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ABSTRACT

Widows' Time, Time Stress and Happiness: Adjusting to Loss*

By age 77 a plurality of women in wealthy Western societies are widows. Comparing older (aged 70+) married women to widows in the American Time Use Survey 2003-18 and linking the data to the Current Population Survey allow inferring the short- and longer-term effects of an arguably exogenous shock—husband's death—and measuring the paths of adjustment of time use to it. Widows differ from otherwise similar married women, especially from married women with working husbands, by cutting back on home production, mainly food preparation and housework, mostly by engaging in less of it each day, not doing it less frequently. French, Italian, German, and Dutch widows behave similarly. Widows are alone for 2/3 of the time they had spent with their spouses, with a small increase in time with friends and relatives shortly after becoming widowed. Evidence from the European countries shows that widows feel less time stress than married women but are also less satisfied with their lives. Following older women in 18 European countries before and after a partner's death shows that widowhood reduces their feelings of time pressure. U.S. longitudinal data demonstrate that it increases feelings of depression. Most of the adjustment of time use in response to widowhood occurs within one year of the husband's death; but feelings of reduced time pressure and of depression persist much longer.

JEL Classification: J22, J14, I31

Keywords: time use, marital status, time stress, life satisfaction, depression

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I. Introduction and the Problem

Seven percent of Americans aged 25+ were widows/widowers in 2006-17, and this group consists disproportionately of women. Only three percent of men aged 25+ were widowers, while eleven percent of women were widows. If we restrict the sample to Americans aged 70+, 47 percent of women were widows, but only 16 percent of men were widowers. The corresponding numbers for most European countries are similar. For example, in 2015 widows constituted 44 percent of women ages 70+ in Germany, 45 percent in France and 51 percent in Italy (with widowers accounting for only 20, 14 and 16 percent of men aged 70+ respectively). Widowhood among women 70+ is about the same in Japan (47 percent), even more common in East European countries, somewhat lower in Scandinavia and an astounding 64 percent in South Korea. It seems fair to conclude that widowhood is the fate of about half of women in wealthy countries who reach their 70s—it is a central fact among the demographic characteristics of older women.[1]

Despite the importance of this demographic group in the U.S. and in other developed countries, remarkably little research has examined the economic circumstances of this major segment of the population of older people. Ethnographers and psychologists have studied widows' psychological conditions in various countries (e.g., Chenube and Omumu, 2011; articles in Jenkins, 2003; Hawkley *et al*., 2019). Some studies have examined widows' remarriage prospects and the incentives to remarry (Brien *et al*., 2004; Baker *et al*., 2004; Carr, 2004); their living arrangements (Bethencourt and Rios-Rull, 2009) and their wealth and incomes (Menchik, 1984; Burkhauser *et al.*, 2005). Only two small-scale studies, neither based on time diaries, have examined how widows use their time (Utz *et al*., 2004; Hahn *et al*., 2011); and none has examined the adjustment process by which a recently-widowed woman alters her time use,

[1]The calculations for the U.S. are from the American Community Survey for 2006-17. The numbers for European countries are based on the Survey of Health, Ageing and Retirement in Europe (SHARE), Wave 6. Even among the oldest old (ages 85+), men are less than half as likely as women to be widows/widowers. The sex difference in the incidence of widowhood pervades the entire adult life cycle (Goldman and Lord, 1983).

spending or other behavior in response to her husband's death—the dynamics of adjustment to a particular demographic shock.[2]

In this study we examine how the time use of this major demographic group—older widows—differs from that of otherwise similar married women, inferring both the size and hebdomadal distributions of the differences. With data that distinguish between newly widowed and longer-term widows, we also consider the dynamics of women's adjustment of their time use in response to the shock of becoming widowed. An immense literature in sociology and economics has considered demographic differences in spending time (summarized in Hamermesh, 2019). No study for any group, however, has examined the path of adjustment of time use to an exogenous demographic shock; and doing so is crucial to understanding how such shocks affect well-being beyond simply comparing welfare in two different equilibria.

With these goals in mind, Section II describes patterns of widowhood among older Americans and details demographic differences among older women who differ by marital status. Section III describes the American Time Use Survey (ATUS) data, including patterns of time use among longer-term and recent older widows and married older women. Section IV studies whether and, if so, how time use differs among these groups whose demographic characteristics differ, and it also examines whether the patterns of behavior observed in America are observed elsewhere by comparing widows to older partnered women using time diaries from France, Italy, Germany, and the Netherlands. Section V disaggregates the largest differences in time use into sub-categories, looks at how widowhood affects the timing of activities and uses these results to infer the structure of household production functions. In Section VI we examine how recent and longer-term older widows alter the people with whom they spend their time compared to married women, while Section VII uses data from the European countries to study how widows' feelings—about being pressed for time, and about their life satisfaction—differ from those of partnered women. Section VIII uses longitudinal data from Europe and the U.S. to examine how women's feelings of time pressure and their mental health change from before to after their partner's death.

[2]In discussing the American data, we refer to the widow's previous partner as her husband—a male. This implicitly ignores the roughly 1.5 percent of older married women who were part of lesbian couples in the ACS 2013-17.

II. The Demographics of Older American Women

In the U.S. data we divide women into four groups: widowed; married with spouse present; divorced; and other (which includes those who never married or who list themselves as single, those who are married but whose spouse is absent, and those who are married but separated).[3] We base the initial look at the demographics of older American women (aged 70+) on the American Community Survey (ACS) 2006-17. During these years, it sampled about 2.5 million women in this age range, more than enough to note statistically significant and often economically important differences among groups.

Figure 1 presents the percentage distributions of women classified by marital status at each age over 69. At age 70 widows account for less than half as much of this population as married women. Seven years later, widows are the plurality; and by age 80 they are the majority of surviving women.[4] Older American widows are less likely than older married women to have been educated beyond high school; they are less likely to be white non-Hispanics and more likely to be African American. These outcomes are, on the one hand, clear reflections of socio-economic disparities in life expectancy of men and of marital patterns. Since age and race/ethnicity are related to differences in how people use time (Hamermesh, 2019, Ch. 8), comparing widows' time use to others' and examining how it adjusts to recent widowhood require accounting for detailed demographic characteristics.

III. Time Use Among Older American Women

The basic data used in this Section come from the ATUS 2003-18, provided by Hofferth *et al.* (2018). (Hamermesh *et al.*, 2005, describes these data in detail.) Because the ATUS is based on diaries kept by respondents who had been included in the eighth-month outgoing rotation groups of the Current Population Survey (CPS), we can link women's marital status in the ATUS to their marital status in their fourth month in the CPS, between 14 and 17 months before the date for which they completed the time

[3]In this sample the never married/single account for 2/3 of this miscellaneous group. All the calculations using the ACS are based on the sampling weights in the public-use data sets.

[4]A graph like Figure 1 for men 70+ looks totally different. Only at age 92 does the population of widowers exceed that of married men with spouse present; and even at ages 95+ widowers barely exceed 50 percent of the sample.

diary as part of the ATUS (and 1 year before their final CPS interview).[5] Linking these data allows classifying widows into two groups: Longer-term widows, those who stated in both their 4th CPS month and in the ATUS that they are widowed; and new widows, those who listed themselves as married with spouse present in their 4th CPS month but as widowed in the ATUS. Throughout we compare the behavior of members of these groups to that of women who listed themselves as married with spouse present in both the 4th CPS month and in the ATUS. Older women in the divorced, never married or "other married" groups are excluded from the analysis to concentrate on the results from having involuntarily left a marriage.[6]

There are 16,817 women aged 70+ in the ATUS samples from 2003-18 whom we designate as belonging to Sample 1 (widow; married with spouse present). Not all these women have information on their marital status at the 4th CPS month. For those who do, we can examine transition probabilities across marital statuses between the 4th and 8th CPS months, shown in Table 1. Slightly fewer than 5 percent of married women with spouse present in this age group became newly widowed over the year preceding their inclusion in the ATUS. The central feature of the transition matrix is the stability of older women's marital status over the twelve-month periods. In each classification at least 94 percent of these older women do not change marital status during the year. Most important for our purposes, 99 percent of older women who are widows remain widows over the twelve months between CPS months 4 and 8. This stability of marital status is consistent with demographic evidence that a woman who is widowed can expect a long period of widowhood—twelve years in the calculations by Compton and Pollak (2019).

To argue that becoming widowed has causal effects on time use, we also need to be sure that becoming widowed is an exogenous event—one that was not expected within the year before we observe widows' time use, when the woman was still married. We cannot infer this from the cross-section data of the ATUS. Information from U.S. estate filings (Kopczuk, 2007, Table II) suggests, however, that most

[5]In the sample of older married women, 18 percent of the diaries were completed 2 months after the woman's final CPS interview, 73 percent after 3 months, nearly 9 percent after 4 months and fewer than 0.5 percent after 5 months.

[6]Because the transition to divorce is hardly exogenous to the woman's decisions, we do not include divorcees in the analysis. In Appendix A, however, we include comparisons of older divorcees and of older never-married women to widows and married older women along the dimensions analyzed in the text.

final illnesses of American men ages 70+ (who comprise 86 percent of spouses of women ages 70+) last less than several months. Data from the European SHARE suggest that one-fourth of deaths resulting in widowhood were from accidents or from illnesses lasting one month or less. We can be somewhat confident that the time use of married women is not altered by pre-adjustments to impending widowhood. The specific timing of widowhood among older women can usually be treated as an unanticipated event and, except for extraordinary circumstances, is not a matter of choice. Widowhood is an absorbing state.

The absence of information on marital status at CPS month 4 reduces the usable sample to the 78 percent included in what we designate as Sample 2. Other factors reduce the usable sample still further from the 16,817 women included in Sample 1. Because some older women report being in none of the three categories—married spouse present in both CPS interviews, longer-term widowed or newly widowed—upon which we concentrate—Sample 3 is reduced to 62 percent of Sample 1. Because a few respondents list large fractions of their diary time as included in "other activities," to avoid prorating much of a woman's time across identifiable aggregates we restrict the sample still further to construct Sample 4, excluding those women whose diary contains more than 3 hours of time in "other activities." This exclusion reduces the sample to 49 percent of Sample 1. Also, while relatively few older women work for pay, to maintain the homogeneity of the sample, Sample 5 excludes another 4 percent of Sample 1 who worked for pay (either reported doing paid work on the diary day, or reported having positive usual weekly workhours), reducing the usable sample to 45 percent of the original sample. Finally, Sample 6 excludes another 5 percent, women who were item non-respondents on their family income.

We know (Abraham *et al.*, 2006) that people included in the ATUS are not observationally different from those who were asked to complete a diary (were in their 8th CPS month). It is also true that there is no more sample attrition among older widows between CPS months 4 and 8 than among women generally: Taking outgoing rotation groups from the CPS for 2003-18, at both waves the fraction of widows among women 70+ was 0.462. Our samples, however, may not be random from among those included in the ATUS (those women in Sample 1). The general conclusion, based on probit estimates shown in Appendix Table B.1, is that there is some non-randomness in attrition as the sample size is restricted, but there is no obvious

pattern of relationships to objective characteristics that accompanies successive restrictions. Even with the use of sampling weights throughout this study, selection into the sub-samples may affect our inferences, although the use of large vectors of covariates should remove any potential problems.

The average respondent reports time spent in only five percent of the more than 400 ATUS categories on a typical diary day. This level of disaggregation is not interpretable or easily usable. We therefore combine the categories into six major aggregates: Market work; home production; sleep; other personal care; TV-watching, and other leisure activities.[7] For respondents in Sample 5, to whom we pay the most attention, market work is zero on the diary day, with a usual workweek of zero paid hours. The fixed 1440 minutes per day mean that there are only four independent aggregates of time use.

The top panel of Table 2 presents for Sample 5 means and their standard errors of time spent in various activities by new widows, longer-term widows, and married women with spouse present.[8] Sleep constitutes by far the largest component of these women's time, with longer-term widows sleeping roughly one hour more per week than married older women. They watch four hours more of television per week than older married women and engage in two more weekly hours of other leisure activities. The two groups differ little in the time spent in other personal activities. Widows make up for the excess time spent in most of these aggregates by spending nearly seven hours per week less time in home production activities. All these differences are highly significant statistically.

The main distinction of new widows' time use is in home production, roughly halfway between that spent by married women and the reduced amount among longer-term widows. Their time watching TV is much closer to that of married women than of longer-term widows. They sleep more than women in both other groups but spend much less time in other personal care (grooming and other personal activities).

[7]The time listed as being spent in "other activities" was pro-rated across these six major activities in proportion to the amounts of time spent in each. Educational activities (a very small fraction of the average day among older Americans) were treated as other leisure among this group of older women. A complete discussion of the nature of these aggregates is in Hamermesh (2019).

[8]All these statistics are based on the ATUS sampling weights. They thus represent the time spent on the average day by the average woman of each marital status. Except for the small average amount of work time in Sample 4, the descriptive statistics here look very similar in that larger sample (and in the slightly smaller Sample 6).

IV. Older Women's Time Use

The differences in the average time spent in different activities among older women classified by marital status are suggestive, but they fail to account for demographic differences among women classified by marital status. To make these adjustments we use the ATUS data to estimate:

(1) $T_{ij} = \alpha_{j0} + \alpha_{jN} I\{\text{New Widow}\} + \alpha_{jL} I\{\text{Longer-term Widow}\} + F(X_i)$, j = 1,…4,

where i is an observation; the T_j are the time-use categories (excluding the aggregate of other leisure activities, since for it each estimated $\alpha_{oN} = -\Sigma\alpha_{jN}$ for new widows (similarly for α_{oL} for longer-term widows) in Sample 5; the I{·} are indicators of marital status, with women married with spouse present being the excluded group; X is a vector of demographic characteristics, and the α are parameters to be estimated.

A. General Estimates for the U.S.

The estimates of the parameters in Equation (1) using Sample 5 are listed in Table 3. The vector X includes indicators of five-year age ranges in this group; racial/ethnic identity, metropolitan status, and major Census region; immigrant status, day of the week, month of the year and year when the time diary was completed.[9] Mainly because widows are on average older than married women in this sample, the implications of the estimates of α_{jN} and α_{jL} are somewhat different from those of the means shown in Table 2. Compared to women who are currently married and had been married for at least a year before they completed their ATUS diaries, longer-term widows spend less time in home production activities and more time watching television and engaging in other leisure activities. They differ little from married women in time spent sleeping or in other personal care activities. In percentage terms the reduction in home production time represents by far the largest difference from married women's time use.

New widows also differ from currently married women. They too spend less time in home production, but more time sleeping, more time in other leisure activities and less time in other personal

[9]Detailed geographic information, including state of residence, is also available, but including indicators for each state would, given the relative paucity of new widows, eliminate much of the sampling variation. Because the ATUS classifies respondents between ages 80 and 84 as age 80, and those ages 85+ as age 85, we cannot control for age at any greater level of detail.

care. The differences among the three groups in spending time do not arise from the restriction to non-workers and those who spend relatively little time in "other activities:" The results are robust to the choice of samples, given that all samples are necessarily restricted to women whose marital histories were traceable to their appearance in their 4th CPS month.[10]

While we have included long vectors of available covariates, unobservable measures might alter the estimated impacts of widow status on time use. To examine this possibility, we estimate how highly correlated a set of excluded variables would have to be with the variables of interest (status as a new or longer-term widow) to vitiate the inferences about their effects on time use (thus measuring the δ in Oster, 2019). Except for those parameter estimates with very low t-statistics (on TV-watching among new widows, on sleep and other personal care among longer-term widows), any unobservable covariates would need to be far more highly correlated with the indicators of marital status than are the observable covariates to render the estimated impacts of marital status statistically insignificant.

Employing the estimates in Table 3, we test whether the uses of time within each of the three pairs of groups classified by marital status are the same: The tests are: 1) $\alpha_{jN} = \alpha_{jL}$, j = 1, …, 4; 2) $\alpha_{jN} = 0$, j = 1, …, 4; and 3) $\alpha_{jL} = 0$, j = 1,…,4. All three joint hypotheses are strongly rejected. Especially interesting are the differences between new widows and longer-term widows, the first joint hypothesis, and between new widows and married women with spouse present, the second. Despite the relative paucity of observations on new widows, they differ sufficiently in their use of time from members of the other two groups to allow strong statements about the statistical significance of these differences.[11]

Two categories of time use deserve attention from the perspective of a more general pattern of adjustment to widowhood. While for new widows as compared to married women, there are significant

[10]The cross-equation correlations of the estimated residuals in this model are statistically significant although not huge, ranging from -0.10 to -.0.28.

[11]Re-estimating these equations over Sample 4, thus including the few older women with paid work time, hardly alters the estimated impacts of new and longer-term widowhood on these categories of time use.

differences in the time devoted to sleep and other personal activities, we find no differences in these categories for longer-term widows.

In the ACS, household incomes of widows ages 70+ averaged only 65 percent of those of married women with spouse present. Given the complementarity of income and time in household production, it makes sense to re-estimate the models in (1) using the slightly reduced Sample 6 of the ATUS. Other things equal, higher household incomes do significantly raise the amount of time spent on other personal activities and other leisure activities, and they reduce time spent watching television or sleeping. Their inclusion in the model, however, hardly alters the parameter estimates describing the differences in time use among older married women, new widows, and longer-term widows.[12]

Eighteen percent of the widows in Sample 5 (including 13 percent of new widows and 19 percent of longer-term widows) list themselves as having someone else (not a spouse or a young child) in the household. While their inclusion in the estimates in Table 3 provides the proper focus on older widows generally, it also means that decision-making and household production may be more like that of married women than that of other widows. To examine this possibility, we re-estimate the equations for the five aggregates of time use excluding these widows. The point estimates of the coefficients on new and longer-term widows in these re-specifications are: Household production, -11.49 and -52.32; sleep, 6.89 and -3.47; other personal activities, -11.72 and -4.93; television-watching, 0.31 and 30.71; and other leisure, 28.23 and 21.64. While there are some differences from the estimates in Table 3, especially for the relatively sparse sample of new widows, the estimates are very similar overall. This is especially the case for the biggest changes from the time use of married older women, the drops in time spent in household production and the greater time spent watching television and in other leisure activities.[13]

[12]The differences between widows and married women are not due to differences by race/ethnicity: Re-estimating the model including only the 75 percent of respondents who are white non-Hispanics hardly alters the parameter estimates on the widow indicator. Similarly, the differences between widows and married older women are the same in rural and metropolitan areas. They are also not due to differences in time spent in religious activities or on the telephone (included as other leisure), which account for minute fractions of the representative day.

[13]These equations were re-specified to include interactions of the indicators of widow status with the vector of indicators of educational attainment. These vectors of interactions were not jointly statistically significant.

None of the women in Sample 5 works for pay, but 10 percent of the married women have working husbands. The theory of household bargaining suggests that power in a married couple is based partly on earnings (ability). Also, evidence on spending behavior (Lundberg *et al*., 2003) shows a discrete change in spending in older couples when the husband retires, with the ratio of spending on an item to time spent shopping for it also changing with age (Aguiar and Hurst, 2007). Taken together, the theory and empirical work suggest that the time use of widows will differ more from that of women with working husbands than that of women with non-working husbands.

To examine these implications in this context, we add an indicator of whether a husband works to the estimates of equation system (1). The estimates support the predictions of the theory—the indicators are jointly statistically significant (p=0.05) across the uses of time. The largest difference across groups is that women with working husbands spend more time in home production than those whose husbands do not work for pay, who in turn, as in Table 3, spend more time in home production than new widows, and still more than longer-term widows. They make up for this by watching less television than other married women, and much less than widows.

In nine of sixteen years in the ATUS samples respondents rated their overall health on a five-point scale (excellent through poor). In Sample 5 28 percent of longer-term widows rate their health as fair or poor (the two lowest categories), while 33 percent of both new widows and married women rate it this low. Since ill-health leads otherwise identical individuals to sleep more and watch more television (Hamermesh, 2019, Ch. 7), including a vector of indicators of self-rated health might alter our inferences about the effect of marital status on time allocation. Re-specifications of the model in (1) do show that TV-watching and sleep both increase monotonically as an older woman's self-rated health decreases. These effects, however, hardly alter the estimated α_{jN} and α_{jL}. The differences that we observe in how older women in the three groups spend their time are not produced by differences in their (self-rated) health.

The CPS is an address-based survey, so that some women who were married at Month 4 may have moved to group facilities upon widowhood, a move that is more likely among women in worse health. Residents of group facilities are also excluded from the samples here, and a disproportionate share of them

are widows. Assuming they are in those facilities because they are less able to engage in home production, their exclusion means that we understate the married-widow differences in time spent in that activity.

More educated older women might adjust their time differently from others, perhaps because they are more efficient at home production (since education alters household technologies; Michael, 1972). To examine this possibility, we create in indicator equaling one for the roughly 1/3 of older women who have attained more than a secondary-school diploma and interact it with the two indicators for widow status. This group of interactions is not statistically significantly nonzero when added to the equations described in Table 3; and only one of the ten interactions is individually statistically nonzero.

Finally, one might be concerned that these pooled cross sections necessarily contain people from different birth cohorts, and that attitudinal differences might differ across birth cohort, so that we confound aging and cohort effects. As an attempt to disentangle these two effects, given the sample sizes the best we can do is to re-estimate the models presented in Table 3 including only those women aged 77 or less before 2011 and those aged 78+ after 2011. This reduction in the sample yields estimated effects for new and longer-term widows of: -36.01 and -51.16 minutes/day on home production; 29.40 and 7.62 on sleep; -13.45 and -7.25 on other personal activities; -2.37 and 41.93 on tv-watching; and 22.42 and 8.86 on other leisure activities. Comparing these to the results in Table 3, this attempt to remove differences arising from the possible confounding of aging and cohort effects does not alter our conclusions.

B. Replication for France, Italy, Germany, and the Netherlands

As a check on the generality of responses of time use to widowhood, we can estimate models like (1) using data from France, Italy, Germany, and the Netherlands, four wealthy European economies for which enough time diaries were completed in recent surveys to allow meaningful comparisons of time use by marital status among women aged 70+. For France we use the 2009-10 *Enquête Emploi du Temps*; for Italy, the 2002 *Indagine Multiscopo sulle Famiglie*: *Uso del Tempo*; for Germany, the *Zeitverwendungserhebung*, 2012-13; while Dutch data are for 2000 and 2005 from the harmonized file produced out of the quinquennial *Tijdbestedingsonderzoek* by the Centre for Time Use Research. Italy is

an especially interesting example, since Italian women, spend much more time in home production than women in other rich countries (Burda *et al.*, 2008).

Because these surveys have many fewer respondents than the ATUS, and because their respondents were not in some prior survey, we cannot distinguish new from longer-term widows. Also, it is crucial to note that the methods of collecting time diaries and the categorizations of activities differ among these surveys and from those in the ATUS. Any estimates are thus not strictly comparable across countries; rather, we present them to see whether the same patterns demonstrated in Table 3 exist in other rich countries.

For all four countries we estimate models based on Equation (1) describing home production, sleep, other personal activities, TV-watching and other leisure activities, restricting the samples to women aged 70+ who do no paid work, who are either widows or partnered, and who have no children under age 18 in their households. Also included in the models are indicators of age (each quinquennium from age 70-84 for France and Italy, only 70-74 for Germany (since the highest age listed is 75), and only 70-74 and 75-79 for the Netherlands (since the highest age listed is 80); of educational attainment; of immigrant status (for France and Germany); and indicators of day of the week, month of the year (quarter in Germany, but not in the Netherlands since the surveys are all in October), and year (except in Italy). Because the French survey obtains two daily diaries for each respondent, the German survey obtains three and the Dutch surveys contain seven, standard errors of the parameter estimates are clustered on the respondents in those countries; and sampling weights are used throughout. The estimates are thus designed to be as closely comparable to those in Table 3 as the inherent differences among the surveys allow.

Table 4 provides the estimates of these models (only the parameter estimates on the indicator for widows) and lists the mean time spent in each activity by partnered women. In all four countries the estimates show that widows spend less time in home production than partnered older women, other things equal. The impacts on home production time are quantitatively consistent with the U.S. results: The decline in time spent in home production in widowhood ranges from 3 percent in the Netherlands to 19 percent in Italy, slightly more than in the U.S. This shortfall is made up by widows spending more time in other leisure

activities and to a lesser extent in watching television. In all the countries there are only relatively small percentage differences in time spent sleeping between older widows and older partnered women.

Do the results in this Section generalize to all older widows? Clearly not, as they are restricted to women not living in group facilities, and women who are healthy enough to complete a 24-hour time diary. We have implicitly excluded the least healthy and least independent older women in all four countries. Despite that, the overwhelming similarity of the differences between widows and partnered older women is generalizable (developed) worldwide to non-institutionalized older women.

V. Disaggregating the Impact of Widowhood on Home Production

Due to the relatively small samples of widows in the other countries, only in the U.S. can we decompose the drop in home production upon widowhood into individual categories of time use. The results in Table 3 showed that the the absolute decline is over ¾ hours per day (47 minutes), which represents a decrease of 18 percent. No other change in time use is nearly so large relatively.

A. Quantitative Disaggregation

We concentrate on four activities: The two broad categories of 'caring for others in the household', and 'purchasing goods', and the sub-categories 'food preparation and cleanup', and 'housework'. Activities included in the first three sub-categories are clear; the last includes interior house-cleaning, laundry, sewing/repairing, and miscellaneous indoor activities. Table 5 lists regression results including the same covariates and indicators of marital status as in Table 3 for these four home production activities separately. The declines in time spent by longer-term widows in these activities total 52.5 minutes—more than the total drop in all home production activities—with the excess accounted for by a small increase in the miscellaneous other activities. Over half the decline in home production time is in 'food preparation and

cleanup'.[14] The decline in time spent in housework accounts for most of the remaining decrease in home production. Without a spouse present time spent 'caring for others in the household' drops to nearly zero.[15]

The bottom row of Table 5 shows the average time spent by husbands of women aged 70+ in these same four activities for which results in the upper part of the table are presented. Time spent by these husbands in 'food preparation and cleanup' and 'housework' totals 34 minutes per day, compared to 150 minutes daily by their wives.[16] Among married older couples men perform very little of these two activities. Total household time spent in them after widowhood decreases by 42 minutes (23 percent).

B. Temporal Disaggregation

All these activities except caring for others in the household are performed both by married women and widows. Essentially each entails a fixed cost of engaging in the activity, for examples, setting up to cook or to clean dishes; doing laundry or mopping floors; or food-shopping. With a sufficiently large decline in the demand for the home-produced commodity by a widow, she has an incentive to cut the fixed costs of home production by engaging in the activity on fewer days. This suggests examining the incidence of each activity—what fraction of women engage in it on a representative (diary) day—and its intensity, the conditional mean time spent by those engaging in it on a given day. If, for example, the incidence of an activity declines with widowhood while its intensity remains the same or even increases, we can conclude that the loss of a husband leads widows to economize on the fixed costs of the activity. On the other hand, if the incidence declines only slightly while its intensity declines a lot, we can conclude that the fixed costs of engaging in the activity are less important than the variable costs.

[14]Widows spend significantly more time (but only two minutes/day more) caring for non-household members than otherwise identical married women. They spend no more time in household financial management than married older women.

[15]Excluding widows not living alone changes the estimates only slightly. Since they are alone in their household, they spend no time caring for others in the household, so the estimates in the first column are slightly larger in absolute value. The other estimates differ little from those in Table 5. Widows also do not substitute time spent eating away from home for time spent in food preparation/cleanup.

[16]The husbands are not spouses of the women in our samples, as the ATUS obtains diaries for only one household member. Rather, they are ATUS respondents who are married with a wife age 70+ present.

To infer the comparisons between the fixed and variable costs of these household activities, Table 6 presents estimates of the differences among new widows, longer-term widows and married women in the incidence and intensity of time spent in these four activities, adjusting for large vectors of covariates. The estimates for care of others are not surprising: Without a husband only a small fraction of older women list caring for others as an activity during their diary day. The estimates describing its intensity are meaningless, since so few widows engage in this activity.[17]

The interesting comparisons are for the other three categories of home production activities. The incidence of time spent on food preparation/cleanup is about 13 percent (0.106/0.805) lower among longer-term widows than among married older women, but its intensity is 29 percent (26.88/92.12) lower. Similar behavior occurs for housework: The decline in incidence is only 5 percent (0.031/0.618), but the drop in intensity is 14 percent (16.73/123.47). Implicitly, the reduction in the scale of the household upon widowhood leads women to economize more on the variable than the fixed costs of time use. The same is not true for purchasing: The small overall decline in time spent purchasing among longer-term widows results entirely from a 6 percent drop in its incidence; time spent when shopping increases slightly.

These results imply that a major mechanism by which widows adjust their time use to the loss of their husbands is by spending less time while engaged in those activities that are stereotypical "women's work." They cut time in these activities by performing them only slightly less often; the larger cuts are in the amount of time spent when doing them. Implicitly the loss of one's husband leads widows to economize on the variable costs of major home production activities more than on their fixed costs.

C. Implications for the Structure of Household Production

We can use the difference in how time is spent between widows and married women to examine one aspect of home production—economies of scale—and thus get at the nature of equivalence scales in

[17]Only four newly widowed women could be included in this conditional regression.

time use to match the myriad estimates of those of goods expenditures.[18] We concentrate on the intermediate production item—food for consumption at home, not including time spent eating—in order to avoid the difficulties of distinguishing scale economies in production from time spent in both production and consumption (thus defining the commodity more narrowly than Lecocq, 2001; Hamermesh, 2008; Couprie and Ferrant, 2015; or Gardes and Starzec, 2018).[19] This comparison is of units that are half the size of those to which they are being compared (widows versus married couples).

In this sub-section we use women in Sample 6 for whom information on food spending is obtainable and in which married women's husbands do no paid work. We assume that the commodity "food eaten at home" is produced by time spent in preparation and clean-up (Column (2) of Table 5) and by time spent shopping for groceries (Column (5) of Table 5). Wives without working husbands spend 77.4 minutes (s.e.= 3.66) in food production. Taking husbands in the ATUS with wives ages 70+ and imputing their time in these activities based on the age and education of these husbands in the ATUS sub-sample, we obtain total time in food production in older couples averaging 108.6 minutes (s.e.=3.66). Widows in Sample 6 spend 52.10 minutes (s.e.=1.88) in food production, i.e., 48 percent as much time producing this commodity as married older couples.

To estimate monetary expenditures on food consumed at home, we link ATUS respondents who kept time diaries in February-May to their responses in the previous December's CPS Food Security Supplements. This linkage allows obtaining information on the food spending of about 1/3 of ATUS respondents. These restrictions yielded a sample of 474 married older women and 1,138 widows. The

[18]Couprie and Ferrant (2015) and Gardes and Starzec (2018) examine food spending and time comparing singles and couples (including couples with children). Each defines the commodity 'eating' broadly, including time spent consuming the food produced by monetary expenditures and time spent shopping, food preparation, and clean-up.

[19]Part of the time spent eating—consuming the home-produced commodity food—consists of socializing, since in the sub-sample used here married older women spend 80.3 minutes/day eating, while widows spent slightly but nearly statistically significantly less time, 76.8 minutes/day.

Supplements provide information on the household's actual weekly food expenditures, with widows spending 69 percent as much money on food each week as married couples.[20]

Taken together, these results suggest that the household production function is implied by the depiction in Figure 2. The Figure shows that this household production function is not homothetic—time inputs rise relative to goods inputs as scale increases. There are diseconomies of scale in food spending, and constant returns to scale in food time. The restriction of this sub-sample to non-working older women who, if married, have non-working husbands, means that in neither group is there a market alternative for their time. Food production is only one of many commodities that households produce (with goods expenditure accounting for only 12.4 percent of pre-tax income among widows in this sub-sample; 12.0 percent in married older households) and only 6 percent of non-sleep time. The comparison between widows and married older women suggests, however, that equivalence scales based solely on expenditures understate the full cost of expanding from a 1- to a 2-person household.[21]

The ratio of goods to time inputs, X/T, clearly rises with widowhood. That conclusion, however, implicitly assumes that women enjoy no extra process utility from time spent preparing food or shopping for groceries when they have a spouse present. Nonetheless, the estimates are among the first to: 1) Consider equivalence scales in time inputs; and they are the only ones to focus on time spent in home production rather than in the production and consumption of home-produced commodities (e.g., eating); and 2) To compare time spent between groups whose value of time is independent of market wage rates.

[20]The Supplements also report usual weekly food expenditures. The analysis is hardly altered if these are used to measure differences in spending between older couples and widows.

[21]The currently used OECD scale assumes that utility is equalized between single- and two-adult households when the latter's spending is 1.5 times that of the former http://www.oecd.org/els/soc/OECD-Note-EquivalenceScales.pdf, quite close to the difference in food expenditures between married older couples and older widows.

VI. Togetherness in Widowhood: "Look at All the Lonely People"[22]

One of the major goals of marriage is to allow individuals to spend time together, taking advantage of both the specialization in home production that togetherness allows, and the complementarities in utility derived from the consumption of goods, leisure, and other time (Becker, 1973).[23] Spouses do spend more time together than randomly matched pairs of opposite-sex adults (Hamermesh, 2002; Hallberg, 2003). When a husband is no longer present, the older widow must reallocate her time to activities with other people who might provide some jointness in household production or in consumption; or she can simply spend time alone.

The ATUS asks people to list whom they were with during each activity on the diary day, although the information is not requested for activities that account for much of the day (particularly sleep and other personal activities). The information is collected in over 20 categories, ranging from spouse through more distant relatives, various types of other people, co-workers standing in various relationships to the respondent, and being alone. We collapse this information into five categories: Other people; friends; other (non-spouse) relatives; spouse; and being alone. In the data new widows aged 70+ report whom they were with for 771 minutes on a representative day, longer-term widows for 769 minutes, and married women for 758 minutes. Figure 3 graphs the distributions of time in the five aggregated categories for each of the three groups of older women in our data (Sample 5). What stands out unsurprisingly is the shift upon widowhood from time spent with one's spouse, with about 2/3 of time that had been spent with a husband shifted to being alone upon widowhood.[24] Beyond that shift, the biggest increase is in time spent with other relatives.[25]

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[22]The Beatles, *Eleanor Rigby*.

[23]This original statement of the theory noted that both positive and negative assortative mating arise, with the latter being a prediction about matching based only in household production. Regrettably, the richness of these predictions has been largely ignored, with most attention given only to sorting/matching along production efficiency lines.

[24]Seventeen of the 5,114 longer-term widows in the sample report spending time with their spouse, averaging eight daily hours, which generates the little blip in time with spouse in this group. No recent widow reports time with spouse. We cannot be sure whether this anomaly is a coding error, a reporting error, or these women are holding séances.

[25]Estimates of the impacts of widow status on the identity of who the time is spent with that adjust for all the covariates used in Table 3 corroborate the statistics depicted in Figure 3. About 2/3 of the time no longer spent with the (deceased) spouse is spent alone, both among new and longer-term widows. Indeed, in only one category does the reallocation of

VII. Time Stress, Life Satisfaction and Widowhood

A. Time Stress

We know (Hamermesh, 2019, Ch. 11) that the time constraint becomes more binding as incomes are higher, consistent with the notion that spending (increasingly abundant) money requires using time (that does not increase with income). Widows' incomes are lower than those of married women, and so too is their spending. Without adjusting for income differences, we would expect widows to be less pressured for time. With that adjustment, it is unclear whether widowhood makes otherwise identical women feel more, or less pressured for time—whether the time constraint becomes relatively more or less binding. We thus cannot say *a priori* whether the Lagrangian multiplier on the time constraint, proxied by feelings of time stress (Hamermesh and Lee, 2007; Buddelmeyer *et al*., 2018), rises or falls upon widowhood.

While the ATUS does not elicit feelings of time pressure, all four European data sets provide information on the degree of time stress that respondents feel. We create an indicator variable equaling one in the French data if the woman says she feels any stress about time, in the Italian data if she is in the highest two (of four) categories, in the German data if she does not disagree with the feeling of being under some time pressure, and in the Dutch data if she feels any time stress. The upper panel in Table 7 reports estimates of the impacts of being a widow on a woman's stating that she feels rushed for time. The same covariates are included that underlay the estimates reported in Table 4. In all four countries, otherwise identical widows feel less pressed for time than partnered women. The point estimates imply that, compared to otherwise identical partnered women, widows are 20, 15, 28 and 32 percent less likely to feel stressed for time in France, Italy, Germany, and the Netherlands, respectively. None of the impacts is highly statistically

time change nearly statistically significantly as the duration of widowhood increases: Newly widowed women spend substantially more time with other relatives than married women, a difference that is smaller among longer-term widows. These data do not allow evaluating the quality of the time spent with other relatives or alone. There is, however, a significant body of literature showing that loneliness, as opposed to just spending time alone, is one of most significant challenges in widowhood (Utz *et al.*, 2014; Dahlberg *et al.*, 2015; Spahni *et al.*, 2015).

significant, although two reach standard levels of significance. Taken together, they suggest that no longer having a partner present reduces older women's feelings of being pressured for time.[26]

The reduction in feeling stressed for time may be due to widows having more time to themselves—choosing how to spend their time on their own rather than making decisions jointly with a husband. The estimates in the upper panel of Table 7 hardly change when we include as covariates the amounts of time spent in different activities. It cannot therefore be that widows undertake activities that are less inherently stressful than those undertaken if a husband were present. Rather, it may be that being able to control their time entirely themselves gives them a feeling of being under less time stress.

B. Life Satisfaction—the Unmerry Widow

While the German and Dutch data do not offer information on the respondents' feelings of life satisfaction or on their happiness, the French and Italian data sets do provide this information.[27] We can thus compare the determinants of life satisfaction to those of time stress in the data in these two countries. Respondents in the French data rated their life satisfaction on a 10 (best possible life) to 0 (worst possible life) scale. We rescale this variable into an indicator equaling one if the person gives a rating of 8 or higher. The Italian data set rated it on a four-point scale, for which we take the two highest ratings as indicating the woman is satisfied with life.

The estimated impacts of widowhood in regressions describing this indicator of life satisfaction are shown in the bottom panel of Table 7. The same vectors of covariates as used throughout are included. In both countries the impact of having been widowed is negative and statistically significant, with widowhood reducing expressed life satisfaction by this measure by 41 and 18 percent in France and Italy, respectively.

[26]Data on household income for all the women used in Table 4 are only available for inclusion here for France and Germany. Including household incomes makes the estimated effect of being widowed on time stress more negative.

[27]Data on life satisfaction are included in the ATUS for 2012 and 2013. Specifications like those presented in this sub-section yield results that are remarkably like those shown here (Adena *et al*., 2021).

The effects of widowed status are even more significant statistically in ordered probits describing the range of responses about life satisfaction.[28]

The estimated effect of widowhood on life satisfaction is hardly altered accounting for the kinds of activities on which these women spend time. Also, including the measures of time stress in the equations for France and Italy shows unsurprisingly that greater feelings of being rushed for time are negatively related to feelings of life satisfaction. Their inclusion increases the estimated shortfall in the expressed life satisfaction of widows compared to otherwise identical older partnered women.

VIII. Longitudinal Analyses as a Mirror

The entire analysis thus far has necessarily been based on cross-section data, because there are no time-diary surveys with longitudinal information on a usefully large sample of widows.[29] The Survey of Health, Ageing and Retirement in Europe (SHARE), however, provides longitudinal data on sufficient numbers of widows and includes information on proxies for their feelings that allow examining the implications of the observed changes in time use, especially the drop in time spent in home production shown in Section IV. Also, the U.S. National Longitudinal Survey of Mature Women, which followed a cohort of women aged 30-44 in 1967 up through 2003, allows examining feelings related to life satisfaction. In both data sets we can follow the same women before and after the deaths of their partners and examine how their feelings change over the years before and after they are widowed.

A. SHARE Evidence on Feelings of Control over Time

We use information from all seven available waves of SHARE collected in Europe and Israel since 2004. Our longitudinal approach relies on observing each woman in the survey for at least two waves, with the sample of widows observed at least once before and after the death of their partner. Since Wave 2 the survey has collected information on each participant who died between the waves. This is done in the form

[28]While self-reported measures of health status are highly correlated with expressed life satisfaction when included in these estimates (for France), adding them hardly alters the estimated impact of widowhood.

[29]Except for small American and British longitudinal data sets (Juster and Stafford, 1991; Gershuny, 2003), both containing very few widows, there is no longitudinal set of time diaries covering more than one week.

of an "end-of-life" interview, usually conducted with the surviving partner or another member of the family. This interview provides details concerning the death of the respondent, including its date and cause, and some additional information about the few months before and after death.

The sub-sample of widows includes 2,830 women from 18 European countries. Using a combination of exact and propensity score matching, we match this sub-sample to a sub-sample of women whose partners did not die over the course of the survey, a control group for our analysis in which widowhood is considered as the treatment.[30] For the non-widowed sub-sample we impute a placebo timing of death of the partner in a way that reflects the real timing of partner's death in the sample of widows. The sampling and the matching approach are described in detail in Adena *et al.* (2021).

As we have demonstrated, many dimensions of widows' lives differ substantially between new and longer-term widows. Additionally, the time dimension of many outcomes reflecting their well-being may matter, given the impact of the possible deterioration of the partner's health on his partner. We address these issues by using the long-running nature of SHARE and examining widows and the control sample spanning up to five years before and after the partner's date of death. The average widow was observed for nearly four years before the partner's death and over three years afterward.

The time paths of some of the outcomes might differ depending on the nature of the partner's death, particularly if it was proceeded by a lengthy illness. We examine this possibility by considering two sub-samples: The roughly one-fourth of all widows who lost their partners to "sudden death," defined as an accidental death or one that followed a period of illness of no more than one month (as recorded in the end-of-life interview), and other widows.[31]

[30]The exact matching is based on country. For the propensity score matching we also include age, education, place of residence, number of children and grandchildren, health status in childhood, interview participation, and several characteristics of the partner in his initial wave of observation (age, education, self-reported health status, BMI category, years of smoking, having siblings, and father's age).

[31]Widowhood may affect the relative likelihood of observing widows versus married women. This could be due to either the effect of widowhood on premature death of the surviving spouse (Boyle, 2011; Elwert and Christakis, 2008; Moon *et al.*, 2011, 2014; Sullivan and Fenelon, 2014), or to the inability of the survey to contact women whose residence has changed. We conduct several robustness tests to examine the difference in the dynamics and find some evidence of attrition related to widowhood. The extent of this attrition does not influence our general conclusions. The consequence of such attrition is that what we estimate are lower-bound effects of becoming widowed.

Figure 4 presents results of local polynomial regressions estimated over the widows and control samples on responses to the question: "How often do you think that family responsibilities prevent you from doing what you want to do?"[32] The question thus elicits responses about older women's feelings about the pressures of time, and thus provides a longitudinal mirror to the results in Section VII.A. We regress the outcome – an indicator equaling one for those who respond 'often' and zero otherwise – on a set of indicators covering months before and after the death of the partner.

As Figure 4 shows, these constraints among widows are growing significantly before the partner's death, which is unsurprising given the likely need to care for a sick or dying partner. This interpretation is validated by differences in the results between the two sub-samples of widows: While in both groups future widows feel more rushed for time than married women, the widows whose partners were failing longer were more pressured for time before the spouse's death, presumably because of their time spent attending to his needs. Family responsibilities become significantly less restrictive after the partner's death, and the widows in both sub-samples feel less pressured for time than otherwise identical married women. The confidence intervals are wider in the smaller sample of "sudden-death" widows; and given the lengths of time that widows are observed, they necessarily become wider as time since death increases. But we can be confident for both sub-samples of widows that even four years after the partner's death they feel less constrained by family responsibilities than women with partners.

B. Depression in the NLSMW, 1989 and 2003

The NLSMW followed women over this fourteen-year period, ending when they were between ages 66 and 80. In both years women were asked to respond to the statement, "During the past week I felt depressed," with possible answers 'rarely', 'some', 'occasionally', and 'most'. For both years we create an indicator variable equaling one among the 25 percent of respondents who give an answer other than 'rarely', and define the usable sub-sample as those older women whose marital status was married in 1989. The treatment is having become widowed between the two years; the crucial variable is an indicator of whether

[32]The Figure is based on 2,157 (non-sudden) and 673 (sudden) individuals in the two sub-samples.

the woman was a widow in 2003 or was married then. We estimate probits describing the probability of being depressed in 2003 as a function of depression in 1989 and becoming widowed during the fourteen-year interval.

We present the probit derivatives of the coefficient estimates from this equation in the first column of Table 8. They show that, compared to women who do not become widowed, those women who become widows are much more likely to state that they are depressed at least sometimes. A married woman who was not depressed in 1989 was 9.4 percentage points more likely to state that she was depressed in 2003 if she had become widowed. As the second column in Table 8 shows, the results are hardly changed if we account for the women's ages. Similarly, age differences do not alter the marginal effect of widowhood on the likelihood of becoming depressed.

Thinking of the longer-term implications of widowhood, we should bear in mind that the effects observed in these panel data sets represent the lower bound of the true impacts, since widowhood is likely to influence panel attrition. There can be no doubt, however, that widowhood causes significant pain which is reflected in substantial and statistically significant increases in depression following the partner's death. Although in the cross-sectional analyses presented in Sections II-VII we could not capture very much of the dynamics of the impacts of becoming widowed, these results make it clear that those differences reflect the causal effect of the partner's death.

IX. Conclusions and Implications

Widows comprise a large fraction of the populations of rich countries; among women aged 70 and over they constitute a near majority. How they spend their time compared to married older women is of interest *per se*, even ignoring what it tells us about the cost of activities like home production or about the dynamics of adjustment to a demographic shock. Evidence from American time diaries shows that the biggest adjustment made by widows to the loss of a husband is a sharp decline in time spent in home production activities. Similar responses to widowhood are observed in France, Italy, Germany, and the Netherlands; and changes in the constraints on time use related to family responsibilities are confirmed in

the longitudinal Survey of Health, Ageing and Retirement in Europe (SHARE). This drop leads widows to spend more time watching television and more time in other leisure activities.

The behavior of widows allows inferring the structure of the cost of some home production activities. It suggests that 'food preparation and cleanup' and 'housework' (totaling slightly more than two hours per day), which account for over half of older married women's home production time, have relatively low fixed costs compared to their variable costs. With one less person (a husband) in the household, women cut back on these activities mainly by doing much less of them each day, not by doing them much less frequently. Their spending of time in food production decreases more than their spending of money on food. This suggests that equivalence scales based solely on comparisons of goods spending across households of different sizes will incorrectly measure differences in the full cost of household production (understating the full costs facing a larger household).

Considering how women adjust to widowhood allows inferring the general nature of the costs of adjusting time use to a demographic shock. With the evidence that new widows—those widowed sometime within 17 months of providing information on their time use—engage in behavior that resembles that of longer-term widows much more closely than that of married women, we can infer that the adjustment process (clearly, only of their use of time) is rapid. While the impact of widowhood on general measures of well-being is greatest immediately after the partner's death and diminishes over time, the recovery is slow and incomplete even five years after the partner's death (Adena *et al.* 2021). The cost of widowhood – in its many dimensions – should be considered as an important policy concern and addressed in a comprehensive manner.

Clearly, the example we have used—older widows—is unique, with the induced changes being more likely than some others to have resulted from an exogenous shock. The example allows easier inferences about behavior compared to other demographic shocks, since the people studied are unlikely to alter their marital status again and are typically not choosing to work for pay. Nonetheless, using this approach to consider how demographic shocks might change other groups' spending of time, of money, and their well-being, seems an extremely useful next step in the examination of household behavior.

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Table 1. Transition Matrix across Marital Statuses, CPS Months 4 to 8, ATUS 2003-18, Women Aged 70+ (percent distributions)

	Widow	Married Spouse Present	Divorced	Other*
Widow	99.3	0.1	0.0	0.6
Married Spouse Present	4.4	94.5	0.1	1.0
Divorced	1.4	0.0	97.9	0.7
Other	4.4	0.6	0.7	94.3

*Other includes never married, married spouse absent, separated.

Table 2. Descriptive Statistics, Time Use Categories, Women 70+ by Marital Status, Representative Day in the ATUS 2003-18 (minutes/day)*

	N =	Home production	Sleep	Other Personal	TV-watching	Other leisure
Group:						
New widows	230	231.91 (11.24)	581.10 (9.35)	123.65 (5.72)	237.15 (12.15)	266.20 (14.01)
Longer-term widows	5,114	199.76 (2.36)	561.95 (1.96)	141.18 (1.53)	269.51 (2.86)	267.60 (2.82)
Married spouse present	2,298	258.29 (3.69)	551.17 (2.44)	144.16 (2.16)	231.80 (3.59)	254.59 (3.99)

*Standard errors in parentheses below means.

Table 3. Estimates of the Effects of Differences in Marital Status on Time Use, and Tests of Hypotheses, Representative Day, ATUS 2003-18 (minutes/day), N=7,642*

	Home production	Sleep	Other personal	TV-watching	Other leisure
Ind. var.:					
New widow	-22.67	25.53	-20.30	-0.25	17.69
	(13.32)	(10.20)	(8.42)	(14.89)	(15.41)
Longer-term widow	-46.78	0.28	-2.96	29.11	20.34
	(4.14)	(3.17)	(2.62)	(4.63)	(4.79)
R^2	0.094	0.039	0.020	0.047	0.050
Hypotheses:	p-value			p-value	
New widow = married on all 5	0.008	**New widow = longer-term widow on all 5**		0.003	
Longer-term widow = married on all 5	<0.001				

*Additional covariates are vectors of age ranges, of educational attainment, racial/ethnic identity, metropolitan status, region, day of week, month of year, and year, and an indicator of immigrant status. The four equations are estimated jointly, with married women the excluded category. Standard errors in parentheses.

Table 4. Estimates of the Effects of Differences in Marital Status on Time Use, Non-working Women Aged 70+, France 2009-10, Italy 2002, Germany 2012-13, and the Netherlands 2000 and 2005 (minutes/day)*

	Home production	Sleep	Other personal	TV-watching	Other leisure
Ind. Var.:			**FRANCE**		
Widow	-32.52	2.49	-24.28	13.32	40.99
	(9.77)	(8.99)	(6.77)	(9.93)	(9.31)
R^2	0.166	0.108	0.081	0.069	0.140
Mean Married	273.96	509.38	222.90	225.38	208.38
N Diaries Married/Widow	1,061	968			
			ITALY		
Widow	-69.74	20.22	8.53	17.24	23.75
	(6.25)	(5.03)	(4.16)	(4.78)	(5.40)
R^2	0.215	0.148	0.051	0.038	0.071
Mean Married	368.24	556.62	116.67	130.94	267.53
N Diaries Married/Widow	967	2,003			
			GERMANY		
Widow	-20.89	7.13	-9.74	10.49	13.01
	(14.30)	(9.85)	(7.74)	(13.33)	(14.93)
R^2	0.108	0.049	0.041	0.052	0.057
Mean Married	278.16	533.32	191.56	157.03	278.54
N Diaries Married/Widow	541	253			

	Home production	Sleep	Other personal	TV-watching	Other leisure
			NETHERLANDS		
Widow	-9.64	0.68	-27.95	12.80	24.17
	(17.83)	(11.75)	(8.84)	(17.62)	(16.78)
R^2	0.093	0.037	0.055	0.047	0.072
Mean Married	357.49	549.76	123.38	133.15	276.37
N Diaries Married/Widow	396	681			

*Based on the *Enquête Emploi du Temps*, 2009-10, *Indagine Multiscopo delle Famiglie: Uso del Tempo*, 2002, the *Zeitverwendungserhebung*, 2012-13 and the Multinational Time Use Study Harmonized Files for the Netherlands. Each equation includes indicators for five-year age intervals over age 69 up through 84 (85+ is the excluded category); educational attainment, immigrant status (France and Germany) and indicators of the day of the week, month of the year, and year (except Italy). Married women are the excluded category. All estimates are based on sampling weights, and standard errors are clustered on individuals (except Italy).

Table 5. Estimates of the Impact of Marital Status on Home Production, Women Aged 70+, ATUS 2003-18 (minutes/day)*

Dep. Var.:	**Care of others in household**	**Food prep/ cleanup**	**Housework**	**Purchasing**	**Purchasing groceries**
Ind. Var.:					
New widow	-10.21	-27.62	-4.84	3.07	-0.24
	(3.37)	(5.77)	(8.11)	(6.69)	(1.89)
Longer-term widow	-7.88	-29.07	-13.44	-2.12	1.26
	(1.05)	(1.79)	(2.52)	(2.08)	(0.59)
R^2	0.017	0.051	0.039	0.048	0.027
Means (S.E.)					
Married women (adjusted)	10.87	74.22	76.31	54.42	8.25
	(1.03)	(1.69)	(2.19)	(1.85)	(0.47)
Husbands of women 70+	7.12	22.34	11.89	47.13	7.36
	(0.77)	(0.94)	(0.80)	(1.59)	(0.42)

*Estimates are from equations including all covariates used in the equations in Table 3. Standard errors in parentheses.

Table 6. Sources of Changes in Home Production, ATUS Women Aged 70+, 2003-18*

Dep. Var.:	Care of others in household	Food prep/ cleanup	Housework	Purchasing
Ind. Var.:		**Incidence (probability)**		
New widow	-0.081	-0.064	0.031	0.024
	(0.019)	(0.034)	(0.038)	(0.038)
Longer-term widow	-0.081	-0.106	-0.031	-0.024
	(0.006)	(0.011)	(0.012)	(0.012)
R^2	0.041	0.027	0.046	0.066
Mean married	0.111	0.805	0.618	0.426
		Intensity (conditional minutes/day)		
New widow	-20.34	-29.34	-15.09	-0.224
	(37.23)	(6.80)	(11.78)	(12.34)
Longer-term widow	20.16	-26.88	-16.73	3.32
	(26.32)	(3.02)	(4.71)	(4.51)
R^2	0.185	0.057	0.042	0.045
N with activity	334	5,492	4,282	2,708
Conditional mean married	97.84	92.12	123.47	127.75

*Estimates are from equations including all covariates used in the equations in Table 3. Standard errors in parentheses.

Table 7. Feelings and Widowhood, France 2009-10, Italy 2002, Germany 2012-13, and the Netherlands, 2000 and 2005*

	France**	Italy**	Germany**	NL**
Dep. Var.		**Rushed*** **		
Widow	-0.076	-0.023	-0.174	-0.132
	(0.038)	(0.015)	(0.069)	(0.078)
R^2	0.120	0.007	0.117	0.108
N =	2,029	2,935	772	1,077
Mean among married	0.357	0.158	0.442	0.412
Dep. Var.	**Upper-2/3 of Life Satisfaction****			
Widow	-0.263	-0.310		
	(0.135)	(0.053)		
R^2	0.325	0.218		
N =	195	2,935		
Mean among married	0.665	0.762		

*Additional covariates are vectors of age ranges, racial/ethnic identity, metropolitan status, region, day of week, month of year, and year, and an indicator of immigrant status. Married women are the excluded category. All estimates are based on sampling weights.

**Based on the *Enquête Emploi du Temps*, 2009-10, *Indagine Multiscopo delle Famiglie: Uso del Tempo*, 2002, the *Zeitverwendungserhebung*, 2012-13 and the Multinational Time Use Study Harmonized File for the Netherlands. Each equation includes indicators for five-year age intervals over age 69, educational attainment, immigrant status (France and Germany), and indicators of the day of the week, month of the year, and year (except France for life satisfaction and Italy in both equations). The estimates for France and Germany include household net income.

Table 8. Depression and Widowhood, NLSMW 1989-2003, Women Aged 66-80 in 2003, N=1,296 (Dep. Var.=1 if Depressed at Least Sometimes)*

Depressed 1989	0.235 (0.032)	0.235 (0.032)
Widowed between 1989 and 2003	0.113 (0.030)	0.110 (0.031)
Age	-------	0.0015 (0.0032)
Pseudo-R^2	0.054	0.054
Mean 1989	0.285	

*The estimates are probit derivatives, with their standard errors in parentheses.

Figure 1. Distribution of the Population by Marital Status, Women 70+, ACS 2006-17

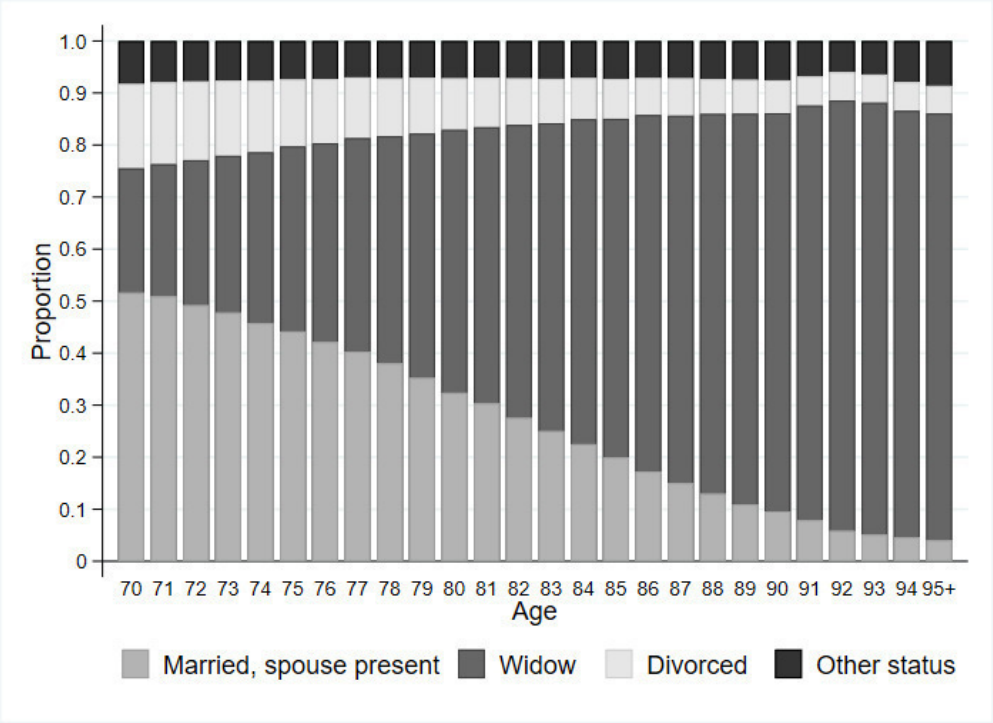


Figure 2. Goods and Time Spending on Food at Home

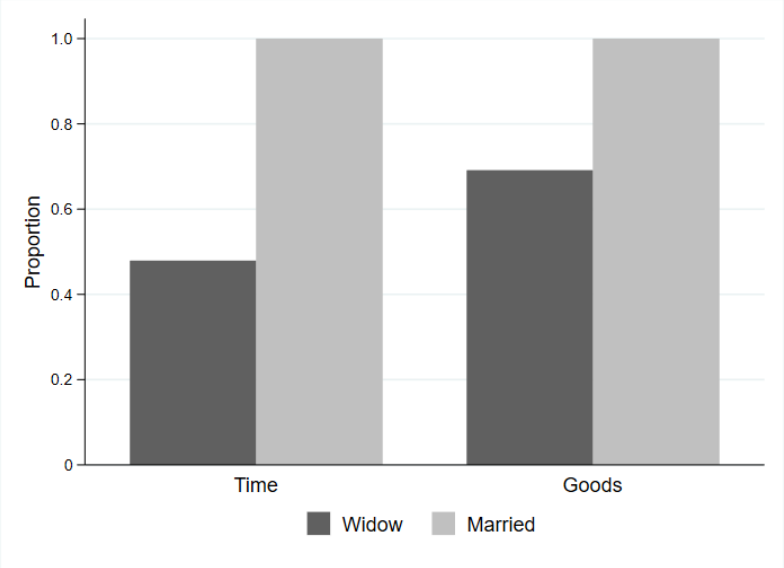


Figure 3. Time Alone or with Various Others, Married, New Widows and Longer-term Widows, ATUS 2003-18

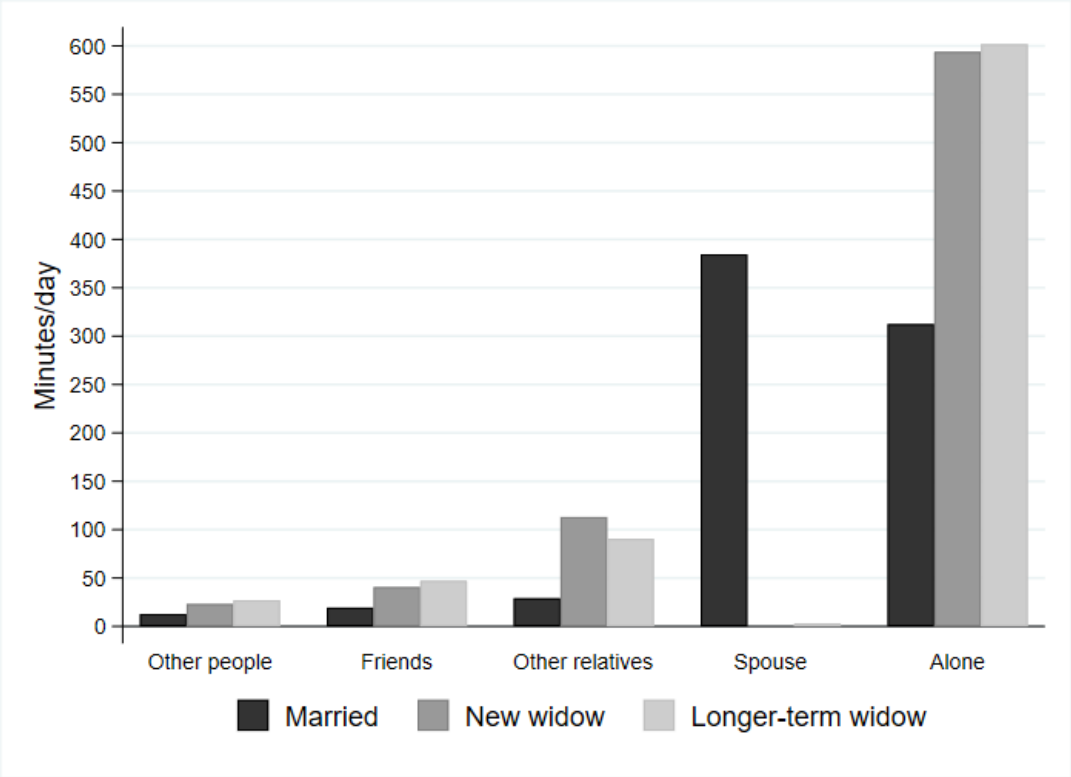
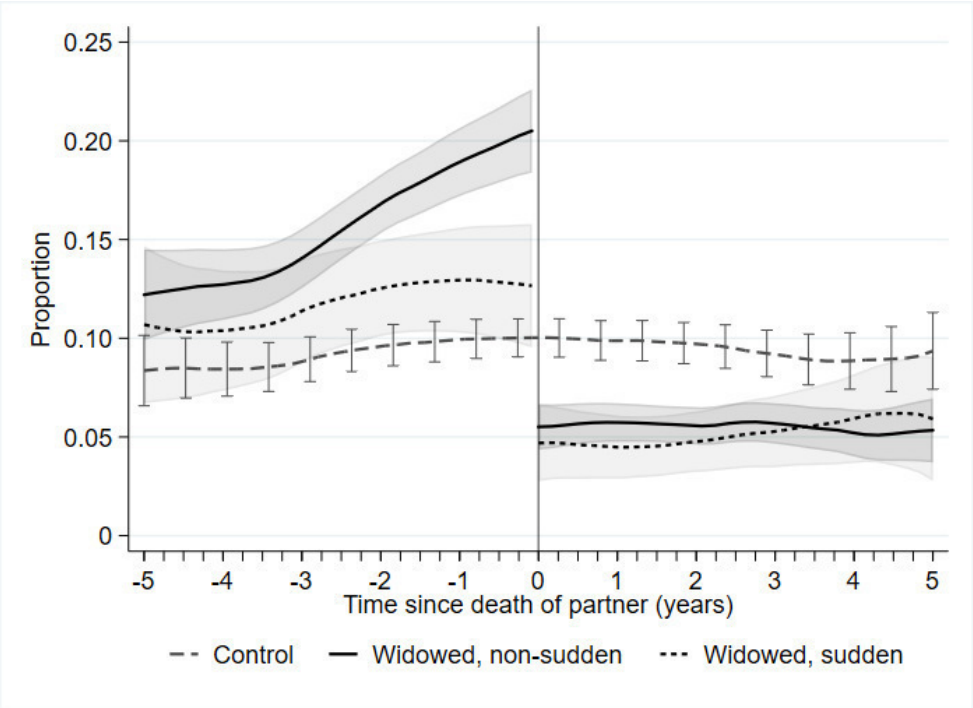


Figure 4. Dynamic Effects of Widowhood on Time Pressure: "How often do you think that family responsibilities prevent you from doing what you want to do?" (Often=1)



Source: Authors' calculations based on SHARE data waves 1-7.

Notes: Number of women for control/non-sudden/sudden samples: 2830/2157/673. Each woman is observed at least twice—before and after partner's death (actual or imputed for controls). For widows separate calculations for time preceding and following partners' death. For methodological details on sampling and matching see Adena *et al.* (2021).

Appendix A. Time Use and "Who With" Among Older Divorcees and Never Married Women

While divorcees are only half as frequent as married women in the samples of women ages 70+ (and only 1/5 as frequent as widows), the samples are sufficiently large to make a comparison of their behavior to that of other groups worthwhile. In what follows we therefore compare their time use and who they spend their time with to that of women in the two groups analyzed in the text.

We initially re-estimate the models described in Equation (1), add divorced older women to Sample 5 and add a variable indicating the woman is a divorcee.[1] Older divorcees' time use does not differ significantly from that of older widows except in one respect: Divorcees watch significantly more television than observationally otherwise identical widows, 23 minutes more per day, and spend commensurately less time in other leisure activities. Taken together, the differences in time use between divorcees and widows are almost statistically significant; and, like widows, divorcees' time use differs sharply from that of married older women.

Expanding the samples used to generate the results in Figure 3 by adding older divorcees shows that they spend significantly less time with friends than do widows, about 8 fewer minutes per day, and also significantly less time with other relatives (15 minutes per day). They make up for these deficits by spending 24 minutes more per day with other people than do widows. Like widows, divorced older women spend much more time alone than married older women; and the difference between divorcees and widows is tiny and not statistically significant.

Replacing divorcees with the even smaller group of never-married older women shows that time use is very similar in these two smaller groups. Like divorcees, the main difference from widows' behavior is that the never married spend more time watching television and less time in other leisure. In terms of whom they spend time with, the never married spend significantly more time with friends, other relatives and other people, less time alone, than do older divorcees.

[1]The results are nearly identical if we use the slightly larger Sample 3 in these estimates and in those reported below.

Appendix Table B1. Probit Derivatives Describing Sample Selection, ATUS 2003-18*

Ind. Var.	Pr{Sample 2| Sample 1}	Pr{Sample3| Sample 2}	Pr{Sample 4| Sample 3}	Pr{Sample 5| Sample 4}	Pr{Sample 6| Sample 5}	Pr{Sample 5| Sample 2}
High school	0.024	-0.017	-0.086	-0.013	0.013	-0.082
	(0.011)	(0.011)	(0.016)	(0.012)	(0.010)	(0.016)
Some college	0.043	-0.040	-0.146	-0.028	0.020	-0.146
	(0.012)	(0.013)	(0.021)	(0.015)	(0.012)	(0.019)
College	0.028	-0.071	-0.190	-0.014	0.038	-0.182
	(0.015)	(0.018)	(0.027)	(0.018)	(0.012)	(0.023)
Masters	0.043	-0.137	-0.199	-0.047	0.051	-0.241
	(0.015)	(0.020)	(0.028)	(0.023)	(0.012)	(0.023)
Doctorate	0.066	-0.180	-0.133	-0.132	-0.042	-0.271
	(0.029)	(0.046)	(0.028)	(0.061)	(0.052)	(0.048)
African-American	0.011	-0.109	0.102	0.041	0.024	0.026
	(0.012)	(0.014)	(0.013)	(0.008)	(0.010)	(0.048)
Non-black Hispanic	0.017	-0.085	0.108	0.034	0.061	0.044
	(0.016)	(0.019)	(0.017)	(0.011)	(0.010)	(0.023)
Asian-American	-0.051	0.058	0.144	0.005	0.081	0.176
	(0.039)	(0.023)	(0.023)	(0.024)	(0.008)	(0.038)
Other race	-0.094	-0.056	0.091	-0.082	0.061	-0.024
	(0.048)	(0.044)	(0.045)	(0.085)	(0.026)	(0.070)
Age 75-79	-0.002	0.029	-0.002	0.045	-0.011	0.065
	(0.010)	(0.008)	(0.014)	(0.008)	(0.011)	(0.014)
Age 80-84	0.016	0.056	-0.015	0.078	-0.011	0.102
	(0.011)	(0.008)	(0.014)	(0.007)	(0.011)	(0.014)
Age 85+	-0.083	0.075	-0.005	0.080	0.022	0.137
	(0.013)	(0.010)	(0.016)	(0.006)	(0.012)	(0.016)
Pseudo-R^2	0.007	0.029	0.030	0.066	0.016	0.026
Mean dep. var.	0.783	0.798	0.792	0.917	0.894	0.580

*Standard errors in parentheses.

Appendix C. SHARE Data Acknowledgements

This study uses data from SHARE Waves 1, 2, 3, 4, 5, 6 and 7 (DOIs: 10.6103/SHARE.w1.710, 10.6103/SHARE.w2.710, 10.6103/SHARE.w3.710, 10.6103/SHARE.w4.710, 10.6103/SHARE.w5.710, 10.6103/SHARE.w6.710, 10.6103/SHARE.w7.710; Börsch-Supan, 2020), see Börsch-Supan et al. (2013) for methodological details. The SHARE data collection has been funded by the European Commission through FP5 (QLK6-CT-2001-00360), FP6 (SHARE-I3: RII-CT-2006-062193, COMPARE: CIT5-CT-2005-028857, SHARELIFE: CIT4-CT-2006-028812), FP7 (SHARE-PREP: GA N°211909, SHARE-LEAP: GA N°227822, SHARE M4: GA N°261982, DASISH: GA N°283646) and Horizon 2020 (SHARE-DEV3: GA N°676536, SHARE-COHESION: GA N°870628, SERISS: GA N°654221, SSHOC: GA N°823782) and by DG Employment, Social Affairs & Inclusion. Additional funding from the German Ministry of Education and Research, the Max Planck Society for the Advancement of Science, the U.S. National Institute on Aging (U01_AG09740-13S2, P01_AG005842, P01_AG08291, P30_AG12815, R21_AG025169, Y1-AG-4553-01, IAG_BSR06-11, OGHA_04-064, HHSN271201300071C) and from various national funding sources is gratefully acknowledged *(see www.share-project.org)*.