	I am generally satisfied with my job.	☐1	☐2	☐3	☐4	☐5

---------- Page Break ----------

Section C: Your work and telework patterns

This section relates to your work patterns, as well as your teleworking interest, feasibility, and activity. ***Please answer the questions in this section as appropriate, even if you cannot or do not want to telework at all.***

---------- Page Break ----------

[Timing]

The following definitions are important to understand before you start answering these questions. However, we will also remind you of these definitions (via pop-up text when you mouse over a key word) as the survey progresses.

- *Your **regular workplace** refers to the main location of your **employer**.*

- *If you **usually work from home**, but sometimes meet physically with your supervisor, coworkers, and/or employees at another location of your organization, please consider **that other location** as your regular workplace, even if it is far away.*
- *If you are **self-employed and your job is based at home** (even if you often travel to customers or elsewhere), please consider your **home** as your regular workplace.*

- ***Teleworking** refers to doing paid work from **home** or **alternative telework locations** instead of the regular workplace or customer locations. However, teleworking does **NOT** include:*
  - *working overtime at home* (e.g. after hours, during the weekend),
  - *working at customer locations,*
  - *moonlighting (working a side job) from home,* or
  - *field visits.*

- ***Alternative telework locations** are places (**other than home**) where you telework. These could include:*
  - ***Alternative offices** located in a different building of your organization, or telework centers/coworking spaces (like WeWork or Regus).*
  - ***Other places** such as coffee shops, parks, or libraries.*

- ***Customer locations** are places where **you go to the customer** to provide in-person services (e.g. housekeeping, caregiving, repairs).*

---------- Page Break ----------

[Timing]

*Working can be either **full day** or **partial day.***

"Full day" means working at a certain location for your ***entire*** normal work schedule that day. Your ***normal work schedule*** is the hours you typically work on a given day. For example:

- If you normally work a 12-hour shift on Mondays, your ***full day*** would be 12 hours that day.

"Partial day" means working at a certain location for only ***some** of your normal work schedule* that day. You might only work a partial day if you ***take some time off*** one day, or a full day can also be split into partial days if you work at ***multiple locations*** during your normal work schedule. For example:

- If you normally work 8 hours on Thursdays, but:
  - one Thursday you work 5 hours and take sick leave for a doctor's appointment for 3 hours, that counts as a **partial day** of work; or

  - one Thursday you work from home 4 hours and then go to the office and work 4 more hours, that counts as a **partial day** of working from home and a **partial day** of working at the regular workplace.

---------- Page Break ----------

For the following few questions, we are interested in your ability to **telework** and your teleworking activity (if any). Please answer these questions with respect to your **primary job**. Your **primary job** is defined as the one at which you work the greatest number of hours.

1. [*] For your **primary job**, how much *can* you telework?

	Never	*Less than once a **month***	*1-3 times a **month***	*1-2 times a **week***	*3-4 times a **week***	*5 or more times a **week***

a.	What is the maximum frequency that **the nature of your job** allows you to telework?	☐1	☐2	☐3	☐4	☐5	☐6
b.	What is the maximum frequency that **your supervisor** lets you telework? (If you are self-employed, please consider yourself as your supervisor.)	☐1	☐2	☐3	☐4	☐5	☐6

2. [*] Regardless of how much you technically *can* telework, how much teleworking does **your organization** suggest/expect that you do nowadays?

☐1 No expectations have been specified
☐2 Never
☐3 Less than once a **month**
☐4 1-3 times a **month**
☐5 1-2 times a **week**
☐6 3-4 times a **week**
☐7 5 or more times a **week**
☐8 "As much as possible or appropriate given each individual's circumstances"

---------- Page Break ----------

Logic: Display C3 if B1_3 = 1 AND (B1_1 = 1 or B1_2 = 1 or B1_4=1)

3. [*] For your **primary job**, are you self-employed?
☐1 Yes ☐2 No

Logic: Display C4 if C3=1 OR if B1_3=1 AND B1_1&2&4=0.

4. [*] Is your self-employed job based at home (even if you sometimes travel to **customer locations**)?
☐1 Yes ☐2 No

---------- Page Break ----------

5. [*] Considering your **primary job,** please indicate ***how often you generally go*** to each of the following places for work. Teleworking can be either full day or partial day, but please do ***NOT*** include ***overtime work*** or a ***side job*** in your responses.

	I am spending FULL days working at…	*Never*	*Less than once a **month***	*1-3 times a **month***	*1-2 times a **week***	*3-4 times a **week***	*5 or more times a **week***
a.	... the regular workplace Logic: Do not display C5a if C4=1.	☐1	☐2	☐3	☐4	☐5	☐6
b.	… home	☐1	☐2	☐3	☐4	☐5	☐6
c.	... alternative telework locations	☐1	☐2	☐3	☐4	☐5	☐6
d.	... customer locations	☐1	☐2	☐3	☐4	☐5	☐6

	I am spending PARTIAL days working at…	*Never*	*Less than once a **month***	*1-3 times a **month***	*1-2 times a **week***	*3-4 times a **week***	*5 or more times a **week***
e.	... the regular workplace Logic: Do not display C5e if C4=1.	☐1	☐2	☐3	☐4	☐5	☐6
f.	… home	☐1	☐2	☐3	☐4	☐5	☐6
g.	... alternative telework locations	☐1	☐2	☐3	☐4	☐5	☐6
h.	... customer locations	☐1	☐2	☐3	☐4	☐5	☐6

---------- Page Break ----------

6. [*] The previous question asked about your *typical* work patterns. However, there are many reasons why what you did *last week* may differ from what is *typical*. Considering your **primary job,** please indicate *how many times you* ***worked from home last week***. Again, please do ***NOT*** include ***overtime work*** or a ***side job*** in your responses.

	Last week, I spent…	***0***	***1***	***2***	***3***	***4***	***5 or more***
a.	***… FULL days working at home***	☐1	☐2	☐3	☐4	☐5	☐6
b.	***… PARTIAL days working at home***	☐1	☐2	☐3	☐4	☐5	☐6

Logic: Display C7 if C5a=1 AND C5e=1.

7. [*] We noticed that in recent months, you never go to a regular workplace. Can you tell us why?
   ☐1 I don't go to the regular workplace because of COVID.
   ☐2 My employer does not have a regular workplace, because everyone works remotely.
   ☐3 I don't have a regular workplace, or it has no fixed location
   ☐4 Other (please specify): _____

---------- Page Break ----------

Logic (survey flow): Display C8-C9 if C1a=2, 3, 4, 5, or 6.

Whether or not you have worked from home before, we are interested in how well suited your home *might be* for teleworking.

8. [*] Do you need and/or have reliable internet connections (e.g., Wi-Fi subscription, cable, router) to do at least part of your job at home as effectively as in the regular workplace?
   ☐1 I do not need internet connections to do my job at home.
   ☐2 I need internet connections to do my job at home, and what I already have is adequate.
   ☐3 I would need to purchase or upgrade internet connections at home to do my job.

9. [*] *If* you were to work from home, how adequate/effective is the space at home from which you would work (e.g., with respect to size, comfort, distractions)?
   ☐1 Poor ☐2 Fair ☐3 Good ☐4 Very good ☐5 Excellent

---------- Page Break ----------

[Timing]

10. [*] Even if you have never teleworked and your job doesn't permit it, you probably still have an idea about what teleworking would be like if you were able to do it. Please answer the following questions based on your opinions of what teleworking *would be* like for you if you *could* do it (or *is* like for you when you *are* doing it).

	Strongly disagree	*Disagree*	*Neutral*	*Agree*	*Strongly agree*
a. Teleworking would make it easier for me to handle my household responsibilities.	☐1	☐2	☐3	☐4	☐5
b. Overall, teleworking would cost me more money (e.g. electricity, equipment, internet) than it would save.	☐1	☐2	☐3	☐4	☐5
c. Teleworking would *increase* the stress that I experience from my job.	☐1	☐2	☐3	☐4	☐5
d. Teleworking would still permit effective teamwork.	☐1	☐2	☐3	☐4	☐5
e. I like the idea of teleworking.	☐1	☐2	☐3	☐4	☐5
f. Teleworking would save me a lot of money (e.g. commuting, parking, grooming, lunch).	☐1	☐2	☐3	☐4	☐5

g. It would be harder to obtain any help I might need on my job if I were teleworking.	☐1	☐2	☐3	☐4	☐5
h. Teleworking would offer me more flexibility regarding *when* I work.	☐1	☐2	☐3	☐4	☐5

---------- Page Break ----------

[Timing]

	Strongly disagree	*Disagree*	*Neutral*	*Agree*	*Strongly agree*
i. If I teleworked, I would miss the amenities at or near my regular workplace (e.g. better furniture, nearby restaurants).	☐1	☐2	☐3	☐4	☐5
j. Teleworking would *reduce* the stress that I experience from my job.	☐1	☐2	☐3	☐4	☐5
k. If I teleworked, I would keep the same amount of quality social interaction with my colleagues as before.	☐1	☐2	☐3	☐4	☐5
l. Working at home may increase conflicts with my family.	☐1	☐2	☐3	☐4	☐5
m. Teleworking would give me more time for my own priorities (e.g. myself, family, personal interests).	☐1	☐2	☐3	☐4	☐5
n. To confirm you are still reading this, please select "Agree" here. Logic: if C10n !=4, terminate survey	☐1	☐2	☐3	☐4	☐5
o. I would feel left out of work-related social interactions if I am one of a few people teleworking.	☐1	☐2	☐3	☐4	☐5
p. Teleworking would let me get a better job, even if that job is far from where I live now.	☐1	☐2	☐3	☐4	☐5
q. There are some amenities at or near my home (or alternative telework location) that I would enjoy using more if I teleworked.	☐1	☐2	☐3	☐4	☐5

---------- Page Break ----------

[Timing]

	Strongly disagree	*Disagree*	*Neutral*	*Agree*	*Strongly agree*
r. It would be hard for me to have the same level of motivation if I were teleworking.	☐1	☐2	☐3	☐4	☐5
s. Teleworking would blur the boundary between my personal and work lives too much.	☐1	☐2	☐3	☐4	☐5
t. Having the option to telework would be among the most important features for my job to have.	☐1	☐2	☐3	☐4	☐5
u. If I teleworked, I would be concerned about my lack of visibility to management.	☐1	☐2	☐3	☐4	☐5
v. Teleworking would inspire me to be more dedicated to my job.	☐1	☐2	☐3	☐4	☐5
w. Teleworking would let me move to a more preferred residential location while keeping the same job.	☐1	☐2	☐3	☐4	☐5
x. I would be more productive if I teleworked.	☐1	☐2	☐3	☐4	☐5
y. My work colleagues would generally be supportive of me teleworking.	☐1	☐2	☐3	☐4	☐5

---------- Page Break ----------

Section D: Key aspects of your lifestyle

Learning more about your residential location and living arrangements will help us understand how these factors affect the way you organize your daily activities and the way you travel.

---------- Page Break ----------

1. [*][Y] Please give the year in which you *moved* to (or, *were born in*) your current neighborhood.
   Year: _____ (e.g. 2005)

2. [*] How would you characterize the area where you live now?
   - ☐1 Urban part of a city / region
   - ☐2 Suburban part of a city / region
   - ☐3 Small / medium-size town
   - ☐4 Rural area

---------- Page Break ----------

Knowing more about your neighborhood will help us put your transportation choices and opinions in context.

3. [*][Z] Please give the address of your home, or if you prefer, an intersection (two streets that cross) near your home.

   Address line 1 [*]
   (or intersection street 1) _____
   Address line 2
   (or intersection street 2) _____
   City [*] _____
   State [*] _____GA_____ Zip code [*][Z] _____

---------- Page Break ----------

4. [*] Do you rent or own the place where you live now?
   - ☐1 Rent
   - ☐2 Own
   - ☐3 Provided by someone else (e.g. relative, employer)
   - ☐4 Other (please specify): _____

5. [*] Which of the following best describes your home?
   - ☐1 A single-family house detached from any other house
   - ☐2 A single-family house attached to one or more houses
   - ☐3 An apartment or condo
   - ☐4 A dormitory or group housing
   - ☐5 A mobile home
   - ☐6 A boat, RV, van, etc.
   - ☐7 Other (please specify): _____

---------- Page Break ----------

6. [*] Who else lives with you? Please check ***ALL*** that apply.
   - ☐1 Husband/wife/partner
   - ☐2 Child(ren)/grandchild(ren)
   - ☐3 Parent(s)/grandparent(s)
   - ☐4 Other relative(s) (e.g. siblings, in-laws)
   - ☐5 Other non-household member(s) (e.g. roommates)
   - ☐6 Pet(s)
   - ☐7 ⊗ I live alone

---------- Page Break ----------

Logic: Display D7 if D6_5=1

7. [*][#] How many ***non-household*** members live with you?

_____

8. [*][#] ***Including yourself***, how many people who are living with you are currently teleworking for a paid job? If the answer is "none", please enter 0.

_____

---------- Page Break ----------

Logic: Display the note below if D6_5=1.
NOTE: For the following question, by "household" we mean "people who live together and share some financial resources". Housemates/roommates are usually **not** considered members of the same household.

Logic: Display the note below if D6_5≠1.
NOTE: For the following question, by "household" we mean "people who live together and share some financial resources".

9. [*][#] Thinking of your entire household, **including** yourself, how many people in your household…

a.	… are under the age of 6?	[Pre-filled with 0]
b.	… are ages 6-14?	[Pre-filled with 0]
c.	… are ages 15-17?	[Pre-filled with 0]
d.	… are ages 18-64?	[Pre-filled with 0]
e.	… are 65 or older?	[Pre-filled with 0]
	Total	[Sum from D9a to D9e]

---------- Page Break ----------

10. [*][**#**] Thinking of your entire household (a total of **[$D9 total]** people as you indicated in the previous question), how many people in your household…

*Please **include yourself** for any applicable category, and enter "0" if your answer is "none" for a given category*

a. … are employed? _____
b. … require special care? _____
c. … currently take classes from home? _____
d. … can drive a car? _____

---------- Page Break ----------

Section E: How you travel

In this section, we would like to get a sense of how you travel, and some of your typical travel patterns.

---------- Page Break ----------

Vehicle ownership
To begin, we would like to know the ***current*** vehicle ownership of your household. Remember, by "household" we mean "*people who live together and share at least some financial resources*" (housemates / roommates are usually **not** considered members of the same household).

1. [*] What best describes your current **vehicle ownership** status? *Please check **ALL** that apply*.
   ☐1 Someone else in my household owns/leases a vehicle (or vehicles)
   ☐2 I own a vehicle (or vehicles)
   ☐3 I lease a vehicle (or vehicles)

☐4 I have regular access to a vehicle (or vehicles) for personal use through my job
☐5 There is no vehicle in **my household** but I have **regular** access to one owned by somebody else (e.g. friend, roommate)
☐6 I am a member of a carsharing organization
☐7 ⊗ There is no **regular** access to a vehicle in my household

2. [*][#] Across all members in your **household** (including yourself), how many vehicles are owned, leased, or provided by an employer? _____

---------- Page Break ----------

3. [*] Do you drive a vehicle, even if only occasionally? ☐1 Yes ☐2 No

---------- Page Break ----------

Logic: Display E4 if E3=1.
4. What are the make (e.g. Toyota), model (e.g. Corolla), and year of the vehicle you drive **most often**?

☐1 The vehicles I drive vary too much (or I drive too seldom) to pick a single one

Make:_____ Model:_____ Year:_____

---------- Page Break ----------

Now, we want you to reflect on ***the past two years***, since the emergence of the pandemic in **March 2020**. The following questions ask about your **household's** vehicles over the past two years.

---------- Page Break ----------

5. [*] What has happened to your household's vehicles ***in the past two years (since March 2020)?***
☐1 The number of vehicles increased
☐2 The number of vehicles decreased
☐3 The total remained the same but one or more vehicles were replaced
☐4 No change – no vehicles were added, disposed of, or replaced

Logic: Display E6 if E5=1.
6. [*] Did the COVID-19 pandemic influence your household's decision to ***increase*** its number of vehicles?
☐1 Not at all
☐2 Somewhat, but other factors were more important
☐3 The pandemic was ***among*** the important factors
☐4 The pandemic was the ***most*** important factor

Logic: Display E7 if E5=2.
7. [*] Did the COVID-19 pandemic influence your household's decision to ***decrease*** its number of vehicles?
☐1 Not at all
☐2 Somewhat, but other factors were more important
☐3 The pandemic was ***among*** the important factors
☐4 The pandemic was the ***most*** important factor

Logic: Display E8 if E5=3.
8. [*] Did the COVID-19 pandemic influence your household's decision to ***replace*** one or more vehicles?
☐1 Not at all
☐2 Somewhat, but other factors were more important
☐3 The pandemic was ***among*** the important factors
☐4 The pandemic was the ***most*** important factor

---------- Page Break ----------

Commute trips
Logic (survey flow): Branch to the following text section if C5a/c/e/g=2, 3, 4, 5, or 6 or C7=1/4.
Now, we need to obtain a picture of your **commute travel.** A **commute trip** is a movement between home and a work location (such as the regular workplace, or an alternative telework location).

---------- Page Break ----------

Regular workplace
Logic (survey flow): Branch to the following section till E10 if C5a/e=2, 3, 4, 5, or 6 or C7=1/4.
In previous questions, you indicated that you work at a **regular workplace**. Recall that your **"regular workplace"** refers to the main location of your job, where you sometimes (even if infrequently) meet physically with your supervisor, coworkers, and/or employees.

9. [*][#] How far do you live from your **regular workplace**? _____ miles

---------- Page Break ----------

Knowing more about where you work will help us understand the transportation options available to you.

10. [*] Please give the address of your **regular workplace**, or if you prefer, an intersection (two streets that cross) near your **regular workplace**.
    Address line 1 [*]
    (or intersection street 1) _____
    Address line 2
    (or intersection street 2) _____
    City [*] _____
    State [*] _____ Zip code [*] _____

---------- Page Break ----------

Regular workplace, full days
Logic (survey flow): Branch to the following section till E14 if C5a=2, 3, 4, 5, or 6.
For the following few questions, please consider ***full days*** that you work at the **regular workplace**.

11. [#] How long does it generally take you to get **from home to your regular workplace**?
    _____hour(s) and
    _____minutes [Validation: either hours or minutes need to be filled]

---------- Page Break ----------
Regular workplace, full days

Logic: Display E12 if C5a=2 or 3.

12. [*] Still thinking of the ***full days*** that you work at the **regular workplace,** what is your ***primary*** means of transportation to your regular workplace? Please check only ***ONE*** option.
    - "***Primary*** means" refers to the means used for the longest distance.
    - "*Car/vanpool **passenger**" (different from "ridehailing") refers to sharing a car/van on a prearranged basis, often with family, friends, co-workers, and/or neighbors.*

    ☐1 Car, **driving** alone
    ☐2 Car, **driving** with passengers
    ☐3 Car/vanpool **passenger**
    ☐4 Ridehailing (e.g. taxi, Uber, Lyft, UberPool, Lyft Line)
    ☐5 Bus or train
    ☐6 Walking
    ☐7 Bicycle
    ☐8 Airplane
    ☐9 Other (please specify): _____

---------- Page Break ----------

Regular workplace, full days

Logic: Display E13-14 if C5a=4, 5, or 6.
(Note: Due to a coding error in the Qualtrics survey, E13 is given to respondents with (1) C5a = 4 OR (2) one of C5a, C5b, C5c and C5d = 5 or 6. Resultingly, E13 is given to some additional respondents who are not supposed to face it, without missing any respondents who are supposed to)

13. [*] Still thinking about ***full days*** that you work at the **regular workplace**, please indicate how often you use each of the following means of transportation for such trips.
    - If you use *more than one means of travel* on a given commute trip, count just the one used for the longest distance.
    - Please do ***NOT*** count the *return-home* trip.
    - "*Car/vanpool **passenger**" (different from "ridehailing") refers to sharing a car/van on a prearranged basis, often with family, friends, co-workers, and/or neighbors.*

	Never	*Less than once a **month***	*1-3 times a **month***	*1-2 times a **week***	*3-4 times a **week***	*5 or more times a **week***
a. Car, **driving** alone	☐1	☐2	☐3	☐4	☐5	☐6
b. Car, **driving** with passengers	☐1	☐2	☐3	☐4	☐5	☐6
c. Car/vanpool **passenger**	☐1	☐2	☐3	☐4	☐5	☐6
d. Ridehailing (e.g. taxi, Uber, Lyft, UberPool, Lyft Line)	☐1	☐2	☐3	☐4	☐5	☐6
e. Bus or train	☐1	☐2	☐3	☐4	☐5	☐6
f. Walking	☐1	☐2	☐3	☐4	☐5	☐6
g. Bicycle	☐1	☐2	☐3	☐4	☐5	☐6
h. Airplane	☐1	☐2	☐3	☐4	☐5	☐6
i. Other (please specify): _____	☐1	☐2	☐3	☐4	☐5	☐6

14. [*] What are the most common departure times of your commute trips to and from the **regular workplace**? For each direction of your commute, please drag the circle to fall under the appropriate departure time.

a. Going to the regular workplace	Slider (12-hour AM/PM clock)
b. Leaving the regular workplace	Slider (12-hour AM/PM clock)

---------- Page Break ----------

Regular workplace, partial days
Logic (survey flow): Branch to the following section till E17 if C5e=4, 5, or 6.
For the following few questions, please consider occasions where you work at the **regular workplace** for ***PARTIAL days***.

For example, you may go to the regular workplace in the morning, come back home at noon, and work the rest of the day at home, **or** *you may work at your alternative telework location in the morning and go to the regular workplace to meet with your project team in the afternoon.*

15. [#] [*]When you work ***partial days*** at the **regular workplace,** how long does it generally take you to get **from home to your regular workplace**?
    _____hour(s) and
    _____minutes [Validation: either hours or minutes need to be filled AND at least one blank must be larger than zero]

---------- Page Break ----------

Regular workplace, partial days

16. [*]When you work ***partial days*** at the **regular workplace**, what is your ***primary*** means of transportation to the regular workplace? Please check only ***ONE*** option.
    - "***Primary*** means" refers to the means used for the longest distance.
    - "*Car/vanpool **passenger**" (different from "ridehailing") refers to sharing a car/van on a prearranged basis, often with family, friends, co-workers, and/or neighbors.*

☐1 Car, **driving** alone	☐4 Ridehailing (e.g. taxi, Uber, Lyft, UberPool, Lyft Line)	☐7 Bicycle
☐2 Car, **driving** with passengers	☐5 Bus or train	☐8 Airplane
☐3 Car/vanpool **passenger**	☐6 Walking	☐9 Other (please specify): _____

17. [*] When you work ***partial days*** at the **regular workplace**, what are the most common departure times of your commute trips to and from the regular workplace? For each direction of your commute, please drag the circle to fall under the appropriate departure time.

a. Going to the regular workplace	Slider (12-hour AM/PM clock)
b. Leaving the regular workplace	Slider (12-hour AM/PM clock)

---------- Page Break ----------

Alternative telework locations

Logic (survey flow): Branch to the following section till E19 if C5c/g=2, 3, 4, 5, or 6.

In previous questions, you indicated that you work at **alternative telework locations**. Please consider the alternative telework location that you go to *most often,* and answer the following questions.

Recall that **alternative telework locations** are places (***other than home***) where you can telework. They could be an alternative office located in a different building of your organization, a telework center/coworking space (like WeWork or Regus), or other places such as coffee shops, parks, or libraries.

---------- Page Break ----------

18. [*][#] How far do you live from the **alternative telework location** that you go to most often?
_____ miles

---------- Page Break ----------

Knowing more about where you work will help us understand the transportation options available to you.

19. [*] Please give the address of the **alternative telework location** , or if you prefer, an intersection (two streets that cross) near your **alternative telework location**.

Address line 1 [*]
(or intersection street 1) _____
Address line 2
(or intersection street 2) _____
City [*] _____
State [*] _____ Zip code [*] _____

---------- Page Break ----------

Logic (survey flow): Branch to the following section till E22 if C5c/g=4, 5, or 6.

For the following few questions, please consider times that you work at the **alternative telework location** that you go to *most often.*

20. [*][#] How long does it generally take you to get from home to the alternative telework location?
_____hour(s) and
_____ minutes [Validation: either hours or minutes need to be filled AND at least one blank must be larger than zero]

---------- Page Break ----------

21. [*] When you work at the **alternative telework location**, what is your ***primary*** means of transportation to the alternative telework location? Please check only ***ONE*** option.
    - "***Primary*** means" refers to the means used for the longest distance.
    - "*Car/vanpool **passenger**" (different from "ridehailing") refers to sharing a car/van on a prearranged basis, often with family, friends, co-workers, and/or neighbors.*

☐1 Car, **driving** alone	☐4 Ridehailing (e.g. taxi, Uber, Lyft, UberPool, Lyft Line)	☐7 Bicycle
☐2 Car, **driving** with passengers	☐5 Bus or train	☐8 Airplane
☐3 Car/vanpool **passenger**	☐6 Walking	☐9 Other (please specify): _____

22. [*] What are the most common departure times for your commute trips to and from the **alternative telework location**? For each direction of your commute, please drag the circle to fall under the appropriate departure time.

a. Going to the alternative telework location	Slider (12-hour AM/PM clock)
b. Leaving the alternative telework location	Slider (12-hour AM/PM clock)

---------- Page Break ----------

Other travel questions 2022

23. [*][#] Some people (would) appreciate not having to commute at all, while others find that the commute trip itself is useful or enjoyable in some way(s). If you could choose, what would be your **ideal one-way travel time to work**? _____ minutes

Logic: Display if C5a, c, e, or g > 1

24. [*] In terms of its ***value to you***, how would you rate the time you spend on your typical trip to your **regular workplace** and/or your **alternative telework location**?

Mostly wasted time ☐1 ☐2 ☐3 ☐4 ☐5 *Mostly useful time*

---------- Page Break ----------

General telework patterns

Logic (survey flow): Branch to the following section through E35 if C5b/c/f/g=3, 4, 5, or 6.

Turning from your commute patterns, we would now like to ask a few questions about your recent teleworking experiences.

Logic: Display E25-E26 if C5b/c=3, 4, 5, or 6.

(Note: Due to a coding error in the Qualtrics survey, E25 is given to respondents with C5b or C5g = 3, 4, 5, or 6. Resultingly, a small portion (less than 2%) of respondents who are supposed to be given the question did not face the question.)

25. [*] In a previous section, you indicated that you engage in teleworking for ***full days***. Please tell us which days of the week you typically telework for full days. Select ***ALL*** that apply. If your schedule varies from week to week, you can select "it varies".

☐1 Monday
☐2 Tuesday
☐3 Wednesday
☐4 Thursday
☐5 Friday
☐6 Saturday
☐7 Sunday
☐8 *It varies*

26. [*] If you save time by ***NOT*** commuting to the regular workplace, what do you do with the time you save? Please check ***ALL*** that apply.

☐1 ⊗ I don't perceive that I save any time
☐2 ⊗ I haven't noticed what I do differently
☐3 ⊗ Nothing in particular / the saved time is too short
☐4 Sleep
☐5 Exercise
☐6 Work
☐7 Prepare meals
☐8 Spend time with my family
☐9 Work on hobbies or other personal activities
☐10 Spend time on leisure or recreational activities
☐11 Other (please specify): _____

---------- Page Break ----------

Logic: Display E27 if C5f/g=3, 4, 5, or 6.

27. [*] In a previous section, you indicated that you engage in teleworking for ***partial days***. Please tell us which days of the week you typically telework for partial days. Select ***ALL*** that apply. If your schedule varies from week to week, you can select "it varies".

☐1 Monday
☐2 Tuesday
☐3 Wednesday
☐4 Thursday
☐5 Friday
☐6 Saturday
☐7 Sunday
☐8 *It varies*

---------- Page Break ----------

The last telework day

For the following questions, please think back to ***the last day you teleworked either a full or partial day***.

28. [*] What was the date of the most recent time you teleworked either a ***full*** or ***partial day***? If you can't remember the exact date, your best guess is fine!
[Insert a calendar]

---------- Page Break ----------

29. [*] On that date ([$E28]), did you telework for a ***full day***, or a ***partial day***?

☐1 I teleworked for a full day.
☐2 I teleworked for part of the day.
☐3 I don't remember.

---------- Page Break ----------

The next few questions ask about how your activity patterns might have changed due to teleworking on that day. We will first ask about things you *did* do on that day, and then ask about things that you *didn't* do (but *would have done* if you hadn't teleworked).

30. [*] Did you do any of the following *out-of-home* activities **on that most recent teleworking day** ([$E28])? Please check ***ALL*** that apply.

☐1 Commute
☐2 Work-related travel (*other* than commuting)
☐3 Visit family/friends
☐4 Drop off/pick up someone
☐5 General errands (e.g. shopping, dry cleaners)
☐6 Personal business (e.g. medical appointment)
☐7 Go out to eat / get take-out
☐8 Recreational activities (e.g. visit parks, movies)
☐9 Exercise (e.g. jog, walk the dog, work out at the gym)
☐10 Other (please specify): _____
☐11 ⊗ No, I didn't go out on that day

---------- Page Break ----------

Logic: Display E31 if E30_1/2/3/4/5/6/7/8/9/10=1.

31. In the previous question, you indicated that you did the following activities *outside your home* **on that most recent teleworking day** ([$E29]). We are interested in whether any of the *out-of-home* activities you did that day were different in some way ***because you teleworked***. For each kind of activity, please select ***ALL*** answers that apply. If you conducted multiple activities under one category, please answer the question with respect to the ***major activity***. The major activity is the one that took you the longest time to complete.
Logic: Display E31μ if E30_[μ]=1, where [μ] is the alphabet order of μ and μ=a[1], b[2], c[3], d[4], e[5], f[6], g[7], h[8] , i[9] , j[10]. Implement separate logic for each activity.

	***Because I teleworked**, I did the activity…*				
	…as a newly added activity	*…on this day instead of another day*	*…on the same day, but at a different time*	*…at a different place*	*Teleworking **did not** affect how I did this activity*
a. Commute	☐1	☐2	☐3	☐4	☐5
b. Work-related travel (*other* than commuting)	☐1	☐2	☐3	☐4	☐5
c. Visit family/friends	☐1	☐2	☐3	☐4	☐5
d. Drop off/pick up someone	☐1	☐2	☐3	☐4	☐5
e. General errands (e.g. shopping, dry cleaners)	☐1	☐2	☐3	☐4	☐5
f. Personal business (e.g. medical appointment)	☐1	☐2	☐3	☐4	☐5
g. Go out to eat / get take-out	☐1	☐2	☐3	☐4	☐5
h. Recreational activities (e.g. visit parks, movies)	☐1	☐2	☐3	☐4	☐5
i. Exercise (e.g. jog, walk the dog, work out at the gym)	☐1	☐2	☐3	☐4	☐5
j. Other [previous answer shown by Qualtrics]	☐1	☐2	☐3	☐4	☐5

---------- Page Break ----------

Logic: Display E32 if E31a/b/c/d/e/f/g/h/i/j=1, 2, 3, or 4.

32. [*] Around what time of day on [$E28] did you *start* each of these out-of-home activities? Again, if you conducted multiple activities under one category, answer the question with respect to the ***major activity***. The major activity is the one that took you the longest time to complete.
Logic: Display E32μ if E31μ=1, 2, 3, or 4, where μ=a, b, c, d, e, f, g, h, i, j. Implement separate logic for each activity.

	Early morning	*Morning*	*Mid-morning to*	*Afternoon*	*Early evening*	*Evening*	*Night*

	3:00 am - 5:59 am	*6:00 am - 9:59 am*	*early afternoon 10:00 am - 12:59 pm*	*1:00 pm - 3:59 pm*	*4:00 pm - 6:59 pm*	*7:00 pm - 9:59 pm*	*10:00 pm - 2:59 am*
a. Commute	☐1	☐2	☐3	☐4	☐5	☐6	☐7
b. Work-related travel (*other* than commuting)	☐1	☐2	☐3	☐4	☐5	☐6	☐7
c. Visit family/friends	☐1	☐2	☐3	☐4	☐5	☐6	☐7
d. Drop off/pick up someone	☐1	☐2	☐3	☐4	☐5	☐6	☐7
e. General errands (e.g. shopping, dry cleaners)	☐1	☐2	☐3	☐4	☐5	☐6	☐7
f. Personal business (e.g. medical appointment)	☐1	☐2	☐3	☐4	☐5	☐6	☐7
g. Go out to eat / get take-out	☐1	☐2	☐3	☐4	☐5	☐6	☐7
h. Recreational activities (e.g. visit parks, movies)	☐1	☐2	☐3	☐4	☐5	☐6	☐7
i. Exercise (e.g. jog, walk the dog, work out at the gym)	☐1	☐2	☐3	☐4	☐5	☐6	☐7
j. Other [previous answer shown by Qualtrics]	☐1	☐2	☐3	☐4	☐5	☐6	☐7

---------- Page Break ----------

Logic: Display E33 if E31a/b/c/d/e/f/g/h/i/j=3.

33. [*] Around what time of day would you have started these activities ***if you had NOT been teleworking*** that day ([$E28])? Your best guess is fine!

Logic: Display E34μ if E31μ=3, where μ=a, b, c, d, e, f, g, h, i, j. Implement separate logic for each activity.

	Early morning *3:00 am - 5:59 am*	*Morning* *6:00 am - 9:59 am*	*Mid-morning to early afternoon* *10:00 am - 12:59 pm*	*Afternoon* *1:00 pm - 3:59 pm*	*Early evening* *4:00 pm - 6:59 pm*	*Evening* *7:00 pm - 9:59 pm*	*Night* *10:00 pm - 2:59 am*
a. Commute	☐1	☐2	☐3	☐4	☐5	☐6	☐7
b. Work-related travel (*other* than commuting)	☐1	☐2	☐3	☐4	☐5	☐6	☐7
c. Visit family/friends	☐1	☐2	☐3	☐4	☐5	☐6	☐7
d. Drop off/pick up someone	☐1	☐2	☐3	☐4	☐5	☐6	☐7
e. General errands (e.g. shopping, dry cleaners)	☐1	☐2	☐3	☐4	☐5	☐6	☐7
f. Personal business (e.g. medical appointment)	☐1	☐2	☐3	☐4	☐5	☐6	☐7
g. Go out to eat / get take-out	☐1	☐2	☐3	☐4	☐5	☐6	☐7
h. Recreational activities (e.g. visit parks, movies)	☐1	☐2	☐3	☐4	☐5	☐6	☐7
i. Exercise	☐1	☐2	☐3	☐4	☐5	☐6	☐7

(e.g. jog, walk the dog, work out at the gym)							
j. Other [previous answer shown by Qualtrics]	☐1	☐2	☐3	☐4	☐5	☐6	☐7

---------- Page Break ----------

34. [*] Now, still thinking about the last day you teleworked ([$E29]): were there any out-of-home activities *you otherwise would have done* that you ***didn't do*** *because you teleworked?* Please select ***ALL*** that apply.

☐1 Commute
☐2 Work-related travel (*other* than commuting)
☐3 Visit family/friends
☐4 Drop off/pick up someone
☐5 General errands (e.g. shopping, dry cleaners)
☐6 Personal business (e.g. medical appointment)
☐7 Go out to eat / get take-out
☐8 Recreational activities (e.g. visit parks, movies)
☐9 Exercise (e.g. jog, walk the dog, work out at the gym)
☐10 Other (please specify): _____
☐11 ⊗ No, there were no activities that I refrained from doing because I teleworked

---------- Page Break ----------

Logic: Display E35 if E34_2/3/4/5/6/7/8/9/10=1.

35. [*] What happened to those out-of-home activities that you ***didn't do*** on your most recent teleworking day ([$E28])? Please select the most appropriate answer(s) for each activity. If there are multiple activities you ***didn't do*** under one category, pick the ***major activity*** to answer the question. The major activity is the one that would have taken the longest time to complete.

Logic: Display E35μ if E34_([μ]+1)=1, where [μ] is the alphabet order of μ and μ=a[1], b[2], c[3], d[4], e[5], f[6], g[7] , h[8] , i[9]. Implement separate logic for each activity.

	It didn't / won't get done	*I did / will do it another day*	*Someone else did / will do it instead of me*
a. Work-related travel (*other* than commuting)	☐1	☐2	☐3
b. Visit family/friends	☐1	☐2	☐3
c. Drop off/pick up someone	☐1	☐2	☐3
d. General errands (e.g. shopping, dry cleaners)	☐1	☐2	☐3
e. Personal business (e.g. medical appointment)	☐1	☐2	☐3
f. Go out to eat / get take-out	☐1	☐2	☐3
g. Recreational activities (e.g. visit parks, movies)	☐1	☐2	☐3
h. Exercise (e.g. jog, walk the dog, work out at the gym)	☐1	☐2	☐3
i. Other [previous answer shown by Qualtrics]	☐1	☐2	☐3

---------- Page Break ----------

Weekly VMD

Logic: Display E36 if E3=1.

36. [*][#] Now, considering your travel for *all* purposes (both work and personal trips), **how many miles** do you **personally drive** in a typical week? *If you are a professional driver (e.g. bus, truck, taxi, or Uber/Lyft*

*driver), please do **not** include the miles you cover as part of your job. Your answer doesn't have to be exact – **your best guess is fine!***

_____ miles per week

---------- Page Break ----------

Weekly VMD quality check

Logic (survey flow): Display the following section till E41 if E3=1 AND E13a/b=4, 5, 6.

Coding notes: [$E13a] = 0 if E13a=1, 2, 3, [$E13b] = 0 if E13b=1, 2, 3.

Now, please help us check your weekly driving distance.

We can estimate your *minimum* weekly driving distance for commuting only, based on your previous answers:

- Your driving frequency (alone) to the regular workplace for full days is about **[$E13a]** days/week.
- Your driving frequency (with others) to the regular workplace for full days is about **[$E13b]** days/week.
- Your one-way commute distance to the regular workplace is **[$E9]** miles.
- Accordingly, your *weekly commute distance by driving* (both ways) for full days is about **([$E13a] + [$E13b]) * [$E9] * 2** miles.

In the previous question, you indicated that your ***total*** *weekly driving distance* (both work and personal trips) is **[$E36]** miles.

37. [*] Could you please confirm if the above answers are correct? Please note, your *total* weekly driving distance (i.e. **[$E36]** miles) should be at least as great as your weekly commute distance by driving to the regular workplace for full days (i.e. the lower end of **([$E13a] + [$E13b]) * [$E9] * 2** miles).

☐1 Yes, the above estimates are correct. ☐2 No, some of the estimates are incorrect.

Logic: Display E38 if E37=2.

38. [*] Which estimate is incorrect? Please check ***ALL*** that apply.

☐1 My driving frequency to the regular workplace for full days

☐2 The one-way commute distance to my regular workplace

☐3 The total vehicle miles I drive in a week

---------- Page Break ----------

Logic: Display the following text if E38_1/2/3=1.

Please adjust the incorrect estimates.

Logic: Display E39 if E38_1=1.

39. [*] Thinking of the ***full days*** that you work at the **regular workplace**, please indicate how often you use each of the following means of transportation to the regular workplace.

- If you use *more than one means of travel* on a given commute trip, count just the one used for the longest distance.
- Please do ***NOT*** count the *return-home* trip.
- "*Car/vanpool **passenger**" (different from "ridehailing") refers to sharing a car/van on a prearranged basis, often with family, friends, co-workers, and/or neighbors.*

	Never	*Less than once a **month***	*1-3 times a **month***	*1-2 times a **week***	*3-4 times a **week***	*5 or more times a **week***
a. Car, **driving** alone	☐1	☐2	☐3	☐4	☐5	☐6
b. Car, **driving** with passengers	☐1	☐2	☐3	☐4	☐5	☐6
c. Car/vanpool **passenger**	☐1	☐2	☐3	☐4	☐5	☐6
d. Ridehailing (e.g. taxi, Uber, Lyft, UberPool, Lyft Line)	☐1	☐2	☐3	☐4	☐5	☐6

e.	Bus or train	☐1	☐2	☐3	☐4	☐5	☐6
f.	Walking	☐1	☐2	☐3	☐4	☐5	☐6
g.	Bicycle	☐1	☐2	☐3	☐4	☐5	☐6
h.	Airplane	☐1	☐2	☐3	☐4	☐5	☐6
i.	Other (please specify): _____	☐1	☐2	☐3	☐4	☐5	☐6

Logic: Display E40 if E38_2=1.

40. [*] [#] How far do you live from your **regular workplace**? _____ miles

Logic: Display E41 if E38_3=1.

41. [*][#] Considering your travel for *all* purposes (both work and personal trips), **how many miles** do you **personally drive** in a typical week? *If you are a professional driver (e.g. bus, truck, taxi, or Uber/Lyft driver), please do **not** include the miles you cover as part of your job. Your answer doesn't have to be exact – **your best guess is fine!***

_____ miles per week

---------- Page Break ----------

Section F: Your desire for future travel and telework

In this section, we are interested in your *expectations* and *preferences* for your ***future*** residential location, travel, and work/telework patterns. There are no right or wrong answers; we only want to know what you think may happen and what you want to do.

---------- Page Break ----------

The following few questions ask about your future residential location choices.

1. [*] In the next three years, how likely are you to **change** where you live?
   ☐1 Very unlikely ☐2 Unlikely ☐3 Somewhat ☐4 Likely ☐5 Very likely

---------- Page Break ----------

Logic (survey flow): Display F2 if F1=1, 2, or 3.

2. [*] Does the possibility that you (or other household members) could ***telework*** have any influence on the likelihood that you will ***stay in the same place*** over the next 3 years?

		Not at all	*Somewhat, but other factors are **more** important*	*Telework is **among** the important factors*	*Telework is the **most** important factor*
a.	Your potential to telework	☐1	☐2	☐3	☐4
b.	Other household members' potential to telework	☐1	☐2	☐3	☐4

---------- Page Break ----------

Logic (survey flow): Display F3 to F6 if F1=3, 4, or 5.

3. [*] Does the possibility that you (or other household members) could ***telework*** have any influence on the likelihood that you will ***move*** over the next 3 years?

		Not at all	*Somewhat, but other factors are **more** important*	*Telework is **among** the important factors*	*Telework is the **most** important factor*
a.	Your potential to telework	☐1	☐2	☐3	☐4
b.	Other household members' potential to telework	☐1	☐2	☐3	☐4

---------- Page Break ----------

4. [*] *If you move*, how would you describe the place you are most likely to move to? Please check the single most likely option.
   - ☐1 I would probably move to a different place in the city/region where I am currently living.
   - ☐2 I would probably move outside of the city/region where I am currently living.
   - ☐3 I am not sure where I would be moving.

5. [*] *Compared to where you live now*, how would you describe the place you would most likely move to?

		A place like your current residential location ↓					
a.	*Less urban*	☐1	☐2	☐3	☐4	☐5	*More urban*
b.	*More residential*	☐1	☐2	☐3	☐4	☐5	*More variety (e.g. restaurants, stores)*

   ☐6 I'm not sure

6. [*] What is the distance between your **regular workplace** and the place you would most likely move to? If you are going to be self-employed and based at home, please answer "Less than 5 miles".

   - ☐1 Less than 5 miles
   - ☐2 5-15 miles
   - ☐3 16-50 miles
   - ☐4 51-200 miles
   - ☐5 More than 200 miles
   - ☐6 I don't know
   - ☐7 My employer will not have a regular workplace because all employees will work remotely
   - ☐8 I do not expect to be working when I move

---------- Page Break ----------

The following questions ask about your employment, teleworking, and commuting situations ***about a year from now (March 2023)***. You can refer to your current primary job if you do not plan to change jobs. If you do plan to change jobs, please imagine the type of job that you are most likely to have when answering the following questions. ***Your best guesses are fine, but your answers to these questions are very important to us!***

7. [*] About a year from now ***(March 2023),*** what do you expect your employment situation to be? ***Select all that apply***.

   - ☐1 I will work full time for pay
   - ☐2 I will work part-time for pay
   - ☐3 I will be self-employed for pay
   - ☐4 I will have two or more paying jobs
   - ☐5 I will do unpaid work
   - ☐6 I will be a homemaker / caregiver
   - ☐7 I will be retired
   - ☐8 I will be looking for a job
   - ☐9 Other (please specify): _____

---------- Page Break ----------

Logic: Display F8 if F7_3=1 and F7_1 or 2 or 4 =1

8. [*] For your **primary job** in ***March 2023***, will you most likely be self-employed?
   ☐1 Yes ☐2 No

Logic: Display F9 if F8=1 or if F7_3=1 AND F7_1 and 2 and 4=0.

9. [*] Will your self-employed job be based at home (even if you sometimes travel to **customer locations**)?
   ☐1 Yes ☐2 No

Logic (survey flow): Display F10-12 if F7_1, 2, 3, or 4=1

10. [*] The following questions relate to your **teleworking** *feasibility* ***about a year from now.***

	Never	*Less than once a* ***month***	*1-3 times a* ***month***	*1-2 times a* ***week***	*3-4 times a* ***week***	*5 or more times a* ***week***
a. How much do you think **the nature of your job** would allow you to telework?	☐1	☐2	☐3	☐4	☐5	☐6
b. How much do you think **your supervisor** would let you telework? (If you are going to be self-employed, please consider yourself as your supervisor.)	☐1	☐2	☐3	☐4	☐5	☐6

---------- Page Break ----------

11. [*] The following questions relate to your **teleworking** and **commuting** *expectations* ***about a year from now.*** Again, teleworking can be either full day or partial day, but please do ***NOT*** include ***overtime work*** or a ***side job*** in your responses.

	Never	*Less than once a* ***month***	*1-3 times a* ***month***	*1-2 times a* ***week***	*3-4 times a* ***week***	*5 or more times a* ***week***
a. How much do you ***expect*** to telework?	☐1	☐2	☐3	☐4	☐5	☐6
b. Logic: Show F11b if F8=2 OR F9=2 OR if F7_1/2/4=1 AND F7_3=0 How much do you ***expect*** to commute to the regular workplace?	☐1	☐2	☐3	☐4	☐5	☐6

---------- Page Break ----------

12. [*] The following questions relate to your **teleworking** and **commuting** *preferences* ***about a year from now***. *(Note: Due to a coding error in the Qualtrics survey, F12b is given to respondents with (1) F8 = 2 and F9 = 2 OR (2) F7_1 or F7_2 or F7_4 = 1. Resultingly, a small portion (around 2%) of respondents who are supposed to be given the question did not face the question (which are considered as missing values).)*

	Never	*Less than once a* ***month***	*1-3 times a* ***month***	*1-2 times a* ***week***	*3-4 times a* ***week***	*5 or more times a* ***week***
a. How much would you ***prefer*** to telework?	☐1	☐2	☐3	☐4	☐5	☐6
b. Logic: Show F12b if F8=2 OR F9=2 OR if F7_1/2/4=1 AND F7_3=0 How much would you ***prefer*** to commute to the regular workplace?	☐1	☐2	☐3	☐4	☐5	☐6

Section G: Some background about yourself

We have reached the final section of the survey! Your answers to these few background questions are important for helping us project the responses from this small sample to the population as a whole.

---------- Page Break ----------

1. [*] Are you… ☐1 Female ☐2 Male ☐3 Prefer to self-describe: _____

2. [*][Y] In what year were you born? Year: _____ (e.g., 1975)

3. [*] Are you Hispanic or Latino/a/x? ☐1 Yes ☐2 No

4. [*] How would you describe yourself? Please check ***ALL*** that apply to you.
   ☐1 Asian or Pacific Islander ☐3 Native American ☐5 Other (please specify):
   ☐2 Black / African American ☐4 White / Caucasian _____

5. [*] What is your educational background? Please check the highest level attained.
   ☐1 Some grade/high school ☐3 Some college/technical school ☐5 Some graduate school
   ☐2 Completed high school or GED ☐4 Bachelor's degree(s) ☐6 Completed graduate degree(s)

6. [*] Please check the category that contains your approximate annual ***household*** income before taxes.
   ☐1 Less than $25,000 ☐3 $50,000 to $74,999 ☐5 $100,000 to $149,999
   ☐2 $25,000 to $49,999 ☐4 $75,000 to $99,999 ☐6 $150,000 or more
   ☐7 Prefer not to answer

We would value any additional comments you may have, on telework or any other topics in this survey. Please write them in the space below.

Text entry

---------- Page Break ----------

We thank you for your time spent taking this survey!
Your response has been recorded.

APPENDIX B: FACTOR LOADINGS FOR ATTITUDES AND PREFERENCES

Attitude/preference[1]		Statement[2] (factor loading)
General[3]	Pro-active modes and transit	I like the idea of walking as a means of travel for me. (0.893) I like the idea of bicycling as a means of travel for me. (0.516) I like the idea of public transit as a means of travel for me. (0.415)
	Tech savvy	Learning how to use new technologies is often frustrating for me. (-0.872) I am confident in my ability to use modern technologies. (0.760)
	Pro-large house	I prefer to live in a smaller home like an apartment or condo for its amenities and/or convenient location, even if it means more noise and less privacy due to close neighbors. (-0.866) I prefer to live in a larger home, even if its farther from public transportation or many places I go. (0.571)
	Satisfied	I am generally satisfied with my life. (0.848) I am generally satisfied with where I am living right now. (0.566)
	Pro-car owning	I definitely want to own a car. (0.726) I like the idea of driving as a means of travel for me. (0.639)
	Pro-environment	I am committed to an environmentally-friendly lifestyle, even if it requires some extra cost or inconvenience. (0.870) Environmental issues are emphasized too much in this country. (-0.563)
	Travel stressed	My commute is stressful. (0.672) I would pay extra to reduce the time I spend in daily traveling. (0.455) I'm too busy to do many things I'd like to do. (0.350)
	Commute positive	My commute is a useful transition between home and work. (0.624) My commute is stressful. (-0.340)
	Career oriented	At this stage of my life, having fun is more important to me than working hard. (-0.627) It's very important to me to achieve success in my work. (0.363)
	Urbanite	I like the idea of having stores, restaurants, and offices mixed among the homes in my neighborhood. (0.554) I see myself living long-term in a lower-density setting (suburban / small town / rural). (-0.359)

Note:

1) Obtained from principal axis factoring in SPSS, using promax rotation with Kaiser normalization.
2) Statements with a factor loading at least 0.3 in magnitude.
3) Factor analysis used statements in Q1 of Section A excluding two: "d" (used for other "work-related" factor analysis) and "p" (trap statement).

Attitude/preference		Statement[1] (factor loading)
Work-related[2]	Work interferes with family	I feel quite a bit of pressure from my job. (0.830) After work, I am often so stressed out that it interferes with the (quality of) interactions I have with my family. (0.795) I have to miss some family activities due to the amount of time I must spend on work responsibilities. (0.486) Conditions at my workplace prevent me from being as productive as I could be. (0.310) Family responsibilities often make it hard for me to concentrate on my work. (0.303)
	Pro-teamwork	I'd rather work on my own than with a team. (-0.908) I'd rather work with a team than on my own. (0.793)
	Family interferes with work	I have to miss some work activities due to the time I must spend on family responsibilities. (0.832) Family responsibilities often make it hard for me to concentrate on my work. (0.462)
	Performance is measurable	The standards for measuring my work performance are vague. (-0.743) My job has an easily measurable output. (0.607)
	Job satisfied	I am generally satisfied with my job. (0.757) I enjoy the social interaction found at my workplace. (0.405) Conditions at my workplace prevent me from being as productive as I could be. (-0.362) My boss tends to overmanage me. (-0.352)
	Autonomous	I would prefer to have step-by-step guidance on how to do my job. (-0.828) Just tell me what needs to be done, and let me decide how to do it. (0.370)
	Experienced	I am good at managing my work time. (0.456) I'm already well-established in my field of work. (0.305)

Note:

1) Obtained from principal axis factoring in SPSS, using promax rotation with Kaiser normalization.
2) Statements with a factor loading at least 0.3 in magnitude.
3) Factor analysis used statements in Q9 of Section B, plus one statement from Section A (statement "d").

Attitude/preference		Statement[1] (factor loading)
TW-related[2]	TW enthusiasm	I would be more productive if I teleworked. (0.592) Teleworking would inspire me to be more dedicated to my job. (0.525) Having the option to telework would be among the most important features for my job to have. (0.401) It would be hard for me to have the same level of motivation if I were teleworking. (-0.382)
	TW location flexibility	Teleworking would let me move to a more preferred residential location while keeping the same job. (0.818) Teleworking would let me get a better job, even if that job is far from where I live now. (0.416)
	TW cost saving	Overall, teleworking would cost me more money (e.g., electricity, equipment, internet) than it would save. (-0.561) Teleworking would save me a lot of money (e.g., commuting, parking, grooming, lunch). (0.320) If I teleworked, I would miss the amenities at or near my regular workplace (e.g., better furniture, nearby restaurants). (-0.319)
	TW negatives	Teleworking would blur the boundary between my personal and work lives too much. (0.479) Working at home may increase conflicts with my family. (0.461) It would be hard for me to have the same level of motivation if I were teleworking. (0.437) If I teleworked, I would be concerned about my lack of visibility to management. (0.385)
	TW lost workplace benefits	I would feel left out of work-related social interactions if I am one of a few people teleworking. (0.615) If I teleworked, I would miss the amenities at or near my regular workplace (e.g., better furniture, nearby restaurants). (0.454) If I teleworked, I would keep the same amount of quality social interaction with my colleagues as before. (0.402)
	TW effective teamwork	Teleworking would still permit effective teamwork. (0.723) I like the idea of teleworking. (0.432)
	TW time flexibility	Teleworking would give me more time for my own priorities (e.g., myself, family, personal interests). (0.679) Teleworking would make it easier for me to handle my household responsibilities. (0.436) Teleworking would offer me more flexibility regarding when I work. (0.410)

Note:
1) Obtained from principal axis factoring in SPSS, using oblimin rotation with Kaiser normalization.
2) Statements with a factor loading at least 0.3 in magnitude.
3) Factor analysis used statements in Q10 of Section C excluding four: “c”, “j”, “q”, and “y”.