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Time Use Before, During, and After the Pandemic

Before 2020, we increasingly worked from home, spent time alone, and shared child-care duties. COVID accelerated and reshaped these trends.

Enghin Atalay

Economic Advisor and Economist
FEDERAL RESERVE BANK OF PHILADELPHIA

The views expressed in this article are not necessarily those of the Federal Reserve.

A profound transformation is unfolding in how Americans spend their time. Traditional work, family, and societal arrangements—working 9 to 5 in an office, mothers assuming the bulk of child-care responsibilities, meeting with friends and family in person rather than virtually, and so on—are being reshaped and replaced. But exactly how large have these shifts been over the last two decades? Who have they impacted the most? And what are the broader implications of these trends?

To tackle these questions, I examine three major shifts in time use before, during, and after the COVID-19 pandemic. Specifically, I explore trends in the share of work hours spent at home, in time spent alone, and in time engaged in child care. I discuss the existing economic research, and I supplement those findings by analyzing a large nationally representative data set of Americans' time diaries, the American Time Use Survey (ATUS).¹ I have three main findings.

First, working from home was already increasing in the decades leading up to the pandemic. Then, during the first months of 2020, the fraction of work hours that took place at home more

than doubled. Although that fraction slowly drifted down thereafter, it stabilized at a level much higher than just before the pandemic. Both the beginning-of-sample extent of working from home and its 2003-to-2022 increase were greater for college-educated individuals.

Second, the share of time that people spend alone slowly increased in the decades before the pandemic, shot up in 2020, and then slowly declined to near prepandemic levels. In contrast to trends in working from home, the share of time spent alone increased more for individuals without a college degree.

Finally, between 2003 and 2019, parental responsibilities were becoming more evenly distributed between mothers and fathers, but only for college-educated parents. Beginning with the pandemic, time spent in secondary child care (that is, having children nearby while engaged in some other activity) increased considerably, especially for college-educated parents, and equally for mothers and fathers.

Understanding trends in time use—and how they differ across demographic groups—is critical for ongoing and important debates in economics and finance. The work-from-home (WFH) revolution has reshaped worker productivity and job satisfaction, real estate price trends, local-government budgets, and the geographical distribution of economic activity. Increases in time alone represent a profound challenge for public health. And, finally, the distribution of parental responsibilities is a key determinant of gender equality in the labor market.

Trends in time use depend on several background characteristics, but in this article I focus on education. Recent research argues that “the economy has increasingly come to serve some, but not all Americans.... [A] central division is between those who do and those who do not have a 4-year college degree.”²

These three trends in time use help us make sense of the growing divide between the educated and the less educated. The opportunity to work from home is uniquely (and recently) available to those with a college degree, and there is a large and growing education gap in the share of adults who are married.³ Both these disparities are relevant for trends in time spent alone and in time spent parenting.

Trends in Working from Home

Up to the mid-19th century, most Americans worked where they lived (primarily as self-employed farmers). This changed with the rise of industrial factories in the late 19th century and modern offices in the early 20th century.⁴ Throughout the 20th century, most Americans spent their work and nonwork hours in two distinct, separate locations. However, these long-running trends have reversed over the past two decades. The boundaries between work and home

are slowly disappearing, at least for some workers.

For each year in the ATUS sample, I computed the fraction of work hours that take place at home.⁵ I found that the share of work time that takes place at home increased steadily in the years preceding the pandemic, from 6 percent in 2003 to 10 percent in 2019 (Figure 1). But both the initial share and the size of the increase were greater for college-educated workers. For these workers, the share increased from 10 percent to 16 percent. For workers without a college degree, the share increased from just 5 percent to 6 percent.

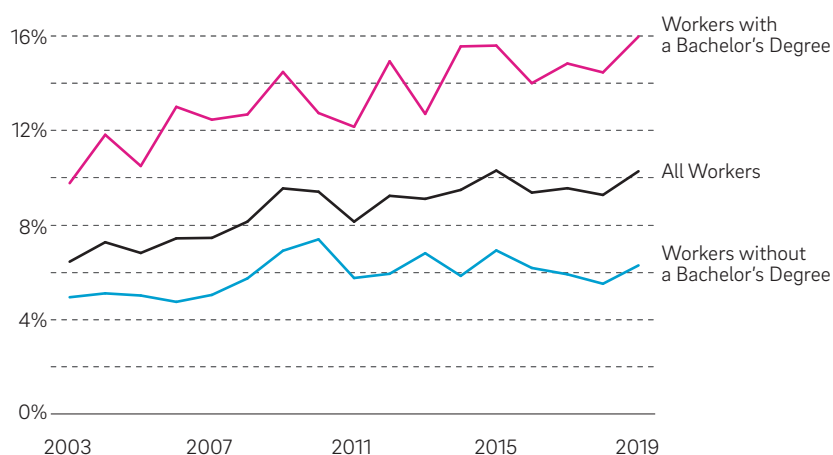
At the onset of the pandemic, the share of work hours spent at home dramatically increased as state and local governments restricted in-person activities and individuals avoided exposure to the coronavirus. Working from home peaked in the second quarter of 2020, when 54 percent of work hours were performed at home—74 percent for college-educated workers, 29 percent for everyone else (Figure 2). As the first wave of COVID-19 cases subsided, workers spent fewer work hours at home. By the end of 2020, 29

See **Data and Measurement.**

FIGURE 1

The Share of Work Time That Takes Place at Home Increased Steadily Before the Pandemic

Percent of work hours spent at home, 2003–2019



Data Source: American Time Use Survey

Note: The sample includes 75,115 adult ATUS survey respondents who reported at least some time working on the day about which they were surveyed.

percent of work hours were performed at home. This share declined further to 24 percent in the fourth quarter of 2021 and 22 percent in the fourth quarter of 2022. Although these numbers are much lower than during the peak of the pandemic, they're still double their prepandemic level.⁶

Why are workers increasingly working at home? Three factors stand out: First, there is a gradual shift in the types of occupations workers are employed in, away from production activities and toward business services.⁷ Second, even accounting for changes in the mix of occupations in which individuals work, advancements in information and communication technologies permit individuals to perform a wider range of tasks from home. Third, workers' and employers' attitudes toward working from home may have changed.

Although technological progress and the economy's occupational mix evolve slowly, attitudes can shift quickly. Faced with temporary health risks associated with COVID-19, workers and firms introduced new work arrange-

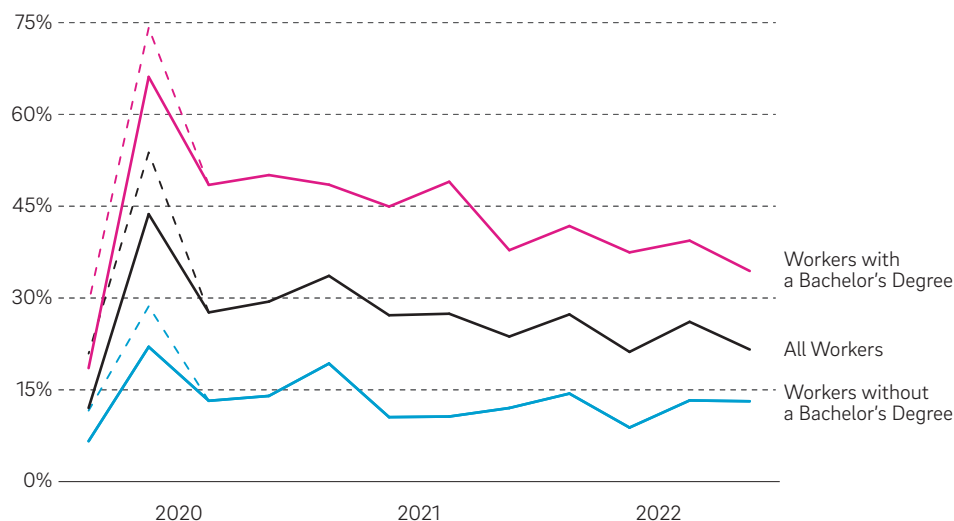
ments to facilitate working from home. Initial experiences during the first months of the pandemic improved workers' perceptions of working from home.⁸ Workers also gained experience using new communication technologies. And some workers moved further from traditional centers of employment, raising the commuting cost of returning to in-person work arrangements.⁹ In sum, the temporary shock of the pandemic

FIGURE 2

As COVID Hit, Working from Home Dramatically Increased

But even after the crisis subsided, hours worked from home was still double their prepandemic level.

Percent of work hours spent at home, 2020–2022



Data Sources: American Time Use Survey and the Google Mobility Trends Database

Note: The sample includes 8,597 adult ATUS survey respondents who reported at least some time working on the day about which they were surveyed. The ATUS survey was not collected between March 18 and May 9, 2020. For 2020Q1 and 2020Q2, the solid lines depict the sample averages for January 1 to March 17, 2020, and May 10 to June 30, 2020, respectively. The dashed lines present quarterly averages, imputing data from March 18 to May 9, 2020. For this period, I apply data from the Google Mobility Trends Database to estimate the share of hours worked from home. These estimates are given by the hollow triangles in Figure A1 of this article's appendix, which can be found at <https://www.philadelphiafed.org/the-economy/macroeconomics/time-use-before-during-and-after-the-pandemic#appendix>.

likely accelerated the pre-existing trend of increasing time spent working from home.¹⁰

Whether working from home continues as a trend will matter for labor markets, real estate markets, public finances, and the geography of economic activity. When it comes to the functioning of labor markets, hybrid and fully remote work arrangements improve workers' job satisfaction.¹¹ The impact on worker productivity, by contrast, is still highly uncertain, with different articles coming to opposing conclusions on whether working from home improves or hinders worker productivity.¹² Finally, shifts to fully remote work arrangements may reduce opportunities for mentoring and hinder career development.¹³

Second, the opportunity to work from home has allowed individuals to move away from the center of large metropolitan areas, and this has dramatically reshaped real estate markets. By one estimate, residential real estate prices increased 30 percent faster (between February 2020 and November 2022) in the exurbs of large metropolitan areas relative to city centers.¹⁴ Another study found significant declines in commercial rents in cities, especially in city centers, and especially in public-transit-oriented cities.¹⁵

Third, property taxes account for between 20 and 40 percent of a typical municipality's revenue,¹⁶ so the effect of working from home on real estate prices may persistently and substantially affect city budgets.

And, finally, working from home may reshuffle the distribution of economic activity

across geographies. In the decades before the pandemic, the largest U.S. cities were hubs of highly educated, high-income individuals working in professional, technical, and managerial occupations.¹⁷ Since 2020, many workers in these professional and technical occupations, now armed with the ability to work remotely, have fled big cities.¹⁸ This may lead to a long-run reduction in income inequality between the largest cities and the rest of the country.

Trends in Alone Time

Americans are increasingly isolated from their communities. The share of Americans reporting having three or fewer close friends nearly doubled—increasing from 27 percent to 49 percent—between 1990 and 2021,¹⁹ and the share of single-person households more than doubled—increasing from 13 percent to 29 percent—between 1960 and 2022.²⁰ In his influential 2000 book, *Bowling Alone*, political scientist Robert D. Putnam chronicled Americans' declining tendency to form connections either formally (for example, through civic, religious, or volunteer organizations) or informally (for example, by visiting friends' homes).

There is an additional measure of social isolation: the share of time that Americans spend alone (Figure 3). ATUS participants describe who they were with for most activities within their time diary.²¹ For activities eligible for measurement, I computed the share of this time that respondents spent alone.

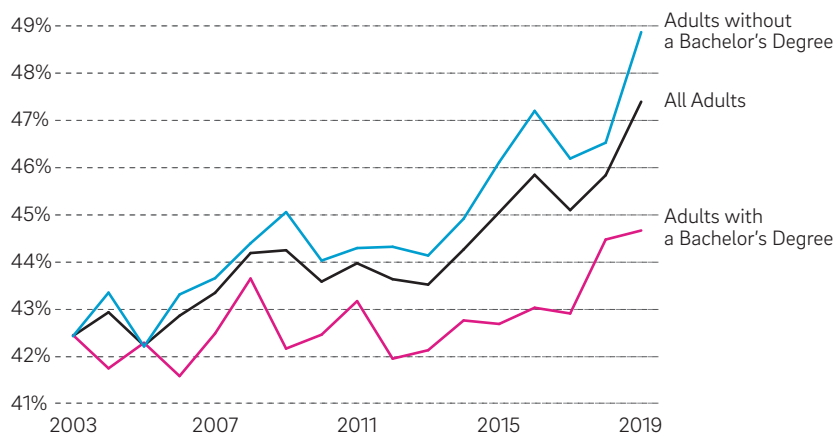
In 2003, Americans spent approximately 42 percent of their time eligible for measurement (4 hours 47 minutes out of a total 11 hours 16 minutes of time eligible for measurement) alone. In 2003, the share of alone time was similar across different educational groups, but between 2003 and 2019, alone time increased much faster for people without a college degree: by 7 percentage points, compared to less than 3 percentage points for those with a college degree and 5 percentage points for the entire population.

Alone time spiked in 2020, peaking in the fourth quarter, which coincided with the pandemic's second wave (Figure 4). During this quarter, Americans spent

FIGURE 3

Alone Time Has Increased Considerably Since 2003

And these increases were much greater for people without a college degree. The share of eligible time when the survey respondent was alone, 2003–2019



Data Source: American Time Use Survey

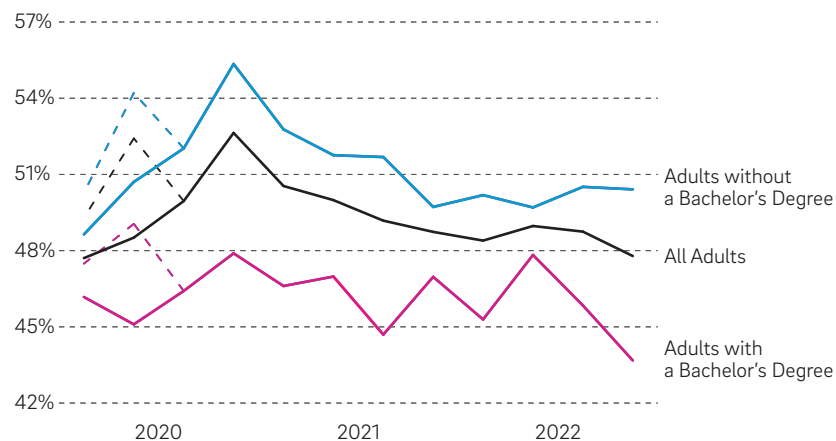
Note: Eligible time includes all activities except for work; sleep; washing, dressing, or grooming oneself; and other private/personal activities. The sample includes 201,834 adult ATUS survey respondents who reported at least some time in eligible activities

FIGURE 4

Alone Time Peaked in the Fourth Quarter of 2020, Coinciding with the Pandemic's Second Wave

By the end of 2022, time alone for most adults had stabilized marginally higher than directly before the pandemic.

The share of eligible time when the survey respondent was alone, 2020–2022



Data Sources: American Time Use Survey and the Google Mobility Trends Database

Note: Eligible time includes all activities except for work; sleep; washing, dressing, or grooming oneself; and other private/personal activities. The sample includes 25,357 adult ATUS survey respondents who report at least some time in eligible activities. The dashed lines present quarterly averages, imputing data from March 18 to May 9, 2020. For this period, I apply data from the Google Mobility Trends Database to estimate the share of eligible time that is spent alone. These estimates are given by the hollow triangles in Figure A2 of this article's appendix, which can be found at <https://www.philadelphiafed.org/the-economy/macroeconomics/time-use-before-during-and-after-the-pandemic#appendix>.

roughly 53 percent of their time alone. This was 5 percentage points—35 minutes per day—higher than in 2019. This increase had mostly reversed by the end of 2021. By the end of 2022, time alone had stabilized at 48 percent—1 percentage point higher than before the pandemic.²²

These trends may reflect a shift in the composition of the American population. Older people spend more of their time alone, as do unmarried people. Changes in the shares of Americans who are older or unmarried explain about one-third of the overall increase in alone time.²³

But even accounting for changes in composition, Americans are spending considerably more time alone than ever before. In a recent paper, I explore some of the reasons behind and implications of this increasing trend toward solitude.²⁴ Americans are spending significantly less time out of the house and with people from households other than their own. (Time spent with people from one's own household has been constant since 2003.) Part of the increase in time alone can also be explained by virtual socialization: playing video games online and, to a lesser extent, engaging with social media.²⁵ In addition, Americans are spending significantly more time watching television, and a greater share of their TV time is spent alone.²⁶

For some people and in some contexts, spending a greater share of time alone may improve well-being. Certain relationships—an unhappy or abusive romantic relationship, for example—can be harmful for one's emotional and physical well-being. A less-extreme example: Some people find mundane social situations a source of anxiety and stress.

However, on average, greater time alone is associated with a decrease in emotional well-being and life satisfaction. The 2010, 2012, and 2013 editions of the ATUS asked about how respondents felt—how happy, sad, stressed, in pain, or tired—during three randomly chosen activities within their time diary as well as their overall life satisfaction. On average, survey respondents who spent a greater share of their time alone reported lower life satisfaction. And activities that are performed alone were rated as less enjoyable.

Consistent with these patterns from the ATUS, in May of this year the U.S. Surgeon General warned, “Across many measures, Americans appear to be becoming less socially connected over time.”²⁷ Summarizing research from epidemiology, public health, and psychology, the Surgeon General suggested that social isolation may increase the risk of cognitive decline in older adults,²⁸ depression,²⁹ and heart disease and stroke.³⁰ All in all, increases in time spent alone likely represent a deterioration in individuals' living standards and an intensifying public health risk.

FIGURE 5

From 2004 to 2019, Primary Child-Care Time Was More Evenly Distributed Between Mothers and Fathers

Since 2019, time in secondary child care has shot up, especially for college-educated parents.

(Top) Hours per week spent in primary child care, mothers and fathers, by education level, 2004–2022

(Bottom) Hours per week spent in secondary child care, mothers and fathers, by education level, 2004–2022



Data Source: American Time Use Survey

Note: Figure 5 (top) presents the average number of hours per week that parents spent in primary child care: caring for and helping household children; activities related to household children's education; activities related to household children's health; and travel related to children's care, education, or health. Figure 5 (bottom) presents the average number of hours per week that parents spent in secondary child care. Secondary child care includes time with one's own children (under the age of 13), excluding primary child care activities. The sample includes 74,309 parents—30,802 fathers and 43,507 mothers—who were surveyed as part of the ATUS between 2004 and 2022 and who had at least one child under 18 years old in their household.

Trends in Child-Care Time

As the 20th century drew to a close, parents—and especially fathers—were spending more time caring for children. The amount of time men spent in child care more than doubled between 1965 and 2003, from 1.4 to 3.2 hours per week. For women, child care increased by about 30 percent, from 5.6 to 7.5 hours per week.³¹ Among all parents, increases in child-care time were larger for parents with more education.³²

How have things changed since 2003? To answer this question, I consider two separate categories of child care. First, primary child care encompasses time parents are actively engaged in child care: caring for and helping household children; activities related to household children's education; activities related to household children's health; and travel related to children's care, education, or health.

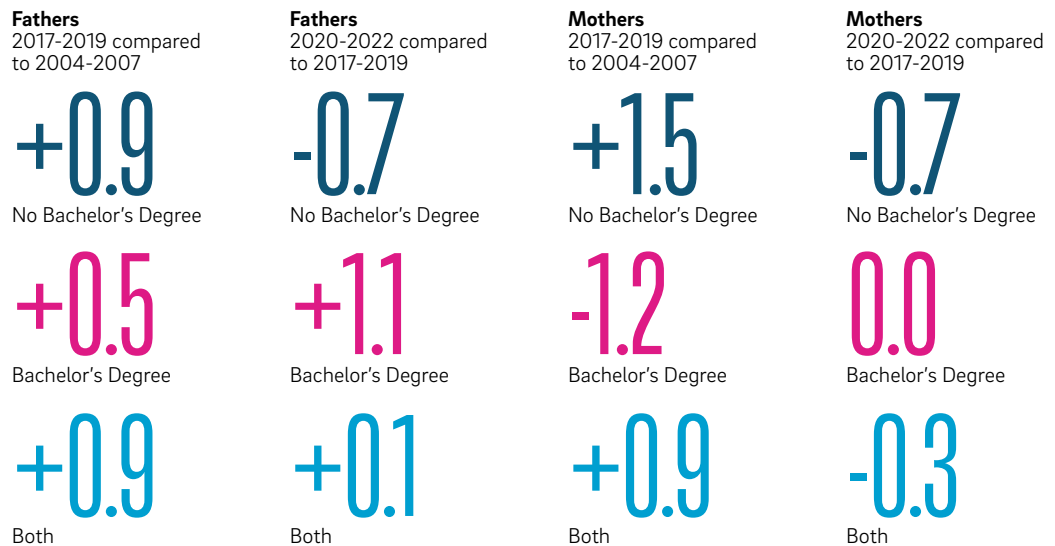
From 2004 to the pandemic, time spent in primary child care increased by nearly one hour per week: from 6.7 to 7.6 hours for fathers and 13.5 to 14.4 for mothers (top half of Figure 5).³³ During the pandemic, there was little overall change in how much time mothers and fathers spent on primary child care.

However, there are important differences across parents' educational backgrounds. Among parents with a college degree, the gap in child-care responsibilities narrowed considerably from 2004 to 2019: Mothers spent 1.2 fewer hours per week in primary child care (a decline from 16.5 to 15.3 hours per week), whereas fathers spent 0.5 hour per week more. As a result, the gap between college-educated mothers and fathers closed by

FIGURE 6

Parents Without a College Degree Spent Less Time in Primary Child Care During COVID, a Reversal of Pre-COVID Trends

Change in number of hours per week spent in primary child care, fathers and mothers, with and without a degree, from average for 2004-2007 to average for 2017-2019, and from average for 2017-2019 to average for 2020-2022.

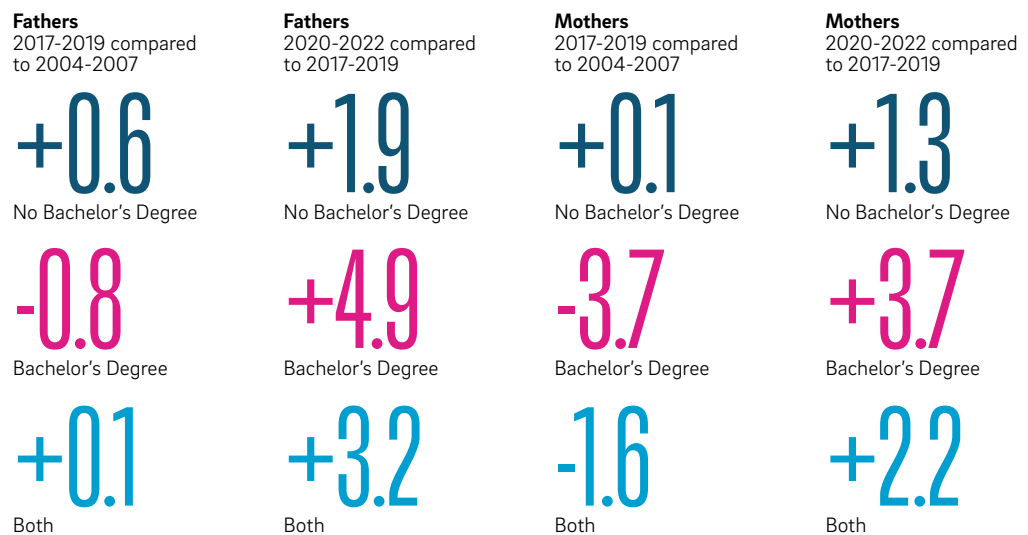


Data Source: American Time Use Survey

FIGURE 7

Parents with a College Degree Spent Many More Hours in Secondary Child Care During COVID, a Reversal of Pre-COVID Trends

Change in number of hours per week spent in secondary child care, fathers and mothers, with and without a degree, from average for 2004-2007 to average for 2017-2019, and from average for 2017-2019 to average for 2020-2022.



Data Source: American Time Use Survey

about 1.6 hours per week (nearly 20 percent of the beginning-of-the-sample gap). In contrast, time spent with children increased for both fathers and mothers without a college degree, but the gap in responsibilities did not shrink.

Secondary child care includes time spent in activities other than primary child care but with one's own child (under the age of 13) in the parent's presence. This alternate set of activities includes, for example, a parent working from home but with their child nearby (bottom half of Figure 5).

Three results stand out: First, parents spend substantially more time engaged in secondary than primary child care. As of 2004, parents spent roughly 32 hours per week—25 hours for fathers, 38 for mothers—in secondary child care, compared to 10 hours per week on primary child care. Second, in the years leading up to the pandemic, the gap between mothers and fathers shrank. Finally, during and after the pandemic, time with children shot up, especially for college-educated parents, who spent an additional 4.3 hours per week in secondary child care in 2020–2022 relative to 2017–2019. The increase for parents without a college degree was only 1.4 hours per week.

Two factors explain this large increase. First, especially during the first year and a half of the pandemic, the closure of schools and child-care centers increased demands on parents' time.³⁴ Second, the availability of WFH arrangements allowed parents to work while supervising their children.³⁵ College-educated workers are more likely to have jobs that can be done from home, and it is largely for this reason that the time they spent in secondary child care increased especially quickly during the pandemic.

To the extent that child-care responsibilities are shared more evenly over time, gaps between men's and women's experiences in the job market may also narrow.³⁶ The unequal distribution of child-care responsibilities between mothers and fathers is a key factor behind the "motherhood penalty": The earnings of mothers, but not fathers, fall around the birth of their first child, with little recovery over time. A recent article estimates that the motherhood penalty is as high as 30 percent and concludes that most of the inequality between men's and women's labor market experiences can be traced to differing child-care responsibilities.³⁷

Conclusion

Over the last 20 years, we have changed how we spend our time. We spend more hours working from home. We are more often alone. And we share parenting responsibilities (slightly) more equitably. The COVID-19 pandemic accelerated trends in where we work and how much time we spend with other people. It also led to an increase in the amount of time we spend supervising our children while working. These trends differ according to education: College graduates had larger increases in working from home, smaller increases in time spent alone, and an increasingly equal division of child-care responsibilities between mothers and fathers.

Time may be our most precious resource. How we allocate our time—whether at home or in the office; alone or with others; in leisure activities, caring for our children, or working for our employer—shapes our life satisfaction, gender differences in the labor market, the state of city centers, macroeconomic productivity, and countless other economic phenomena. We need to pay close attention to changes in how we spend our time if we are to address issues of pervasive inequality, vulnerable city finances, and increasing social isolation. And by accelerating so many of these time-use changes, COVID-19 has presented us with a unique opportunity to think critically about how we want to spend our time. ■

Data and Measurement

This article draws on two main data sources: the ATUS and the Google Mobility Trends database.

The ATUS has been conducted by the Bureau of Labor Statistics (BLS) since 2003.³⁸ Roughly 10,000 adults participate each year. Survey participants are asked to provide a detailed time diary of the previous day. For this 24-hour period, they describe, minute by minute, the activities they were pursuing, whom (if anyone) they were with, and where they were. In addition, the ATUS contains rich detail on the demographics of the survey respondents: their location; their race and ethnicity; their level of education; the number of children and other adults in their household; and a variety of other measures.

However, the BLS was unable to retrieve ATUS time diaries between March 18 and May 9, 2020. Lack of data from this eight-week period is problematic, as working from home and social isolation likely spiked during this initial stage of the pandemic. If I were to omit the weeks during which data were missing, I might understate the increase of working from home and time alone during the first half of 2020. In this article's Appendix, which can be found at <https://www.philadelphiafed.org/the-economy/macroeconomics/time-use-before-during-and-after-the-pandemic#appendix>, I discuss how I used the Google Mobility Trends Database to fill in this missing data.

Notes

1 Although this article focuses on the U.S., time use patterns in other developed economies are broadly like those here. As in the U.S., in other countries the prevalence and attractiveness of remote work increased in the first years of the pandemic (Aksoy et al., 2022). Also as in the U.S., mothers spend significantly more time on child care than fathers; the gap in child-care responsibilities between mothers and fathers has been shrinking over time; and highly educated parents spend relatively more time on child care compared to less educated parents (Dotti Sani and Treas, 2016). Although there are differences between the U.S. and other countries, too—for example, some evidence suggests that the postpandemic "return to the office" movement is stronger in other countries—many of this article's conclusions likely pertain more broadly.

2 The quote is from Case and Deaton (2022), p. 2. Valletta (2018) and Autor, Dube, and McGrew (2023) document that the gap in incomes between workers with a college degree and those without has stayed relatively constant since 2003. But money isn't everything. Case and Deaton (2022) argue that less educated individuals are at a higher risk from "deaths of despair": accidental drug overdoses, alcoholic liver disease, and suicide.

3 According to the American Community Survey, 69 percent of people aged 25-64 with a college degree were married in 2003. For those without a college degree, the share who were married was 6 percentage points lower, at 63 percent. By 2021, this gap had doubled to 12 percentage points.

4 See Davies and Frink (2014).

5 In this calculation, "home" refers to the survey respondent's own home but not someone else's home. (The results would not be much different if we included time spent in others' homes.) Work activities include those beginning with "0501," using the code list published at https://www.atusdata.org/atus-action/variables/activity#codes_section.

6 Other researchers and surveys find similar results. For instance, the Survey of Working Arrangements and Attitudes (SWAA) collects a wide variety of measures relating to working from home. The fraction of workdays spent at home fell from 61 percent to 29 percent between the SWAA's first edition in May 2020 and the end-of-2022 edition. For more on the SWAA, see Barrero, Bloom, and Davis (2023).

7 Approximately one-tenth of the overall change in working from home is due to the shift in occupations over time. To arrive at this result, I estimate a regression with individuals' WFH shares as the dependent variable, and year fixed effects and detailed-occupation fixed effects as the explanatory variables. This regression suggests that—holding fixed the composition of occupations—WFH shares would have risen by 16.0 percentage points between 2003 and 2022. This is 90 percent of the observed 17.6 percentage point increase in WFH shares over this period.

8 As reported by Barrero, Bloom, and Davis (2023).

9 See Ramani and Bloom (2022).

10 This finding is consistent with the analysis of Bick, Blandin, and Mertens (2022).

11 See Bloom, Han, and Liang (2022).

12 Bloom, Liang, Roberts, and Ying (2015) study the introduction of working from home in the call center of a Chinese travel agency, finding that it led to an increase in productivity. However, more recent research has documented productivity declines in firms adopting remote-only work arrangements. See Emanuel and Harrington (2023).

13 See Bloom, Han, and Liang (2022).

14 See Ramani and Bloom (2022).

15 See Rosenthal, Strange, and Urrego (2022).

16 See Van Nieuwerburgh (2023).

17 See Autor (2019).

18 See Althoff, Eckert, Ganapati, and Walsh (2022).

19 See Cox (2021).

20 See U.S. Census Bureau (2022).

21 Participants were not asked who they were with while sleeping; washing, dressing, or grooming themselves; or during other private and personal activities. Only beginning in 2010 were participants asked who they were with while working.

22 Frazis (2023) finds that time spent alone while working increased considerably during the initial year of the pandemic, primarily for college-educated workers. The increase in time spent alone while working reflects an increase in working from home as well as an increase in working alone while at

one's workplace. When pursuing nonwork activities, survey respondents report lower emotional well-being while alone than when with others. This is not the case with work activities. This distinction between work activities and other eligible activities is a second reason, in addition to the lack of data before 2010, why I exclude work activities when computing trends in alone time.

23 Compared to those who are married and younger than 50, the alone time share is 17 percentage points higher for those who are unmarried and younger than 50, 11 percentage points higher for those who are married and 50 years or older, and 39 percentage points higher for those who are unmarried and 50 or older. In a regression-based exercise, I estimate how much alone time would have increased between 2003 and 2022 if the fractions of adults who are young and/or married were the same as in 2003. Instead of increasing by 6.2 percentage points, as we observed, the share of alone time would have increased by 4.0 percentage points. Thus, shifts in marital status and age explain roughly one-third ($\approx 2.2/6.2$) of the change in alone time shares.

24 See Atalay (2023).

25 The ATUS defines aloneness based on whether one is in the physical presence of another person that the survey respondent knows. So, one can chat via social media or play video games online with friends while still being classified as alone. Whether these activities should be counted as alone time is a hotly debated topic. Although digital interactions provide social support in certain contexts, the predominant view is less sanguine, with depression and loneliness linked to greater social media use. See, for example, Lin et al. (2016) and Twenge, Spitzberg, and Campbell (2019). Moreover, according to the emotional well-being questions described in this article, for computer, e-mail, or gaming (which includes online gaming) activities, ATUS respondents reported being happier if they were in the physical presence of others. So, physical presence matters in and of itself when one is engaged in digital activities.

26 In 2003, Americans spent 1 hour 12 minutes per day alone watching TV, and 8 minutes per day alone pursuing virtual activities (on e-mail, on one's phone, and playing games). By 2022, these numbers increased to, respectively, 1 hour 26 minutes and 19 minutes.

27 Office of the U.S. Surgeon General (2023), p. 12.

28 See Lazzari and Rabottini (2021).

29 See Mann et al. (2022).

30 See Valtorta et al. (2016).

31 See Aguiar and Hurst (2007), who compared time-use diaries from the 1960s to the early 2000s.

32 See Ramey and Ramey (2010).

33 The sample in Figure 5 includes both married and unmarried parents. Nearly 90 percent of parents with a bachelor's degree and 72 percent of parents without a bachelor's are married. The changes depicted in Figure 5 would look similar if one were to focus solely on married parents.

34 During the initial stage of the pandemic, in the final months of the 2019–2020 school year, nearly "90 percent of US school-age children were in school only remotely and most child-care facilities were shuttered" (Goldin, 2022, p. 84; see also Andrew et al., 2020). Simultaneously, in a sample of school districts studied by Jack, Halloran, Okun, and Oster (2023), 35.4 percent of school days were in-person; 41.2 percent were hybrid, where schooling was in-person for only part of the school week; and 20.9 percent were online only. And school closures led parents to increase the amount of time they were working while also engaged in secondary child care (Atalay, Kobler, and Michaels, forthcoming).

35 Per Pabilonia and Vernon (2023), who used the ATUS to compare days when parents are working from home with days when they are not.

36 Measuring parents' time spent in child care should also be relevant for understanding children's development and well-being. But when they summarized the literature as of 2008, Guryan, Hurst, and Kearney found that "the empirical evidence on the relationship between parental time investment and children's outcomes is only moderately convincing" (2008), p. 38.

37 See Kleven et al. (2019).

38 See Hofferth, Flood, and Sobek (2020).

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Time Use Before, During, and After the Pandemic

Appendix: Using the Google Mobility Trends Database to Fill in Missing ATUS Data **Enghin Atalay**

The views expressed in this appendix are those of the author and do not necessarily represent the views of the Federal Reserve System or the Federal Reserve Bank of Philadelphia.

This appendix discusses my attempts at using cellphone data from the Google Mobility Trends database to estimate time use from March 18 to May 9, 2020, during which the American Time Use Survey (ATUS) was not collected.

The Google Mobility Trends data set tracks certain cellphone users' time spent in various locations: parks, transit stations, retail and recreation establishments, grocery stores and pharmacies, workplaces, and residential locations.¹

When Google Mobility Trends and ATUS data are available, there is a tight correspondence between their measures of time use.

The left panel of Figure A1 presents the relationship between weekly time spent at home (according to the Google Mobility Trends data set) and the fraction of work time that takes place at home (according to the ATUS) for college-educated individuals.² As one might expect, there is a strong relationship between these two variables.³

In the solid orange line, I plot the (quadratic) curve that best fits the dates plotted in the scatterplot. Using this line, I get a rough sense of what the ATUS would have recorded as the share of time that college-educated workers worked from home between March 27 and May 8,

¹ The database is based on cellphone users who have opted to turn on their location tracking.

² The Google Mobility Trends data display extremely large fluctuations around holidays. In producing weekly averages of cellphone traffic data for Figures A1 and A2, I drop data from the 4th of July, Thanksgiving, Christmas Eve, and Christmas.

³ Directly before the lockdowns, in February 2020, cellphone users spent similar amounts of time at home relative to the baseline period of January 3 to February 6, 2020. In these weeks, approximately 14 percent of college-educated workers' hours were performed at home. In contrast, in the week ending May 15, 2020, 84 percent of work hours took place at home, according to the ATUS. Google cellphone traffic in residences was up 14 percent relative to the baseline period.

2020. For example, given that the Google Mobility Trends database reports a 15 percent increase (relative to Google’s prepandemic baseline period) in time spent at home for the week of May 8, the relationship depicted in the orange curve suggests a 76 percent work-from-home (WFH) share for college-educated workers for that week. I follow the same method to fill in values for WFH time for college-educated workers for the remaining weeks during which the ATUS survey was not collected.

The right panel of Figure A1 depicts a similar relationship between cellphone time in residential locations and WFH shares for workers without a college degree. Workers without a college degree spent a smaller fraction of their work hours at home. However, as was observed in the left panel, there’s a positive relationship between the ATUS’ measures of hours worked from home and Google’s cellphone measures of time spent at home.

I follow a similar approach to impute the share of time that individuals spent alone from March 18 to May 9. I find that — among the measures in the Google Mobility Trends data set — cellphone time spent in groceries and pharmacies is most closely related to time spent alone in the ATUS. Figure A2 depicts the relationship between time in groceries and pharmacies and ATUS measures of time spent alone. The negative relationship between the two measures reflects the influence of governmental and private efforts to prevent the spread of the coronavirus. In the earliest stage of the pandemic (late February and early March 2020) individuals’ time diaries and cellphone activity indicated less social isolation; the opposite is true toward the end of 2020 (during the pandemic’s second wave). Using the estimated relationship between the two measures of social isolation, I estimate that — during the weeks that ATUS data collection was interrupted — roughly 54 percent of college-educated individuals’ time was spent alone, with a somewhat higher share (59 percent) for individuals without a college degree.

I use these predicted values to describe trends in working from home (main article, Figure 2) and time spent alone (main article, Figure 4) during the pandemic period.

[DATA DEFINITION:] Work-from-home time in the ATUS and residential time in Google Mobility Trends, people with a college degree and people without a college degree, 2020

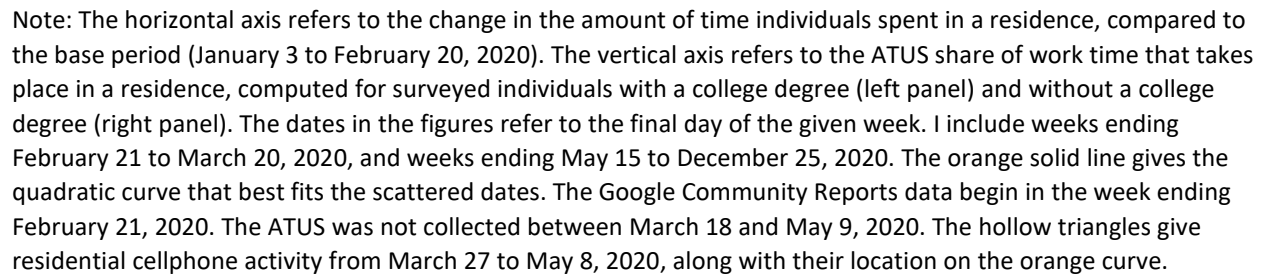
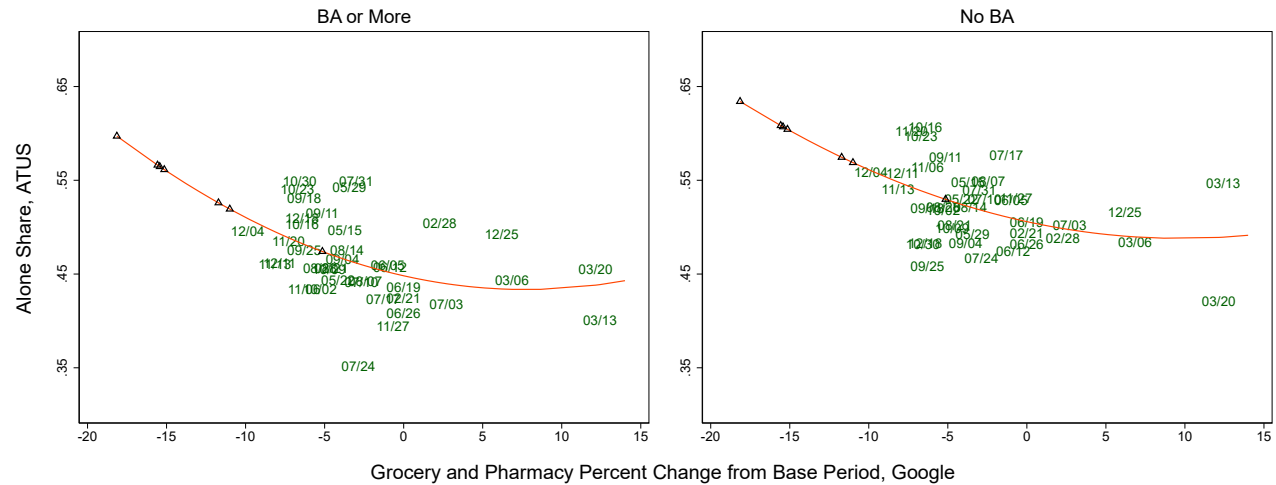


FIGURE A2

[TITLE:] Very Early in the Pandemic, There Was Less Social Isolation

[SUBTITLE:] The opposite is true during the pandemic's second wave.

[DATA DEFINITION:] Alone time in the ATUS and grocery and pharmacy time in Google Mobility Trends, people with a college degree and people without a college degree, 2020



Data Source: ATUS and Google Mobility Trends

Note: The horizontal axis refers to the change in the amount of time individuals spent in a grocery store or a pharmacy, compared to the base period (January 3 to February 20, 2020). The vertical axis refers to the ATUS share of eligible time that took place alone, computed for surveyed individuals with a college degree (left panel) and without a college degree (right panel). The dates in the figures refer to the final day of the given week. I include the weeks ending February 21 to March 20, 2020, and the weeks ending May 15 to December 25, 2020. The orange solid line gives the quadratic curve that best fits the scattered dates. The Google Community Reports data begin in the week ending February 21, 2020. The ATUS was not collected from March 18 to May 9, 2020. The hollow triangles give grocery and pharmacy cellphone activity for the weeks between March 27 and May 8, 2020, along with their location on the orange curve.