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ABSTRACT

Telework and Time Use*

This chapter reviews the evidence on the relationship between telework and households' time allocation, drawing heavily on the empirical evidence from time diary data, and discusses the implications of telework for workers' productivity, wages, labor force participation, and well-being. Telework results in significant time savings for workers, as they reduce time on commuting and grooming activities by over one hour on telework days. This time is reallocated to household and leisure activities, but differentially for men and women. Men spend most of their time windfall on leisure activities; however, fathers also increase time on primary child care. Women, on the other hand, increase their household production. Children and parents benefit because they spend more time together; however, average full-time workers spend more time alone when they telework.

JEL Classification: J22, J31, D13

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

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1. Introduction

Telework, also referred to in the literature as telecommuting, working from home, or remote work, is a flexible workplace arrangement where employees work at home instead of commuting to an office, on some or all their workdays. In 2017–2018, according to the American Time Use Survey Leave and Job Flexibilities (ATUS-LV) module, 13% of US wage and salary workers had at least one workday over a two-week period when they worked only at home, while another 12% of wage and salary workers regularly did some work from home in addition to their work in the office (Bureau of Labor Statistics 2019). According to the American Community Survey (ACS), 4.1% of wage and salary workers performed their jobs from home on at least half of their workdays each week in 2019 (US Census Bureau 2019).

Telework is often promoted as a workplace policy that can help workers to better balance work and life responsibilities. It has the potential to result in significant time savings for households, as workers eliminate lengthy commutes and spend less time getting dressed and ready for work. These timesaving benefits may come in handy at times of the day when children are most in need of care, because school hours rarely cover parents' work hours; or extra time can be spent on leisure, food preparation, or housework. Greater flexibility in daily work schedules, which often accompanies a telework arrangement, allows workers to address life responsibilities—buying goods and services, cooking a healthy meal, meeting with a child's teacher, or attending a doctor's appointment—during the day by shifting work hours toward mornings or evenings instead of having to take time off. Working from home may also open the door to joint production activities. For example, workers may perform their work duties while keeping an eye on the laundry, supervising children, providing eldercare, or waiting for the repairman. Telework may also allow workers to be more productive or less stressed while

working by reducing interruptions from co-workers (Global Workplace Analytics 2021). However, multitasking during work hours may interfere with job responsibilities, creating a concern for supervisors that workers may shirk while not being monitored, and thus many employee-employer telework agreements specifically prohibit combining work with domestic duties, such as child care.

This chapter reviews the evidence from the two decades preceding the COVID-19 pandemic on the relationships between telework, time allocation, well-being, productivity, and wages for wage and salary workers, drawing heavily on empirical evidence from US and international data. The self-employed are excluded, because they likely face different constraints regarding their work hours as they are not monitored by managers, are less likely to work in teams, and have different reasons for working from home, such as not running a business establishment outside the home. First, the trends in telework are described, showing a slow, steady rise at the beginning of the 21st Century in this type of flexible workplace arrangement, as well as the prevalence and potential future of telework by worker demographic and job characteristics. Second, the sources of time savings resulting from working at home, namely the reduction in commuting and grooming activities, are discussed, and how these timesaving benefits are reallocated to market work, household production, caregiving, eating and food preparation, sleeping, and leisure. Finally, the implications of telework for workers' productivity, wages, labor force participation, and well-being are discussed, as well as its impact on energy savings and traffic congestion. Divergent findings in the literature are highlighted to better understand the debate about the benefits and costs of telework. The implications of COVID-19 on the future of telework are discussed in a separate chapter of this handbook.

2. Trends and prevalence of telework prior to the COVID-19 pandemic

During the two decades preceding the COVID-19 pandemic, advances in information and communication technologies (ICTs) alongside a shift from manufacturing to service-oriented jobs made telework more feasible and less costly. In 2000, fewer than 1% of US households had broadband internet at home, but by 2019, 93% of college-educated adults had high-speed internet (Pew Research Center 2021). Despite these tremendous technological advances, the growth in working from home was relatively slow prior to the pandemic. The percentage of US wage and salary workers reporting that they did any work from home as part of their job rose from 15% to 25% between 2004 and 2017–2018, while the percentage who regularly worked only from home on their workday at least once every two weeks rose from 3% to 13% over the same period (Bureau of Labor Statistics 2004, 2019). As illustrated in Figure 1, the percentage of total work hours done at home by wage and salary workers increased from 4.2% in 2003 to 8.2% in 2019. These percentages include all work from home, both within and outside of normal working hours.

In Europe, telework adoption has unfolded unevenly across countries, at least in part because of regulatory barriers on workplace flexibility policies in some countries (Gschwind and Vargas 2019). In general, the Nordic countries have made the greatest use of flexible working time and work location arrangements, while the Southern and Eastern European countries have made the least use of these arrangements. Central European countries have fallen somewhere in between. In Germany, the percentage of employers offering home-based telework policies increased from 8% in 2003 to 21% in 2012 (BMFSFJ 2013).

Data from the 2015 European Working Conditions Survey show that about 3% of European workers did regular home-based telework several times a month, while about 10%

worked either from home or another location on an occasional basis (Eurofund and International Labor Organization (ILO) 2017). Denmark, the Netherlands, and Belgium had the most regular home-based teleworkers, between 5 and 10%, while fewer than 5% of employees in the other European countries were regular home-based teleworkers. Combining both regular and occasional teleworkers, teleworking was most prevalent in Denmark, Sweden, and the Netherlands, with over 20% of employees teleworking. Thirteen out of the 28 European countries with surveyed workers, including Germany, had fewer than 10% of employees teleworking at least occasionally.

Working from home in Japan was also a relatively uncommon practice in 2016. Most telework was done through informal arrangements, with less than 7% of full-time employees reporting that they worked from home regularly (Sato 2019). Only 2.9% of companies offered their employees formal work-from-home arrangements.

The rest of this chapter focuses on workers who work from home during regular operating hours on some of their workdays, excluding those who do supplementary work from home that extends their workday or workweek, i.e., off-the-clock hours. Figure 2 shows that the percentage of weekday workdays (with at least 4h of work) that were done exclusively from home by all US wage and salary workers increased from about 2.1% in 2003 to over 6.0% in 2019. For research focused on US workers who bring extra work home from the office, see Song (2009), Eldridge and Pabilonia (2010), and Glass and Noonan (2016).

Using information on tasks for occupations from the O*NET combined with early 2020 occupational employment estimates from the Occupational Employment and Wage Statistics (OEWS), Dingel and Neiman (2020) estimate that 37% of US jobs could plausibly be done

entirely from home. In other countries with a different occupational employment mix, such as Mexico and Turkey, they find fewer than 25% of jobs could be done from home.

Matching Dingel and Neiman (2020)'s classification of occupations where remote work is plausible with data from the 2017–18 ATUS-LV, Dey et al. (2020) get an even higher estimate: about 44% of US wage and salary workers in the US are in jobs that could be performed mostly from home. Both studies point out that remote work is plausible in most management, professional, and administrative support jobs, but not in most service, construction, transportation, and production jobs. The percentage of workers who can feasibly telework is highest in the information, financial activities, professional and business services, and public administration industries, but lowest in the leisure and hospitality, agriculture, and construction industries (Dey et al. 2020).

Even though 44% of wage and salary workers in the ATUS-LV module could plausibly work entirely remotely, only 11% had days when they worked entirely from home, resulting in a 25% take-up rate among the feasible set of workers. Dey et al. (2020) found the take-up rate was higher for those workers who were more educated, aged 25–64, worked in full-time jobs, male, married, and lived in large metropolitan areas, but lower for Hispanics and those younger than 25. The take-up rate was also highest in management, professional, and sales occupations (about 29%), and information and professional and business services industries (37% and 41%, respectively). The take-up rate was lowest in service and office and administrative support occupations (7% and 10%, respectively), and in construction and leisure and hospitality industries (13%). Using the ATUS-LV module but focusing on full-time workers, Pabilonia and Vernon (2021) document the variance in telework incidence across more-detailed occupation groupings. Telework was most prevalent among computer and mathematical science

occupations, followed by legal and business and financial operations occupations. In some occupations, there were also significant gender differences in the prevalence of telework, including in legal, community and social service, arts, design, entertainment, and sports, life, physical, and social science, and protective service occupations. These stark differences in the incidence of telework across occupations and industries are also prevalent in European countries (Eurofund and ILO 2017).

Dey et al. (2020) also determined the feasibility of working from home (45%) and take-up rate of working from home for at least 8 hours a week (22%) for individuals interviewed in the 1979 cohort of the National Longitudinal Surveys of Youth (NLSY79) between October 2016 and November 2017. NLSY79 respondents were aged 51–59 at the time of their 2016–17 interview, and the NLSY79 collected information about the job duties of those who worked. Remote work was not as feasible and take-up rates were lower in jobs that required more time on physical tasks, repetitive tasks, routine tasks, and contact with patients, and less time managing and supervising and reading long documents. Using data from the 2012–2018 GSS, Mas and Palais (2020) find that telework is associated with a higher probability of a worker reporting having the freedom to decide how to do one’s job (job autonomy) and a lower probability that a worker reports working on a team.

The difference between the feasibility and incidence of telework (the take-up rate) will vary depending on employers’ willingness to permit their employees to telework and employees’ desire to telework when given the opportunity (Dey et al. 2020). Employers may be unprepared for the shift to remote work if it requires them to make expensive investments in tech support, remote access software, or a way to monitor employees, which may include the use of surveillance software (Abril and Harwell 2021). On the other hand, the rising cost of office space

may encourage some employers to embrace telework. By 2019, according to the Society of Human Resources Management (SHRM) survey, 69% of US employers offered teleworking on an ad hoc basis (i.e., intermittently throughout the year or as a onetime event), 42% on a part-time basis, and 27% on a full-time basis. In addition, more than half of organizations (57%) offered flextime (the ability to vary the start and end time of one's hours). According to the 2017–18 ATUS-LV module, although flextime is more common than having telework days (57% flextime, with 90% of teleworkers and 57% of office workers among full-time workers saying that they have flexibility in terms of start and end times of their work (Woods 2002; Pabilonia and Vernon 2021). This has implications for how workers allocate their time over the day based on their teleworker status.

Workers, however, may be reluctant to take up telework, as they are concerned about being left out of promotion opportunities if their managers equate being out-of-sight with out-of-mind. According to the SHRM (2021) survey of supervisors of remote workers, many supervisors consider remote workers to be more easily replaced than on-site workers, sometimes forget about remote workers when assigning tasks, have to spend more time supervising remote workers than on-site workers, and prefer that their subordinates work in the office. The SHRM survey of employees suggests that most employees believe they are more productive when working remotely, but the majority say that working entirely remotely would diminish networking opportunities and lead to longer working hours. In addition, roughly half of all remote workers reported spending between \$100 and \$499 of their own money on equipment and/or furniture needed to facilitate working entirely remotely because of the COVID-19 pandemic.

3. Empirical evidence

This section reviews the empirical evidence on the sources of time savings from working at home, namely savings in terms of commuting time and time spent on grooming activities, and how these timesaving benefits are potentially reallocated to other activities, including market work, household production, caregiving, eating and food preparation, and sleeping and other leisure.

Estimates from time diary data are generally preferred to those from retrospective studies that ask about time spent on activities over the last week or on a typical week, because they have a shorter recall period (often asking respondents about the previous day) and they ask respondents to list activities for an entire 24-hour-period, which reduces both social desirability bias and aggregation bias (Juster et al. 2003). This section therefore focuses heavily on insights from the American Time Use Survey (ATUS) and similar surveys in other countries. For comparison's sake, non-time diary results are also examined. Particular attention is paid to differences in the relationship between telework and time allocation by gender, marital/partnered status, and parental status, because these individual and household characteristics influence time allocation differently (Aguiar and Hurst 2007).

Several studies based on pre-2017 ATUS time diaries (Giménez-Nadal et al. 2019; Song and Gao 2020) could only identify the location of work activities on the diary day and whether the worker spent any time commuting, but they could not tell how often the respondent works from home and had no way of examining whether teleworkers reallocate their work and non-work activities over the week or spend different amounts of time on various activities in total compared to office workers. A few recent studies (Restrepo and Zeballos 2020; Carlson et al. 2021; Pabilonia and Vernon 2021) based on the 2017–18 ATUS-LV module highlighted in this

section can incorporate frequency of telework because respondents were asked how many days per week they worked only from home. While the studies using the ATUS-LV all examine wage and salary workers, as this was an eligibility criterion for the module, there are some differences in sample selection criterion across studies and in the choice of how to define a telework day and whether to include non-workdays. Both Restrepo and Zeballos (2020) and Pabilonia and Vernon (2021) report examining workers in white-collar occupations in which workers are more likely to be able to telework, but Restrepo and Zeballos (2020) exclude those working in sales and related occupations, even though over 10% of full-time teleworkers work in those occupations.

Pabilonia and Vernon (2021) analyze full-time workers aged 18–65, compare time use by work location for weekday workdays with at least 4 hours of reported work, compare time use by teleworker status on all days regardless of work status, and assign teleworker status to respondents who work exclusively from home at least once every two weeks. Restrepo and Zeballos (2020) study prime working-age adults (aged 25–54) working either on a part-time or full-time basis, compare time use by work location for weekday workdays with any amount of work reported, and have a broader definition of teleworkers that includes those who telework less frequently than once every two weeks. Carlson et al. (2021) do not restrict workers based on their reported occupation, but examine only partnered fathers. Their definition of teleworkers includes those who report ever having days when they work only from home, and they focus on comparing time spent on housework and child care by teleworker status on all days.

3.1 Time savings: Commuting and grooming

Recent evidence from the 2017–2018 (ATUS-LV) shows the significant time windfall that teleworkers get from not having to commute to an office. For full-time wage and salary

workers in white-collar occupations who work at least four hours on their weekday diary day, Pabilonia and Vernon (2021) find that the average teleworker on work-at-home days saves approximately one hour by not having to commute. Analyzing the 2003 to 2017 ATUS weekday workday diaries of knowledge workers, Stiles and Smart (2020) also find that full-day telework decreases total daily travel time, with most of the reduction coming from a decrease in work-related travel, as they by definition have no commute. However, there are also statistically significant reductions in travel related to household and leisure activities (by 35% and 12%, respectively) when people work from home. In addition, teleworking decreases the likelihood of traveling for any reason during peak travel hours, especially during the morning peak travel period (6 a.m. to 9 a.m.). It is teleworkers who work most of their days from home who save significantly over the workweek (about 2 fewer hours commuting) (Pabilonia and Vernon 2021). Those who work occasionally at home (1–2 days a week) spend just as much time commuting over the workweek, suggesting that their commutes may be slightly longer.

Researchers from the Netherlands (de Vos et al. 2018) found that teleworkers sort into jobs based upon residential and commuting preferences. For every additional 8 hours spent teleworking, Dutch workers are willing to accept 3.5% longer daily commutes. A household travel study on teleworking in Chicago by Hu and He (2016) also concludes that reductions in travel from telework may be offset by residential location choice, with part-time teleworkers having longer commutes than non-teleworkers. Earlier studies also found that teleworking reduced travel times. For example, analyzing time diaries from the 2005 Canadian General Social Survey, Lachapelle et al. (2018) find that teleworking on the diary day decreases overall travel time by 14 minutes.

Besides saving on commute time, Pabilonia and Vernon (2021) find men save 15 minutes by reducing grooming activities on weekday work-from-home days, while women save 23 minutes on grooming activities. Including all weekday workdays regardless of the workday length, Restrepo and Zeballos (2020), also using the ATUS-LV module, find that partnered individuals spend 33 fewer minutes on grooming activities when they work from home.

3.2 Market work

Recent evidence from the ATUS time diaries shows no difference in total work time over the week by teleworker status for average, full-time employed men and women (Pabilonia and Vernon 2021). This suggests that, on average, workers are not shirking during their days worked at home nor are they being overworked. However, this is in contrast with several earlier studies suggesting that teleworking leads to an increase in work time. For example, a survey of workers in 15 OECD countries in 2015 (Eurofound and the International Labour Office 2017) finds that remote workers work longer weekly hours, especially men. Using much older data from the 1999–2000 Finish Use of Time dataset, Nätti et al. (2011) find that those who are paid for work at home during normal working hours work more minutes on the average day compared to non-homeworkers. Peters and van der Lippe (2007) also find a positive association between teleworking and longer hours in the Netherlands, especially for men. When comparing full-time teleworkers to office workers in a randomized trial at a large Chinese travel agency call center, Bloom et al. (2015) find that those teleworkers who previously had the longest commutes work longer; teleworkers also are more likely to start work on time, have fewer sick days, and take shorter work breaks than their office counterparts, all leading to their working 9.5% more minutes on the phone. Mas and Pallais (2020) find that telework in the US is associated with

more days that require extra hours and working late hours. Felstead and Henseke (2017) find that teleworkers in the UK have a hard time switching off at the end of their workday and end up working more hours than office-based employees.

Although they find no increase in total working hours among full-time workers, Pabilonia and Vernon (2021) find there is important variation in daily weekday work hours when comparing workdays (weekdays with at least four hours reported work time) by telework status, suggesting that telework allows workers to shift the timing of their work to better balance work and life responsibilities. On telework days, men work 37 fewer minutes, while women work 27 fewer minutes (though the latter was not statistically significant). On office days, female teleworkers work about a half hour more than non-teleworkers. Examining all prime working-age full- and part-time workers regardless of their workday length, Restrepo and Zeballos (2020) also find that workers spend substantially less time working on work-at-home days than on office days, especially those living with a spouse or partner (218 fewer minutes in partnered households and 123 minutes in non-partnered households). However, their estimates also include days with only brief spells of work that happen to be done from home, such as checking work email. When comparing diary days with at least an hour of market work, Giménez-Nadal et al. (2019) also find those working from home spend less time working than do commuters (96 minutes less per day for men and 110 minutes less per day for women). Stiles and Smart (2020) also find that full-day teleworkers spend less time working on their weekday diary day than do commuters.

In terms of the timing of work, both Giménez-Nadal et al. (2019) and Pabilonia and Vernon (2021) find that teleworkers who are working at home on their diary day are less likely to be working during the central hours of their workday than those working in the office. Figure 3 shows the share of full-time workers at work by their work location on weekday workdays.

Although all workers are less likely to be working from noon to 1 p.m.—the typical workers’ lunch hour—among teleworkers, those working from home are less likely to be at work between 10 a.m. and 4 p.m. than those working on-site on their diary day.

3.3 Household production

Using the ATUS, Pabilonia and Vernon (2021) and Giménez-Nadal et al. (2019) find that female teleworkers, but not male teleworkers, spend more time on household production activities on their work-at-home days than on their office days, and at least some of this extra time on household production is done during core working hours. Over the week, however, female teleworkers do not spend more time on household production, suggesting that they are reallocating this activity from non-workdays to workdays (Pabilonia and Vernon 2021). Using the 2017–18 ATUS-LV module to examine the association between telework and time use for partnered fathers, Carlson et al. (2021) find partnered fathers spend more time on routine housework on their telework days but not more time on average. In addition, they find that fathers who telework more frequently spend less time in housework, among fathers whose partners do not work full time. In fact, among fathers whose partners did not work full time, those who worked from home for job-mandated reasons did the least amount of housework, even less than those who never telework. This suggests that fathers’ participation in housework may depend on whether the decision to telework is employer- or employee-driven and if a partner is full-time employed.

3.4 Caregiving

Comparing weekday workdays in 2017–18 by work location, Pabilonia and Vernon (2021) found that parents who work full-time spend more time with their children on work-at-home days versus office days. Fathers spend 26 minutes more on primary child care activities on weekday workdays if at home rather than the office. This is consistent with Carlson et al. (2021), who, using the same dataset, show that partnered fathers who telework engage in more primary child care regardless of their rationale for teleworking or their partners' employment status. Thus, increasing telework has the potential to decrease the large gender care gap. For fathers, Pabilonia and Vernon (2021) find much of the additional time with children on work-at-home days is done in the after-school hours when children are most in need of care, while for mothers, the additional time with children on work-at-home days is more evenly spread out during core working hours. In addition, mothers report working 57 minutes with their children present on work-at-home weekdays, while fathers report working 27 minutes with their children present.

Comparing workdays in 2003–2015 with at least 60 minutes of market work reported, Giménez-Nadal et al. (2019) find that teleworkers spend over 12 minutes per day working with children present, while commuters spend only about 3 minutes working with children present. They find even larger differences when considering time working while doing secondary child care for children under age 13. In these cases, the child is not necessarily in the room, but the child was under their care, presumably in another area of the home. Teleworking fathers and mothers spend 46 and 54 minutes more on secondary child care while working than their commuting counterparts. Thus, the studies by Giménez-Nadal et al. (2019) and Pabilonia and Vernon (2021) provide some evidence that parents engage in joint production activities on telework days.

Using the British Household Panel Study 1991–2009, Giovanis (2018) documents that women are more likely to state that household chores, such as cooking, cleaning, ironing and child care, are shared when their partner works from home. Similarly, Dockery and Bawa (2019) find evidence using 2001 to 2013 data from the Household, Income and Labour Dynamics in Australia Survey that when partnered fathers work from home, as long as their hours are not excessive, there is a more equitable division of household.

These findings suggest that teleworking improves work-life balance for parents, reduces the gender care gap, and possibly reduces child care expenses.

3.5 Eating and food-related activities

Restrepo and Zeballos (2020) study the impact of telework on eating and food preparation, because by eliminating the time spent commuting, working from home may free up time to prepare food on lunch breaks. Among partnered, prime working-age adults, they find workers spend more time on food production and consumption on weekday workdays when they work from home (25 minutes and 48 minutes more, respectively). Non-partnered workers also spend more time on eating and drinking activities when working at home (33 minutes more). Pabilonia and Vernon (2021) and Giménez-Nadal et al. (2019) find a greater share of workers are on break during the noon lunch hour on home days than on office days, while Pabilonia and Vernon (2021) show that male full-time teleworkers on their weekday workdays spend 21 minutes longer eating their meals if they are at home. Figure 4 shows that most of the additional time eating done by teleworkers comes in the form of a more leisurely breakfast and lunch with some additional eating late at night (around 10 p.m.).

Thus, teleworkers may enjoy greater health benefits than non-teleworkers, because home-produced meals tend to be healthier than meals prepared away from home, and more leisurely eating is associated with lower body mass index (BMI) (Hurst and Fukuda 2018; Todd et al. 2010; Zeballos and Restrepo 2018). One cannot tell from time use surveys, however, whether the food consumed at home was prepared at home or purchased from a food service establishment to be consumed at home.

3.6 Sleeping

For full-time workers, Pabilonia and Vernon (2021) find no difference in total sleep time by teleworker status or on work-at-home days versus office days; however, they find a significant difference in the timing of sleep on weekday workdays. Specifically, wake-up times are later on work-at-home days than on office days, by 19 minutes for men and 43 minutes for women. This could plausibly explain the reduction in travel during the morning peak rush hour documented by Stiles and Smart (2020). Including part-time and full-time workers, Restrepo and Zeballos (2020) find that prime working-age workers sleep 37 minutes longer on work-at-home days than office days, suggesting that either part-time workers who work from home enjoy more sleep or prime working-age workers enjoy more sleep on home days than do other workers.

3.7 Other Leisure Activities

Pabilonia and Vernon (2021) find that teleworkers have substantially more leisure time on weekday workdays when they work at home instead of at the office. Male teleworkers spend 66 minutes more on leisure, and female teleworkers spend 55 minutes more on leisure. Teleworkers spend 33 minutes of this increase in leisure activities watching TV and using

computers for leisure; however, they do not increase their total time watching TV over the week. Male teleworkers also spend 23 minutes more on social activities on work-from-home days relative to office days. Comparing weekday workdays by work location for partnered workers, Restrepo and Zeballos (2020) find they spend 94 minutes more on leisure activities on their work-from-home days compared to their office days.

4. Implications of telework for worker well-being

Telework has been promoted as a workplace practice with the potential to boost workers' ability to balance work and family responsibilities. Yet, the literature offers conflicting evidence.

Many studies have shown that how we spend time and with whom matters for our happiness and well-being. Parents spending time with their children is one of their most enjoyable activities (Connelly and Kimmel 2015; Musik et al. 2016). Commuting is one of workers' least enjoyable daily activities and increases perceived stress levels (Gottholmseder et al. 2009; Kahneman et al. 2004; Kahneman and Krueger 2006). Using the 2012–13 ATUS and 2014–15 British Time Use Survey, Hamermesh (2020) shows that life satisfaction improves for married individuals when they spend more time with their spouse and for single individuals when they spend more time with other people. Using time diaries for heterosexual couples from the 2014–15 United Kingdom Time Use Survey, Vagni (2021) finds that time spent as a family, as a couple, or with children alone all improve mothers' and fathers' enjoyment relative to time spent alone, even when accounting for the type of activity they are doing.

When flexible work hours are permitted, couples adjust their work schedules, presumably to improve their well-being. Bryant and Sevilla (2017) find that childless working couples who have flexibility of daily start and finish times in the UK choose to coordinate their schedules and

spend 0.5–1h more together per day. However, Fox et al. (2013) and Taht and Mills (2012) find that some dual-earner couples use non-daytime work and intentionally de-synchronised schedules to care for young children and avoid additional childcare expenses. By allowing more flexibility, telework can help partnered adults reallocate time throughout the day and over the workweek to more enjoyable activities and at more-desirable times, from less time commuting to more time with children and their significant others, and thus improve their well-being. Stewart (2010) finds that part-time work similarly allows mothers of pre-school-aged children to shift their work schedules to later in the day so they can maximize the time they spend with their children at the times of the day when the time is potentially more valuable for child development. Using the 2002 and 2006 GSS, Golden et al. (2013) find that having work schedule flexibility where workers have the ability to take time off during the workday and, to a somewhat lesser extent, to vary starting and stopping times daily, is associated with greater happiness. Giovanis (2018) finds that British women are happier when they or their spouses are teleworkers, and these women report higher levels of happiness when the household production process is a shared one. In families with children, Dockery and Bawa (2019) find when fathers' teleworking results in greater gender equality in domestic tasks, this has positive implications for parent-child relationships.

Psychology literature suggests that the greater job satisfaction reported by telecommuters is linked to enhanced perceptions of autonomy on the job (Gajendran et al. 2014), while the reduction in stress is linked to more control over one's time (Duxbury and Halinski 2014). In a longitudinal study of employees at one financial firm in 2010–11, Henke et al. (2016) find that exclusively on-site workers face a greater risk of obesity, alcohol abuse, physical inactivity, tobacco use, and depression than telecommuters, but they find no association between

telecommuting and stress or nutrition. Using four waves of the GSS (2020, 2006, 2010, and 2014), Kim et al. (2020) find positive relationships between flexible schedule control, telework, worker happiness, and job satisfaction. Using longitudinal data from the UK and fixed-effects regression models, Reuschke (2019) finds that teleworking at least half the workweek increases both job satisfaction and leisure time satisfaction. Bloom et al. (2015) find that home-based workers report higher work satisfaction than their office-based co-workers and their attrition rates are lower, but their promotion rates conditional on performance are also lower. Giménez-Nadal et al. (2019) find that when teleworking, men have lower levels of stress, pain, and tiredness; however, besides having a relatively small sample size, their models do not control for individual fixed effects, and thus their estimates may be biased.

A few studies find negative effects of telework on subjective well-being. Controlling for individual fixed-effects, Song and Gao (2020) find teleworking on weekdays increases fathers' stress and lowers mothers' happiness relative to working in a workplace, which they suggest is likely because of an increase in work-family conflicts, as they find no differences for childless men and women. Mas and Pallais (2020) find telework is associated with a job being seen as being stressful and reporting that work interferes with family. Studying 164 workers in four public Costa Rican institutions where slightly more than half were teleworkers but few could define their own work schedule, Solís (2017) find that work-family conflicts occurred more often for teleworkers when they had greater responsibilities outside of their work environment (e.g., care of young children, eldercare, studying for a degree, and responsible for all housework).

Teleworkers also spend over three hours more of their time alone on the average day, and time alone has been found to be negatively associated with enjoyment (Pabilonia and Vernon 2021; Vagni 2021). They also spend less time in the same physical space with co-workers, and

male teleworkers spend less time with friends (Pabilonia and Vernon 2021). This increased time alone could lead to feelings of isolation and loneliness, potentially decreasing teleworkers' overall life satisfaction and their social relationships, particularly among single men and women (Hamermesh 2020).

An interesting question arises: Does the intensity of work from home matter for job satisfaction? Rodríguez-Modroño and López-Igual (2021) analyze the impact of telework frequency on job quality and work-life balance using the 2015 European Working Conditions Survey covering the 28 EU Member States, as well as Switzerland, Norway, Albania, Macedonia, Montenegro, Serbia, and Turkey. They find occasional teleworkers who telework once a week or less report the best job quality and work-life balance, beating those who work from home more frequently. The telework status of managers also influences employees' perceptions. Golden and Fromen (2011) find that compared to subordinates with office-based managers, work experiences and outcomes are generally less positive for subordinates with managers who spend some or all of their workweek away from the office.

In addition to timesaving benefits, teleworkers may benefit from monetary savings (Global Workplace Analytics 2021). They can spend less on food, child care, and work attire. For the 40.5% of the labor force who commuted by personal vehicle in 2019 (Ruggles et al. 2021), an increase in telework may reduce the need to use or even to own a car, and thus they can save on vehicle fuel, repairs, insurance, and parking.

Overall, because most teleworkers prior to COVID-19 worked from home occasionally, they likely experienced positive effects, but a small share of teleworkers—those who worked mostly from home, possibly found it challenging to maintain work-life balance. Future studies may want to explore whether a hybrid model of working mostly on-site with once or twice a

week telework improves worker well-being relative to working entirely remotely or entirely on site. It would be interesting to see how the reduction in stigma around telework allows workers to self-select the frequency of working from home that matches their individual and family needs.

5. **Implications of telework for worker productivity and wages**

Does improved well-being for the majority of teleworkers translate into higher productivity and higher wages? Being happier and less stressed can increase productivity. Oswald et al. (2015) find evidence from several laboratory and natural experiments that happier workers are more productive. Using longitudinal data from the Add Health and controlling for sibling fixed effects, DeNeve and Oswald (2012) show that happier people also go on to earn more.

Sleep and the timing of sleep may be another mechanism through which telework may increase worker productivity. Extra sleep has been shown to have positive effects on wages, presumably by increasing productivity (Gibson and Shrader 2018). The time use research described above suggests that some teleworkers may sleep longer and/or wake up later on weekday workdays when they work from home. Waking up later may be more consistent with circadian rhythms that then allows workers to feel more alert at other times of the day. (It may also allow their children to wake up later, as school-age children of employed mothers tend to wake up earlier than those of non-employed mothers, which could have positive effects on their academic productivity (Stewart 2014; Pabilonia and Groen 2019).)

Two experimental studies conducted pre-COVID provide causal evidence that at least some workers can be more productive while working from home. Bloom et al. (2015) find that

randomly assigned remote workers at the Chinese travel agency call center were 13% more productive than their office counterparts, of which 9% was from working more minutes per shift (because of fewer breaks and sick days) and 4% from making more calls per minute (because of a better work environment). When the firm post-experiment allowed their employees to choose between working from home or the office, over half switched their work location, which led to even greater productivity gains for the home workers, because the relatively poor performers at home relocated to the office. This highlights the importance of accounting for workers' selection into telework arrangements. In another experimental study where random assignment was among university students, Dutcher (2012) found that teleworking may have positive implications for productivity on creative tasks, but negative implications for productivity on routine tasks. Using an individual fixed-effects model and examining patent examiners at the US Patent Office, Choudhury et al. (2020) find that those who work from home produce more output than their office counterparts, though workers self-selected into the work-from-home program, and thus their estimates cannot be interpreted as causal.

The connection between telework and wages is more complicated because factors other than individual productivity may play a role. Along with differences in employee productivity, wages may reflect incentive pay schemes, compensating differentials, and firm productivity.

Employers may be more willing to permit workers to telework when workers do not require costly supervision and their jobs can be done independently, or mostly asynchronously. They may also selectively allow only their most trustworthy or productive employees, who are already paid more, to work from home. In the case of the Chinese travel agency, only managers could work from home (and only on an ad hoc basis) prior to the employee remote work experiment (Bloom et al. 2015). When monitoring is problematic, employers may pay efficiency

wages to elicit greater effort. However, over recent years, the costs of monitoring office workers who do most of their work via computer have fallen dramatically, and firms are increasingly using surveillance software to track keystrokes to ensure that their employees are not shirking and to track their productivity (White 2019; Abril and Harwell 2021).

Telework eliminates the ability of coworkers to visit their colleagues' office spaces to chat informally, network, engage in mentoring activities, or talk about work-related issues face-to-face. These informal interactions may be important to the success of a team. Management case studies from two Dutch telecommunication firms suggest that for teams developing new products, face-to-face interaction is particularly important during the projects' early phases, but telework combined with basic face-to-face contact (i.e., a hybrid telework model) can also improve knowledge sharing and thus the speed and quality of new product development (Coenen and Kok 2014).

Working from home or working non-standard hours by one member of a team may impose a negative externality on others, as it can make group communication, brainstorming, problem-solving, and coordination more difficult for the team. One person working from home can reduce the benefit of being in the office for another worker, who as a result may decide to stay home. Even if most workers prefer to be in the office, all workers may end up at home. Lack of face-to-face interaction can reduce trust and interpersonal bonds within an organization. The latter two factors are important predictors of knowledge sharing, which is critical for innovation (Golden and Raghuram 2010). To create an environment conducive to innovation, tech firms such as Google and Yahoo refrained for a long time from letting workers telework, and instead developed workplace cultures that maximized social interactions (Schmidt and Rosenberg 2014). Thus, employers who more highly value teamwork may pay higher wages to

encourage workers' on-site presence. In addition, if employers are more apt to promote those who are more frequently in the office, teleworkers may end up earning lower wages in the long run even with no discernable differences in individual worker productivity (Rhee 2008; Bloom et al. 2015; Glass and Noonan 2016).

Another important channel connecting telework and wages is whether telework is viewed by the employee as a positive job amenity, and therefore whether they will accept lower wages for jobs that include telework as an option. According to the theory of compensating differentials (Rosen 1986), a wage penalty for the option to telework will occur in equilibrium if and only if the telework option is both valuable to the marginal teleworker and costly for the marginal employer to offer. A couple of experimental studies (Mas and Pallais 2017; He et al. 2021) show that employees highly value location flexibility, and many report that they will accept substantially lower wages for the option to work from home. Mas and Pallais (2017) provide evidence from a field experiment where they elicit preferences on several alternative work arrangements by asking applicants for positions at a national call center about their preferences between two job descriptions—a baseline position with a traditional full-time schedule and on-site work and an alternative position where they randomly vary both the alternative work arrangement and wages. For 7,000 applicants, they estimate the willingness-to-pay distribution for each alternative arrangement—flexible scheduling, working from home, and irregular schedules. They find that working from home is the most highly valued, with applicants willing to accept 8% lower wages for a telework option, but there is also considerable heterogeneity across individuals. They find that women—especially women with young children—have a relatively high willingness to pay for the option to work from home. Using job ads with different combinations of wages and flexibility options in China, He et al. (2021) provide experimental

evidence that workers value both work location and hours flexibility. Married workers, especially married females, are much more likely to apply for flexible jobs, conditional on pay. In addition, job seekers reveal they are willing to accept lower pay for more flexibility, and married women particularly value highly flexible jobs.

Depending on the type of work done at the firm, some firms by increasing their number of teleworkers may increase their total factor productivity and thus be able to offer their employees higher wages. Employers may benefit from a reduction in office space, a reduction in employee turnover and training costs, and an increase in worker output unless face-to-face communication is essential. In the case of the Chinese travel company, Bloom et al. (2015) estimate that total factor productivity could increase by 30% if all its employees worked from home.

Ultimately, whether teleworkers earn higher or lower wages is an empirical question. Early research on this topic by Oettinger (2011) focused on differences in pay for full-time wage and salary workers whose primary place of work was their home. Using the US Decennial Censuses and controlling for observable human capital, Oettinger finds workers earned substantially lower wages in 1980 and 1990 when they worked from home. However, by 2000, after a large increase in the prevalence of home-based work and significant advances in IT, which lowered employers' costs of providing a telework option, home-based workers earned about the same as on-site workers on average, while those working in sales and as engineers earned more than observationally equivalent on-site workers. Using data from the ACS and the US Census PUMS, White (2019) finds that by 2014, full-time home-based teleworkers earned a 5% wage premium on average. Consistent with a principal-agent model in which firms offer more performance-based pay to home-based workers than office workers because of the higher

costs of monitoring off-site workers, he also finds that the variance in wages for home-based teleworkers has declined relative to the variance in wages for on-site workers over time, which he attributes to a reduction in the costs of monitoring employees. Using the 2017–18 German Qualifications and Career Survey, Irlacher and Koch (2021) find teleworkers in Germany earn wage premium of more than 10%, even after controlling for an extensive set of individual and workplace characteristics.

Using linked employer–employee data from Statistics Canada’s Workplace and Employee Survey covering the years 1999 to 2005 and focusing on women, Fuller and Hirsch (2017) find that when women perform paid telework, the motherhood wage penalty declines by 3.7 percentage points, suggesting flexible work arrangements have positive productivity effects as they allow mothers to better balance work and family responsibilities; however, at the same time, doing some work from home increases the motherhood wage penalty for mothers with postgraduate degrees within establishments by 17 percentage points, suggesting that these women experience a stigma for working from home as they hold managerial and professional jobs where long hours of face time are highly valued (Goldin 2014).

Using the more recent 2017–18 ATUS-LV module and focusing on full-time workers in white-collar occupations, Pabilonia and Vernon (2021) document that teleworkers, regardless of the intensity of their working from home, earn higher average wages than their counterparts who work only in the office. After controlling for individual and job characteristics and correcting for bias from unobservables using an econometric technique popularized by Oster (2019), they find that male home-based teleworkers earn more than male office workers. In addition, fathers and women without children who worked occasionally from home earn higher wages than those who worked in the office. Mothers, however, do not earn a telework wage premium (regardless of the

frequency at which they telework), which is consistent with the story that mothers place a higher valuation on this job amenity.

6. Implications for gender equality

Recent literature in labor economics has documented that the gender wage gap is essentially a “child penalty” linked to the presence of children in the household as well as to gender norms around the division of unpaid labor in households with children (Kleven et al. 2019). Goldin (2014) points out that the motherhood wage gap is especially large for highly educated workers because some occupations, such as those in the corporate, financial, and legal worlds, value long and unpredictable hours. Mothers may consequently sort into occupations with lower earnings penalties for hours reductions.

The availability of flexible location arrangements for parents has the potential to ease the burden of combining work and child care and thus reduce the child penalty. Mothers can directly benefit through increased attachment to the labor force, which puts workers on a steeper wage trajectory. As a result of commuting less, mothers also may devote more time to paid work. Using a large household panel survey from the UK covering the years 2009 to 2014, Chung and van der Horst (2018) find suggestive evidence that new mothers in jobs with flextime and access to telework are more likely to remain employed and less likely to reduce their working hours following childbirth. In Japan, beginning in 2012, the government began promoting telework to counteract falling labor force participation rates, especially to encourage women and the elderly to work (Sato 2019).

Bonacini et al. (2021) warn that telework may exacerbate existing inequalities if an increase in the opportunity to telework continues to favor those who are male, older, more

educated, and better paid. However, fathers who telework also enjoy the time saved on commute, and they may increase their share of household production, which in the long run may lead to changing social norms around how household production is divided. The time-use findings discussed in section 3 suggest that fathers who telework do more child care, although the evidence is more mixed about how telework affects fathers' housework time.

Finally, the costs and benefits of telework depend on other labor market policies. Song and Gao (2020) stress that some government and/or employer policies could minimize work and family conflicts for parents who telework, including greater support for child care, care for aging parents, and increasing social networks or workspace within the home.

7. Implications for energy use, greenhouse gas emissions, and transportation infrastructure

An overall reduction in commuting because of an increase in teleworking may lead to positive societal benefits in terms of a reduction in greenhouse gases, particulate matter emissions, and travel congestion during the peak rush hour (Shabanpour et al. 2018; Stiles and Smart 2020).

O'Brien and Aliabadi (2020) review the empirical literature on whether telework results in less energy use and greenhouse gas emissions than centralized office working. They conclude that this problem is complex and that current datasets and methods are inadequate to answer this research question. While most studies show some benefits of teleworking, a few suggest it increases energy use—even in the transportation domain. A study by Kim (2017) using the 2006 Household Travel Survey in Korea warns that the reduction in commute time by household heads who telework is in part offset by an increase in travel by other household members.

Similarly, efforts aimed at reducing automobile emissions by encouraging organizations to implement telecommuting programs may be offset by an increase in household energy use.

A shift to 100% remote for a large share of workers may reshape cities. A reduction in the number of individuals commuting by automobile would lower the long-term transportation infrastructure costs and reduce the need for highway expansion because of reduced peak hour travel. Fewer commuters means lower demand for shops and restaurants in city centers and higher demand for those in the suburbs. Delventhal et al. (2021) identify the three most likely effects of a permanent increase in telework as a result of the COVID-19 pandemic: (1) jobs move to the city center, while residents move to the city periphery, (2) traffic congestion and travel times decline, (3) real estate prices fall on average, with declines in the city center and increases in the city periphery. Workers who can work remotely gain by saving on commute time and moving to cheaper neighborhoods, while on-site workers also gain because of shorter commute times, improved access to in-person jobs, and more affordable center-city housing options. Moving away from the city center to where real estate is more affordable can increase home ownership rates. However, telecommuters living in more remote locations may contribute to urban sprawl, leading to longer trips to the grocery store, restaurants, etc.

8. Summary

The ability to work from home regularly will probably remain a permanent feature of the work environment for many in the post-COVID era. Thus, understanding its full impact is more important than ever. In this chapter, we presented state-of-the-art findings about the benefits and costs of teleworking from the individual and organizational standpoint. This meta-analysis can be useful for firms wishing to implement better organizational practices and for public policy

makers setting incentives to improve outcomes for firms, workers, and families. The literature is mostly positive about the net benefits of remote work, especially for workers who choose to telework. With significant time savings because of not having to commute, workers can spend more time with family and children. In searching for the elusive work-life balance, most individuals and organizations have arrived at a hybrid solution that includes a combination of both occasional telework and face-to-face interactions on-site. Whether there is a crucial threshold for the optimal amount of time an individual should telework, beyond which there are diminishing returns, and how it varies with the tasks to be completed are open questions for further research.

The current literature on the implications of telework lacks robust analysis of the impact of telework on productivity and well-being. Most studies do not include a control group to assess the difference or may draw on small samples or case studies, and their findings may not apply to other companies. The causal link between key variables, such as productivity and the frequency of telework, is not clear. We still do not know whether work from home leads to high performance or whether it is high-performing firms that adopt telework.

From the researcher's standpoint, it would be useful to have sharper measures of the intensity of telework, such as the percentage of time a worker telecommutes per day or per week, or the hours the worker spent teleworking instead of a binary "home-based worker" indicator, such as is provided in the ACS. In surveys, the distinction between work at home during regular hours as part of an alternative workplace arrangement and work brought home to extend the workday could be made clearer so that excessive telework could be identified. Surveys should also ask about employers' formal and informal telework policies.

A number of potential benefits of telework are long term and have not been well studied yet. For example, does telework provide expanded work opportunities for disabled individuals, military spouses, rural workers, and the under-employed who are not working as many hours as they would like? Does remote work reduce discrimination, because virtual interaction changes the dynamics of employee meetings and reduces the influence of office politics? Will new performance management systems be adopted that reflect workers' marginal product rather than when, where, and how work is done? Will labor markets become more flexible, thus reducing the costs of recessions, because laid-off workers are no longer geographically constrained when looking for new positions? We still have much to learn about other potential societal benefits and costs of widespread telework when it comes to its impact on birth rates, health, crime, traffic accidents, business travel, and net energy use in the economy.

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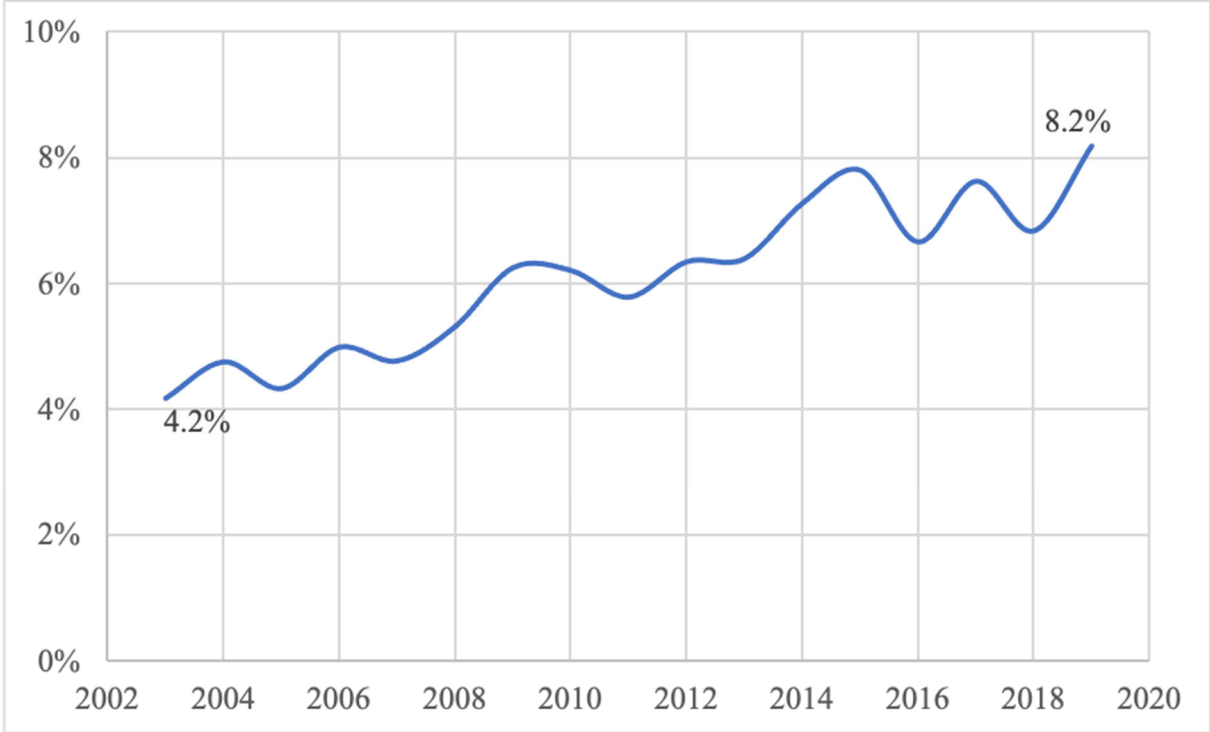
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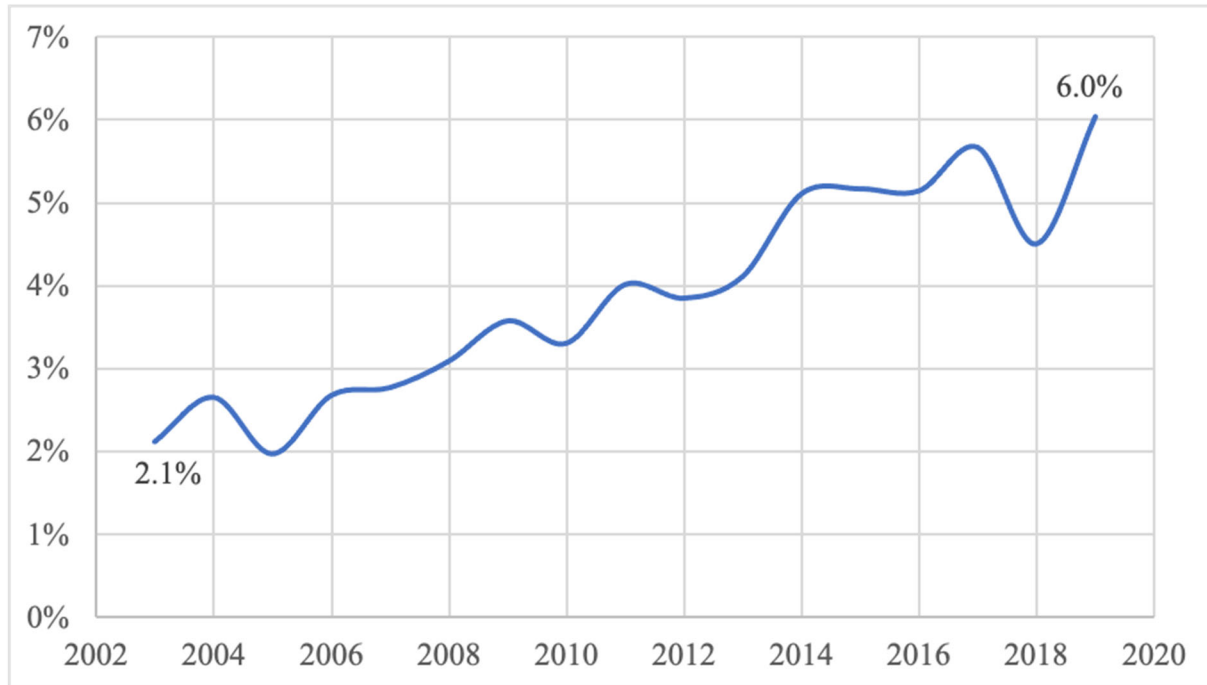
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Figure 1: Percentage of total work hours done at home



Note: Sample includes all wage and salary workers. Work does not include work-related travel.
Source: Author’s calculations based on the American Time Use Survey (Bureau of Labor Statistics 2020a)

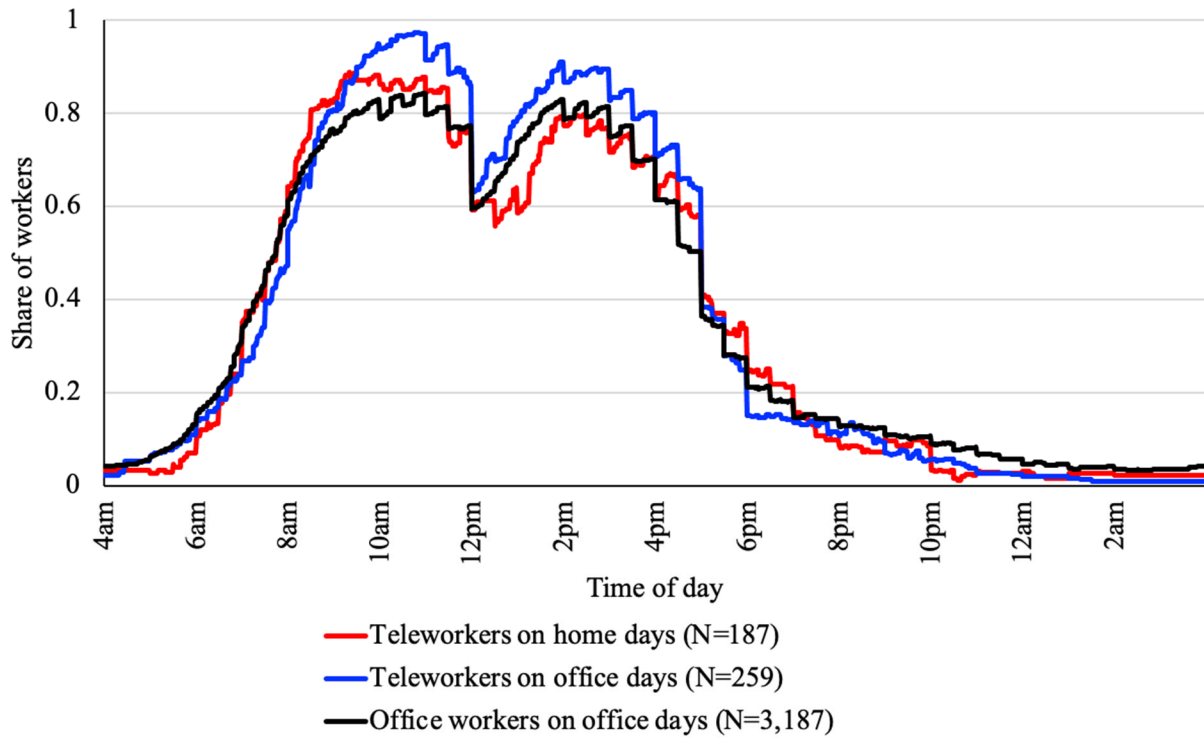
Figure 2. Percentage of weekday workdays worked exclusively from home



Note: Sample includes all wage and salary workers. Workdays are those with at least 4 hours of reported work time. Work does not include work-related travel.

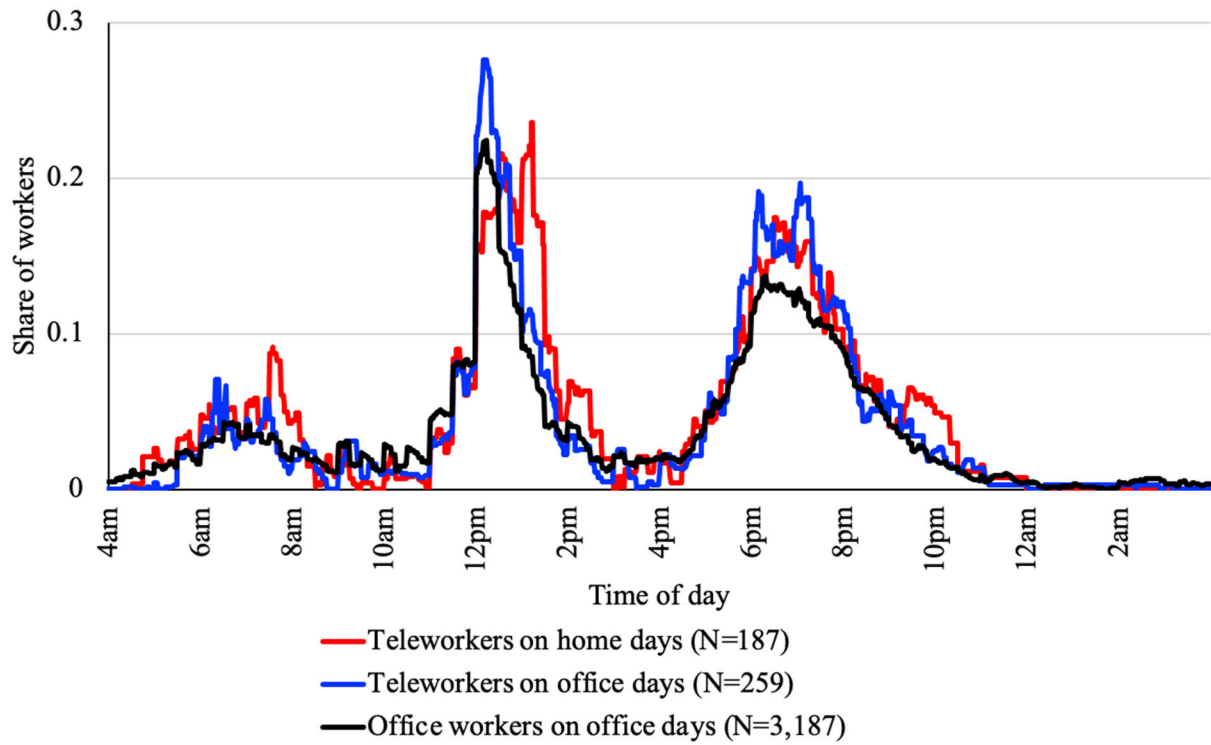
Source: Author's calculations based on the American Time Use Survey Workdays are those with at least 4 hours of reported work time.

Figure 3. Share of full-time wage and salary workers age 18–64 at work on weekday workdays



Source: Authors' calculations based on the 2017–18 American Time Use Survey Leave and Job Flexibilities Module (Bureau of Labor Statistics 2020b)

Figure 4. Share of full-time wage and salary workers age 18–64 eating on weekday workdays



Source: Authors' calculations based on the 2017–18 American Time Use Survey Leave and Job Flexibilities Module (Bureau of Labor Statistics 2020b)