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ORIGINAL PAPER

Unpaid Care to Older Persons and Tradeoffs in Time Use: The Experience of Working-Age Women and Men in the US

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Abstract
The need to better understand the nature of work related to unpaid caregiving to older persons and its effect on the caregivers has become a pressing issue given the worldwide trend toward population aging. This study focuses on those who frequently provide this type of unpaid care in the US. Using pooled 2011–19 American Time Use Survey data for individuals aged 25–61-years old and a correlated system of regressions, we examine the gendered time allocation pattern of those who frequently provide care to older persons. We find that female caregivers spend less time on market work compared to male caregivers. Our results also suggest that frequent caregiving is associated with more time spent on domestic and care work and less time on market work and self-care. On days when they don't perform or just do little care work, frequent caregivers tend to spend long hours performing market work and reduce their time on domestic chores, care work, and leisure. Sensitivity checks confirm these findings.

Keywords Aging · Care · Unpaid work · Time use · United States

JEL Classification J14 · J16 · J22

Introduction

In many countries, including the United States, families continue to be the main caregivers for aging members. Yet, despite the increasing recognition of the importance of unpaid care on the older person's well-being, it remains inadequately understood and measured (Schulz & Eden, 2016). The diversity of patterns, frequency, and tasks associated with informal caregiving to older persons pose challenges in capturing the range of its activities. An assessment of how unpaid caregivers of older persons organize their daily life can provide a better understanding of how this economic activity affects these unpaid caregivers' living standards and well-being.

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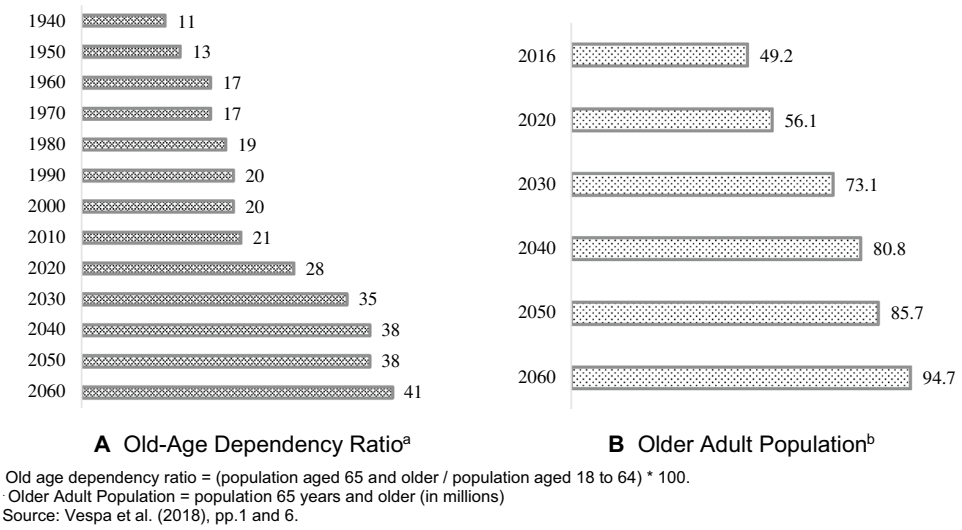
Care of older persons has become an urgent issue, given the increase in life expectancies. Figure 1 shows that in the US, the number of people aged 65 and older is expected to increase from 56.1 million in 2020 to 73.1 million in 2030 and 85.7 million in 2050. At the same time, the old-age dependency ratio, which has increased from 19 to 28% between 1980 and 2020, is expected to rise to 35% in 2030.

To cope with the increasing proportion of the aging population that will live with disabilities and mental health issues, many high-income countries have introduced public insurance systems such as Long-Term Care Insurance (LTCI). In South Korea, the government introduced universal Long-term Care Insurance (LTCI) in 2007, socializing much of the care for older persons through a compulsory, national social insurance scheme (Peng & Yeadle, 2017). The LTCI is supplemented by voucher programs that support those who are not eligible for long-term care insurance services but need care services. Many European countries have adopted a socialized LTCI system (Peng & Yeadle, 2017). In Germany, this is financed through pay-as-you-go insurance premiums payable into LTCI funds, which is accompanied by private insurance (for higher earners) and state welfare funds (for those with fewer resources). In Sweden, care for



Old age dependency ratio = (population aged 65 and older / population aged 18 to 64) * 100.
Older Adult Population = population 65 years and older (in millions)
Source: Vespa et al. (2018), pp.1 and 6.

Fig. 1 Projections of the old-age dependency ratio and older adult population in the US

older persons is extensive and based on universal rights; that is, it is based on citizenship rather than on income or previous labor market participation. LTCI in Finland is provided and primarily financed through its municipalities, which have significant tax-raising powers; the strong social contract between the government and its people has created social attitudes that favor the support for and use of public care services. The US and Southern European countries such as Spain and Italy follow a different care system for older persons from the East Asian and Northern European models. Gálvez-Muñoz et al. (2011) reveal the distinctiveness of the Mediterranean and U.S. models, which are characterized by the existence of strong ''familialism'' and weak institutional support to families caring for older persons. About 54% and 60% of older individuals residing in the US and Southern European countries (Spain and Italy), respectively, are dependent on informal care (Barczyk & Kredler, 2019). Public spending on long-term care in the US is the lowest among the OECD countries, accounting for only 0.5% of GDP in 2015, compared to 0.8% in Southern Europe and 3% in Northern Europe (ibid).

Recent concern with informal care for older persons in the US has been prompted by a growing interest in the connection between unpaid care and labor supply. If a growing number of working-age individuals are spending more time caring for older persons, does labor force participation decline? Several studies provide a mixed picture. Johnson and Sasso (2006), and Van Houtven et al. (2013) find that providing unpaid care to older persons reduces the paid working hours of the caregivers, but Butrica and Karamcheva (2015) find no effect.[1]

This ambiguous finding may be due to differences in the focus, sampling, and methodologies, as well as variation in the level and intensity of unpaid caregiving to older persons, which make its estimation challenging. Eldercare can be given infrequently, say a few times a year or once a month, or on a daily (or near-daily) basis by a relative or neighbor. It may involve only emotional support, for example, talking, listening, and providing companionship and/or basic support, for example, dressing, feeding, giving bath, etc.

Existing studies on unpaid caregiving to older persons do not provide information on adjustments in time allocation that a care provider undertakes since many use special surveys such as the Health and Retirement Surveys (HRS), whereby respondents are asked about the total time spent on helping the older person(s) for a given reference period only (Arora & Wolf, 2014). Hence these studies are unable to examine whether caring for older person(s) leads to less time for market work, leisure, and self-care activities. Others, such as Lam and Garcia-Roman (2017) and Hammersmith and Lin (2019), use the American Time Use Survey (ATUS) to examine the relationship between caregiving to older individuals and time spent on paid work, leisure, social activities/sports, and household work. However, none of these studies take into account the level of frequency in caregiving, which affects time allocation patterns among caregivers. Additionally, these studies do not investigate the gender differences in time allocation among caregivers providing care to older persons nor take into consideration the

[1] Studies outside the US also have mixed results. Leigh (2010) and Nguyen and Connelly (2014) studies on Australian working-age population, and Vangen (2021) and Crespo and Mira (2014) studies on European population find a negative effect of eldercare on labor force participation. On the other hand, Schneider et al. (2013) (on working population in Austria) and Meng (2013) (on persons aged 36–63 in Germany) find that eldercare has no effect on labor force participation.

simultaneous adjustments in time spent on various activities when care is provided.

This paper builds on the existing research on caring for older persons in the US by examining the gendered time allocation pattern of working-age caregivers and non-caregivers using the 2011–19 ATUS data. More specifically, it answers the following question: how do working-aged women and men manage their time across various activities when they provide care to older persons on a frequent basis, as compared to non-caregivers? This segment of the population is likely to face tensions in attaining work-life balance and severe time constraints in performing market work alongside care responsibilities.

We estimate a correlated series of regressions describing time allocation over six activities (care work, domestic work, market work, other-activities, leisure, and self-care) of individuals aged 25–61 years. In the estimation, we compare the time use pattern of three groups of working-age women and men: a) those who frequently provide care and have provided care on the day their time-use diary is collected, b) those who frequently provide care and happen to not provide care on the day their time-use diary is collected, and c) non-caregivers who do not provide care to any older persons. Our findings indicate that on days frequent caregivers provide care to older persons, these caregivers spend between 98.7 to 105 min less time on market work and between 63.3 to 102.1 min more on domestic and care work on average compared to frequent caregivers who happen not to provide care to older persons and to the time spent on these activities by non-caregivers. We also find that on the day frequent caregivers do not provide care to an older person(s), they end up spending the same amount of time on market work as non-caregivers. Frequent caregivers seem to habitually allocate more time to domestic work, even on days when they don't provide care to an older person(s), compared to non-caregivers. With longer workdays, they have less time for leisure and self-care (a reduction of 33.8 min on average) compared with non-caregivers. Our results also show that female frequent caregivers spend 74.1 min less on market work on average during care days than male caregivers.

Caregiving and Aging Population in the US

The aging U.S. population means that the dependency ratio of the older population on younger adults aged 18 to 64 years is likely to increase. In 1940, the old-age dependency rate was 11%. As life expectancy lengthens, it is projected to increase to 41% by 2060 (see Fig. 1).

These trends indicate that a growing number of families in the US are likely to face the inevitable questions of what arrangement will be undertaken to care for a frail older person and if provided by a relative, who is likely to provide it. Although filial duty and care obligations of children have eroded over time with the nuclearization of households and the rise of individualist culture, caring for older persons – in terms of labor and financial resources –remains in accord with the so-called 'American family values' (Schulz & Eden, 2016). Public discourses on the subject find little 'wrong' with the prevailing care system, despite the fact that the care needs of an aging population are large and growing. Thus, there is an implicit assumption and social expectation that the giving and organization of care for the aged is primarily a family responsibility. Although care for older persons in the US is provided in a range of settings – homes, assisted residential living centers, and nursing homes, for example, a significant portion of families provide care to older adults on their own and do so without any training or organized support (Reinhard et al., 2019). Limited pensions and the lack of long-term care insurance and public investment in care for the aging population have made non-family options unaffordable to many frail older persons. Moreover, given the inadequate monitoring and regulatory mechanisms, the wide variation in the quality of care provided by for-profit and non-profit services has made such options less attractive (Harrington, 2001).

Notwithstanding, social norms also govern personal relations, for example, between older parent and child(ren), and commitments that are embodied in implicit contracts, for example, husband caring for his frail wife and vice versa, or parents caring for children and the latter caring for parents in their old age (Kabeer, 2000). The time allocation decision on caring for older persons is influenced by social norms and informal familial contracts regarding caring for an older spouse, parent, parent-in-law, aunt, or uncle. These relationships and obligations are relevant to understanding the time allocation decision of an individual in the US, particularly regarding the time spent in unpaid caregiving to older persons. These implicit contracts are likely to be enforced, especially when resources to hire paid substitutes are limited, long-term care insurance is either unaffordable or non-existent, and/or government support for caring for older individuals is inadequate or absent.

Conceptual Framework

The theory of time allocation demonstrates that there are tradeoffs in the use of time by an individual on a given day. If one spends more time caring for older person(s), then s/he must reduce the time spent on other activities such as market work, leisure, etc. Nevertheless, the extent to which caring for an older person(s) affects a person's engagement in the labor market depends, among other things, on the frequency and intensity of caregiving provided. Sons and daughters, daughters-in-law and sons-in-law, nieces and nephews, etc.,

may only provide care to older person(s) occasionally (i.e., when they visit once a month or twice a year), in which case there is little or no impact of caregiving to older person(s) on their day-to-day lives.

It is a different story, however, for those who do perform caregiving to older persons for several hours on a daily or near-daily basis. These frequent caregivers can end up reshuffling their schedules, potentially leading to a reduction in paid work hours or even withdrawal from the labor market entirely. In this case, not only does caring for older persons reduce the person's time for market work on a given day, but it also makes holding a full-time job less tenable (Butrica & Karamcheva, 2015; Chari, Ray, & Mehrotra, 2015; Feinberg, 2016; Reinhard et al., 2015). It also can lead to a "time squeeze" in the sense that frequent caregivers have less time for leisure and social activities. Time squeeze and longer work hours can have longer-term welfare effects in terms of chronic exhaustion and greater stress (Floro, 1995). Recent studies on caring for older persons and time use in the US have shown that caring for older persons is associated with less time in self-care and social activities as well as higher stress levels using American Time Use Survey datasets. (Arora & Wolf, 2014; Hammersmith & Lin, 2019; Lam & Garcia-Roman, 2017). In fact, Zagheni et al. (2015) show that the majority of caregivers find caring for an older person more stressful than childcare.

Caring for older persons is complex and oftentimes intense (Reinhard et al., 2019). The need can arise unexpectedly, and the tasks involved can be exhausting, especially when the older person has debilitating health conditions such as dementia, respiratory diseases, or arthritis. Caring for older persons involves a variety of tasks. These include activities such as assisting the older person with daily living (eating, bathing, getting dressed, toileting, and transferring), known as activities of daily living (ADL), and providing assistance with financial, housing, and legal issues known as instrumental activities of daily living (IADL). Caring for older persons also involves activities that provide emotional support and companionship, such as listening, taking the person out to dinner or for a walk, etc.

Although both men and women in the US are shown to provide informal care to older persons (U.S. Bureau of Labor Statistics, 2019), a gendered analysis of time allocation among unpaid or informal frequent caregivers who provide unpaid care to older persons is yet to be examined. There are advantages to the use of time-use datasets, for example, ATUS, when performing a gendered analysis. For one, the ATUS data include male as well as female respondents who provide informal care to older persons, not only to parents but also to other groups such as a spouse, other relatives, and friends. Second, the data enable us to examine empirically whether there is any difference in time use when caregivers who provide unpaid care to older individuals take a 'break' from caregiving, compared to their 'regular' caregiving days, which provides rigor to our analysis.

There are two reasons for a gendered analysis of time allocation among unpaid or informal frequent caregivers. First, social expectations that men are the 'main breadwinners' and women are the 'primary caregivers' continue to prevail and affect the time allocation of women and men differently. Second, care responsibilities, which are predominantly shouldered by women, seriously constrain their time and affect their participation in the labor market. Studies have acknowledged the link between women's care responsibilities and gender gaps in labor market outcomes, including labor force participation (Maurer-Fazio et al., 2011; Moussa, 2019; Stampini et al., 2022; Wang & Zhang, 2018).

To examine the gender dimensions of time allocation associated with unpaid care provided to older individuals, we focus on a subsample of women and men aged 25–61 years who provide care to older persons on a daily or near-daily basis. To gain a comprehensive understanding of the lives of these caregivers, we explore the gendered patterns in their time use, taking into account any differences between days when they provide care and days when they do not. We also examine the extent to which their time allocation pattern differs from those of non-caregivers. In the following section, we also empirically test whether the amount of time shifted from market work, leisure, other activities, and self-care towards household and care work activities is greater for female caregivers compared to male caregivers.

Empirical Analysis

Data and Sampling

This paper uses the pooled cross-sectional American Time Use Survey (ATUS) data from 2011 to 2019 collected by the U.S. Bureau of Labor Statistics. The ATUS interviews one randomly selected individual aged 15 years and older from a subset of households that have completed their eighth and final month of interviews with the Current Population Survey (U.S. Bureau of Labor Statistics, 2018a). The interviews are conducted over the phone to record the time use of the selected respondent for one day (1440 min). The time-use diary records the primary activities in 10-min intervals for the preceding day. The ATUS also collects information on socio-demographic and labor market information.

Since 2011, the ATUS has recorded unpaid care provisions to older persons via a separate eldercare module. The ATUS defines unpaid care to older persons as "not including financial assistance or helps that one provided as part of her paid job, whether one has provided any other care or assistance in the last 3–4 months for an adult who needed help because of a condition related to aging" (U.S. Bureau

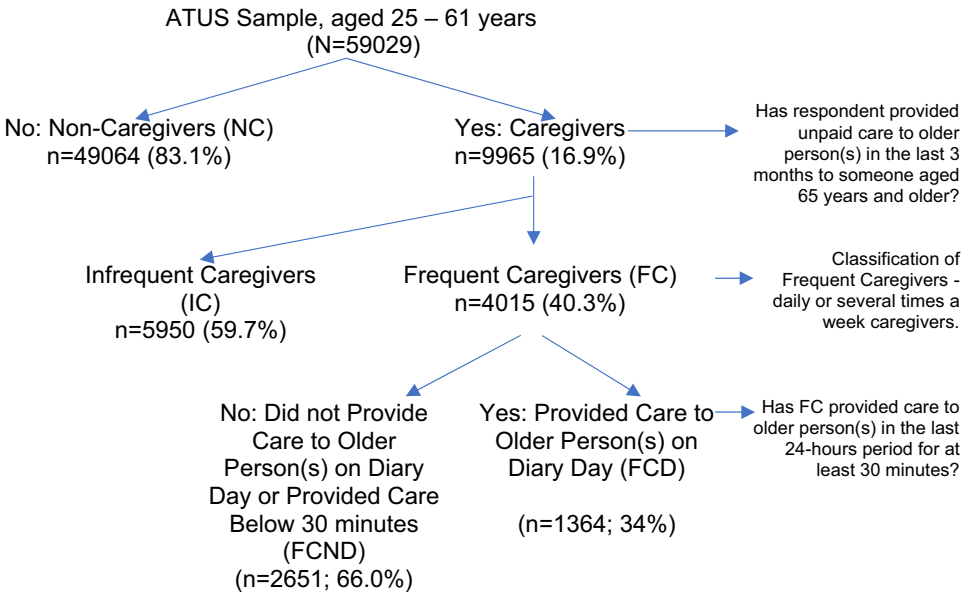


Fig. 2 Distribution of the ATUS respondents aged 25 to 61 years, by unpaid care provision to older person(s) and presence ssof these care activities in the diary

of Labor Statistics, 2018a, p. 46). The caregiver can be a household or non-household member. The ATUS eldercare module collects information on the older care recipient, including age, the frequency of care provision by the respondent-caregiver, the relationship with the caregiver, and whether co-residing with the caregiver or not.

In the eldercare module, the ATUS asks the respondent a) if s/he is a caregiver and b) whether s/he has provided any unpaid care on the previous day, that is, the day his/her time diary is recorded. If the answer is yes to both questions, the respondent records in the diary the time and the set of primary activities performed for or with the older person present. In the latter case, we assume that the task at hand (e.g., shopping or cooking) is done either with the older person(s) or for the older person(s), given the conditional nature of the survey questions.

This paper focuses on working-age respondents aged 25–61 years. The lower bound of the sample starts from the prime working-age when respondents are likely to face time constraints in terms of performing market work and care responsibilities. Additionally, since an individual in the US can retire with partial social security benefits starting at age 62 years, the upper bound is restricted to 61 years to avoid bias in the estimation of the relationship between providing care to older persons and time spent on market work. Figure 2 presents the distribution of 59,029 ATUS sample respondents aged 25–61 years by the extent of the care provision.[2]

To obtain our subsample of frequent caregivers who provided unpaid care to an older person(s), we first group the ATUS respondents according to whether they provided care to an older person (aged 65 years or older) in the last 3–4 months or not (referred to non-caregivers (NC)). Caregivers can provide care to the older person, such as parent(s), parents-in-law(s), friends, neighbors, other relatives, etc. Caregivers who provided unpaid care to any older person are then grouped on the basis of frequency of care provision: those providing on a daily or several times a week basis (referred to as frequent caregivers or FC) and those who provide it once a week, a month or a few times a year basis (referred as infrequent caregivers or IC). We focus our analysis on the effect of caring for older individuals on the time use of frequent caregivers (FC), particularly on the extent to which they have to adjust their schedules in order to accommodate care work for older individuals.

The ATUS diaries only record the time spent in primary activities in the past twenty-four hours (diary day) for each respondent. Hence it is the case that not all caregivers provided care to an older person(s) on the day their time diary was recorded. It may be that on the day the diary of the caregiver was recorded, s/he was taking a 'break' from caregiving to an older person(s). Figure 2 below illustrates the distribution of frequent caregivers FC in the sample who provided care to an older person(s) on their diary day and those who did not provide care to an older person(s) on their diary day.

For our study purposes, we use both the response to the frequency of care question and the time diary information to classify frequent caregivers into two groups: 1) those whose time diaries indicate that at least 30 min of their time is spent on caregiving during their diary days, referred as FCD; and

[2] There are no missing data in the ATUS dataset as this has been cleaned. The time use diary recorded 1440 min of activities for all respondents.

2) those whose diaries indicate that either they didn't provide any or they spent less than 30 min of caregiving during their diary days, referred as FCND. We obtain a subsample of 1364 FCD and 2651 FCND.

In this study, we compare the time use patterns of NC with those of FCD in order to shed light on how time spent in providing care to older persons modifies or changes a person's daily routine. Additionally, we compare the time use patterns of the FCD and FCND, as well as those of NC and FCND to examine the difference in time use when frequent caregivers take a 'break' from caregiving compared to their 'regular' caregiving days.

There are several caveats that should be noted. First, activities performed in caring for older person(s) during the 'diary days' and the amount of time spent on these activities are self-reported. This subjective reporting may lead either to underreporting or overreporting of care activities. For instance, an individual setting up a medical appointment for the older person online or to ask advice about a medical condition may or may not consider such activity as care and, therefore, the activity may be recorded as a 'media use' activity. Second, time diaries only record whether or not the older person was present when a primary activity was performed. They do not specify whether or not the activity, for example, cooking was done specifically for the older person. We treat the time diary context variable indicating the presence of an older person to involve, at the very least, a supervisory form of care. The latter refers to awareness of the older person's functioning and continuing needs and the ability to intervene in an emergency or crisis and provide assistance. Third, the recording of care activities in the ATUS does not include information on the specific nature of care, that is, for whom or whether the activities were done simultaneously or sequentially with other activities.

Table 1 provides the summary characteristics of the frequent caregiver (FC) respondents in our sample. We also include the characteristics of non-caregivers for comparison. More than two-thirds (64.6%) of frequent caregivers who provided care to older person(s) on their diary day are women, compared to 56.6% of frequent caregivers who did not provide care to older person(s) on their diary day, and 49.7% of non-caregivers. Table 1 reveals that overall, the likelihood of being a frequent caregiver increases with age and then falls slightly as they get older, indicating that as they age, so do their parents and in-laws, who eventually need care. The average ages of frequent caregivers who provided care and did not provide care to older person(s) on their diary days are around 50 and 48 years, respectively. Widowed, divorced, separated, and never married men are more likely to be frequent caregivers who provided care on their diary days (35.5%) than non-caregivers (26.5%); no significant differences are observed for women, however. Men with household income below USD 25,000 are 11.1 percentage points more likely to be frequent caregivers who provided care on their diary days than non-caregivers; they are 9.2 percentage points less likely to be frequent caregivers who provided care on their diary days if their annual household income is USD 100,000 and above than non-caregivers.[3] We observe no significant difference in women's participation in eldercare across the different household income categories.

Time Allocation Among Eldercare Providers

On any given day, individuals allocate 1440 min across various activities. Table 2 compares the time allocation patterns of frequent caregivers and non-caregivers across 6 main activity categories: market work, domestic work, care work, leisure, other non-work activities, and self-care. We classify market work to include wage employment and other production of goods and services for income, travel to and from labor market work, job search activities, and travel related to looking for employment. Domestic work includes activities associated with household maintenance, management, shopping for one's own household, and travel and telephone calls related to household and professional services. Care work activities include time spent caring for and helping household and non-household members, as well as travel related to such activities. Next, we classify leisure as eating and drinking, socializing, relaxing and leisure, sports, and recreation, as well as travel related to such activities, etc. Other activities include community service, civic obligations, religious and educational activities, etc. Finally, we classify activities associated with personal care, including sleep, as self-care (U.S. Bureau of Labor Statistics, 2018b).

We examine the interconnectedness of care work, domestic work, market work, other primary activities, leisure, and self-care using the Seemingly Unrelated Regression (SUR) Ordinary Least Square (OLS)-type approach.[4] In the time allocation model, the time allocated to different primary activities is determined by the same set of explanatory variables and is estimated jointly as a system. Two restrictions are imposed on the empirical model in order

[3] The median family income in the US (in current dollars) ranged from USD 50,054 in 2011 to USD 61,372 in 2017. Source: US Census Table H-6. Regions–All Races by Median and Mean Income: 1975 to 2017. Retrieved from: https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-income-households.html.

[4] The empirical analysis presented in this section follows the procedure first introduced by Neuwirth (2007). Kalenkoski, Ribar, and Stratton (2005), and Kimmel and Connelly (2007) applied a SUR Tobit-type model to analyze the determinants of time allocation. Following Neuwirth (2007), we adopted a SUR OLS-type approach because OLS is statistically more appropriate than Tobit for analyzing time diary data (Stewart, 2013).

Table 1 Sample characteristics, by occurrence of care provision

	Female						Male					
	Frequent caregivers provided care to older person(s) on diary day (FCD)	Frequent caregivers did not provide care to older person(s) on diary day (FCND)	Non-caregivers (NC)	FCD vs. FCND (ttest)	FCD vs. NC (ttest)	FCND vs. NC (ttest)	Frequent caregivers provided care to older person(s) on diary day (FCD)	Frequent caregivers did not provide care to older person(s) on diary day (FCND)	Non-caregivers (NC)	FCD vs. FCND (ttest)	FCD vs. NC (ttest)	FCND vs. NC (ttest)
A. Characteristics of respondents												
Asssge (in years)												
25 to 34	10	12.1	30.3	− 2.1	− 20.3***	− 18.2***	8.2	13.8	30	− 5.6**	− 21.8***	− 16.2***
35 to 44	15.6	19.9	27.4	− 4.3**	− 11.8***	− 7.5***	18.2	19.1	26.9	− 0.9	− 8.7***	− 7.8***
45 to 54	37.2	39.2	25.5	− 2	11.7***	13.7***	40.9	37	26	3.9	14.9***	11.0***
55 to 61	37.2	28.9	16.9	8.3***	20.3***	12***	32.7	30.1	17.2	2.6	15.5***	12.9***
Average age	49.6	47.9	42.1	1.7***	7.5***	5.8***	49	47.5	42.2	1.5*	6.8	5.3***
Educational level												
Less than grade 1	0	0	0.1	0	− 0.1***	− 0.1***	0.8	0.7	0.2	0.1	0.6	0.5
Grade 1 to 12	5.5	4.9	9.2	0.6	− 3.7***	− 4.3***	7.9	5.9	10.3	2.0	− 2.4	− 4.4***
High school diploma	31	24.9	25.8	6.1**	5.2**	− 0.9***	38.7	33.1	30.2	5.6	8.5***	2.9
Some college or associate degree[a]	28.4	32.1	25.6	− 3.7	2.8	6.5***	25.6	25	23.5	0.6	2.1	1.5
Bachelor degree and above	35.1	38.1	39.3	− 3	− 4.2**	− 1.2	26.9	35.3	35.8	− 8.4**	− 8.9***	− 0.5
Disability												
Has disability	7.9	6.5	7.3	1.4	0.6	− 0.8	9.2	7.2	6.9	2.0	2.3	0.3
Race												
White	70	71	61.3	− 1	8.7***	9.7***	69	71.2	64	− 2.2	5.9*	7.2***
Black	12.7	13.6	12.7	− 0.9	0	0.9	13.2	12.7	11	0.5	2.2	1.7
Asian	3.5	3	6	0.5	− 2.5***	− 3***	3.2	3.7	5.1	− 0.5	− 1.9*	− 1.4*
Hispanic	12.5	10.5	18.2	2	− 5.7***	− 7.7***	12	10.2	18.1	1.8	− 6.1***	− 7.9***
Mixed	1.3	1.9	1.8	− 0.6	− 0.5	0.1	2.6	2.2	1.7	0.4	0.9	0.5

Table 1 (continued)

	Female						Male					
	Frequent caregivers provided care to older person(s) on diary day (FCD)	Frequent caregivers did not provide care to older person(s) on diary day (FCND)	Non-caregivers (NC)	FCD vs. FCND (ttest)	FCD vs. NC (ttest)	FCND vs. NC (ttest)	Frequent caregivers provided care to older person(s) on diary day (FCD)	Frequent caregivers did not provide care to older person(s) on diary day (FCND)	Non-caregivers (NC)	FCD vs. FCND (ttest)	FCD vs. NC (ttest)	FCND vs. NC (ttest)
Marital status												
Married–spouse present	56.5	61.9	59.1	− 5.4**	− 2.6	2.8*	40	59.9	59.4	− 19.9***	− 19.4***	0.5
Married–spouse absent	1.5	0.9	1.4	0.6	0.1	− 0.5**	1.7	1.6	1.7	0.1	0	− 0.1
Single-widowed/divorced/separated	18.4	20.5	17.2	− 2.1	1.2	3.3***	22.8	15.9	12.5	6.9**	10.3***	3.4**
Single–never married	23.6	16.7	22.3	6.9***	1.3	− 5.6***	35.5	22.7	26.5	12.8***	9.0***	− 3.8**
Household income (in USD)												
Below 25,000	17	15.5	18.2	1.5	− 1.2	− 2.7**	26.7	12.8	15.6	13.9***	11.1***	− 2.8**
25,000 to below 35,000	10.9	9.9	9.6	1	1.3	0.3	12	7.9	9.3	4.1*	2.7	− 1.4
35,000 to below 60,000	23.4	20.9	21.4	2.5	2	-0.5	20.7	21.3	22.2	− 0.6	− 1.5	− 0.9
60,000 to below 100,000	24.1	24.9	24.6	− 0.8	− 0.5	0.3	22.5	29.4	25.7	− 6.9**	− 3.2	3.7*
100,000 and above	24.5	28.8	26.2	− 4.3*	− 1.7	2.6	18	28.6	27.2	− 10.6***	-9.2***	1.4
Number of children under 6	0.1	0.1	0.3	0.0	− 0.2***	− 0.2***	0.1	0.2	0.3	− 0.1***	− 0.2***	− 0.1***
Number of males aged 16 and older	1.0	1.1	0.9	0.1**	0.1***	0.2	1.4	1.4	1.3	0.0	0.1***	0.1*

Table 1 (continued)

	Female						Male					
	Frequent caregivers provided care to older person(s) on diary day (FCD)	Frequent caregivers did not provide care to older person(s) on diary day (FCND)	Non-caregivers (NC)	FCD vs. FCND (ttest)	FCD vs. NC (ttest)	FCND vs. NC (ttest)	Frequent caregivers provided care to older person(s) on diary day (FCD)	Frequent caregivers did not provide care to older person(s) on diary day (FCND)	Non-caregivers (NC)	FCD vs. FCND (ttest)	FCD vs. NC (ttest)	FCND vs. NC (ttest)
Number of females aged 16 and older	1.6	1.4	1.3	0.2***	0.3***	0.1***	1.0	1.1	0.9	0.1**	0.1	0.2***
Number of observations	917	1621	26,007				447	1030	23,057			

[a]Includes individuals with some college but no degree; associate degree includes occupational/vocational and associate degrees

*$p < .10$; **$p < .05$; *** $p < .01$; Statistics are survey weight adjusted

to capture the interdependence of these activities. Under the time constraint, variations in the amount of time in one activity triggered by a change in an exogenous variable must be compensated by changes in the time spent in the other activities, holding other control variables constant. The first restriction is that the sum of the intercepts of the six equations is equal to the total number of minutes in a day, or 1440 min. The second restriction is that the sum of the coefficients of each explanatory variable over all activities should be equal to zero.

In the empirical model, we use the interaction variable, female × status of caregiving to older persons, to test whether or not there are significant differences in the way women and men reallocate their time when they perform eldercare. The model specification is given below:

$$H_a = \beta_{a0} + \beta_{a1}E_i + \beta_{a2}F_i + \beta_{a3}(F_i \times E_i) + \beta_{aX}X_i + \gamma_a + t_a + d_a + \varepsilon_a$$

where H_a refers to the number of minutes per day spent by individual i on activity $a = 1, 2, .., 6$ representing care work, domestic work, market work, other non-work activities, leisure, and self-care respectively; β_0 is the intercept; E_i refers to the status of care provision to older person(s).

F_i is individual's sex (female = 1); $F_i \times E_i$ indicates the difference in time spent on a given activity between women and men if they provide care to older person(s) on a frequent basis; X_i is a vector of control variables; β_{a1} and β_{aX} are the vectors of coefficients; γ_a is a vector of state fixed effects; t_a is a vector of time fixed effects; d_a is a vector of diary-day fixed effects; and ε_a is the error term.

Our analysis compares the time use of frequent caregivers when they provide care to older person(s) on their diary days with different groups of respondents in the ATUS dataset and so E_i represents different comparative groups. In Model A, E takes the value of 1 if individual i is a frequent provider who provided at least 30 min of care to older person(s) on their diary day (FCD) and 0 if they are a non-caregiver (NC). In Model B, it takes the value of 1 if the individual i is an FCD and 0 if the individual is FCND, that is, a frequent caregiver who either has not provided any care or has provided less than 30 min of care on their diary day. In Model C, it takes the value of 1 if the individual is an FCND and 0 if they are an NC.

The vector Xi includes the control variables mentioned in Table 1. These are individual and household characteristics as follows that may affect the dependent variable: lifecycle stage (age in years and age-squared), level of education categories, disability status (to control for health-related issues), race/ethnicity, marital status, annual household income categories, and household composition (number of children under 6, number of male adults 16 years and older, and number of female adults 16 years and older). In addition to the control variables in Table 1,

Table 2 Summary of SUR estimates on time allocation of frequent caregivers and non-caregivers

	(1) Care work[a]	(2) Domestic work[b]	(3) Market work[c]	(4) Other activities[d]	(5) Leisure[e]	(6) Self-care[f]
Panel A. Comparison between frequent caregivers provided care to older person(s) on diary day (FCD) and non-caregivers (NC)[g]						
FCD = 1 vs. NC = 0	59.96***	42.20***	− 104.96***	− 2.04	27.12**	− 22.28***
	(7.96)	(8.39)	(15.33)	(4.43)	(13.76)	(7.90)
Sex (Female = 1)	33.14***	75.16***	− 115.04***	9.75***	− 34.89***	31.88***
	(1.15)	(1.98)	(3.37)	(1.28)	(2.47)	(1.66)
Female x FCD	− 9.67	− 0.59	40.91**	8.28	− 22.74	− 16.19*
	(9.76)	(10.52)	(19.08)	(6.28)	(16.43)	(9.42)
Number of observations	50,428	50,428	50,428	50,428	50,428	50,428
Panel B. Comparison between frequent caregivers provided care to older person(s) on diary day (FCD) and frequent caregivers did not provide care to older person(s) on diary day (FCND)[h]						
FCD = 1 vs. FCND = 0	43.12***	20.19*	− 98.69***	− 8.35	48.52***	− 4.79
	(8.23)	(10.44)	(18.71)	(5.35)	(15.41)	(8.98)
Sex (Female = 1)	21.42***	62.52***	− 91.02***	2.62	− 19.19**	23.65***
	(4.89)	(8.88)	(14.03)	(4.49)	(9.69)	(6.27)
Female x FCD	1.64	8.47	20.71	11.36	− 33.20*	− 8.98
	(10.52)	(13.15)	(22.58)	(7.30)	(18.10)	(10.83)
Number of observations	4,015	4,015	4,015	4,015	4,015	4,015
Panel C. Comparison between frequent caregivers did not provide care to older person(s) on diary day (FCND) and non-caregivers (NC)[i]						
FCND = 1 vs. NC = 0	14.77***	23.20***	− 12.43	8.22**	− 20.71***	− 13.05**
	(2.98)	(7.10)	(12.02)	(3.48)	(7.70)	(5.12)
Sex (Female = 1)	33.09***	75.51***	− 116.36***	9.71***	− 34.16***	32.21***
	(1.13)	(1.98)	(3.36)	(1.28)	(2.45)	(1.66)
Female x FPWD	− 9.52**	− 11.16	21.80	− 4.68	11.47	− 7.91
	(4.47)	(8.92)	(14.67)	(4.64)	(9.74)	(6.37)
Number of observations	51,715	51,715	51,715	51,715	51,715	51,715
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Control for interview day	Yes	Yes	Yes	Yes	Yes	Yes
Other controls[j]	Yes	Yes	Yes	Yes	Yes	Yes

[a]Care work activities include caring for and helping household and non-household members (e.g., providing physical care and medical care to household and non-household children and adults, reading to or with household or non-household children, etc.), and related travel and telephone calls

[b]Domestic work activities include household work activities (e.g., food and drink preparation, etc.), consumer purchases, professional care activities (e.g., using financial and banking services, using legal services, etc.), household services (e.g., using cleaning services, vehicle maintenance services, etc.), and related travel and telephone calls

[c]Market work activities include market work- and work-related activities (e.g., work in main job, other income generating activities, job search, interviewing, etc.) and the travel related to work- and work-related activities

[d]Other activities include volunteer activities (e.g., participating in social service and care activities except medical care, performance and cultural activities, etc.), government services and civic obligations, religious or spiritual activities, education, and related travel and telephone calls

[e]Leisure includes eating and drinking, socializing, relaxing and leisure, sports, exercise and recreation, and related travel and telephone calls

[f]Self-care includes personal care activities (e.g., sleeping, washing, and grooming oneself, health related self-care, etc.) and travel related to personal care activities

[g]Full results are provided in Supplementary Online Appendix, Table A1

[h]Full results are provided in Supplementary Online Appendix, Table A2

[i]Full results are provided in Supplementary Online Appendix, Table A3

[j]Other controls includes: age, age-squared, level of education categories, disability status, race/ethnicity, marital status, annual household income categories, and household composition (number of children under 6, number of male adults 16 years and older, and number of female adults 16 years and older)

Standard errors are in parentheses; *$p < .10$; **$p < .05$; ***$p < .01$; Estimates are survey weights adjusted

during estimation, we also include a dummy variable for the diary day to take into account the variation in time use that may arise between weekend days and weekdays. Moreover, the time fixed effects in the estimation control for the change in time-use patterns over the years from 2011 to 2019, while the state fixed effects control for the differences in time-use patterns across regions.

Given the time constraint of 1440 min total for all activities in a given day, the estimated coefficients must satisfy the following conditions:

$$\sum \beta_{a1} = 0; i.e., \beta_{31} = 0 - \beta_{11} - \beta_{21} - \beta_{41} - \beta_{51} - \beta_{61}$$

$$\sum \beta_{a2} = 0; i.e., \beta_{32} = 0 - \beta_{12} - \beta_{22} - \beta_{42} - \beta_{52} - \beta_{62}$$

$$\sum \beta_{a3} = 0; i.e., \beta_{33} = 0 - \beta_{13} - \beta_{23} - \beta_{43} - \beta_{53} - \beta_{63}$$

$$\sum \beta_{aX} = 0; i.e., \beta_{3X} = 0 - \beta_{1X} - \beta_{2X} - \beta_{4X} - \beta_{5X} - \beta_{6X}$$

and,

$$\sum \beta_{a0} = 1440; i.e., \beta_{30} = 1440 - \beta_{10} - \beta_{20} - \beta_{40} - \beta_{50} - \beta_{60}$$

The fixed effects in the model also follow the same rule of having the coefficients add up to zero.

There is an endogeneity problem, however, in the relationship between time use and frequent care provision. A person may choose to spend more time providing care to older person(s) on the day that s/he spends less time in market work. Alternatively, one may decide to allocate less time to market work that day because s/he needs to provide care to older person(s). Due to the lack of an appropriate instrument to identify the impact of providing care to older persons frequently on time allocation, we set a more modest goal of testing the association between frequent care provision and time allocation, including time spent in market work rather than asserting causality.

We use the ATUS sample weights throughout our regression analyses. The ATUS weights take into account the issues of oversampling of some of the demographic groups, variation in the sampling of weekends and weekdays, and non-responses (U.S. Bureau of Labor Statistics, 2018a).

Empirical Results

Table 2 presents the estimates of the SUR-OLS models. Consistent with the predictions of the conceptual framework regarding time tradeoffs, our findings in Model A suggest that on the day frequent caregivers provide care, they tend to spend less time on market work by 105 min on average and spend more time on domestic work by 42.2 min and care work by 60 min per day on average, compared to non-caregivers (Panel A in Table 2). Our results also show that providing care to older persons on a daily or near-daily basis imposes a greater toll on the female labor supply than the male labor supply. The results suggest that female non-caregivers and frequent caregivers spend significantly less time in market work (115 min per day on average) compared to their male counterparts. On the day women frequent caregivers provide care, they spend less time on market work by 74.1 min than men. The difference in market work time between non-caregivers and frequent caregivers providing care to an older person(s) on their diary day is less among women (40.9 min less on average for the latter) compared to that among men (about 105 min less).

In addition to spending less time on market work, the results also show that on the day frequent caregivers provide care to older person(s), they also spent less time on self-care by 22.3 min on average. But, strikingly, on that day, frequent caregivers spent more time on leisure by 27.1 min on average compared to the non-caregivers. In the SUR-OLS model, the total time spent on a primary activity is mainly the sum of the time spent only on the primary activity, with and without the care provided to older persons. As such, individuals performing a primary activity, for example, leisure, may also perform eldercare (including supervisory care) in overlap or simultaneously. Taking this possibility into consideration, a closer look at leisure as a primary activity suggests that although frequent caregivers spent more time on average in leisure activities on the day they provided care to an older person(s) than non-caregivers, their leisure mostly involved some forms of overlapping care activities performed for older person(s).[5] An example is going out to dinner and taking an older person along, which can be considered non-discretionary in that the older person's condition affects one's choice of venue. As mentioned earlier, ATUS does not collect information on secondary activities nor identify the exact nature of the primary care activities. Hence, it is beyond the scope of this paper to analyze such form of non-discretionary leisure. However, future research can focus on analyzing the exact nature of care activities (ADL and IADL) alongside the secondary/overlapping activities performed while providing care to an older person.

In this paper, we further examine whether the time use pattern among frequent caregivers changes when they have a 'break' from eldercare, for which we compare the time allocation of frequent caregivers who provided care to older person(s) on the day their diaries are recorded to

[5] For details on the overlapping care activities to older persons with leisure for frequent caregivers on the day they provided care and non-caregivers, see Appendix, Table 5.

those frequent caregivers who did not provide care to older person(s) on the day their diary is recorded (Model B). Furthermore, we also compare the time use pattern of frequent caregivers who did not provide care to older person(s) on the day their diary is recorded with non-caregivers (Model C). The SUR-OLS results are given in Panels B and C in Table 2.

Our findings from Model B confirm our previous conclusion that on the day frequent caregivers provide care to older person(s) they spent less time on market work by 98.7 min compared to days when frequent caregivers do not provide care (Panel B in Table 2). On the day frequent caregivers provide care to older person(s), they also spend more time in domestic and care work (20.2 and 43.1 min, respectively) than on days frequent caregivers do not provide care. Similar to findings in Panel A in Table 2, we find that on the day frequent caregivers provide care to older person(s), they spent more time on leisure (primarily non-discretionary leisure) by 48.5 min compared to days when frequent caregivers do not provide care.

Additionally, our findings from estimating Model C presented in Panel C in Table 2 shows some interesting pattern. The findings in Panel C in Table 2 suggest that on the day frequent caregivers do not provide care to an older person(s), they catch up with their market work by spending similar time on market work as non-caregivers. The results in Panel C in Table 2 also specifically indicate that frequent caregivers routinely spend more time on domestic chores than non-caregivers, irrespective of whether or not they are providing care to an older person(s) that day. Compared to non-caregivers, frequent caregivers spent 23.2 min more on domestic work, even on days they do not provide care (Panel C in Table 2). Because on non-caregiving days, frequent providers spend similar time on market work but spend more time on domestic chores and care work, they likely end up experiencing time-squeeze compared to non-caregivers. To balance, frequent providers reduce their time from leisure by 20.7 min and self-care by 13.1 min on average during non-caregiving days compared to non-caregivers.[6]

Sensitivity Analyses

We perform sensitivity analyses using two subsamples to validate our SUR-OLS results in Table 2. First, we limit the FCD, FCND, and NC subsamples to include only full-time workers (709 FCD, 1666 FCND, and 32,551 NC respondents). In the previous subsamples, we included individuals irrespective of their labor force status. Hence, they include unemployed and part-time workers whose time in market work may not necessarily reflect their choice but rather their inability to find full-time jobs. We expect that full-time workers are more constrained in their reallocation of time since they are less able to reduce market work time compared with the previous subsample. Second, we limit the FCD, FCND, and NC subsamples to those who performed at least 480 min (8 h) of market work in the last 24-h (228 FCD, 726 FCND, and 14,361 NC). These subsamples consider the time constraint that an individual faces when s/he provides eldercare while employed on a full-time basis.[7]

The sensitivity analysis results are given in Tables 3 and 4 (full results are provided in the Supplemental Online Appendix, Table D1–D3, and E1–E3). In both subsamples, frequent caregivers (FC) spend less time in market work (between 31.8 and 35.9 min on average) and spend more time in care work time (between 23.2 and 29.1 min on average) on the day they provide care to older person(s). These are consistent with our previous results and confirm our finding that care performed during diary days by frequent caregivers is associated with less time spent on market work than non-caregivers and those frequent caregivers who did not provide care on the day their diaries are recorded. Our results also confirm that frequent caregivers who did not provide care during their diary day spend similar time on market work as non-caregivers. However, they still spend more time on unpaid domestic work (9.2 min), and due to time-squeeze they spend significantly less time on leisure (around 23 min).

[6] The full results provided in Tables A1–A3 in the Supplementary Online Appendix also show that an additional child below 6 years of age in the household leads to an increase in care work time between 59 and 67 min on average and a reduction in market work time between 25.5 and 31.8 min, which implies that the care work burden of the 'sandwich generation,' that is, individuals who provide both eldercare and childcare, is likely to be even heavier.

[7] We further test the sensitivity of the results by running the SUR-OLS regressions without interaction variable $F_i \times E_i$ using the original subsamples and the subsamples we use for the robustness checks. The results are consistent across the subsamples and are provided in Tables B1-B3 in the Supplementary Online Appendix. We also ran a sensitivity analysis using a subsample of frequent caregivers (FC) that includes only those individuals who have performed at least 60 min of eldercare in the last 24 h. The results are given in Tables C1-C3.

Table 4 Summary of the robustness tests: SUR estimates on the time allocation of respondents who performed at least 480 min (8 h) of market work in the last 24-h period only

	(1) Care work[a]	(2) Domestic work[a]	(3) Market work[a]	(4) Other activities[a]	(5) Leisure[a]	(6) Self-care[a]
Panel A. Comparison between frequent caregivers provided care to older person(s) on diary day (FCD) and non-caregivers (NC)[b]						
FCD = 1 vs. NC = 0	29.06***	31.33***	− 31.76***	4.56	− 9.37	− 23.82**
	(8.37)	(10.59)	(10.73)	(4.83)	(13.28)	(9.64)
Sex (Female = 1)	11.95***	33.19***	− 37.07***	4.17***	− 35.02***	22.78***
	(1.21)	(1.76)	(2.44)	(1.30)	(2.50)	(2.18)
Female x FCD	− 2.22	− 0.87	38.57**	− 6.90	9.65	− 38.23***
	(10.40)	(12.87)	(15.99)	(5.66)	(17.40)	(13.35)
Number of observations	14,589	14,589	14,589	14,589	14,589	14,589
Panel B. Comparison between frequent caregivers provided care to older person(s) on diary day (FCD) and frequent caregivers did not provide care to older person(s) on diary day (FCND)[c]						
FCD = 1 vs. FCND = 0	23.22***	8.26	− 35.90***	2.69	8.36	− 6.63
	(8.96)	(10.08)	(13.22)	(5.40)	(14.41)	(11.40)
Sex (Female = 1)	7.31	20.74***	− 38.42***	− 4.20	0.18	14.39
	(4.68)	(6.60)	(10.22)	(3.80)	(9.74)	(8.86)
Female x FCD	3.64	23.31*	24.48	− 2.14	− 19.89	− 29.40*
	(10.72)	(12.81)	(17.79)	(6.74)	(19.05)	(15.23)
Number of observations	954	954	954	954	954	954
Panel C. Comparison between frequent caregivers did not provide care to older person(s) on diary day (FCND) and non-caregivers (NC)[d]						
FCND = 1 vs. NC = 0	4.79	9.20**	11.66	4.67	− 22.79***	− 7.53
	(3.12)	(4.30)	(7.37)	(3.09)	(7.03)	(6.35)
Sex (Female = 1)	11.79***	33.51***	− 37.61***	3.83***	− 34.88***	23.36***
	(1.19)	(1.75)	(2.43)	(1.29)	(2.48)	(2.18)
Female x FPWD	− 5.56	− 12.72**	4.92	− 8.49**	34.47***	− 12.62
	(4.21)	(6.20)	(9.64)	(4.04)	(10.04)	(8.67)
Number of observations	15,087	15,087	15,087	15,087	15,087	15,087
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Control for interview day	Yes	Yes	Yes	Yes	Yes	Yes
Other controls[e]	Yes	Yes	Yes	Yes	Yes	Yes

[a]For definition of activities check footnote in Table 2

bFull results are provided in Supplementary Online Appendix, Table E1

[c]Full results are provided in Supplementary Online Appendix, Table E2

[d]Full results are provided in Supplementary Online Appendix, Table E3

[e]For the list of other controls, see footnote in Table 2

Standard errors are in parentheses; *$p < .10$; **$p < .05$; ***$p < .01$; Estimates are survey weights adjusted

Conclusion

Given the rise in life expectancies and an increase in old-age dependency rates throughout the world, including the United States, the need to better understand the economic and welfare consequences of unpaid caregiving to older persons has become more pressing. Many older individuals live with mental issues and various levels of disability or limited functionalities, which makes the tasks associated with this type of caregiving diverse and complex. Irrespective of the availability of alternative arrangements in the US for providing care to older persons, family caregivers tend to provide most of the care to older adults, the majority of those caregivers are women.

This paper examined the time use patterns of frequent caregiving to older persons using the time diary and elder-care modules of the ATUS 2011–2019 data for individuals aged 25–61 years. Our findings support existing evidence

Table 3 Summary of the robustness tests: SUR estimates on the time allocation of full-time worker respondents only

	(1) Care work[a]	(2) Domestic work[a]	(3) Market work[a]	(4) Other activities[a]	(5) Leisure[a]	(6) Self-care[a]
Panel A. Comparison between frequent caregivers provided care to older person(s) on diary day (FCD) and non-caregivers (NC)[b]						
FCD = 1 vs. NC = 0	45.65***	25.00***	− 55.39***	0.25	9.51	− 25.02***
	(8.15)	(9.21)	(17.88)	(5.07)	(14.61)	(9.16)
Sex (Female = 1)	16.7***	45.66***	− 52.13***	5.22***	− 45.02***	29.57***
	(1.22)	(2.08)	(3.78)	(1.19)	(2.71)	(1.91)
Female x FCD	− 17.1*	11.36	20.59	4.38	− 6.91	− 12.32
	(9.55)	(12.15)	(24.63)	(6.69)	(18.69)	(11.85)
Number of observations	33,260	33,260	33,260	33,260	33,260	33,260
Panel B. Comparison between frequent caregivers provided care to older person(s) on diary day (FCD) and frequent caregivers did not provide care to older person(s) on diary day (FCND)[c]						
FCD = 1 vs. FCND = 0	33.67***	9.47	− 54.29***	− 10.73*	34.50**	− 12.62
	(8.93)	(11.91)	(20.83)	(5.77)	(15.75)	(9.99)
Sex (Female = 1)	10.91*	27.45***	− 33.57**	− 4.35	− 19.36*	18.92**
	(5.59)	(9.50)	(15.71)	(4.59)	(10.23)	(7.59)
Female x FCD	− 11.28	29.74**	− 5.02	14.14*	− 23.09	− 4.49
	(10.68)	(15.15)	(27.43)	(7.89)	(19.74)	(12.94)
Number of observations	2,375	2,375	2,375	2,375	2,375	2,375
Panel C. Comparison between frequent caregivers did not provide care to older person(s) on diary day (FCND) and non-caregivers (NC)[d]						
FCND = 1 vs. NC = 0	11.54***	16.02*	− 3.93	8.26**	− 23.28***	− 8.61
	(3.34)	(8.43)	(13.61)	(3.34)	(7.31)	(5.68)
Sex (Female = 1)	16.44***	45.99***	− 52.97***	4.98***	− 44.39***	29.95***
	(1.20)	(2.07)	(3.76)	(1.19)	(2.69)	(1.89)
Female x FPWD	− 6.19	− 20.09*	22.05	− 7.55	21.87**	− 10.09
	(6.06)	(10.26)	(17.01)	(4.84)	(10.12)	(7.43)
Number of observations	34,217	34,217	34,217	34,217	34,217	34,217
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Control for interview day	Yes	Yes	Yes	Yes	Yes	Yes
Other controls[e]	Yes	Yes	Yes	Yes	Yes	Yes

[a]For definition of activities check footnote in Table 2

[b]Full results are provided in Supplementary Online Appendix, Table D1

[c]Full results are provided in Supplementary Online Appendix, Table D2

[d]Full results are provided in Supplementary Online Appendix, Table D3

[e]For the list of other controls, see footnote in Table 2

Standard errors are in parentheses; *$p < .10$**$p < .05$; ***$p < .01$; Estimates are survey weights adjusted

that shows frequent caregiving to older persons in countries with low public spending in long-term care is associated with less time spent on market work. Our findings are based on precise data regarding the use of time by caregivers and non-caregivers. Crespo and Mira (2014) reached similar conclusions using the data from the Survey of Health, Ageing and Retirement in Europe (SHARE), which includes countries with similar care models as the US. They find that caregivers of older persons in Southern European countries are likely to do less paid work compared to those in Central European countries.[8]

The findings in this paper further demonstrate that in managing care work alongside market work, working-age caregivers who provide care to older persons on a frequent basis routinely shoulder a heavier workload than the non-caregivers. Although frequent caregivers expectedly

[8] Similar to the US, public spending in long-term care as a percentage of GDP in Southern Europe is lower than in other European countries (Barczyk & Kredler, 2019).

spend less time on market work and more time on care work on days that they provide care to older person(s), they spend their time catching up with market work during non-caregiving days. This increase is not offset by a decline in domestic work time. Instead, frequent caregivers consistently spend more time on domestic work compared to non-caregivers and end up reducing their leisure time. Our analysis also suggests that women in the US shoulder the caregiving burden more than men by participating in greater numbers in taking care of older persons and in spending longer time in caregiving. However, we find that a considerable number of men in the US also provide frequent care to older persons.

The findings in our paper have important policy implications. The adverse economic and welfare impact on informal caregivers as they strive to meet the growing demand for care of older persons suggest the urgency of public investment in quality care services and long-term care insurance to make them more accessible and affordable. Given the weak regulation of private care institutions for older individuals in the US and the lack of unpaid government care for older persons is likely to be performed by working-age men and women. They are more likely to face financial hardship not only in the present period but also in their retirement age if they are compelled to shift to part-time work or leave their jobs. This paper sheds light on how unpaid caregiving to older persons may adversely affect the well-being of working-age women and men and reaffirms the need to consider public investment in caregiving alongside gender-sensitive labor policies that promote and support healthy work-life balance.

Appendix

See Table 5.

Table 5 Average time allocation a day on leisure as primary activity and overlapped with care to older person(s) by caregiving status

Activities	Frequent caregivers provided care to older person(s) on diary day (FCD)	Frequent caregivers did not provide care to older person(s) on diary day (FCND)	Non-caregivers (NC)	ttest		
				FCD–FCND	FCD–NC	FCND–NC
Average total time spend on leisure per day (in minutes)	**353.5**	**329.6**	**324.5**	**23.9****	**29.0*****	**5.1**
Without taking care of an older person(s) at the same time	274.0	329.6	324.5	− 55.6*****	− 50.5*****	5.1
With taking care of an older person(s) at the same time	79.6	–	–	–	–	–

*$p < .10$; **$p < .05$; ***$p < .01$; Statistics are survey weight adjusted

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Data Availability American Time Use Survey data is available from https://www.bls.gov/tus/data.htm.

Code Availability Codes are available upon request.

Declarations

Conflict of interest None.

Ethical Approval The findings, interpretations, and conclusions expressed in this paper are entirely those of the authors. They do not necessarily represent the views of the World Bank and its affiliated organizations, or those of the Executive Directors of the World Bank or the governments they represent.

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