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ABSTRACT

Telework and Time Use in the United States*

Remote work is rapidly increasing in the United States. Using data on full-time wage and salary workers from the 2017–2018 American Time Use Survey Leave and Job Flexibilities Module, this paper examines the characteristics of teleworkers, the effects of teleworking on wages, and differences in time-use patterns between office and work-at-home workdays. We find that some teleworkers earn a wage premium, but it varies by occupation, gender, parental status, and teleworking intensity. Teleworkers also spend less time on commuting and grooming activities but more time on leisure and household production activities and more time with family on work-at-home days.

JEL Classification: J22, J31, D13

Keywords: working from home, telework, telecommuting, commuting, home-based work, alternative work arrangements, work-life balance, time use, wages

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I. Introduction

Advances in information and communications technologies (ICT) and access to high-speed internet service in over 75 percent of U.S. working-age adults' homes have greatly increased the ability of workers to vary the location of their work (Anderson 2019). In May 2004, when the Current Population Survey (CPS) last asked workers about work-at-home arrangements in the Work Schedules and Work at Home (WS) Supplement, 15 percent of wage and salary workers in the U.S. reported that they did some work at home, but only 3 percent of workers worked exclusively at home at least one day every two weeks.[1] More recently, according to the 2017–2018 American Time Use Survey Leave and Job Flexibilities (ATUS-LV) Module, 25 percent of wage and salary workers reported that they did some work at home and 13 percent of workers worked exclusively at home at least once every two weeks (U.S. Bureau of Labor Statistics 2019). According to the 2018 American Community Survey (ACS), 3.6 percent of employees worked exclusively at home at least half their workdays (Global Workplace Analytics 2020). Many more jobs will expand their telework options in the near future as businesses continue to invest in new technologies and try to lower their rents, especially in high-cost metropolitan areas, and policymakers push for solutions to lessen the impacts of commuting on congestion and the environment. Additionally, in response to the COVID-19 pandemic and health officials' calls for physical distancing, workplaces have recently been pushed to not only increase the telework capacity of jobs that were already being performed remotely to some extent, but also to expand telework capabilities to positions that typically involve a great deal of face-to-face interaction and were rarely or never done remotely, such as counseling, personal

[1] Authors' calculations based upon the Current Population Survey (CPS) Data at NBER (2004). For additional findings from this supplement, see U.S. Bureau of Labor Statistics (2005). See Song (2009) and Eldridge and Pabilonia (2010) for analyses of off-the-clock hours worked from home using the 2001 and 2004 CPS-WS Supplements respectively.

training, and outpatient health services. Many experts believe that these current changes will have a lasting impact on flexible workplace practices even after COVID-19 restrictions are lifted, because workers will have gained technical skills and businesses will have identified job tasks that can be performed remotely and paid the fixed costs necessary to carry out those tasks remotely (Loh and Fishbane 2020).[2]

Telework or telecommuting, a formal or informal arrangement allowing workers to work from home or a location other than their traditional workplace, is often promoted as a tool to help workers attain greater work-life balance.[3] In the 2017–2018 ATUS-LV Module, parents who worked at home reported that their number one reason for working at home was to coordinate their work schedule with their personal or family needs (Woods 2020). Using the ATUS-LV Module (2017–2018), we are for the first time able to determine telework status for all wage and salary workers and then compare time-use patterns for teleworkers on days worked at home to time-use patterns for teleworkers on days worked at their workplace, as well as compare time-use patterns between teleworkers and non-teleworkers. Therefore, we can observe whether the time-use patterns are consistent with telework allowing greater work-life balance and whether differences in non-work activities may contribute to increased worker productivity while teleworking. We do so by dividing workers into the following three categories: (1) office workers

[2] In the first week after physical distancing measures were implemented, Microsoft reported that their Teams app had 12 million additional users per day (Timberg et al. 2020). Using Occupational Information Network (O*NET) data on job tasks to determine the feasibility of performing all work at home for all occupations and merging this classification with occupational employment counts from the U.S. Bureau of Labor Statistics, Dingel and Neiman (2020) estimate that at most 34 percent of current U.S. jobs can be performed entirely at home. Using a Google Consumer Survey, Brynjolfsson et al. (2020) found that 34.1 percent of workers who had previously commuted switched to WFH by the first week of April 2020 as a result of COVID-19. This was in addition to the 14.6 percent who reported that they were WFH exclusively prior to COVID-19. Note that this latter estimate is much higher than estimates from the ATUS and ACS.

[3] Technically, telework is the substitution of technology for travel and telecommuting is the substitution of technology for the commute. Therefore, bringing work home from the office is telework, not telecommuting (Global Workplace Analytics 2020). However, we use these terms interchangeably to refer to those who do not commute to their office on some or all of their workdays.

(those who do not work exclusively from home on a regular basis, although they may still bring paid or unpaid work home from the office to be completed in the evening or other the weekend), (2) occasional teleworkers (those who work exclusively from home on their workday at least once a month and at most 2 days a week), and (3) home-based teleworkers (those who work the majority of their workdays exclusively from home). Thus, our analyses show the effects based on the intensity of teleworking. Previous research by both Giménez-Nadal, Molina and Velilla (2019) and Song and Gao (2019) used prior years of the ATUS to examine the relationship between working from home (WFH) and workers' subjective well-being. However, they could not determine whether workers were WFH on an occasional basis or for the majority of their workdays or just bringing work home from the office on their diary day, nor could they identify all teleworkers from their single diary day. Giménez-Nadal, Molina and Velilla (2019) did, however, find that working exclusively from home on the diary day resulted in a shift from market work activities to non-market work and leisure activities during core working hours. In concurrent research, Frazis (2020) uses the ATUS-LV module to examine the characteristics of all wage and salary workers who ever work at home exclusively on their workday and are paid for that work and studies the effects of telecommuting on workers' time allocation. In this paper, we focus our analyses on full-time non-agricultural wage and salary workers and classify workers based on their frequency of teleworking. We do not require workers who telework on a regular basis to also report being paid for their work at home, although 89 percent of our sample of teleworkers do state being paid for work done at home, because all workers are compensated for their work (which is their reason for working) even if it is delayed compensation in terms of a promotion (Song 2009).[4] We consider only full-time wage and salary workers in order to

[4] For example, an educator may work certain contractual hours in a school building and may consider their Sundays spent grading each week as unpaid even if those hours are part of their usual/customary hours worked. On Sundays,

examine the effects of location flexibility on time use and wages for workers who have more similar usual hours worked per week.

A few papers (Wight and Raley 2009; Eldridge and Pabilonia 2010; Genadek and Hill 2017) used matched sample of respondents from the 2004 CPS-WS Supplement and the 2004–2005 ATUS to examine how WFH is associated with work and non-work time-use patterns. Although teleworkers can be identified in the supplement, the matched sample is much smaller than the new ATUS-LV module sample due to job turnover and loss between the final CPS interview and the ATUS diary interview occurring 2–5 months later, and it covers only a portion of the year (July 2004 to January 2005) whereas the ATUS-LV module covers most days over a two-year period. In addition, WFH was not as prevalent in 2004 as it was in 2017–2018, potentially resulting in different time-use patterns. Using the matched sample, Wight and Raley (2009) found that women who ever worked from home spent less time doing market work than those who did not work from home. They also found that fathers who worked at home spent less time on primary childcare. More recently, Genadek and Hill (2017) examined differences in parents' time with children under the age of 13 by different workplace flexibility measures and found that mothers, but not fathers, who had work location flexibility spent more total time with their children (almost 50 minutes more) than mothers who did not work from home. Because of the small sample sizes, neither Wight and Raley (2009) nor Genadek and Hill (2017) distinguished in their analyses between work-at-home days and work brought home from the office and done in the evening; however, Eldridge and Pabilonia (2010) surmised that the majority of the work done at home in 2004 was work brought home from the office and done in the evening or over the weekend.

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they may have a choice to work in the workplace or work exclusively at home. Thus, our analysis focuses on flexibility in the location of work.

In this paper, we ask three main questions: (1) Who is a teleworker? (2) Does teleworking lead to higher or lower wages? and (3) Is teleworking associated with time-use patterns that suggest that these alternative work arrangement leads to greater work-life balance? To answer the first question, we use a multinomial logit model to examine the demographic and job determinants of the probabilities of being an occasional teleworker and home-based teleworker. To investigate whether teleworkers earn a wage premium or pay a wage penalty, we first estimate weekly wage regressions using ordinary least squares. Then, because teleworkers likely differ in unobserved ways reflecting heterogeneity in motivation, mix of job tasks, or workplace characteristics that are also correlated with wages, we use an econometric technique developed by Oster (2019) that relates selection on observables to selection on unobservables in order to place bounds on the true causal effects.[5] To answer the last question, we use time diary data to compare conditional mean time use and the timing of their daily activities on weekday workdays for teleworkers when work is done exclusively at home versus when at least some of the work is done in the office, and then also compare these days to weekday workdays of office workers. We also compare time use on all days for our three groups of workers because workers may shift activities across days without changing the total amount of time spent on activities over the week.

In terms of demographic characteristics, we find that being more educated increases the probability of being an occasional teleworker but not a home-based teleworker. We also find some differences by race and ethnicity, with being black increasing the probability of being a home-based teleworker for females and being Hispanic decreasing the probability of being an

[5] For example, Briscoe, Wardell, and Sawyer (2011) found a positive association between workplace size and the probability of WFH among high-skilled IT workers. Because larger firms pay higher wages than smaller firms (Bloom et al. 2018), estimates are likely to be biased upward.

occasional teleworker for males (relative to non-Hispanic white). We find that living in a metropolitan area where rents are high and commutes are long increases the probability of being an occasional teleworker. Married men are more likely to be a home-based teleworker. Mothers with school-aged children and middle-aged women are more likely to be an occasional teleworker.

In terms of job characteristics, we find that being paid by the hour decreases the probability of being a teleworker while having a flexible hours schedule increases the probability of being a teleworker, both home-based and occasional. Holding a union job decreases the probability of being an occasional teleworker. For males, we find holding multiple jobs increases the probability of being a home-based teleworker. In addition, we find some differences across occupations and industries that change the probability of being a teleworker and the type of teleworker, illustrating that some jobs are not amenable to being done mostly from home. Surprisingly, given that WFH is promoted as a way to increase work-life balance, we do not find that females are more likely to telework than males.

Teleworkers, both those who work from home the majority of their workdays and those who work from home less frequently, earn more than office workers, on average. However, when we relate selection on observables to selection on unobservables to estimate bounds on the true causal effect of telework on wages, we find that the existence of a wage premium varies by occupation, gender, parental status, and type of teleworker. The only wage premium (18 percent) that we find for home-based teleworkers by occupation is for males working in management, business, and financial operations occupations. However, we find that occasional teleworkers earn a wage premium of 5–22 percent in most occupations, with the exception of females working in professional and technical occupations. In addition, we find that fathers who are

home-based teleworkers earn a wage premium of 1–14 percent while women with no children who are occasional teleworkers earn a wage premium of 1–18 percent.

With regard to differences in time use between worker types and location of work, we find evidence that teleworking intensity increases family time together. On WFH days, males and females gain a significant time windfall due to not commuting and spending less time on grooming activities. They spend some of this time windfall on food preparation, watching TV, and using the computer for leisure. However, there are also some differences in time use by gender. Males spend more time preparing food, eating and drinking and doing primary childcare on WFH days. Fathers also spend more overall total time with their children, and coupled males spend more time with their partner. Females, on the other hand, spend more time on household production activities, such as laundry, cleaning, household management activities, and food preparation. Mothers also spend more total time with their children, but not with their partner nor do they increase their primary childcare time. However, we also find evidence that teleworkers are shifting some of their activities between workdays and non-workdays. Thus, on the average day, teleworkers do not spend more total time watching TV or doing household production activities than office workers do. However, female home-based teleworkers spend more time on sports and active leisure on their average day than female office workers do.

We find that most workers are working from 9 to 5, regardless of their work-at-home status. However, we do find that teleworkers are flexing their time, with fathers spending more time in the late afternoon with children and females spending more time on household production throughout the core working hours on their WFH days. Workers also differ in terms of the timing of their leisure. Finally, there are some differences in sleep schedules on WFH days versus office days, with teleworkers rising later in the morning on their WFH days. Overall, these

findings on time use and timing of activities suggest that teleworking improves work-life balance and families' well-being.

II. Wage Effects of Telework

There are various hypothesized ways that telework may affect wages. Whether teleworking leads to higher or lower wages is ultimately an empirical question. To the extent to which wages reflect workers' productivity, wages of teleworkers may be higher than office workers if giving workers the option to work from home has positive organizational effects on productivity, retention and absenteeism. A few randomized controlled trials have found evidence that WFH is more productive than working in the office, at least for some workers. For example, Bloom et al. (2015) randomly assigned employees at a large Chinese travel company (among a group who volunteered) to work from home and found that the home-based teleworkers were more productive, had fewer unscheduled absences and lower quit rates than their office counterparts. The firm also had lower office expenses when its workers teleworked. In a random experiment in a large Italian company, Angelici and Profecta (2020) found that once-a-week teleworkers were more productive and had fewer absences, with stronger effects for women. In another experiment, Dutcher (2012) found evidence that productivity was higher when creative tasks were done while WFH, but not routine tasks.

Workers may be more productive WFH due to fewer in-office distractions, greater happiness and less tiredness. Oswald, Proto, and Sgroi (2015), for example, found a link between productivity and happiness. Kahneman et al. (2004) and Kahneman and Krueger (2006) found commuting to be one of the least enjoyable activities people do. Yet, Americans spend a lot of time commuting to work each day. Song and Gao (2019), using the ATUS Well-being Module, found that workers reported being less tired while WFH than while working in the office, perhaps

because they had eliminated their taxing commutes. Another reason teleworkers may be less tired is if they substitute sleep time for their commuting time, and recent research has shown that increasing sleep can have a positive effect on productivity and wages (Gibson and Shrader 2018; Groen and Pabilonia 2019). Thus, teleworkers who spend less time commuting may be happier and less tired, and therefore more productive.

On the other hand, productivity could be negatively impacted if teleworkers are more likely to experience stress and mental health problems due to their inability to separate home and work responsibilities (Mann and Holdsworth 2003). During the workday, children and other family members may call for attention or teleworkers may be distracted by household chores. In addition, staying connected outside of core work hours has been shown to produce social exclusion and create persistent problems at home so much as to necessitate coping strategies to create boundaries between work and family activities (Tietze 2002; Myrie and Daly 2009). Yet, Arntz, Yahmed, and Berlingieri (2019) found no significant effects of WFH on job or life satisfaction for working parents living in Germany.

Teleworkers with competing demands on their time may shirk on the job. From an employer's standpoint, telework arrangements are easier to implement when workers do not require costly supervision or coordination, where teamwork is less important and output can be easily measured, and in jobs with a high degree of autonomy. If monitoring is costly, managers may grant telecommuting rights to the most trusted and highly-productive workers, who have a lower propensity to shirk. They may pay efficiency wages to elicit greater effort when monitoring is problematic. With improvements in ICT, the costs of monitoring teleworkers has fallen over time.

The nature of some low-wage jobs requiring face-to-face communication with clients or consistent work in teams limits remote work. For example, most service workers in traditional sectors—food industry, retail sales, police and construction—have to be present on-site to complete their tasks. Thus, a positive association between wages and telework may simply reflect unobserved differences in productivity not directly associated with the location of the work. On the other hand, the more workers are away from the office, the less visible they are to management, or perhaps they are perceived as being less committed to their firm and thus the less likely they are to be promoted, leading to lower wage trajectories even with no difference in productivity (Rhee 2008; Bloom et al. 2015; Glass and Noonan 2016).

WFH may also be viewed as a positive job amenity for many workers, and thus workers may be willing to accept lower wages. For example, people may value WFH if it gives them more time for highly-valued activities such as social interactions or leisure activities or if they can combine work with household production, such as doing the laundry (i.e. multitask). In addition, couples may be better able to coordinate joint leisure activities and parents may spend more time with their children (Hamermesh 2002). Dockery and Bawa (2017) found that in Australia, telework contributed to a more equitable division of household tasks between partners with children. In addition, workers may save on the monetary costs of commuting and prepared foods (Global Workplace Analytics 2020). Some researchers have found evidence that work location flexibility is highly valued by workers. For example, Mas and Pallais (2017) found that of all alternative work arrangements offered to staffers applying for a job at a national call center, workers, especially women, were willing to give up the most in terms of wages for the option of WFH (8 percent on average). Using a random experiment on a Chinese job board, He, Neumark and Weng (2019) found that workers were more likely to apply for flexible jobs, conditional on

earnings, and were willing to take lower pay for more flexible jobs, particularly those offering location flexibility. Using a stated-preference approach and a nationally representative sample, Maestas et al. (2018) found that workers in the U.S. were willing to pay 4.1 percent for the opportunity to work from home.

Policy activists often advocate expansion of flexible location arrangements as a way for women to stay attached to the labor force. Telework thus may potentially lead to higher earnings for women and reduce the gender wage differential. However, if women view WFH as a job amenity while men see it as a demand of the job, men may select themselves into jobs that pay a premium for WFH while women may accept lower pay in exchange for location flexibility. Thus, WFH may increase the gender wage gap (Maestas et al. 2018; Kleven, Landais, and Søgaard 2019).

To date, studies on the wage effects of WFH using U.S. data have found mixed evidence, though they have varied in how they classified WFH, with some including supplemental work brought home from the office or done on weekends to catch-up on unfinished projects, while others examined only home-based teleworkers. Most are cross-sectional in nature and do not account for selection effects. Using the 2001 and 2004 CPS-WS Supplements, Weeden (2005) found a positive relationship between flexible work arrangements and wages, with higher wage premiums in non-manual occupations. She did not find that wage premiums varied by gender or parental status. Using the 2001 CPS-WS Supplement, Gariety and Shaffer (2007) found that wage differentials associated with WFH varied across industries. They attributed the negative wage differentials to being driven by preferences for WFH and the positive differentials to being driven by WFH being more productive, either as a result of selection by employers or from workers being able to be more productive while WFH. Oettinger (2011) documented wage

penalties in the 1980 and 1990 U.S. Censuses, and a small wage premium in the 2000 Census, for home-based workers, those WFH most of their workweek. Between 1980 and 1990, the wage penalties fell fastest in IT-intensive occupations. More recently, using the 1980–2014 ACS and Decennial Census data and controlling for selection using a Heckman selection model, White (2019) found that home-based workers earned a 5 percent wage premium in 2014. Using an instrumental variables technique and U.S. data, Heywood, Seibert, and Wei (2007) found a positive wage differential for WFH but not for other workplace practices. Using the German Socio-Economic Panel and a fixed-effects model, Arntz, Yahmed, and Berlingieri (2019) show that women earned higher wages only if they switched into jobs that allowed WFH while men earned higher wages when they worked from home even if they remained with the same employer. They also found that the share of women in jobs permitting WFH expanded more rapidly between 1997 and 2014 than the share of men in jobs permitting work from home, and that mothers' labor force attachment increased with WFH.

III. Data

For our analyses, we use information about wage and salary workers' job flexibilities and work schedules for their main jobs collected as part of the 2017–2018 ATUS LV Module as well as information collected as part of the main ATUS interview and time diary.[6] The main ATUS sample consists of a sample of people living in households that have completed their final CPS interview, which occurred 2 to 5 months earlier (one respondent per household). For each ATUS respondent, the survey contains a household roster and demographic and labor market information for the respondent and all other household members, including age, education,

[6] The data is available at https://www.bls.gov/tus/lvdatafiles.htm (U.S. Bureau of Labor Statistics 2017–2018). For additional details on the findings from the LV Module, see U.S. Bureau of Labor Statistics (2019).

employment, earnings and usual weekly hours of work. In addition, a retrospective time diary is collected where the respondent sequentially details how she spends her time over a 24-hour period starting at 4 a.m. on the day prior to the interview (start and stop times are reported for each activity). Activities are coded into detailed categories and, for most activities, both the location of the activity and who else was present during the activity are also available, with the exception of sleep and personal care activities. Only the respondents' primary activities are collected, with the exception of secondary childcare. We examine major time use categories, including work and work-related activities, travel time, personal care, household production, care activities, and leisure activities as well as important subcategories, such as commuting, and summary measures of time with family, friends and coworkers (Appendix Table A1 shows how we group activities into mutually exclusive categories). Half of ATUS respondents are surveyed on a weekday and the other half on a weekend day. We use the LV module final weights throughout our analyses. In addition, we perform our analyses separately by gender, given the large differences in both time allocation and occupations held by men and women (Aguiar and Hurst 2007; Blau and Kahn 2017).

The main advantage of the ATUS-LV module is that it offers the most up-to-date information on WFH that allows us to distinguish between home-based and occasional teleworkers as well as office workers in a nationally representative dataset. It also allows us to examine non-market work activities and the timing of activities. The main drawback is that time use data are available for only one person per household on a single day; thus we are not able to analyze the impact of telecommuting on spousal time allocation, with the exception of couple time together, nor compare work-at-home days to office workdays for the same workers.

We restrict the sample to full-time, non-agricultural wage and salary workers aged 18–64 who usually work at least 35 hours per week on their main job because we want to be able to compare time allocation on typical workdays by work location an estimate effects on wages for workers with similar hours. Workers were asked "Do you ever work at home?" If they responded "yes," then they were asked "Are there days when you work only at home?" If they responded "yes," then they were asked, "How often do you work only at home?" We define a "home-based teleworker" as a worker who works exclusively at home 3 or more days a week, and an "occasional teleworker" as a worker who works exclusively at home at least once a month and at most 2 days a week. An "office worker" is a worker who either never works exclusively from home or works at home less than once a month. Workers may work at a location other than their home or workplace on their diary day. For example, they may be on work-related travel or visiting a client's worksite. Note that our definition of home-based teleworker corresponds closely with the home-based worker definition derived from the ACS, which asked respondents "How did this person usually get to work LAST WEEK?" If a respondent answers that they "worked at home," then they are classified as a home-based worker.[7]

Often, workers are offered a bundle of flexible workplace practices at once; and thus examining the effects of one, such as telework, without controlling for others may lead to erroneous conclusions (though the prior literature suggests that workers are most willing to accept lower wages for the opportunity to work from home). Another flexible workplace practice, which we can identify from the LV module and which has been promoted as a way to improve work-life balance, often offered in conjunction with a flexible location arrangement, is

[7] In 2019, the ACS changed the phrase "worked at home" to "worked from home" to better reflect how workers refer to this option (U.S. Census Bureau 2017).

the ability to adjust the starting and stopping times of scheduled work hours.[8] We define flexible hours schedule status as one if the respondent answered that they can frequently change the time they begin and end their workday, and zero otherwise, and we control for whether a worker has access to this practice in our multi-variate analyses.

Our sample consists of 341 home-based teleworkers, 844 occasional teleworkers, and 6,870 office workers, or 4 percent, 9 percent and 87 percent of sample workers, respectively. About 28 percent of all workers in our sample do some work from home, and 13 percent report working entire days exclusively at home at least once a month as part of their main job. Although 4 percent are classified as home-based workers, many home-based workers still go into the office on occasion, with 2.2 percent of all workers typically working 5 or more days a week at home and 1.8 percent typically working 3–4 days a week at home.[9] Around 90 percent of all teleworkers report that they also have flexible hours, while only half of office workers report the same. When asked whether they can change the time that they begin and end work on a frequent basis (as opposed to occasionally or rarely), about half of all teleworkers but only 14 percent of office workers report that they can. Over 93 percent of all teleworkers report working daytime schedules between 6 a.m. and 6 p.m., compared to 85 percent of office workers. In addition, a higher share of all teleworkers work a regular Monday-Friday schedule, over 80 percent compared to 71 percent among office workers. We do not find any difference in the share of workers who work from home by gender, overall or in the intensity of teleworking. Sample means (Appendix Table A2) suggest that teleworkers on average are more educated, older, more

[8] Golden, Henly, and Lambert (2013) found a positive relationship between flexible schedule control and worker happiness. See Mas and Pallais (2020) for a review of other alternative workplace arrangements and different surveys that measure their prevalence.

[9] Workers were asked how many days they work per week. Among home-based workers who work 5+ days a week at home, they work about 0–0.22 days in the office, while those who work 3–4 days a week at home work between 1.32 and 2.32 days in the office.

likely to be partnered, have a spouse/partner who is employed, be non-Hispanic white, be born in the United States, live in a metropolitan area, work longer hours, earn higher wages, and have a flexible hours schedule, and are less likely to be paid by the hour, belong to a union, or have government sector job than office workers. Occasional teleworkers are more likely than office workers to have children under the age of 18. Home-based male teleworkers are more likely than male office workers to have school-aged children. Home-based female teleworkers are less likely than female office workers to have children under the age of 6.

Figure 1 illustrates the prevalence of telework (home-based plus occasional) by detailed occupation category.[10] The highest share of teleworkers by far is among computer and mathematical scientists (about 42 percent). Between 20 and 30 percent of workers working in 1) management, 2) art, design, entertainment and sports, 3) life, physical, and social science, 4) business and financial operations, and 5) legal occupations are teleworkers. On the other hand, occupations such as 1) food preparation, 2) production, 3) installation, maintenance, and repair, and 4) transportation and material moving have barely any teleworkers. Figure 2 illustrates the incidence of telework by major industry group. Business and professional services, information, and financial industries have the greatest shares of teleworkers, with almost 28 percent each.[11]

IV. Empirical Strategy and Results

A. Who is a Teleworker?

[10] We use the variable TRDTOCC1 in ATUS—the intermediate occupation classification from the 2010 Census Occupation Classification Codes.

[11] We note that even though the share of teleworkers in the natural resources and mining industry group is relatively large, only 1 percent of respondents in our sample belong to this group.

To examine who is a teleworker, we estimate a multinomial logit model where the comparison group is being an office worker. Thus, for each demographic and job characteristic, we estimate the probabilities of being a home-based teleworker relative to being an office worker and being an occasional teleworker relative to being an office worker as follows:

$$ln\frac{\text{Prob}(Y_i = \text{Home-based teleworker}_i)}{\text{Prob}(Y_i = \text{office worker}_i)} = \alpha_1 + \beta_1 X_i + \varepsilon_{1,i} \quad (1)$$

$$ln\frac{\text{Prob}(Y_i = \text{Occasional teleworker}_i)}{\text{Prob}(Y_i = \text{office worker}_i)} = \alpha_2 + \beta_2 X_i + \varepsilon_{2,i} \quad (2)$$

where X_i includes controls for the demographic and job characteristics of individual i; α_1 and α_2 are constant terms; β_1 and β_2 are the coefficients of interest; and $\varepsilon_{1,i}$ and $\varepsilon_{2,i}$ represent the error terms. Vector X_i includes a quartic polynomial in age, usual weekly hours worked, and indicator variables for race and ethnicity (non-Hispanic black, Hispanic, non-Hispanic Asian), presence of a spouse or partner, spouse or partner is employed, education (some college, college, graduate degree), presence of children age 0–5, presence of children age 6–17, presence of another adult age 18–69, presence of an elderly person age 70+, foreign born, Census region residence (Midwest, Northeast, West), metropolitan residence, paid hourly, flexible hours schedule, union member, multiple job holder, government sector job, survey year, as well as controls for 9 industry and 4 occupational categories.[12]

Table 1 presents average marginal effects from the multinominal logit model. The determinants of telework vary substantially by intensity of teleworking and to a lesser extent by gender. In terms of demographic characteristics, we find that higher education significantly increases the probability of being an occasional teleworker. For males, having a college degree or graduate degree compared to no college experience increases the probability of being an

[12] We tried to use more detailed occupation categories, but the sample of teleworkers in some occupations is too thin.

occasional teleworker by 6–8 percentage points on average. For females, having some college increases the probability of being an occasional teleworker by 5 percentage points. Having a college degree or graduate degree increases the probability of being an occasional teleworker by 7–9 percentage points. For females, we find that the probability of being an occasional teleworker is higher for middle-aged workers than for younger and older workers. We also find that non-Hispanic black females are 2 percentage points more likely to be home-based teleworkers than are non-Hispanic white females. Mothers with school-aged children are 2 percentage points more likely to be occasional teleworkers than are females without children. However, we find no other differences in the probability of teleworking for parents. In addition, for females, being foreign born decreases the probability of being an occasional teleworker by 5 percentage points compared to being U.S. born. For males, we find that being Hispanic decreases the probability of teleworking by 3 percentage points. For males, we also find that having an elderly person living in the household increases the probability of working at home by 4 percentage points, perhaps due to an increased preference to provide care or supervision. In addition, for males, being married or partnered increases the probability of being a home-based teleworker by 2 percentage points. For both females and males, we find that living in a metropolitan area increases the probability of being an occasional teleworker by 4 and 7 percentage points, respectively. We also find some differences across Census regions with females living in the Midwest being 3 percentage points less likely to be occasional teleworkers than those living in the South and males living in the West being 2 percentage points more likely to be home-based teleworkers.

In terms of job characteristics, we find that being paid hourly decreases the probability of being a home-based teleworker by 2 percentage points and being an occasional teleworker by 5–

7 percentage points for both males and females. Having a flexible hours schedule increases the probability of being a home-based teleworker by 3–5 percentage points and the probability of being an occasional teleworker by 6–7 percentage points. Both telework and flexible hours scheduling are likely more prevalent in jobs requiring less monitoring and teamwork. Thus, this alternative work arrangement may proxy for the structure of job tasks. We find that being a union member decreases the probability of being an occasional teleworker by 4–7 percentage points. For males, being a multiple job holder increases the probability of being a home-based teleworker by 2 percentage points. For females, having a government sector job decreases the probability of being a home-based worker by 6 percentage points.

We find differences in the intensity of teleworking by industry and occupation that also suggest teleworking is more prevalent when jobs require less interaction with the public, less teamwork, and less manual labor and do not require the use of heavy equipment. For female workers, being in service and support occupations or sales and administrative support (compared to management, business, and financial operations occupations) decreases the probability of being an occasional teleworker by 8 and 4 percentage points, respectively. For male workers, being in service and support occupations or sales and administrative support decreases the probability of being an occasional teleworker by 5 points and 3 percentage points, respectively. For male workers, being in professional and technical occupations increases the probability of being a home-based teleworker by 2 percentage points and being in service and support occupations decreases the probability of being a home-based teleworker by 2 percentage points. For both males and females, being a production worker decreases the probability of being a home-based teleworker by 3–4 percentage points and an occasional teleworker by 8–9 percentage points. For males only, working in construction, natural resources, or mining (as

opposed to business and professional services) decreases the probability of being an occasional teleworker by 6 percentage points. Working in manufacturing decreases the probability of being a teleworker by 2–3 percentage points. Working in education, health services, leisure, hospitality and other services also decreases the probability of being an occasional teleworker by 6–7 percentage points. For females, working in wholesale and retail trade decreases the probability of being a home-based teleworker by 5 percentage points. Also, for females, working in education, health services, leisure, hospitality, and other services decreases the probability of being a teleworker by 3–6 percentage points. Being in information, however, increases the probability of being a home-based teleworker by 3 percentage points.

B. Does Teleworking Lead to Higher or Lower Wages?

To estimate the magnitude and direction of the relationship between telework intensity and wages, we first estimate weekly wage regressions using ordinary least squares (OLS) as follows:

$$\log W_i = \alpha + \beta_1 \textit{ Home-based teleworker}_i + \beta_2 \textit{ Occasional teleworker}_i + \beta_3 X_i + \varepsilon_i \qquad (3)$$

where the dependent variable, $\log W_i$, is log of individual weekly earnings on the main job. We multiply the top-coded value by 1.5, a common practice in the literature (e.g., Autor, Katz, and Kearney 2008). Earnings have been adjusted using the CPI-U and represent 2018 dollars. *Home-based teleworker*$_i$ and *Occasional teleworker*$_i$ are indicators for the category of teleworker as defined previously; X_i includes the previously-mentioned control variables; α is a constant term; β_1 and β_2 are the coefficients of interest; and ε_i represents the error term.[13] Because we include usual weekly hours worked as a control variable, the coefficients reflect hourly wage differentials. Given the potential for heterogeneous effects across workers, we also estimate

[13] We also estimated these models using an hourly wage. Results are similar.

separate regressions for parents with children and for workers with no children in their household, and then for three major occupation categories (given the small number of teleworkers, we collapse services and support, sales and administrative support, and production workers into one category).

All existing studies, including this one, acknowledge the difficulty of disentangling a causal relationship between wages and work location. If a premium is found, does it mean that WFH makes the employee more productive leading to higher wages, or do higher-wage workers receive incentive pay that discourages shirking? Or do unobservable workers' skills or motivation affect both wages and the choice of WFH? For example, individuals with better negotiation skills and advanced computer training may be more likely to work at home and also receive higher wages. In this case, the coefficients on the telework indicators in the OLS wage regressions would combine the effects of WFH with the impact of these skills on wages, and thus will overestimate the true impact of off-site work on wages. Therefore, we also estimate bounds on the true causal effects using an econometric technique developed by Oster (2019) that relates selection on observables to selection on unobservables using changes in estimated coefficients when observables are included in the model along with an assumption about the relative effect on coefficient stability of including observables versus unobservables. We assume that the selection bias from the observables and the selection bias from the unobservables are proportional ($\delta = 1$) and have the same sign.

Tables 2A and 2B present our OLS coefficient estimates, adding controls successively to show that the estimates are potentially subject to omitted variable bias. In column 1 of Panel A with no controls, we find that teleworkers earn statistically significantly higher wages, with male home-based teleworkers earning substantially more than male office workers in comparison to

the wage premium earned by female home-based teleworkers (82 percent for males and 39 percent for females).[14] When we add demographic characteristics in column 2, the coefficients are reduced in magnitude by about half. In addition, the R-squared term increases from 0.1 to 0.4. In the final specification, we add job characteristics. The R-squared term increases slightly from 0.4 to 0.6. Again, however, the coefficients fall in magnitude by over half for males (14 percent wage premium); and for female home-based teleworkers, the coefficient on the home-based teleworker indicator is now negative and not statistically significant but the coefficient on the occasional teleworker indicator is still significant and indicates a 14 percent wage premium for occasional teleworkers.

These results showing the strong effects of selection based on observables suggest that selection on unobservables is also likely to be an issue. Thus, in column 4, for our models with full controls, we report Oster betas, which represent the bias-adjusted estimates when $\delta = 1$ and $R_{max} = 1.3*\tilde{R}$ where $\tilde{R}$ is the estimated R-squared in each regression. Specifically, Oster betas, denoted by β^*, are calculated as:[15]

$$\beta^* = \tilde{\beta} - \delta\left[\dot{\beta} - \tilde{\beta}\right]\left(\frac{R_{max}-\tilde{R}}{\tilde{R}-\dot{R}}\right) \quad (4)$$

where $\tilde{\beta}$ and $\tilde{R}$ are the coefficient on the telework indicator and the R-squared from column 3 (full set of controls) and $\dot{\beta}$ and $\dot{R}$ are the coefficient on the telework indicator and the R-squared from a regression with no controls (including the other telework indicator).

Oster betas represent lower bounds, while the estimated coefficients in column 3 represent the upper bounds for the Oster bounds on the effect of telework on wages. When the

[14] $(e^{\beta} - 1)*100$ is the percentage change in the wage due to a unit change in the indicator variable.
[15] These were estimated using the STATA command psacalc.ado (Oster 2013). Oster (2019) suggested that $R_{max} = 1.3*\tilde{R}$ was an adequate assumption based on a set of randomized control trials. Oster argued that an $R_{max} = 1$ is too high of a bound, especially if measurement error is likely.

Oster bounds include zero, the estimated effects are not robust to correcting for omitted variable bias, as is the case for many of our specifications. We find that fathers who are home-based teleworkers earn somewhere between 1 and 14 percent more than fathers who are office workers while women with no children who are occasional teleworkers earn somewhere between 1 and 18 percent more than women with no children who are office workers. Our finding that mothers who telework do not earn wage premiums is consistent with the literature suggesting that women are more willing to pay for the extra flexibility allowed by WFH (Mas and Pallais 2017). For males who are in management, business, and financial operations occupations, we find that home-based teleworkers earn about 18 percent more than office workers (the bounding set for the coefficient is very small, 0.161–0.165). In addition, for males, we find that occasional teleworkers earn somewhere between 7 and 16 percent more than office workers. Among professional and technical workers, male occasional teleworkers earn between 6 and 13 percent more than male office workers. Among service, sales, administrative support and production workers, male occasional teleworkers earn between 6 and 19 percent more than male office workers. For females, we find that occasional teleworkers earn more than office workers in management, business and financial operations occupations (6 to 19 percent wage premium) and services, sales, administrative support, and production worker occupations (5 to 22 percent wage premium) but not in professional and technical occupations. Overall, we find that some teleworkers earn wage premiums rather than pay wage penalties.

C. Time Use

To examine differences in mean time use on home days versus office days for teleworkers and also between teleworkers and office workers on typical workdays, we estimate minutes spent in daily activities on weekday workdays when respondents work at least four

hours.[16] Similar to Nätti et al. (2011), we control for various background characteristics that may result in differences in time allocation. Thus, we estimate a series of regressions using OLS based on the model below:

$$Y_i = \beta_1 \textit{ Work at home day for teleworker}_i + \beta_2 \textit{ Work at office day for teleworker}_i + \beta_3 \textit{ Work at office day for office worker}_i + \beta_4 X_i + \varepsilon_i \quad (5)$$

where the dependent variable, Y_i, represents the total daily minutes spent in an activity (work, leisure, household production, childcare, etc.) or with family, friends, and co-workers; the *Work at home day for teleworker*$_i$ indicator equals one if the teleworker (due to the limited sample of WFH days we pool home-based and occasional teleworkers) worked at home for at least four hours and worked in the office for zero minutes and zero otherwise (they may have also worked at another location). The *Work at office day for teleworker*$_i$ indicator equals one if the teleworker worked in the office for at least four hours and zero otherwise, and the *Work at office day for office worker*$_i$ indicator equals one if the office worker worked in the office for at least four hours and zero otherwise; X_i is a vector of demographic and job characteristics as mentioned earlier (these regressions also include log hourly wage but do not include usual hours of work); and ε_i represents the error term.[17] This model omits the constant term.

In columns 1–3 of Tables 3A and 3B, we present conditional mean time spent for all the daily activities on Monday-Friday workdays and then separately for total time spent over the diary day with family, friends and coworkers.[18] Note that time with children is the sum of all

[16] We also explored including those who work at least 60 minutes on their diary day; however, the higher work time restriction leads to more similar mean working times across worker types/locations without a significant drop in observation counts.
[17] We also estimate conditional means only conditioning on demographic characteristics (not shown); and the results are similar, suggesting omitted job characteristics other than work at home do not affect time allocation.
[18] We also examine all workdays when workers work at least four hours, and results are similar for the most part, although we find differences in working time for males (Appendix Table A.3.A and A.3.B); however, we prefer to

time spent on activities during which at least one child under age 18 was present, including work time; consequently, the majority of time with children is secondary childcare activity. Because these are predicted means, the total minutes working at the workplace and commuting for teleworkers on home days are not zero, even though we defined home days as days with no work occurring in the workplace. In column 4, we indicate whether the conditional mean differences are statistically significant.

For males (Table 3A), we find that office workers spend 27 minutes longer on all work and work-related activities than teleworkers do on their office days and 44 minutes longer than teleworkers do on their work-at-home days. We find that teleworkers on their office days also do some work from home and they work 17 minutes longer at home than do office workers. Teleworkers and office workers on office days spend 65 and 57 minutes commuting to work, respectively; thus teleworkers on home days experience a significant time windfall from not having to commute.[19] In addition, they gain an additional 14 minutes by spending less time on grooming activities.

In terms of work-life balance, the results suggest that male teleworkers who work from home on their diary day spend 12 more minutes on food preparation than do male teleworkers who work in the office on their diary day and 10 more minutes than do male office workers. This may be because workers are eating more takeout food when they go to the office. Male teleworkers also spend more time eating their meals on days that they work from home than on days they work in the office (13 minutes more). In addition, male teleworkers who work from home on their diary day spend more time caring for family members and pets than do male office

focus on weekdays, because teleworkers work primarily on weekdays and we may pick up work brought home from the office by including weekend days.

[19] We calculate commuting time using the trip tour methodology described in Kimbrough (2019).

workers and teleworkers who work in the office on their diary day. This time is spent almost entirely on primary childcare activities (15–16 minutes more). Fathers who telework also spend more time around their children in general on their WFH days than on their office days (2 hours 2 minutes more). Male teleworkers also enjoy more time on TV and computer activities for leisure on their home days than on office days (43 minutes more). They also spend significantly more time with their spouse or partner on WFH days than do office workers and teleworkers on their office days (49–56 minutes more). Male workers who go to the office spend more time socializing with friends than do teleworkers on their WFH days. When we look at the timing of activities, we observe that males socialize after working in the office and during their commutes. Teleworkers on WFH days spend less time with their coworkers or clients (and consequently more time alone), but office workers and teleworkers on office days spend similar amounts of time with their coworkers. We find some evidence that fathers who work from home on their workday sometimes have children in their presence (21 minutes more per day than office workers). This is unsurprising, because children's school hours are usually less than the hours their parents who have full-time positions work each day.

For females (Table 3B), we find that teleworkers and office workers spend similar amounts of time working. Office workers and teleworkers on their office days spend 52–56 minutes commuting to work; thus female teleworkers on WFH days also experience a significant time windfall from not having to commute. They also gain an additional 21 minutes by spending less time on grooming activities.

In terms of work-life balance, we find that female teleworkers on WFH days spend substantially more time on home production activities than do female teleworkers on office days or female office workers (40–41 minutes more). In addition to spending more time preparing

meals, as male teleworkers do, but following gendered social norms, female teleworkers spend more time on housework, such as laundry and cleaning, and household management activities on WFH days than on office days (27 minutes more). Females also enjoy more time on TV and computer activities on WFH days than on office days (32 minutes more). Mothers spend more time around their children in general on WFH days than on office days (1 hour 35 minutes more) but not more time on primary childcare activities. In addition, they do not spend more time with their spouse or partner. Male and female teleworkers on WFH days spend about the same amount of time with their children in total (254 minutes versus 270 minutes, respectively). Similar to male teleworkers, female teleworkers also spend less time with their coworkers or clients on WFH days but teleworkers and office workers spend similar amounts of time with their coworkers on office days. Finally, we find some evidence that mothers have children in their presence to a greater extent than do fathers when they are WFH (42 minutes more per day than office workers).

In a final model similar to equation 4, we predict time on an average day for our three groups of workers (home-based teleworkers, occasional teleworkers and office workers) conditional on their demographic and job characteristics and include additional controls for Saturday and Sunday. In Table 4A and 4B, we show differences in mean time spent on activities over all days, not just workdays, because workers may shift their activities from office days to home days or workdays to non-workdays to create more balance in their lives but not actually increase their total time on household and family activities. For males (Table 4A), on the average day, we find no difference in total work time. We find that male office workers and occasional teleworkers spend more time commuting than do male home-based teleworkers (18–19 minutes more on the average day). However, male office workers do not spend more time commuting

than do male occasional teleworkers, suggesting that for the latter group the commute to the office may be slightly longer, which de Vos, Meijers, and van Ham (2018) and de Vos, van Ham, and Meijers (2019) found to be true for some workers in the Netherlands (especially those living in moderately urban municipalities).[20] To further examine this finding, we pool males and females due to the small sample size and similar commute times and estimate commute time on workdays with additional indicators to control for office workday and non-office workday for home-based workers, occasional teleworkers and office workers. We find that occasional teleworkers spend 5 minutes longer commuting to the office than do office workers, and home-based teleworkers spend 11 minutes longer commuting to the office than do office workers, but the estimates are not statistically significant at conventional levels. In terms of grooming activities, we find that male office workers and occasional teleworkers spend more time on grooming activities than do male home-based teleworkers (10–12 minutes more). We also find that male teleworkers spend slightly more time eating and drinking than do male office workers (9 minutes more). We do not find any differences in TV time, suggesting that male teleworkers only shift which days of the week that they watch TV and use computers for leisure but do not spend more time overall. Male home-based teleworkers spend 40 minutes more on the average day with their children than office workers do, and 7 minutes more on primary childcare time. Thus, we find evidence that increasing the intensity of teleworking increases family time overall when the father is a teleworker.

In an additional sensitivity analysis, we examine time use for males working in management, business, and financial operations occupations and who worked at least 60 minutes on their diary day (Appendix Table A.4). Although the sample includes only 40 home-based

[20] Rhee (2008) also argued that when telecommuting is adopted, then one may be more likely to choose to commute more to a distant workplace than to a nearby workplace.

teleworkers, we find evidence that they sleep more than do occasional teleworkers and office workers (46 and 27 minutes more respectively), which may be one mechanism through which teleworking leads to their higher wages.

For females (Table 4B), we also find no differences in total work time. However, office workers and occasional teleworkers spend more time commuting than do home-based teleworkers (18 and 15 minutes more on the average day, respectively). Office workers spend more time grooming on the average day than do both groups of teleworkers, and occasional teleworkers spend 10 minutes more on average grooming than do home-based teleworkers, again highlighting that time spent grooming is lower on WFH days. We find that home-based teleworkers spend 9–10 minutes more per day on average engaging in sports and active leisure activities than do other workers, but this is the only difference that we find for leisure activities. Lastly, for females, we find statistically significant differences in time spent with children but not time spent with spouse, with mean time spent with children being 55 minutes higher for home-based teleworkers than for office workers.

The time-use differences between teleworkers and office workers may be biased due to selection into telework and omitted workplace variables. In addition, the time-use differences between teleworkers on office days and work-at-home days may be biased because home-based workers will appear in the work-at-home day category with higher frequency. In order to verify that our results in Tables 3A, 3B, 4A, and 4B are robust, we estimate OLS regressions (varying the omitted worker group and including a constant term) and calculate Oster betas. For all our statistically significant results, the Oster bounds exclude zero suggesting our results are robust (see Appendix Tables A.5 and A.6).

D. Timing of Activities: Teleworking 9 to 5?

Workers also change the timing of certain activities on WFH days versus office days. In Figure 3, we examine the share of workers among teleworkers on WFH days, teleworkers on office days and office workers on office days who are participating in select activities (work, household production, travel, leisure, sleep, and for parents, time with children) at each minute on a weekday workday. In Panels A and B of Figure 3, we find that the majority of workers in all groups are working during core working hours (9 a.m. to 5 p.m.). However, we see that male teleworkers are slightly less likely to be working in the afterschool hours (3 to 5 p.m.) on their WFH days than on their office days, but they are just as likely to be working on their WHF days as office workers are. Instead, we see that male teleworkers on their WFH days are more likely to be doing household production activities and spending time with children during this period. For example, at 4 p.m., about 75 percent of male teleworkers on office days are working while only 60 percent of male teleworkers on home days are working (Panel A); 19 percent of male teleworkers on home days are doing household production activities (Panel C) and 32 percent of fathers who are teleworkers and WFH on their diary day are spending time with children (Panel E) while less than 3 percent of male teleworkers on office days are doing household production and 7 percent of fathers who are teleworkers and work in the office on their diary day are spending time with children. As would be expected, we see a large dip in the share of all workers working at lunchtime. Male office workers are more likely to be working in the evening hours than are male teleworkers. However, only one percent of male office workers are doing their evening work from home (not shown). Female teleworkers are much less likely to be working during core working hours on their WFH days than on their office days or than are office workers, suggesting that WFH allows them greater flexibility to conduct household or family

responsibilities (alternatively, they may be shirking) (Panel B). When we look at travel time (Panels G and H), we find that teleworkers on office days have much more concentrated travel times than do office workers, with spikes in the share of teleworkers traveling around 8 a.m. and 5 p.m. This suggests that they organize their daily work-life schedules differently. For both men and women, we find that most of their leisure activities on weekday workdays occur after 4 p.m., with the exception of a small share of male teleworkers who have leisure activities between 6 and 7 a.m. (18 percent) (Panels I and J). However, we see that female teleworkers are more likely to participate in leisure activities between 7 and 9 p.m. on WFH days than on office days, while male teleworkers are substantially more likely to participate in leisure activities between 10 p.m. and 12 a.m. on WFH days than on office days.

When we examine sleep, we find that a slightly greater share of male teleworkers are sleeping during morning core working hours on their WFH days versus office days (Panel K). It also appears that WFH allows the workers' waking hours to shift to later in the day, i.e., they wake later and go to sleep later, which may be an indication that to some extent standard work schedules do not sync with circadian rhythms (Panels K and L).[21] On average, male teleworkers on WFH days wake up at 6:38 a.m. but at 6:16 a.m. on office days, while female teleworkers on WFH days wake up at 6:32 a.m. but at 6:08 a.m. on office days (22 and 24 minutes earlier on office days, respectively). Thus, even though we do not find differences in the conditional mean sleep time between worker types, there may nonetheless be productivity effects resulting from increased quality of sleep due to differences in the timing of sleep.

V. Discussion and conclusion

[21] We looked at conditional mean sleep time differences for non-parents who are not constrained by school bell schedules (results not shown), but we found no difference in total sleep time.

A growing share of the labor force has access to jobs that permit the opportunity to work from home on a regular basis, with about 13 percent of full-time wage and salary workers working exclusively from home at least one day a month in 2017–2018. We find that teleworking on a regular basis varies widely by education, age, race and ethnicity, foreign-born status, metropolitan residence, hourly pay status, flexible hours schedule status, union member status, government worker status, industry and occupation, but surprisingly not by gender. For female workers, we find that if they have school-aged children then they are slightly more likely to occasionally work from home compared to those without children. In addition, middle-age women are more likely to be occasional teleworkers. For male workers, we find that if they are coupled or if there is an elderly person living in their household then they are slightly more likely to be a home-based teleworker (compared to uncoupled workers or those living in a household without an elderly person, respectively). On the whole, our findings suggest that the ability to complete job tasks remotely may matter more than workers' preferences over the location of their tasks.

Understanding the link between telework status and wages is important to shed light on the effects of workplace policy on work-life balance and gender equality. In this study, we investigate whether teleworkers earn higher or lower wages than office workers. Although mean wages are higher for teleworkers than office workers, once we account for omitted variable bias using Oster's (2019) method, we find that only some workers earn a wage premium. For example, men working in management, business, and financial operations occupations employed full-time as home-based teleworkers earn substantially more than those working in their traditional workplace. Thus, we do not find evidence to suggest that increasing the number of telework days will reduce the gender wage gap within occupations, but may instead increase the

gender gap for those working in management, business and financial operations occupations. However, increasing the prevalence of occasional telework may result in higher wages for both men and women because we find wage premiums between 5 and 20 percent for both men and women in most occupations, with the exception of professional and technical occupations for women. We also find that fathers earn wage premiums when they telework but mothers do not, which is consistent with prior research indicating that women are more willing to pay for location flexibility.

Using time diary day from the new ATUS-LV module, we find differences in time allocation on days WFH versus days worked in the office among teleworkers and also between teleworkers on their WFH days and office workers on their office workdays that suggest that WFH improves wellbeing, at least when it comes to helping working families balance work and family responsibilities. Our results suggesting no difference in total work time for full-time wage and salary workers on the average day between home-based teleworkers, occasional teleworkers and office workers lead us to conclude that workers are not shirking on the job but rather flexing their work schedules to balance their multiple responsibilities. On the average day (workdays and non-workdays combined), home-based teleworkers spend less time commuting than do occasional teleworkers and office workers, but occasional teleworkers spend the same amount of time commuting as office workers do on their office days. Thus, it is likely that expanding teleworking intensity (days per week) will reduce traffic congestion and CO2 emissions. In addition, workers may be more alert on their jobs when they can skip the commute, resulting in higher productivity on their WFH days. Teleworkers use some of this time windfall to do more household production activities on their WFH days. Males increase time on primary childcare while females increase their physical leisure activities on the average day. We find that parents

spend more total time with their children and at different times of the day when they work from home. These non-market work activities are more likely to occur during core working hours. Thus, we find some evidence that telework may decrease the gender gap in childcare responsibilities. In addition, telework potentially has positive implications for child development—because children receive more parental care when they need it (Fiorini and Keane 2014; Hsin and Felfe 2014; Caetano, Kinsler, Teng 2019)—and positive implications for parents' wellbeing—because parents report enjoying time spent with their children more than doing other activities (Connelly and Kimmel 2015; Musik et al. 2016). Couples are also potentially better off when the male partner works at home, because they spend more time together. Couples prefer to coordinate their schedules to increase leisure time together (Hamermesh 2002) and time together increases marital satisfaction (Kingston and Nock 1987; Johnson et al. 2006; Hamermesh 2020). Teleworkers also spend more time watching TV and using the computer for leisure on their WFH days versus office days, though not on the average day. This suggests that the timing of activities changes over the days of the week, which could still enhance teleworkers' well-being. Finally, we find that workers shift their wake-up times to later in the day on their telecommuting days, which could be a mechanism through which telework leads to higher worker productivity and/or wages.

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Table 1. Determinants of telework status, multinomial logit average marginal effects

	Men		Women	
	Home-based teleworker	Occasional teleworker	Home-based teleworker	Occasional teleworker
Usual hours, main job	0.000	0.000	0.000	0.001
	0.000	(0.001)	(0.001)	(0.001)
Some college	0.019	0.009	-0.023	0.048**
	(0.014)	(0.026)	(0.014)	(0.024)
College degree	0.012	0.075***	-0.018	0.069***
	(0.014)	(0.024)	(0.014)	(0.022)
Graduate degree	0.015	0.063**	-0.005	0.087***
	(0.015)	(0.025)	(0.015)	(0.023)
Lives with spouse/partner	0.021*	0.007	0.010	0.008
	(0.012)	(0.018)	(0.016)	(0.020)
Spouse/partner employed	-0.007	0.007	0.003	-0.013
	(0.008)	(0.013)	(0.014)	(0.020)
Age	-0.050	0.053	-0.105	0.254**
	(0.054)	(0.102)	(0.088)	(0.111)
Age^2/100	0.208	-0.149	0.391	-0.851**
	(0.199)	(0.380)	(0.326)	(0.408)
Age^3/1000	-0.036	0.018	-0.061	0.123*
	(0.032)	(0.061)	(0.052)	(0.064)
Age^4/10000	0.002	-0.001	0.003	-0.006*
	(0.002)	(0.004)	(0.003)	(0.004)
Black, non-Hispanic	0.017	0.012	0.024*	-0.007
	(0.012)	(0.021)	(0.012)	(0.016)
Hispanic	-0.004	-0.034*	0.008	-0.027
	(0.014)	(0.021)	(0.015)	(0.020)
Asian, non-Hispanic	-0.022	0.022	-0.029	0.040
	(0.019)	(0.020)	(0.020)	(0.026)
Children age<=5 present	-0.016	-0.003	-0.013	0.010
	(0.012)	(0.016)	(0.012)	(0.016)
Children age 6–17 present	-0.001	-0.003	-0.018	0.022*
	(0.010)	(0.016)	(0.011)	(0.013)
Other adult 18–69 present	-0.009	0.004	-0.002	-0.013
	(0.011)	(0.016)	(0.010)	(0.014)
Elderly age 70+ present	0.042**	-0.080	0.012	-0.057
	(0.019)	(0.059)	(0.026)	(0.045)
Foreign born	-0.018	-0.009	-0.015	-0.051**
	(0.014)	(0.016)	(0.014)	(0.023)
Metropolitan residence	0.004	0.072***	0.025	0.040*
	(0.011)	(0.022)	(0.016)	(0.023)
Midwest	0.010	0.013	0.004	-0.026*
	(0.009)	(0.015)	(0.011)	(0.014)
Northeast	0.018	0.014	0.002	0.006
	(0.011)	(0.014)	(0.012)	(0.014)
West	0.018*	-0.006	0.016	0.018
	(0.010)	(0.014)	(0.012)	(0.014)
Year 2018	-0.010	0.015	0.000	0.003
	(0.007)	(0.011)	(0.008)	(0.010)
Paid hourly	-0.017*	-0.052***	-0.021**	-0.067***
	(0.010)	(0.016)	(0.010)	(0.014)
Flexible hours schedule	0.028***	0.064***	0.052***	0.069***
	(0.007)	(0.011)	(0.009)	(0.010)
Union member	-0.018	-0.044*	0.011	-0.071***
	(0.017)	(0.026)	(0.015)	(0.022)
Multiple job holder	0.020*	0.013	0.021	-0.017
	(0.011)	(0.023)	(0.015)	(0.024)
Government job	-0.001	-0.001	-0.058***	0.016
	(0.018)	(0.025)	(0.018)	(0.017)

Table 1. Determinants of telework status, multinomial logit average marginal effects (continued)

	Men		Women	
	Home-based teleworker	Occasional teleworker	Home-based teleworker	Occasional teleworker
Occupations:				
Professional and technical	0.024**	-0.014	0.016	-0.002
	(0.012)	(0.015)	(0.013)	(0.017)
Service and support	-0.019*	-0.049*	-0.005	-0.081***
	(0.011)	(0.028)	(0.021)	(0.019)
Sales and administrative support	0.010	-0.034*	0.004	-0.040**
	(0.012)	(0.018)	(0.011)	(0.016)
Production	-0.026***	-0.090***	-0.035***	-0.084***
	(0.009)	(0.016)	(0.009)	(0.017)
Industries:				
Construction, natural resources, and mining	-0.025	-0.064**	-0.020	0.007
	(0.026)	(0.029)	(0.029)	(0.039)
Manufacturing	-0.023**	-0.033*	-0.011	0.01
	(0.011)	(0.017)	(0.017)	(0.022)
Wholesale and retail trade	-0.014	-0.065***	-0.050***	-0.003
	(0.015)	(0.022)	(0.019)	(0.026)
Transportation and utilities	-0.031	-0.03	-0.028	-0.002
	(0.022)	(0.031)	(0.030)	(0.031)
Information	0.013	-0.006	0.034*	-0.014
	(0.014)	(0.023)	(0.020)	(0.031)
Financial Activities	0.019*	-0.011	-0.006	0.018
	(0.011)	(0.018)	(0.012)	(0.018)
Education and health services	-0.006	-0.056***	-0.031***	-0.047***
	(0.012)	(0.020)	(0.011)	(0.017)
Leisure, hospitality, and other services	-0.006	-0.074***	-0.060**	0.038
	(0.015)	(0.025)	(0.024)	(0.026)
Public administration	-0.039	-0.036	0.004	-0.009
	(0.026)	(0.030)	(0.024)	(0.027)
N	4,207	4,207	3,848	3,848

Notes: ATUS leave module weights used. Standard errors are in parentheses. Sample: full-time wage and salary workers age 18–64. The table shows percentage point effects of various controls on the probabilities of being a teleworker by teleworking intensity. Omitted categories for occupation: Management, for industry: Business and professional services. Here 70 observations on workers in the natural resources and mining industry are combined with the construction industry because there are not enough teleworkers to obtain separate estimates.
***indicates significance at the 0.01 level, **at the 0.05 level, and *at the 0.10 level.
Source: American Time Use Survey Leave and Job Flexibilities Module (2017–2018)

Table 2A. Effects of teleworking on weekly wages for men

MEN	No controls	Add personal controls	Add job controls	Oster beta
	1	2	3	4
Panel A. All workers				
Home-based teleworker	0.599***	0.255***	0.127**	-0.001
	(0.061)	(0.053)	(0.056)	
Occasional teleworker	0.628***	0.276***	0.135***	-0.032
	(0.049)	(0.039)	(0.033)	
R^2	0.10	0.39	0.55	
N	4,200	4,200	4,200	
Panel B. children age <18 present				
Home-based teleworker	0.556***	0.263***	0.132**	0.011
	(0.071)	(0.064)	(0.065)	
Occasional teleworker	0.640***	0.281***	0.162***	-0.016
	(0.049)	(0.042)	(0.043)	
R^2	0.12	0.39	0.53	
N	2,060	2,060	2,060	
Panel C. No children age <18 present				
Home-based teleworker	0.617***	0.246***	0.110	-0.035
	(0.092)	(0.078)	(0.087)	
Occasional teleworker	0.596***	0.273***	0.115**	-0.052
	(0.075)	(0.060)	(0.048)	
R^2	0.09	0.38	0.57	
N	2,140	2,140	2,140	
Panel D. Occupations: Management, business and financial operations				
Home-based teleworker	0.239*	0.155*	0.165*	0.161
	(0.134)	(0.090)	(0.100)	
Occasional teleworker	0.374***	0.196***	0.146***	0.065
	(0.065)	(0.049)	(0.050)	
R^2	0.07	0.42	0.49	
N	814	814	814	
Panel E. Occupations: Professional, technical				
Home-based teleworker	0.233***	0.169***	0.091	0.065
	(0.076)	(0.062)	(0.066)	
Occasional teleworker	0.307***	0.206***	0.119**	0.061
	(0.065)	(0.054)	(0.046)	
R^2	0.05	0.3	0.44	
N	1,125	1,125	1,125	
Panel F. Occupation: Service, sales, admin support, production				
Home-based teleworker	0.822***	0.421***	0.220*	0.033
	(0.139)	(0.135)	(0.130)	
Occasional teleworker	0.518***	0.262**	0.171*	0.055
	(0.148)	(0.126)	(0.093)	
R^2	0.05	0.27	0.48	
N	2,261	2,261	2,261	

Notes: Columns 1–3 in this table reports OLS regression coefficients where we regress teleworker status on log weekly earnings. ATUS leave module weights used. Standard errors are in parentheses. Controls in column 2: year, region, education, spouse or partner present, spouse/partner employed, quartic polynomial in age, race/ethnicity (black, Hispanic, Asian), presence of own children age 0–5, presence of own children age 6–17, presence of other adult age 18–69, presence of elderly person age 70+, foreign born, metropolitan residence. Additional controls in column 3: usual hours of work at main job, paid hourly, flexible hours schedule, union member, multiple job holder, government job, industry, occupation. Column 4 shows Oster betas assuming $\delta = 1$ and $R_{max} = 1.3*\tilde{R}$.

***indicates significance at the 0.01 level, **at the 0.05 level, and *at the 0.10 level.

Source: American Time Use Survey Leave and Job Flexibilities Module (2017–2018)

Table 2B. Effects of teleworking on weekly wages for women

WOMEN	No controls	Add personal controls	Add job controls	Oster beta, 1.3R
	1	2	3	4
Panel A. All workers				
Home-based teleworker	0.328***	0.153**	-0.041	-0.159
	(0.070)	(0.064)	(0.050)	
Occasional teleworker	0.591***	0.301***	0.128***	-0.078
	(0.042)	(0.043)	(0.040)	
R^2	0.07	0.35	0.53	
N	3,845	3,845	3,845	
Panel B. Children age <18 present				
Home-based teleworker	0.355***	0.079	-0.072	-0.187
	(0.079)	(0.065)	(0.058)	
Occasional teleworker	0.563***	0.255***	0.085*	-0.082
	(0.053)	(0.052)	(0.045)	
R^2	0.08	0.37	0.58	
N	1,792	1,792	1,792	
Panel C. No children age <18 present				
Home-based teleworker	0.315***	0.188**	-0.012	-0.096
	(0.097)	(0.089)	(0.071)	
Occasional teleworker	0.603***	0.316***	0.166***	0.012
	(0.062)	(0.062)	(0.057)	
R^2	0.07	0.35	0.53	
N	2,053	2,053	2,053	
Panel D. Occupations: Management & financial services				
Home-based teleworker	0.196**	0.026	-0.039	-0.079
	(0.091)	(0.083)	(0.077)	
Occasional teleworker	0.491***	0.252***	0.171***	0.054
	(0.064)	(0.058)	(0.058)	
R^2	0.11	0.36	0.49	
N	806	806	806	
Panel E. Occupations: Professional, technical				
Home-based teleworker	0.114	0.031	-0.111	-0.179
	(0.128)	(0.110)	(0.087)	
Occasional teleworker	0.252***	0.1	0.042	-0.067
	(0.072)	(0.070)	(0.071)	
R^2	0.02	0.33	0.5	
N	1,385	1,385	1,385	
Panel F. Occupation: Service, sales, admin support, production				
Home-based teleworker	0.407***	0.282***	0.079	-0.02
	(0.125)	(0.106)	(0.080)	
Occasional teleworker	0.673***	0.462***	0.199***	0.048
	(0.074)	(0.074)	(0.076)	
R^2	0.07	0.24	0.46	
N	1,654	1,654	1,654	

Notes: ATUS leave module weights used. Standard errors are in parentheses. See the notes for Table 2A for control variables. Columns 4 shows Oster betas assuming $\delta = 1$ and $R_{max} = 1.3*\tilde{R}$. ***indicates significance at the 0.01 level, **at the 0.05 level, and *at the 0.10 level.
Source: American Time Use Survey Leave and Job Flexibilities Module (2017–2018)

Table 3A. Conditional mean time use for men, Monday-Friday workdays (minutes/day)

MEN Time Use Activities	Teleworkers on home days	Teleworkers on office days	Office workers on office days	Differences between groups
	1	2	3	4
N	83	182	1,401	
Work & work-related activities	499	516	543	3>1*** 3>2***
Working at main job	487	513	537	3>1*** 3>2**
Work from workplace	-7	482	527	all ***
Work from home	481	23	6	all ***
Work from other place	13	8	4	3>1*** 2>1***
Travel time	35	97	82	2>3**
Commuting	5	65	57	3>1*** 2>1***
Non-commuting	31	30	26	
Personal care	570	581	558	1>3**
Sleep	466	464	458	
Grooming	23	37	41	3>1*** 2>1***
Meals	79	66	57	1>3*** 1>2* 2>3*
Household production	56	44	46	
Food preparation	26	14	16	1>3** 1>2**
Housework	15	18	16	
Buying goods and services	8	8	8	
Household management	8	4	5	
Care	40	21	23	1>3*** 1>2***
Primary childcare	31	15	16	1>3*** 1>2***
Leisure	240	181	188	1>3*** 1>2***
Social activities	48	31	31	1>3*
Physical activity	10	13	12	
Relaxing	25	24	20	
TV and computer for leisure	150	107	117	1>3*** 1>2***
With children age <18 (parents)	254	132	140	1>3*** 1>2***
With spouse/partner (couples)	218	169	162	1>3*** 1>2**
With friends	4	16	17	3>1** 2>1**
With coworkers/clients	-4	415	429	3>1*** 2>1***
Alone	676	325	329	1>3*** 1>2***
Child present at work (parents)	23	2	2	1>3** 1>2**

Notes: ATUS leave module weights used. Workdays are days on which the respondent reports at least 4 hours of work. The table contains conditional mean values computed from OLS regressions with the following set of controls: year, region, spouse or partner present, spouse/partner employed, quartic polynomial in age, race/ethnicity (black, Hispanic, Asian), presence of own child age 0–5, presence of own child age 6–17, presence of another adult age 18–69, presence of an elderly person age 70+, foreign born, metropolitan residence, paid hourly, flexible hours schedule, union member, multiple job holder, log hourly wage, government job, industry, occupation. Column 4 shows whether the group differences are statistically significant. ***indicates significance at the 0.01 level, **at the 0.05 level, and *at the 0.10 level.
Source: American Time Use Survey Leave and Job Flexibilities Module (2017–2018)

Table 3B. Conditional mean time use for women, Monday-Friday workdays (minutes/day)

WOMEN Time Use Activities	Teleworkers on home days	Teleworkers on office days	Office workers on office days	Differences between groups
	1	2	3	4
N	86	147	1,249	
Work & work-related activities	507	533	521	
Working at main job	506	530	515	
Work from workplace	0	493	507	3>1*** 2>1***
Work from home	501	34	5	all***
Work from other place	5	3	3	
Travel time	32	84	79	3>1*** 2>1***
Commuting	1	56	52	3>1*** 2>1***
Non-commuting	31	29	26	
Personal care	568	569	582	
Sleep	477	460	463	
Grooming	35	56	58	3>1*** 2>1***
Meals	54	52	57	
Household production	103	62	63	1>3*** 1>2***
Food preparation	40	30	28	1>3**
Housework	37	17	17	1>3** 1>2**
Buying goods and services	15	10	12	
Household management	12	5	7	1>2*
Care	29	35	31	
Primary childcare	20	25	23	
Leisure	200	156	165	1>3*** 1>2***
Social activities	30	28	31	
Physical activity	14	11	9	
Relaxing	26	15	19	
TV and computer for leisure	124	92	95	1>3*** 1>2**
With children age <18 (parents)	270	175	172	1>3*** 1>2**
With spouse/partner (couples)	146	143	148	
With friends	21	19	17	
With coworkers/clients	13	444	443	3>1*** 2>1***
Alone	632	284	282	1>3*** 1>2***
Child present at work (parents)	47	13	5	1>3*

Notes: ATUS leave module weights used. Workdays are days on which the respondent reports at least 4 hours of work. See the notes for Table 3A for control variables. Column 4 shows whether the group differences are statistically significant.
***indicates significance at the 0.01 level, **at the 0.05 level, and *at the 0.10 level.
Source: American Time Use Survey Leave and Job Flexibilities Module (2017–2018)

Table 4A. Time use conditional means for men, Monday-Sunday typical day of the week (minutes/day).

MEN Time Use Activities	Home-based teleworkers	Occasional teleworkers	Office workers	Differences between groups
	1	2	3	4
N	159	458	3,590	
Work & work-related activities	349	351	364	
Working at main job	344	346	357	
Work from workplace	106	275	331	all***
Work from home	205	56	11	all***
Work from other place	32	15	15	
Travel time	69	91	82	2>1*
Commuting	18	37	36	3>1*** 2>1***
Non-commuting	46	51	45	
Personal care	611	617	604	
Sleep	513	499	501	
Grooming	25	35	37	3>1*** 2>1***
Meals	73	73	64	2>3** 1>3*
Household production	87	90	86	
Food preparation	21	21	21	
Housework	39	41	39	
Buying goods and services	18	20	18	
Household management	10	7	8	
Care	41	36	32	
Primary childcare	28	24	21	1>3*
Leisure	283	255	271	1>2*
Social activities	57	55	57	
Physical activity	19	19	18	
Relaxing	39	28	27	
TV and computer for leisure	156	147	159	
With children age <18 (parents)	290	268	250	1>3*
With spouse/partner (couples)	291	274	264	
With friends	32	36	39	
With coworkers/clients	76	252	280	3>1*** 2>1***
Alone	493	328	318	1>3*** 1>2***
Kids present during work (parents)	10	7	3	

Notes: ATUS leave module weights used. Columns 1–3 contains conditional mean values computed from OLS regressions with the following set of controls: year, region, spouse or partner present, spouse/partner employed, quartic polynomial in age, race/ethnicity (black, Hispanic, Asian), presence of own child age 0–5, presence of own child age 6–17, presence of another adult age 18–69, presence of an elderly person age 70+, foreign born, metropolitan residence, paid hourly, flexible hours schedule, union member, multiple job holder, log hourly wage, government job, industry, occupation. Column 4 shows whether the group differences are statistically significant.
***indicates significance at the 0.01 level, **at the 0.05 level, and *at the 0.10 level.
Source: American Time Use Survey Leave and Job Flexibilities Module (2017–2018)

Table 4B. Time use conditional means for women, Monday-Sunday typical day of the week (minutes/day).

WOMEN Time Use Activities	Home-based teleworkers	Occasional teleworkers	Office workers	Differences between groups
	1	2	3	4
N	182	386	3,280	
Work & work-related activities	351	334	340	
Working at main job	348	330	331	
Work from workplace	40	239	304	all***
Work from home	273	72	11	all***
Work from other place	35	16	16	
Travel time	67	78	79	
Commuting	14	29	32	3>1** 2>1*
Non-commuting	54	50	45	1>3*
Personal care	608	620	627	
Sleep	505	509	506	
Grooming	37	47	53	3>1*** 2>1***
Meals	59	59	62	3>2**
Household production	119	118	115	
Food preparation	35	42	36	2>3*
Housework	46	42	46	
Buying goods and services	23	25	24	
Household management	15	9	10	1>2*
Care	40	47	44	
Primary childcare	28	33	32	
Leisure	257	243	236	
Social activities	69	61	60	
Physical activity	20	10	11	1>2** 1>3*
Relaxing	32	23	25	
TV and computer for leisure	121	137	126	
With children age <18 (parents)	337	297	282	1>3**
With spouse/partner (couples)	249	246	239	
With friends	44	34	31	
With coworkers/clients	40	233	280	all ***
Alone	500	308	290	1>3*** 1>2***
Kids present during work (parents)	20	19	5	1>3** 2>3**

Notes: ATUS leave module weights used. See the notes for Table 4A for control variables. Column 4 shows whether the group differences are statistically significant.
***indicates significance at the 0.01 level, **at the 0.05 level, and *at the 0.10 level.
Source: American Time Use Survey Leave and Job Flexibilities Module (2017–2018)

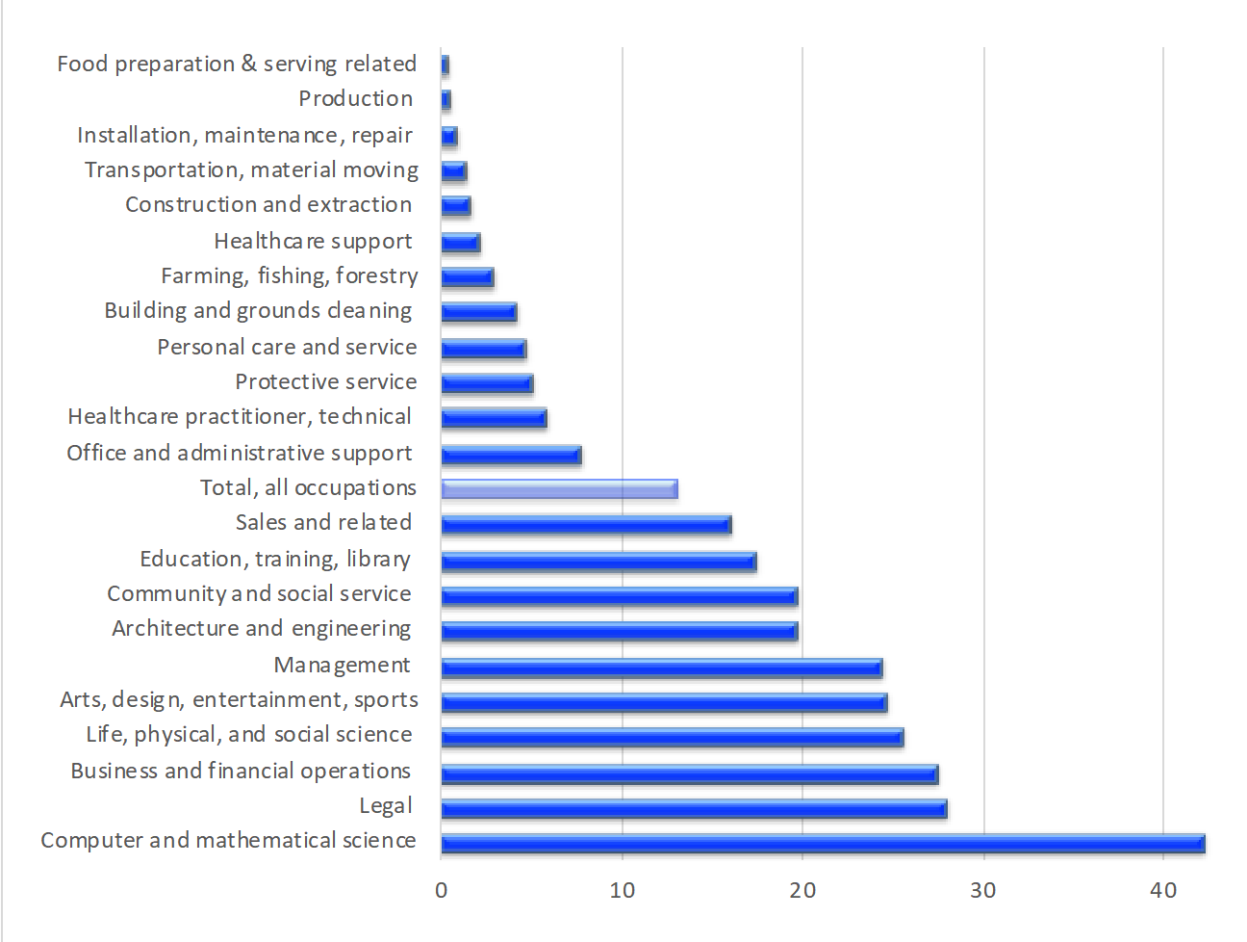

Figure 1. Percent of teleworkers among full-time wage and salary workers by detailed occupation group, 2017–2018

Source: American Time Use Survey Leave and Job Flexibilities Module (2017–2018)

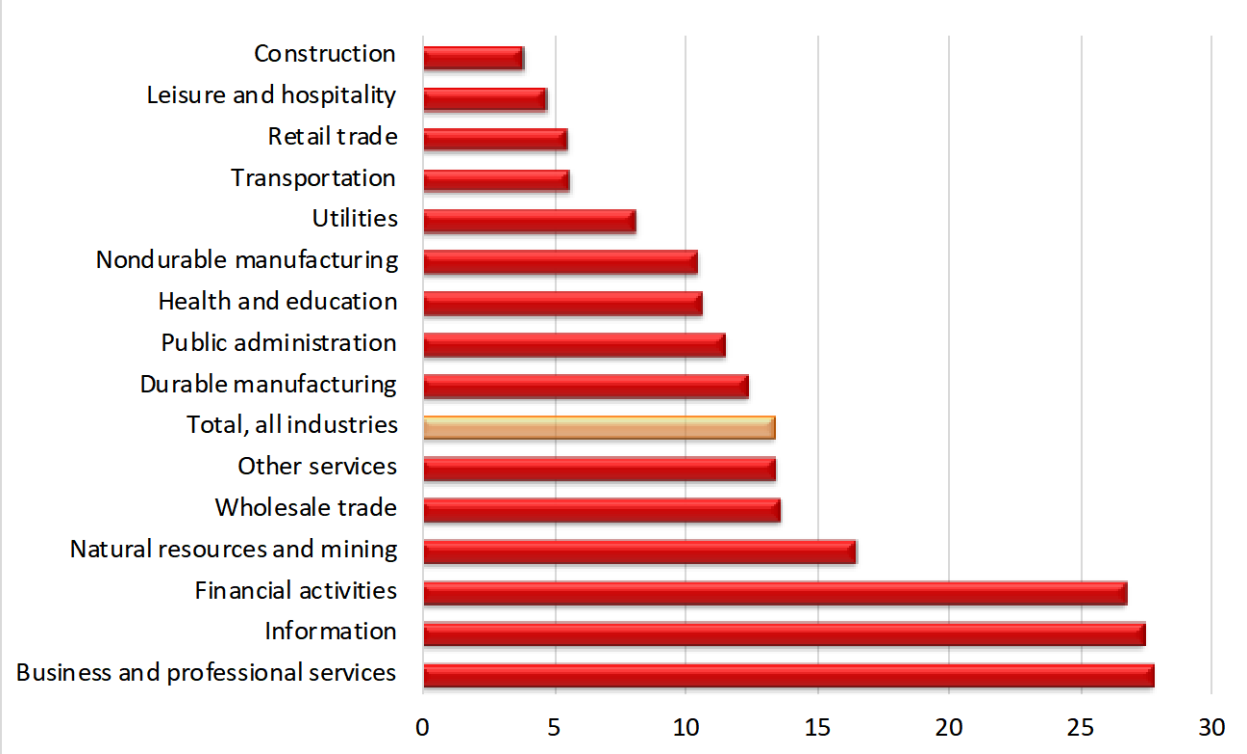

Figure 2. Percent of teleworkers among full-time wage and salary workers by major industry group, 2017–2018

Source: American Time Use Survey Leave and Job Flexibilities Module (2017–2018)

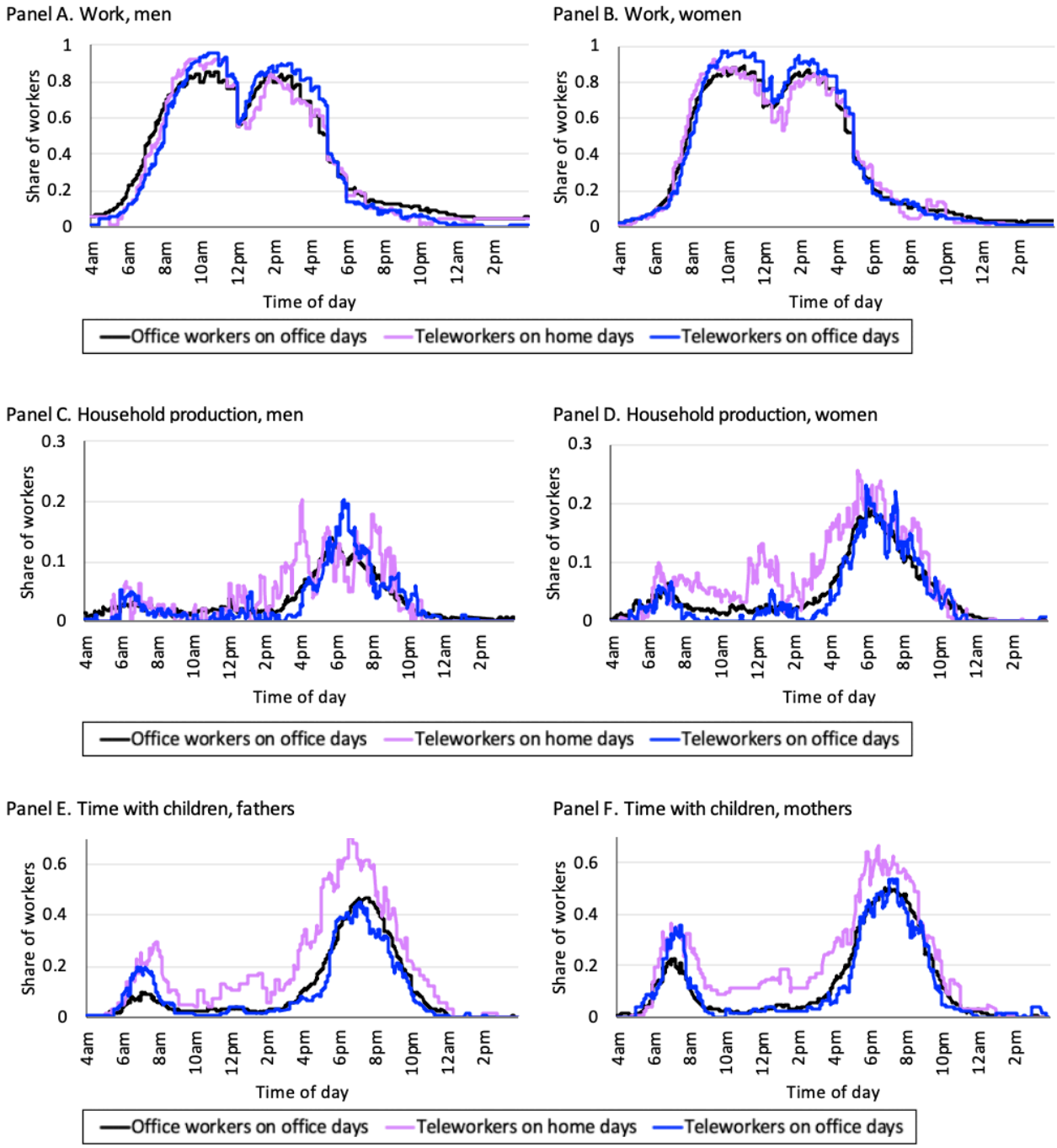

Figure 3. Time use by type of worker. Monday-Friday workdays

Note: Workdays are days on which the respondent reports at least four hours of work. Sample sizes for work, household production, travel, leisure, sleep and graphs are: men (N = 1,401, 83, 182), women (N = 1,249, 86, 147) for the three groups of workers respectively. Sample sizes for time with children graphs are: Fathers (N = 681, 49, 100), Mothers (N = 551, 37, 82). Time with children includes time spent working.
Source: American Time Use Survey Leave and Job Flexibilities Module (2017–2018)

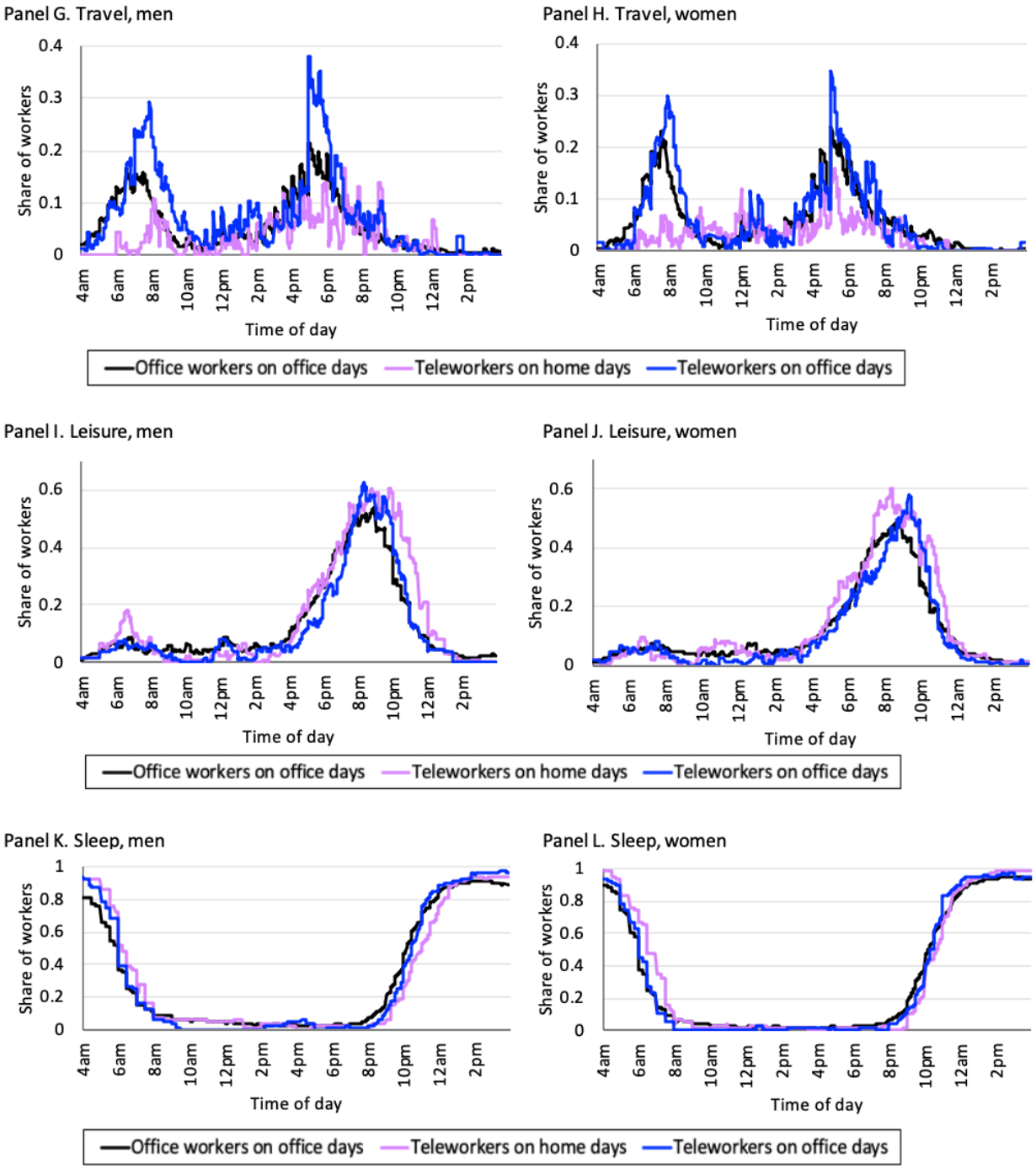

Figure 3. Time use by type of worker. Monday-Friday workdays (Continued)

Note: Workdays are days on which the respondent reports at least four hours of work. Sample sizes for work, household production, travel, leisure, sleep and graphs are: men (N = 1,401, 83, 182), women (N = 1,249, 86, 147) for the three groups of workers respectively. Sample sizes for time with children graphs are: Fathers (N = 681, 49, 100), Mothers (N = 551, 37, 82). Time with children includes time spent working.
Source: American Time Use Survey Leave and Job Flexibilities Module (2017–2018)

APPENDIX

Table A.1. Variables from the American Time Use Survey

Time-Use Category	ATUS Activity Tier Codes and Variables
Work and Work-related activities	T1 = 5
Working at main job	T1 = 5 & T2 = 1 & (T3 = 1 | T3=99)
Work from workplace	T1 = 5 & T2 = 1 & T3 ≠ 2 & TEWHERE = 2
Work from home	T1 = 5 & T2 = 1 & T3 ≠ 2 & TEWHERE = 1
Work from other place	T1 = 5 & T2 = 1 & T3 ≠ 2 & TEWHERE ≠ 1 or 2
Travel time	T1 = 18
Commuting	T1 = 18 & T2 = 5. Adjusted using trip tour methodology.
Non-commuting	T1 = 18 (excluding T2 = 5). Adjusted using trip tour methodology.
Personal care	T1 = 1, T1==8 & (T2==4 | T2==5), T1 = 11
Grooming	T1 = 1 & T2 = 2
Sleep	T1 = 1 & T2 = 1
Other personal care	T1 =1 & T2 = 3, 4, 5, or 99, T1==8 & T2=4, 5
Meals	T1 = 11
Household production	T1 = 2 & T2 ≠ 6, T1 = 7, T1 = 8 (T2 ≠ 4, 5, 7), T1 = 9 & T2 ≠ 3, T1 = 10
Buying goods and services	T1 = 7, T1=8 & T2 ≠ 4, 5, 7, T1 = 9 & T2 ≠ 3, T1 = 10
Housework (cleaning, laundry)	T1 = 2 & T2 = 1
Food preparation and clean-up	T1 = 2 & T2 = 2
Home and vehicle maintenance	T1 = 2 & (T2>2 & T2<=99 & T2 ≠ 6, 9)
Household Management	T1 = 2 & T2 = 9
Care	
Primary childcare for household	T1 = 3 & T2<=3, T1 = 4 & T2<=3
Adult care	T1 = 3 & (T2 = 4, 5), T1 = 4 & (T2 = 4, 5)
Pet care & veterinary services	T1 = 2 & T2 = 6, T1 = 8 & T2 = 7, T1 = 9 & T2 = 3
Leisure	T1 = 6, T1 = 12, T1 = 14, T1 = 13 & T2>=2, T1 = 15, T1 = 16 & (T2 = 1 & T3<=2), T1 = 50

Social and organizational activities (socializing, attending or hosting social events, arts/sport/recreation events, religious and spiritual activities, volunteering)	T1 = 6, T1 = 12 & T2 ≠ 3, T1 = 14, T1 = 13 & T2>=2, T1 = 15
Sports and active leisure	T1 = 13 & T2 = 1
Relaxing (listening to music, reading, conversations, relaxing, doing nothing)	T1 = 12 & T2 = 3 & T3 ≠ 3, 4, 7, 8
Watching TV and, using computer for leisure	T1 = 12 & T2 = 3 & T3 = 3
Time with family and friends	
Time with children under age 18	All activities where TUWHO = 22 | TUWHO = 40
Time with spouse/partner	TRTSOUSE, TRTUNMPART
Time with coworkers/clients	TRTCCC_WK _
Time with friends	TRTFRIEND
Time Alone (including at work)	TRTALONE_WK

Note: T1 refers to first tier activity code. T2 refers to second tier activity code. T3 refers to third tier activity code. TEWHERE refers to the location of the activity. TUWHO refers to who was in the room or accompanied you on an activity. Trip tour methodology on average increases work-related travel by 3 min for men and by 8 min for women compared to reported commute time (Kimbrough, 2019). In turn, non-work related travel is reduced by the same amount. This methodology classifies as commute trip chains that contain no stop of more than 30 minutes and either begin at home and end at work or begin at work and end at home. The travel time (but not the stop time) on such tours is summed to calculate each worker's commute, or work-related time.

Table A.2. Sample means

	Men			Women		
	Home-based teleworkers	Occasional teleworkers	Office workers	Home-based teleworkers	Occasional teleworkers	Office workers
N	159	458	3,590	182	386	3,280
Wage	46.1***	46.3***	26.6	29.2***	38.1***	23.2
	(25.3)	(28.7)	(18.8)	(15.8)	(21.5)	(16.4)
Weekly earnings	2,105***	2,224***	1213	1,353***	1,694***	985
	(1,173)	(1,304)	(877)	(881)	(942)	(745)
Usual hours, main job	45.4***	44.6***	43.7	43.3**	44.0***	41.1
	(9.1)	(7.3)	(7.9)	(6.6)	(7.9)	(5.5)
Some college	0.189**	0.097***	0.255	0.168***	0.146***	0.281
College degree	0.407***	0.512***	0.220	0.345***	0.408***	0.274
Graduate degree	0.329***	0.326***	0.121	0.306***	0.385***	0.166
Spouse or partner present	0.787***	0.755***	0.626	0.658***	0.665***	0.572
Spouse/partner employed	0.566*	0.570***	0.453	0.597***	0.589***	0.490
Age	44.4**	41.8	40.0	42.2	42.2	41.1
Black, non-Hispanic	0.122	0.090***	0.112	0.156	0.094***	0.149
Hispanic	0.073***	0.061***	0.199	0.098***	0.064***	0.147
Asian, non-Hispanic	0.033	0.106***	0.056	0.035	0.079**	0.055
Children age<=5 present	0.138	0.205***	0.171	0.134**	0.167*	0.140
Children age 6–17 present	0.266***	0.231***	0.196	0.207	0.267*	0.207
Other adult 18–69 present	0.175*	0.192***	0.304	0.233**	0.191***	0.331
Elderly age 70+ present	0.044	0.005***	0.032	0.035	0.016*	0.036
Foreign born	0.094***	0.166	0.204	0.083**	0.087***	0.145
Metropolitan residence	0.932**	0.971***	0.860	0.958***	0.957***	0.856
Midwest	0.232	0.260	0.244	0.200	0.171***	0.240
Northeast	0.235**	0.215***	0.161	0.177	0.197**	0.167
West	0.267	0.199	0.229	0.252	0.250***	0.197
Year 2018	0.429	0.541	0.496	0.550**	0.554	0.514
Weekend day	0.238***	0.308	0.302	0.285	0.320	0.296
Flexible hours schedule	0.540***	0.505***	0.157	0.527***	0.458***	0.125

Table A.2. Sample means (Continued)

	Men			Women		
	Home-based teleworkers	Occasional teleworkers	Office workers	Home-based teleworkers	Occasional teleworkers	Office workers
Paid hourly	0.162***	0.140***	0.593	0.297***	0.171***	0.615
Union member	0.048***	0.039***	0.133	0.067***	0.055***	0.129
Multiple job holder	0.079**	0.055	0.046	0.076	0.041	0.055
Government job	0.108***	0.120*	0.153	0.096***	0.214**	0.238
Occupation:						
Managerial	0.254***	0.351***	0.145	0.303***	0.410***	0.171
Professional and technical	0.526***	0.467***	0.207	0.428	0.419**	0.341
Service and support occupations	0.023***	0.0372***	0.141	0.041***	0.010***	0.140
Sales and administrative support	0.181*	0.113	0.137	0.223	0.152***	0.267
Production workers	0.016***	0.032***	0.371	0.005***	0.009***	0.081
Industry:						
Natural resources and mining	0.000	0.022	0.011	0.000	0.004	0.004
Construction	0.017***	0.023***	0.107	0.009	0.012	0.010
Manufacturing	0.099**	0.152	0.182	0.092	0.094	0.079
Wholesale and retail trade	0.079	0.061***	0.138	0.047	0.067***	0.101
Transportation and utilities	0.017***	0.038***	0.089	0.015	0.026	0.029
Information	0.049***	0.040***	0.019	0.070**	0.022	0.014
Financial services	0.203***	0.144***	0.057	0.165***	0.164***	0.082
Business and professional services	0.289***	0.312***	0.113	0.239***	0.178***	0.090
Education and health services	0.170	0.122	0.124	0.286***	0.284***	0.427
Leisure, hospitality, and other services	0.056*	0.037***	0.098	0.036**	0.078	0.106
Public administration	0.021**	0.050	0.062	0.041	0.073	0.059

Note: ATUS leave module weights used. Standard deviations are in parentheses for continuous variables.
*** p<0.01 ** p<0.05, * p<0.1 differences significant with respect to office workers.
Source: American Time Use Survey Leave and Job Flexibilities Module (2017–2018)

Table A.3.A. Conditional mean time use for men, Monday-Sunday typical workday (minutes/day)

MEN Time Use Activities	Teleworkers on home days	Teleworkers on office days	Office workers on office days	Differences between groups
	1	2	3	4
N	97	192	1,719	
Work & work-related activities	489	515	543	3>1*** 3>2**
Working at main job	477	512	537	3>1*** 2>1**
Work from workplace	-7	482	527	3>2**
Work from home	471	23	6	all ***
Work from other place	13	8	4	all ***
Travel time	37	98	81	3>1*** 2>1***
Commuting	5	64	56	2>3**
Non-commuting	33	31	25	3>1*** 2>1***
Personal care	574	581	559	2>3**
Sleep	467	465	460	3>1*** 2>1***
Grooming	23	37	41	1>3*** 1>2**
Meals	82	65	57	2>3*
Household production	59	43	46	1>3* 1>2**
Food preparation	25	14	16	1>3** 1>2***
Housework	15	17	16	
Buying goods and services	11	8	8	
Household management	9	4	5	
Care	38	21	23	1>3** 1>2***
Primary childcare	30	14	16	1>3*** 1>2***
Leisure	243	183	189	1>3*** 1>2***
Social activities	53	31	31	1>3** 1>2*
Physical activity	9	13	11	
Relaxing	27	23	20	
TV and computer for leisure	147	109	118	1>3*** 1>2***
With children age <18 (parents)	256	133	141	1>3*** 1>2***
With spouse/partner (couples)	226	172	163	1>3*** 1>2**
With friends	9	18	18	
With coworkers/clients	0	417	431	3>1*** 2>1***
Alone	668	322	324	1>3*** 1>2***
Kids present during work (parents)	22	3	3	1>3** 1>2*

Notes: ATUS leave module weights used. Workdays are days on which the respondent reports at least 4 hours of work. See the notes for Table 3A for control variables. Column 4 shows whether the group differences are statistically significant.
***indicates significance at the 0.01 level, **at the 0.05 level, and *at the 0.10 level.
Source: American Time Use Survey Leave and Job Flexibilities Module (2017–2018)

Table A.3.B. Conditional mean time use for women, Monday-Sunday typical workday (minutes/day)

WOMEN Time Use Activities	Teleworkers on home days	Teleworkers on office days	Office workers on office days	Differences between groups
	1	2	3	4
N	102	153	1,483	
Work & work-related activities	507	529	520	
Working at main job	505	526	514	
Work from workplace	0	489	506	3>1*** 2>1***
Work from home	492	33	5	all ***
Work from other place	14	4	3	
Travel time	33	86	78	3>1*** 2>1***
Commuting	1	56	51	3>1*** 2>1***
Non-commuting	33	32	27	
Personal care	565	569	582	
Sleep	474	460	464	
Grooming	34	55	57	3>1*** 2>1***
Meals	54	52	57	
Household production	104	64	64	1>3*** 1>2***
Food preparation	40	30	27	1>3** 1>2*
Housework	36	18	18	1>3** 1>2**
Buying goods and services	14	11	12	
Household management	14	5	7	1>3* 1>2**
Care	31	35	30	
Primary childcare	21	25	22	
Leisure	200	158	166	1>3*** 1>2***
Social activities	30	30	32	
Physical activity	14	10	9	
Relaxing	26	16	20	
TV and computer for leisure	123	92	95	1>3** 1>2**
With children age <18 (parents)	288	175	170	1>3*** 1>2***
With spouse/partner (couples)	158	148	149	
With friends	20	19	17	
With coworkers/clients	13	436	441	3>1*** 2>1***
Alone	617	288	282	1>3*** 1>2***
Kids present during work (parents)	61	14	5	1>3*** 1>2**

Notes: ATUS leave module weights used. Workdays are days on which the respondent reports at least 4 hours of work. See the notes for Table 3A for control variables. Column 4 shows whether the group differences are statistically significant.
***indicates significance at the 0.01 level, **at the 0.05 level, and *at the 0.10 level.
Source: American Time Use Survey Leave and Job Flexibilities Module (2017–2018)

Table A.4. Conditional mean time use for males in management, business, and financial occupations, Monday-Sunday typical day of the week (minutes/day)

MEN Time Use Activities	Home-based teleworkers	Occasional teleworkers	Office workers	Differences between groups
	1	2	3	4
N	40	179	595	
Work & work-related activities	347	363	367	
Working at main job	341	359	361	
Work from workplace	152	271	334	3>1*** 2>1*** 3>2**
Work from home	184	72	15	1>3*** 1>2** 2>3***
Work from other place	5	15	12	
Travel time	80	113	97	2>1**
Commuting	39	47	44	
Non-commuting	43	59	51	
Personal care	631	601	595	
Sleep	512	466	485	1>2**
Grooming	28	37	39	3>1*
Meals	95	78	67	1>3*** 2>3**
Household production	80	80	86	
Food preparation	18	21	23	
Housework	45	36	37	
Buying goods and services	10	16	18	3>1*
Household management	7	8	9	
Care	37	43	38	
Primary childcare	33	33	26	
Leisure	265	240	257	
Social activities	69	38	62	3>2**
Physical activity	12	21	20	
Relaxing	17	30	24	
TV and computer for leisure	164	144	139	
With children age <18 (parents)	255	253	260	
With spouse/partner (couples)	287	260	262	
With friends	24	33	30	
With coworkers/clients	64	252	277	3>1*** 2>1***
Alone	485	352	328	1>3*** 1>2**
Kids present during work (parents)	7	9	4	

Notes: ATUS leave module weights used. Here the respondent worked at least 60 minutes on their diary day. See the notes for Table 4A for control variables. Column 4 shows whether the group differences are statistically significant.
***indicates significance at the 0.01 level, **at the 0.05 level, and *at the 0.10 level.
Source: American Time Use Survey Leave and Job Flexibilities Module (2017–2018)

Table A.5. Coefficients on 'Work at home day for teleworker', Monday-Friday workdays

Time Use Activities	MEN (N = 1,666)				WOMEN (N = 1,482)			
	Relative to Work at office day for office worker		Relative to Work at office day for teleworker		Relative to Work at office day for office worker		Relative to Work at office day for teleworker	
	Coefficient (S.E)	Oster beta	Coefficient (S.E)	Oster beta	Coefficient (S.E)	Oster beta	Coefficient (S.E)	Oster beta
	1	2	3	4	5	6	7	8
Work & work-related activities	-44.1*** (14.7)	-53	-17 (17)	-12	-13.5 (16.5)	-15	-25.4 (19.3)	-33
Working at main job	-50.2*** (13.3)	-58	-25.9 (15.9)	-20	-8.5 (16.3)	-10	-23.5 (19.2)	-32
Travel time	-47.1*** (6.1)	-49	-62.4*** (8.5)	-74	-46.8*** (5)	-49	-52.6*** (6.2)	-61
Commuting	-52.2*** 3.2)	-51	-60.0*** (5.3)	-64	-50.9*** (3.2)	-52	-54.8*** (4.6)	-63
Non-commuting	5.8 (5.5)	3	1.2 (7.1)	-4	4.8 (4.6)	4	1.8 (5.5)	0
Personal care	12.4 (13.7)	18	-10.6 (15.6)	-15	-13.6 (10.5)	-15	-1.4 (13.6)	1
Sleep	7.1 (13.1)	12	1.4 (14.7)	5	13.7 (10.6)	13	17.1 (13.4)	17
Grooming	-17.4*** (3)	-18	-13.9*** (3.4)	-12	-23.0*** (4.8)	-22	-21.5*** (5.2)	-20
Meals	22.3*** (5.9)	22	13.4* (7.1)	7	-3.8 (4.7)	-5	1.8 (5.3)	3
Household production	10.4 (8.2)	11	12.6 (8.7)	13	40.5*** (14.6)	43	41.5*** (13.9)	46
Food preparation	9.4** (4.2)	10	11.4** (4.5)	13	12.4* (6.5)	14	9.9 (6.4)	11
Housework	-1.8 (4.2)	-1	-2.9 (4.7)	-3	19.8** (8.5)	21	19.4** (7.9)	22
Buying goods and services	0.3 (2.4)	0	0.7 (2.5)	1	3.6 (4.1)	3	5.6 (4.1)	6
Household management	2.5 (3.8)	2	3.4 (3.8)	3	4.7 (3.5)	4	6.6* (3.8)	7
Care	16.7** (6.5)	14	18.8*** (6.7)	16	-1.7 (5.3)	-1	-6.4 (6.5)	-8
Primary childcare	15.4*** (5.6)	13	16.6*** (5.8)	14	-3.3 (3.8)	-3	-5.9 (4.8)	-7
Leisure	51.6*** (13.8)	58	58.5*** (15.8)	71	35.2*** (12.7)	37	44.2*** (14.5)	52
Social activities	17.7* (10.2)	17	17.6 (12.3)	17	-1 (8)	-1	1.6 (8.8)	3
Physical activity	-1.4 (4.2)	-3	-3.2 (5)	-6	5.3 (5)	5	3.8 (5.8)	3
Relaxing	4.8 (6.4)	6	1.1 (6.5)	1	6.5 (7.8)	5	10.9 (8)	12
TV and computer for leisure	33.0*** (12.2)	40	42.6*** (13.2)	56	29.1*** (11.2)	32	31.8** (12.5)	38
With children age <18 (parents)	114.3*** (17.8)	116	121.9*** (20.3)	129	98.5*** (36.3)	101	95.1** (37.9)	98
With spouse/partner (couples)	56.0*** (18.7)	54	48.9** (20.7)	43	-1.7 (17.1)	-5	3.3 (21.8)	1
With friends	-13.4** (5.3)	-14	-12.4** (6.1)	-13	4.1 (9.7)	4	1.8 (10.3)	0
With coworkers/clients	-432.7*** (15.3)	-446	-419.6*** (20.8)	-410	-430.5*** (12.8)	-419	-431.3*** (22.6)	-320
Alone	347.5*** (24.9)	346	351.2*** (29)	353	350.4*** (40)	342	348.0*** (43.2)	330
Child present at work (parents)	20.5** (9.7)	19	20.5* (10.5)	18	42.3* (21.9)	43	33.7 (22)	29

Notes: ATUS leave module weights used. See Table 3A notes for control variables. Oster betas assuming $\delta = 1$ and $R_{max} = 1.3*\tilde{R}$.
***indicates significance at the 0.01 level, **at the 0.05 level, and *at the 0.10 level.
Source: American Time Use Survey Leave and Job Flexibilities Module (2017–2018)

Table A.6. Coefficients on 'Home-based teleworker', all days

Time Use Activities	MEN (N = 4,207)				WOMEN (N = 3,848)			
	Relative to office worker		Relative to occasional teleworkers		Relative to office worker		Relative to occasional teleworkers	
	Coefficient (S.E)	Oster beta	Coefficient (S.E)	Oster beta	Coefficient (S.E)	Oster beta	Coefficient (S.E)	Oster beta
	1	2	3	4	5	6	7	8
Work & work-related activities	-14.7 (20.6)	-26	-1.5 (21.9)	-9	11.5 (19.9)	7	17.3 (21.5)	13
Working at main job	-13.5 (20.4)	-23	-2.1 (21.8)	-9	16.9 (19.8)	12	18.8 (21.5)	13
Travel time	-13.6 (10.5)	-17	-22.3* (11.5)	-32	-11.1 (9)	-12	-11 (9.4)	-13
Commute	-18.2*** (5.7)	-19	-18.8*** (5.9)	-20	-18.6** (8)	-20	-15.2* (8.1)	-15
Non-commuting	1.1 (9.2)	-1	-5 (10.3)	-11	8.9* (5.2)	9	4.1 (5.8)	2
Personal care	6.8 (13.3)	12	-6 (14.2)	-3	-18.5 (13.4)	-18	-11.5 (13.9)	-7
Sleep	12.4 (11.3)	21	14.2 (12.5)	25	-0.9 (10.9)	1	-4.2 (11.5)	-3
Grooming	-12.1*** (2.6)	-12	-10.6*** (2.7)	-10	-16.0*** (3.5)	-16	-10.0*** (3.9)	-7
Meals	9.2* (4.9)	8	-0.3 (5.8)	-5	-2.7 (4.2)	-3	-0.4 (4.7)	0
Household production	1.2 (8.8)	3	-2.2 (10.6)	0	3.7 (11.8)	6	0.4 (12.4)	2
Food preparation	-0.1 (2.9)	0	0.2 (3.2)	0	-1 (4.5)	1	-6.7 (4.8)	-7
Housework	-0.2 (7.1)	1	-2 (8.7)	-1	0.5 (7.9)	1	3.1 (8.1)	6
Buying goods and services	-0.5 (2.7)	2	-2.7 (3.4)	-1	-0.9 (3.8)	-1	-2 (4.4)	-3
Household management	2 (3.8)	1	2.3 (3.7)	2	5.1 (3.4)	5	6.0* (3.6)	6
Care	8.7 (5.3)	9	4.4 (6.4)	3	-4.7 (5.2)	-5	-7.3 (6)	-9
Primary childcare	7.3* (4)	7	4.3 (4.7)	3	-5 (3.9)	-5	-5.4 (4.6)	-6
Leisure	11.7 (15.2)	16	27.5* (15.9)	39	19.2 (14.3)	22	12.1 (15.5)	12
Social activities	0 (9.5)	0	2.3 (10.9)	3	9.4 (10.4)	11	9.4 (11.3)	11
Physical activity	1.7 (4.9)	1	0.7 (5.2)	-1	8.4* (4.6)	8	10.0** (4.9)	10
Relaxing	12 (9.5)	12	10.7 (9.7)	11	5.8 (6.4)	5	7.5 (6.9)	7
TV and computer for leisure	-2.8 (12.5)	4	8.7 (13)	24	-3.2 (13)	-1	-14.8 (14.1)	-17
With children age <18 (parents)	39.9* (21.5)	49	22 (24.4)	27	55.1** (26.8)	54	40.8 (29.3)	32
With spouse/partner (couples)	27.7 (17.6)	35	17.7 (19.7)	23	10.3 (21.3)	8	3.6 (24.1)	-3
With friends	-7.2 (8.6)	-5	-4.6 (9.3)	0	14.1 (10.9)	15	10.9 (11.8)	10
With coworkers/clients	-204.6*** (23.1)	-208	-176.6*** (25.4)	-169	-239.4*** (20)	-241	-192.7*** (23.9)	-169
Alone	174.9*** (26.1)	170	165.3*** (28.8)	155	209.7*** (27.9)	205	192.0*** (31.1)	174
Child present at work (parents)	7.2 (4.8)	7	3.3 (5.5)	0	15.6** (6.7)	17	1.5 (8.5)	-5

Notes: ATUS leave module weights used. See Table 4A notes for control variables. Oster betas assuming $\delta = 1$ and $R_{max} = 1.3*\tilde{R}$.
***indicates significance at the 0.01 level, **at the 0.05 level, and *at the 0.10 level.
Source: American Time Use Survey Leave and Job Flexibilities Module (2017–2018)