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COMMENTS WELCOME

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

Daniel S. Hamermesh, Michał Myck and Monika Oczkowska*

ABSTRACT

By age 77 a plurality of women in wealthy Western societies are widows. Comparing older (ages 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 to it. Widows differ from otherwise similar married women, and especially from married women with working husbands, by cutting back on home production, especially food preparation and housework, mostly by engaging in less of it each day, not doing it less frequently. British, French, Italian, German and Dutch widows behave similarly. Widows are alone during most of the time they had spent with their spouses, with only a small increase in time with friends and relatives (except shortly after becoming widowed). They feel less time stress than married women but are less satisfied with their lives, with the shortfall stemming entirely from the extra time spent alone. Following older women in 18 European countries before and after a partner's death shows the exact same changes in their feelings of time pressure and life satisfaction. Most of the adjustment of time use in response to widowhood occurs within one year of the husband's death; but reduced life satisfaction and feelings of depression persist much longer.

*Daniel S. Hamermesh: Barnard College, IZA and NBER; Michał Myck: Centre for Economic Analysis - CenEA and IZA; Monika Oczkowska, Centre for Economic Analysis, CenEA. We thank the University of Minnesota Population Center IPUMS for the ATUS-X extracts, the Centre Maurice Halbwachs for the French data, the Centre for Time Use Research for the U.K. and Dutch data, ISTAT for the Italian data and the IZA for the German data. The SHARE data are from Börsch-Supan (2020), funded by the European Commission and various national funding sources (see Appendix C for the complete SHARE acknowledgement). Michał Myck and Monika Oczkowska acknowledge support from the Polish National Science Centre (grant number: 2018/29/B/HS4/00559). We thank Katie Genadek, Jonathan Gershuny, Frances Hamermesh (fortunately now in a minority), Shelly Lundberg, Hilmar Schneider, and especially Melanie Lührmann for useful comments, as well as participants in seminars at several universities and institutes. Len Goff provided very helpful research assistance.

I. Introduction and the Problem

Seven percent of Americans ages 25+ were widows/widowers in 2006-17. But this group consists mainly of widows: Only three percent of men in this age group were widowers, while eleven percent of women were widows. If we restrict the sample to Americans ages 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 examples, 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 respectively of men ages 70+). 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 the women in wealthy countries who reach their 70s—it is a central fact among the demographic characteristics of 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 incomes (Burkhauser *et al.*, 2005). Only one small-scale study has examined how widows use their time (Hahn *et al*., 2011); and none has examined the adjustment process by which a recently-widowed woman alters her time use, spending or other behavior in response to her husband's death—the dynamics of adjustment to a particular demographic shock.[2]

[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).

[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.

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 study 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 how and whether time use differs among these groups whose demographic characteristics differ, and it also examines whether this American behavior is observed elsewhere by comparing older partnered women and widows in time-use data sets from France, the U.K., Italy, Germany and the Netherlands. Section V disaggregates the largest differences 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 change the people with whom they spend their time compared to married women, while Section VII studies how widows' feelings—about being pressed for time, or about their life satisfaction—differ from those of partnered women. Section VIII uses longitudinal data to examine how women's feelings of time pressure, their mental health and their life satisfaction change from before to after their partner's death.

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] In the European data we distinguish between widows and women who are partnered. We base the initial look at the demographics of older American women (ages 70+) and of widows in particular on the American Community Survey (ACS) 2006-17. During these years this survey provided a sample of about 2.5 million women in this age range, more than enough to note statistically significant and often economically important differences among groups that differ by marital status.

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 widows represent the majority of surviving women.[4] Older American widows are less likely than other older married women to have been educated beyond high school; they are less likely to be white non-Hispanics than married older women with spouses present and more likely to be African-American. Since we know that 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, somewhere between 14 and 17 months before the date for which they completed the time diary as part of the ATUS (and 1 year before their final CPS interview).[5] Linking these data allows

[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.

[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.

classifying widows into two groups: Longer-term widows, those who stated in both their 4th CPS month and in the ATUS that their marital status was 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 ages 70+ in the ATUS samples from 2003-18 whom we designate as belonging to Sample 1 (widow or married with spouse present in the ATUS). The difficulty is that not all these women have information on their marital status at the 4th CPS month. For those who do, we can examine the transition probabilities across marital statuses over the year between that and the 8th CPS month. The transition matrix is 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. Small fractions (of the much smaller groups) of divorced and other married women also list themselves as transitioning into widowhood, and we exclude these from further analyses.

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. Almost none say that they re-married during this period. This stability of marital status is consistent with demographic evidence that a woman who is widowed can expect a long period of widowhood—12 years in the calculations by Compton and Pollak (2019).

[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 also older never-married women to widows and married older women along the dimensions analyzed in the text.

In order 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 the majority of final illnesses of American men ages 70+ (who comprise the overwhelming majority, 86 percent, of spouses of women ages 70+) last less than several months. GAIN (2010, Figure 9) suggests too that the final illnesses of over 80 percent of all deaths in Northern Ireland were of 6 months or shorter duration. Longitudinal data from the European SHARE, which we analyze in Section VIII, suggest than one-fourth of deaths resulting in widowhood were from accidents or from illnesses lasting one month or less. We can be fairly confident that the time use of married women is not altered by pre-adjustments to impending widowhood. Widowhood among older women is usually the result of an unanticipated event; and as Table 1 showed, it 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 respondents 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.[7]

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 months 4 and 8 in the CPS than among women generally: Taking outgoing rotation groups from the CPS for 2003-18, at both waves the fraction 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). To consider the role of sample selectivity across Samples 2-6, Appendix Table B1 presents estimates of probits describing the probability that an observation is included in Sample k conditional on its inclusion in Sample k-1, k=2,…, 6. Also presented is a probit describing the probability of inclusion in Sample 5, the sample used most in this study, conditional on being included in Sample 2. The general conclusion from this examination is that there is some non-randomness in the inclusion of observations as the sample size is restricted, but that there is no obvious pattern of relationships to objective characteristics that accompanies successive restrictions. It is true that moving from Sample 2, on which information on changes in marital status is available, to Sample 5 is not random. Rather, continued inclusion is more common for less educated respondents, for minority respondents and for women in their early 70s. 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 5 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 aggregate the categories into six major divisions: Market work; home production; sleep; other personal care; TV-watching and other leisure activities.[8] For respondents in Sample 5, to whom we pay the most

[7]Slightly less than ½ percent of the widows in Sample 5 list themselves as co-habiting with another person in the 8th CPS month. Removing these women alters only minutely the results reported here.

[8]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)

attention, market work is zero on the diary day, and they report a usual workweek of zero paid hours. For them 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 the means and their standard errors of time spent in various activities by non-working new widows, longer-term widows and married women with spouse present.[9] 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 other 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 of these differences are highly significant statistically.

The main difference between new and longer-term widows in their average use of time is in home production, which is roughly halfway between the amount spent by married women and the reduced amount spent by 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).

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 the demographic differences among women classified by marital status based on the ACS that were discussed above. To make these adjustments we use the ATUS data to estimate:

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

were treated as other leisure among this group of older women. A complete discussion of the nature of these aggregates is in Hamermesh (2019).

[9]All of 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 look very similar in that larger sample (and in the slightly smaller Sample 6).

where i is an observation; the T_j are the time-use categories (excluding the aggregate of other leisure activities, o, 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 zero-one 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.[10] 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.[11] 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 they spend more time sleeping, more time in other leisure activities and less time in other personal care. The differences among the three groups in how time is spent do not arise from the restriction of our main sample to non-workers and those who spend relatively little time in "other activities:" The

[10]The parameters are estimated using the STATA command *sureg* to provide estimates of the cross-equation correlation matrix of the residuals and allow testing the cross-equation restrictions.

[11]Detailed geographic information, including state of residence, is also available, but including indicators for each state would, given the relative paucity of new widows in the sample, 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.

results are robust to the choice of samples, given that the samples are all necessarily restricted to women whose marital histories were traceable to their appearance in their 4th CPS month.[12]

While we have included long vectors of available covariates, unobservable measures might, if they could be included, 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 parameters that have very low t-statistics (on TV-watching among new widows, on sleep and other personal care among longer-term widows), these calculations suggest that 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 use of time within each of the three pairs of groups classified by marital status is the same. This suggests testing: 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 newly widowed older women, 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.

Two categories of time use deserve attention from the perspective of a more general pattern of adjustment to widowhood over time. While for new widows as compared to married women there are significant differences in the time devoted to sleep and other personal activities, we find no differences in these categories for longer-term widows. Albeit a bit stronger, these findings are consistent with the development of a number of important measures of well-being over time after the partner's death (see Adena *et al.* 2020), two of which we examine later.

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

In the ACS the 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.

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. Finally, 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.

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) 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]

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 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 the respondents rate 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 the allocation of time. Re-specifications of the model in (1) do show

[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. The same vectors of interactions were added to the equations estimated over the ATUS described in Sections VI and VII. In those cases too these additions were not statistically significantly nonzero.

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.

More educated older women might adjust their time differently from their less educated peers, perhaps because they are more efficient at home production (since we know that education alters household technologies (Michael, 1972)). To examine this possibility, we create in indicator equaling 1 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. Taken as a group, these interactions are not statistically significantly nonzero when added to the equations described in Table 3; and only one of the ten interactions is individually statistically nonzero.

B. Replication for France, the U.K., 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, the U.K., Italy, Germany and the Netherlands, five large 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 ages 70+. For France we use the 2009-10 *Enquête Emploi du Temps*; the estimates for the U.K. are based upon the 2014-15 United Kingdom Time Use Survey; those for Italy use the 2002 *Indagine Multiscopo sulle Famiglie*: *Uso del Tempo*, those for Germany use the *Zeitverwendungserhebung*, 2012-13, while Dutch data are for 2000 and 2005 from the harmonized file produced 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 five surveys and from those in the ATUS. Any estimates are thus not strictly comparable across countries; rather, they are presented to see whether the same general patterns demonstrated by the results in Table 3 exist in other rich countries.

For all five 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 ages 70+ who do no paid work and who are either widows or partnered and have no children present in their households. Also included in the models are indicators of age (each quinquennium from age 70-84 for France, the U.K. 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, for which the information is available); 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 and British surveys obtain two daily diaries for each respondent, the German survey obtains three and the Dutch data set contains 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 results of estimating these models (only the parameter estimates on the indicator for widows) and lists the mean time spent in each activity by married women. The samples are much smaller than the ATUS sample. Nonetheless, in all five countries widows spend less time engaged in home production than partnered older women, other things equal. This shortfall is made up by widows spending more time in other leisure activities and to a lesser extent watching television. In all five countries there are only relatively small percentage differences in time spent sleeping between older widows and older married women. The most noticeable similarity to the American results is the lesser time spent in home production, with these results being quantitatively quite consistent with those for the U.S. The decline in time spent in home production in widowhood ranges from 3 percent in the Netherlands to a 19 percent shortfall in Italy, slightly more than in the U.S.

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 6 countries. Despite

that, the overwhelming similarity of the differences between widows and married 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 particular uses of time. The results in Table 3 showed that the largest adjustment of time use by widows is in home production: 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 absolutely or relatively.

A. Quantitative Disaggregation

We can disaggregate home production activities in the ATUS as consisting of the broad categories of caring for others in the household; household activities, which include many diverse sub-categories; and purchasing activities. To decompose the overall drop in home production once the adjustment to widowhood is complete, 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 former sub-category are clear; the latter includes interior house-cleaning, laundry, sewing/repairing and miscellaneous indoor activities.

Table 5 lists regression results that include 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 four activities total 52.5 minutes—more than the total drop in all home production activities—with the excess accounted for by small increases in all the other miscellaneous activities included among household activities. Over half the decline in home production time is in food preparation/cleanup, a drop of almost 40 percent compared to otherwise identical married women with spouse present.[14] The decline in time spent in housework accounts for most of the remaining decrease in

[14]While widows do spend significantly more time caring for non-household members than do otherwise identical married women, the difference is only two minutes per day. And widows spend no more time in household financial management than married older women.

home production. Not surprisingly, 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 older women in these same four activities for which results in the upper part of the table are presented. Time spent by these husbands in food prep/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. We can then infer that time spent in these two activities after adjustment to widowhood, a decrease of 42 minutes (28 percent), represents a proportionate decline in production.

B. Temporal Disaggregation

All these activities except caring for others in the household are performed both by married women and those without a spouse present. 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; and 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. Obversely, if the incidence declines only slightly while its intensity declines a lot, we can infer that the fixed costs of engaging in the activity are less important than the variable costs.

[15]Excluding those widows not living alone, the estimates change only slightly. Since they are alone in their household, by definition 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 4. It is also not the case that widows 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 spouse present and whose wives are ages 70+.

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 on 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 actually 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 spent 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—the nature of economies of scale—and thus get at the nature of equivalence scales in time use to match the myriad estimates of those of goods expenditures.[18] We concentrate on the

[17]Only 4 newly widowed women could be included in this conditional regression.

[18]Couprie and Ferrant (2015) and Gardes and Starzec (2018) examine food spending and time comparing singles and couples (and couples with children). Each defines the commodity eating fairly broadly, including time spent

intermediate production item—food for consumption at home, not including time spent eating, in order to avoid the difficulties of inferring 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] Also, by comparing widows' behavior to that of married women without children, this comparison is clearly of units that are twice the size of those to which they are being compared.

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 (estimates shown in 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 who have wives ages 70+, and imputing their time in these activities based on the age and education of husbands of wives 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., 0.48 as much time producing this commodity as do 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

consuming the food that is produced by monetary expenditures and time spent in 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 in this sub-section married older women spend 80.3 minutes/day eating, while widows spent slightly but nearly statistically significantly less time, 76.8 minutes.

Supplements provide information on the household's actual weekly food expenditures, with widows spending 0.69 as much money on food each week as couples with a married older woman.[20]

Taken together, the implied household production function is depicted in Figure 2. There appear to be 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. The Figure suggests that this household production function is not homothetic—time inputs rise relative to goods inputs as scale increases. 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 published equivalence scales based solely on expenditures understate the full cost of expanding from a 1- to a 2-person household.[21]

It is clear that X/T, the ratio of goods to time inputs, rises with widowhood. That conclusion, however, implicitly assumes that women enjoy no process utility from time spent preparing food or shopping for groceries, which may vary depending on the presence of a spouse. Nonetheless, they are among the first to: 1) Consider equivalence scales in time inputs, and the only ones to focus on time spent in home production rather than in the production and consumption of home-produced commodities; 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 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 purposes of the institution 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 the utility derived from the consumption of leisure and other time (Becker, 1973).[23] Clearly, spouses do spend more time together than randomly-matched pairs of opposite-sex adults (Hamermesh, 2002; Hallberg, 2003). When one spouse (a husband) is no longer present, the older widow has to reallocate her time to activities with other people who might provide some jointness in production or consumption of the time, or simply spend it alone.

The ATUS asks people to list who they were with during each particular 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 5 categories: Other people; friends; other (non-spouse) relatives; spouse; and being alone. In the data new widows ages 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 5 aggregated categories for each of the 3 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 the majority of the time shifted to being alone.[24] Beyond that shift, the biggest increase is in time spent with other relatives.

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[22]The Beatles, *Eleanor Rigby*.

[23]This original statement of the theory made it clear that positive and negative assortative mating will both 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 lines of efficiency in production.

[24]17 of the 5,114 longer-term widows in the sample report spending time with their spouse, averaging 8 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 few women are holding séances.

As with the amount of time spent in various activities, we should expect that the identities of the individuals with whom time is spent will depend on demographic and economic characteristics. For example, culture and location in immigrant enclaves may lead immigrants to spend less time alone and more time with friends and relatives. Also, declining mobility with age may limit older women's ability to leave their residence and engage in activities with friends. Finally, with the total amounts of time reported as being with others or alone differing, albeit slightly, by marital status, adjusting for these totals may also alter inferences about the identity of people with whom new and longer-term widows, and married older women choose to spend their time.

Table 7 lists estimates of the impact of being a new or longer-term widow on choices about with whom time is spent compared to those of married women. Included in these regressions are all the covariates underlying the estimates in Table 3, and the total amount of time that the respondent lists as being with someone else or alone. The estimates of the effects of the other covariates show that as a woman ages beyond 70 she spends less time with friends, less time with other relatives and more time with other people. Increasing age *per se* is unrelated to the amount of time spent alone. Immigrant women spend less time alone and more time with other relatives. White non-Hispanics spend more time alone and less time with other relatives.

The estimates of the impacts of widow status on the identity of who the time is spent with generally 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 time change nearly statistically significantly as the duration of widowhood increases: Newly widowed women spend substantially more time than married women with other (non-spouse) relatives, a difference that is smaller among longer-term widows.[25] 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

[25]As with the distribution of time use by widows, so too the distribution of the types of people with whom they spend time does not differ by widows' level of education.

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).

VII. Time Stress, Life Satisfaction and Widowhood

A. Time Stress

We know (Hamermesh, 2019, Ch. 11) that the time constraint seems 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. Thus we cannot say a priori whether the Lagrangian multiplier on the time constraint (Hamermesh and Lee, 2007; Buddelmeyer *et al*., 2018), proxied by feelings of time stress, rises or falls upon widowhood.

The ATUS offers no help with this question—feelings of time pressure are not elicited—so that we cannot distinguish between new and longer-term widows. All five European time-use data sets, however, provide information on the degree of time stress that respondents feel. The U.K. data set only offers information on whether the respondent felt rushed or not. We create an indicator variable equaling 1 in the French data if the woman says she feels any stress about time, in the Italian data if she is in the higher 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 8 reports the 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 5. In all five countries, otherwise identical widows feel less pressed for time than do partnered women. The point estimates imply that, compared to otherwise identical partnered women, widows are 20, 18, 15, 28 and 32 percent less likely to feel stressed for time in France, the U.K., Italy, Germany and the Netherlands respectively. None of the estimated impacts is highly statistically significant, although two

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

Why the reduction in feeling stressed for time occurs 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 8 hardly change when we include as covariates the amounts of time spent in different activities. Thus it cannot 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 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 ATUS (in several years' surveys), French, U.K. and Italian data sets do provide this information. We can thus compare the determinants of life satisfaction to those of time stress in three data sets, and we can examine the former in the ATUS. Respondents in the 2012 and 2013 waves of the ATUS and 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 1 if the person gives a rating of 7 or higher. The U.K. time-use data set asked respondents to rate their life satisfaction on a 7 to 1 scale, which we aggregate into an indicator equaling 1 if the respondent answers "6" or "7" on this question, 0 if not; and 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 estimates of the impact of widowhood (distinguishing new from longer-term widows in the U.S. data) in regressions describing this indicator of life satisfaction are shown in the bottom panel of Table 8. For all four countries the same vectors of covariates as used throughout are included, which is crucial given the evidence (Blanchflower and Oswald, 2017) of changes in average reported happiness as people age through their 70s and 80s. In all four the impact of having been a widow (for at least one year in the

[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.

U.S. data) is negative and statistically significant, with widowhood reducing expressed life satisfaction by this measure by 12, 41, 37 and 18 percent in the U.S., France, the U.K. and Italy respectively. The effects of widowed status are even more significant statistically in ordered probits describing the entire range of responses to the questions about life satisfaction.[27]

Even the U.S. sample is relatively small here, with only 44 new widows included in the sub-sample over which this equation is estimated. For that reason, the estimated impact on life satisfaction of being newly widowed is not statistically significant. The point estimate is, however, larger than that of being a longer-term widow, although the estimated impacts are not statistically different from one another. The effect of widowhood on life satisfaction is hardly altered if we account for the kinds of activities on which these women spend time.[28]

While how they spend their time does not affect older women's life satisfaction, with whom they spend it does: The estimated impact of widowhood on life satisfaction shrinks to near zero if we add information on the distribution of women's time across individuals who are present with them (the information we analyzed in the previous Section). The differences in life satisfaction by widowhood status are thus entirely due to its correlation with the identities of the people with whom that time is spent. Widows who spend more time with friends are no less satisfied with life than otherwise identical partnered women; and those widows who spend more time alone are nearly significantly less satisfied with their lives. Widows who spend more time alone are less happy.[29]

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

[28]Breaking down time spent in other leisure, it is the case that women who spend more time in religious activities are more satisfied with their lives. But this effect is the same for widows and married older women.

[29]This finding provides a good rationale for the recent creation in the U.K. of a Minister for Loneliness https://www.gov.uk/government/publications/loneliness-annual-report-the-first-year/

VIII. Longitudinal Analyses as a Mirror

The entire analysis thus far—all the work using the various national time-diary data sets—has necessarily been based on cross-section data, because there are no time-diary surveys providing longitudinal information on a useful large sample of widows.[30] The Survey of Health, Ageing and Retirement in Europe (SHARE), however, provides longitudinal data on a sufficient numbers of widows and includes information on proxies for their feelings that allow us to examine the same issues as in Section VII and that speak to the observed changes in time use, especially the drop in time spent in home production, that were shown in Section IV. In these data we can follow the same women before and after the deaths of their partners and examine impulse-response models of how their feelings along various dimensions change over the few years around the time of their widowhood.

We use information from all seven available waves of SHARE collected in Europe and Israel since 2005. 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 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 sample of widows consists of 2,235 women from 18 European countries. Using a combination of exact and propensity score matching, we match this sample to a 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.[31] For the non-widowed sample we impute a placebo timing of death of the partner in a

[30]With the exception of the small American longitudinal data set described by Juster and Stafford (1991) and the small British data set described by Gershuny (2003) we know of no longitudinal data (covering the same person's diaries in more than week). These data sets are much too small to have a set of older women large enough for any analyses here.

[31]Exact matching is based on country, age, education and time span between interviews. Apart from these, for the propensity score matching we include place of residence, number of children and grandchildren, some life-history information (childhood controls like health status, having had any vaccinations, performance at schools in math and language, and family socio-economic situation, proxied by the number of rooms per person in household at age 10,

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.* (2020).

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 outcomes for the widows and the control sample using local polynomial regression analysis spanning the period of up to five years before and after the date of death recorded in the survey. Table 9 presents the sample statistics for widows by country, including information on the average number of months between the death of the partner and the first and last observation in the survey. The average widow in the sample 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 surprise or lack thereof of the husband's death. We examine this possibility by examining a sub-sample, roughly one-fourth of all widows, who lose their partners to "sudden death," which we define as a death that follows a period of illness of no more than one month or an accidental death (as recorded in the end-of-life interview). Secondly, the death of one's partner might also affect the likelihood of observing the spouse in the subsequent waves of the survey, possibly resulting in sample attrition.[32]

We present results of local polynomial regressions estimated over the widows and control samples in Figures 4a-f.[33] In each case we regress the outcome on a set of indicator dummies covering the period

number of shelves with books), and several characteristics of the partner in his initial wave of observation (age, education, self-reported health status, BMI category and reported symptoms of depression).

[32]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 a women whose residence has changed. Adena *et al.* (2020) conduct a number of robustness tests to examine the difference in the dynamics of a long range of outcomes and conclude that panel attrition does not influence the general conclusions. In any event, the consequence of such attrition is that what we estimate are lower-bound effects of becoming widowed.

[33]The Figures are based on nearly complete sub-samples, with 2,206, 541, 2,198, 541, 2,220 and 544 observations underlying Figures 4a-f respectively.

from five years before to five years after the death of the partner. Figures 4a, 4c and 4e show the results for the full sample of widows, while Figures 4b, 4d and 4f present results for widows whose partners died suddenly.

We first examine how time constraints relate to family responsibilities. As Figure 4a shows, these constraints among widows are already growing before partner's the death, which is unsurprising given the likely need to provide care to a dying partner. This interpretation seems validated by results using the sample of widows who lost their partners to sudden death (Figure 4b), where no pre-death difference is seen. Family responsibilities are less restrictive after the partner's death. Here and in the remaining sets of Figures 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.

In the full sample 43 percent of women are often or sometimes prevented from doing what they wish due to family responsibilities just before the death of their partner, which drops to about 20 percent after the death of the partner and remains roughly constant thereafter. In the control sample the proportion of women limited by family responsibilities is relatively stable between 34 and 38 percent. The widowed-partnered difference and its timing mirror the cross-section evidence above showing widows' feeling less stressed for time than partnered older women.

Consider the time path of life satisfaction of widows compared to partnered women, shown in Figures 4c and 4d. About five years after the partner's death the well-being of widows is still below that of newly widowed women, but the difference is much less than immediately post- (partner) mortem. This partial adjustment mirrors perfectly the greater negative coefficient among newly widowed women than longer-term widows shown in the cross-section results in the bottom panel of Table 8. The differences observed in the first years after death are substantial. For example, life satisfaction among all widows drops from 7.15 to 6.75 – and the difference is even greater compared to the controls, whose average life satisfaction at the placebo point of death is about 7.4. Despite the passage of time the level of life satisfaction among widows remains lower by about 0.2 points on the 10-0 scale.

Figures 4e and 4f examine feelings of sadness or depression over the past month. The proportion of widows who declared having such feelings increases sharply at the point of their partner's death, rising from 0.56 to 0.80 for all widows, and from 0.48 to 0.75 those whose partners died suddenly. Time seems to heal the wounds, in the sense that five years after death the incidence of such feelings among widows and the control sample are statistically indistinguishable, although the point estimate of the difference remains positive.

Thinking of the longer-term implications of widowhood, we have to bear in mind that the effects observed in panel data represent the lower bound of the true impact, 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 declines in well-being following the partner's death. Although in the cross-sectional analyses presented in Sections II-VII we could not capture the dynamics of the impact of becoming widowed, the results here 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 population of rich countries; among women ages 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 micro-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, the U.K., 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. In particular, it suggests that food preparation/cleanup and housework (totaling slightly more than 2 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 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 (in this case, 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 fairly rapid. Our analysis using panel data confirms this and further suggests that this adjustment of time use, at least in relation to household production, is permanent and does not change as time passes since the partner's death. 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. 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 what is truly an exogenous shock. The example allows easier inferences about behavior than other shocks might, since the people examined 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 Ages 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	581.10	123.65	237.15	266.20
		(11.24)	(9.35)	(5.72)	(12.15)	(14.01)
Longer-term widows	5,114	199.76	561.95	141.18	269.51	267.60
		(2.36)	(1.96)	(1.53)	(2.86)	(2.82)
Married spouse present	2,298	258.29	551.17	144.16	231.80	254.59
		(3.69)	(2.44)	(2.16)	(3.59)	(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 Ages 70+, France 2009-10, U.K. 2014-15, 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			
			U.K.		
Widow	-20.96	-14.67	-15.08	-1.55	52.23
	(13.57)	(11.22)	(9.39)	(14.96)	(12.74)
R^2	0.155	0.121	0.086	0.137	0.129
Mean Married	286.65	529.36	199.08	197.51	209.65
N Diaries Married/Widow	447	492			
			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			
			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, the United Kingdom Time Use Survey, 2014-15, *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 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 Ages 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 Ages 70+, 2003-18*

Dep. Var.:	Care of others in household	Food prep/ cleanup	Housework	Purchasing
		Incidence		
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		
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. Effects of Marital Status on Choice of Whom Time is Spent With, Representative Day, ATUS 2003-18, (minutes/day), N=7,642*

	WHO WITH				
	Alone	**Other relatives**	**Other people**	**Friends**	**Spouse**
Ind. var.:					
New widow	270.55	83.93	10.63	24.31	-389.43
	(17.10)	(11.52)	(6.17)	(7.41)	(13.53)
Longer-term widow	278.14	63.69	14.05	32.00	-387.89
	(5.33)	(3.59)	(1.92)	(2.31)	(4.21)
R^2	0.469	0.067	0.025	0.045	0.574
Hypotheses:					
New widow = longer-term widow (p-value)	0.66	0.08	0.58	0.30	0.91
Mean married	312.46	29.06	12.73	19.34	384.64

*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. Also included is the total amount of time the woman lists as being alone or with someone else. Married women are the excluded category. Standard errors in parentheses.

Table 8. Feelings and Widowhood, ATUS 2012-13, France 2009-10, U.K. 2014-15, Italy 2002, Germany 2012-13, and the Netherlands, 2000 and 2005*

	U.S.*	France**	U.K.**	Italy**	Germany**	NL
Dep. Var.			**Rushed*** **			
Widow		-0.076	-0.022	-0.023	-0.174	-0.132
		(0.038)	(0.024)	(0.015)	(0.069)	(0.078)
R^2		0.120	0.121	0.007	0.117	0.108
N =		2,029	867	2,935	772	1,077
Mean among married		0.357	0.120	0.158	0.442	0.412
Dep. Var.	**Upper-2/3 of Life Satisfaction****					
New widow	-0.130	-------	-------	-------		
	(0.115)					
Longer-term widow (or all widows)	-0.088	-0.263	-0.310	-0.136		
	(0.034)	(0.135)	(0.053)	(0.020)		
R^2	0.049	0.325	0.218	0.049		
N =	888	195	395	2,935		
Mean among married	0.728	0.665	0.827	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, the United Kingdom Time Use Survey, 2014-15, *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. Married women are the excluded category.

Table 9. Widows in SHARE by Country: Time between Survey Participation and Partner's Death

	N		Average time between partner's death and…	
Country	**All widows**	**Widows with partner sudden death**	**…initial observation (months)**	**…final observation (months)**
Austria	94	24	43	35
Belgium	160	31	51	42
Czech Republic	183	51	35	29
Denmark	109	25	53	43
Estonia	240	67	26	27
France	146	29	48	46
Germany	90	22	51	35
Greece	100	43	63	51
Israel	129	24	55	40
Italy	199	44	58	38
Luxembourg	5	1	11	7
Netherlands	96	24	45	46
Poland	118	32	47	44
Portugal	31	8	26	20
Slovenia	43	8	22	17
Spain	285	74	51	38
Sweden	150	26	56	56
Switzerland	57	15	51	35
All 18 Countries	**2,235**	**548**	**47**	**39**

Source: own calculations based on SHARE data waves 1- 6 (rel. 7.1.0).

Note: Sudden death defined as death due to illness lasting less than 1 month or due to accident.

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

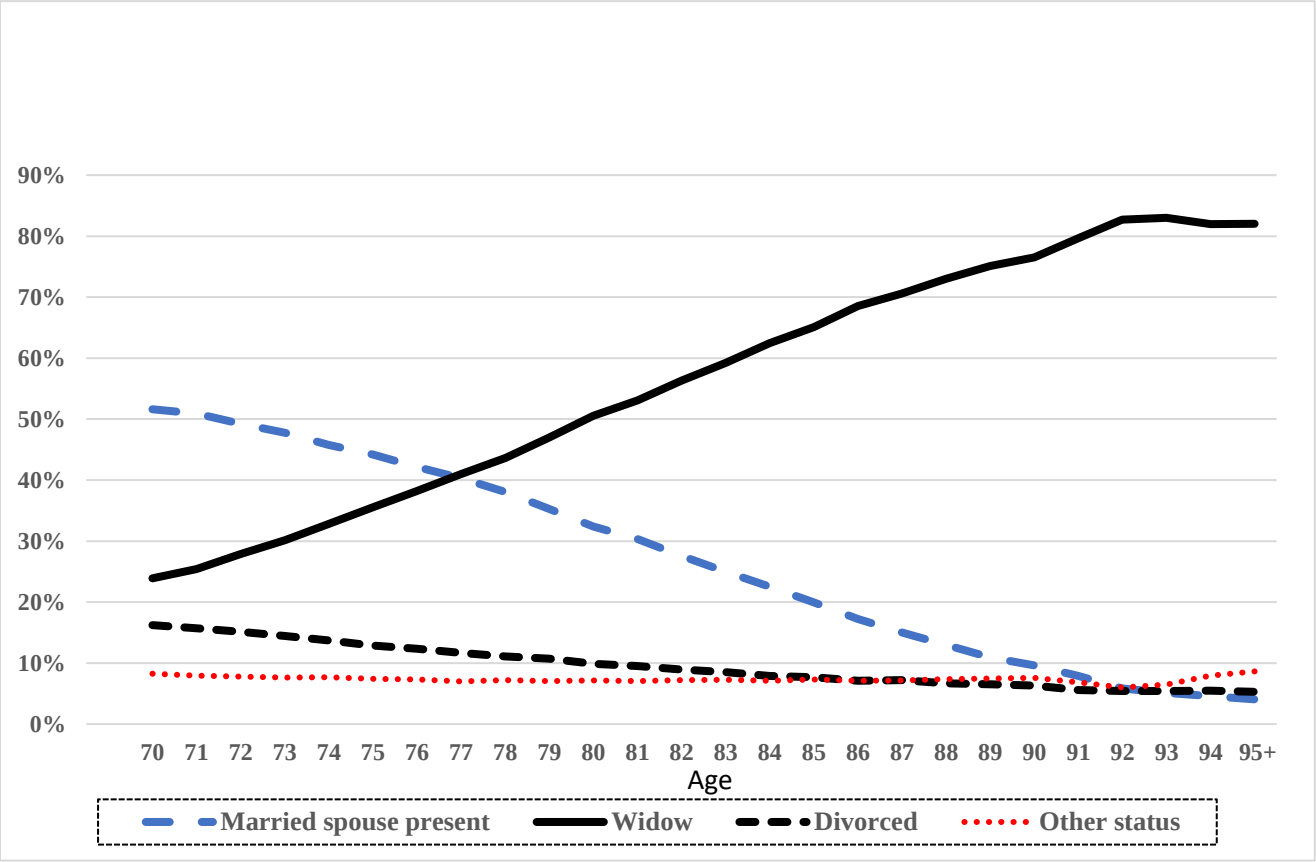


Figure 2. Goods and Time Spending on Food at Home

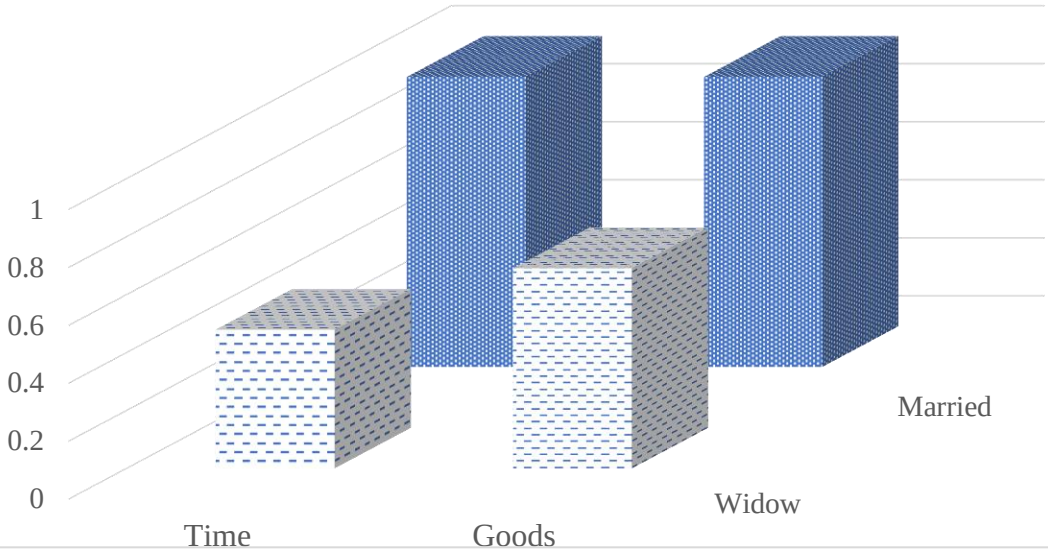


Figure 3. Time Alone or with Various Others, Married, New Widows and Longer-term Widows, ATUS 2003-18.

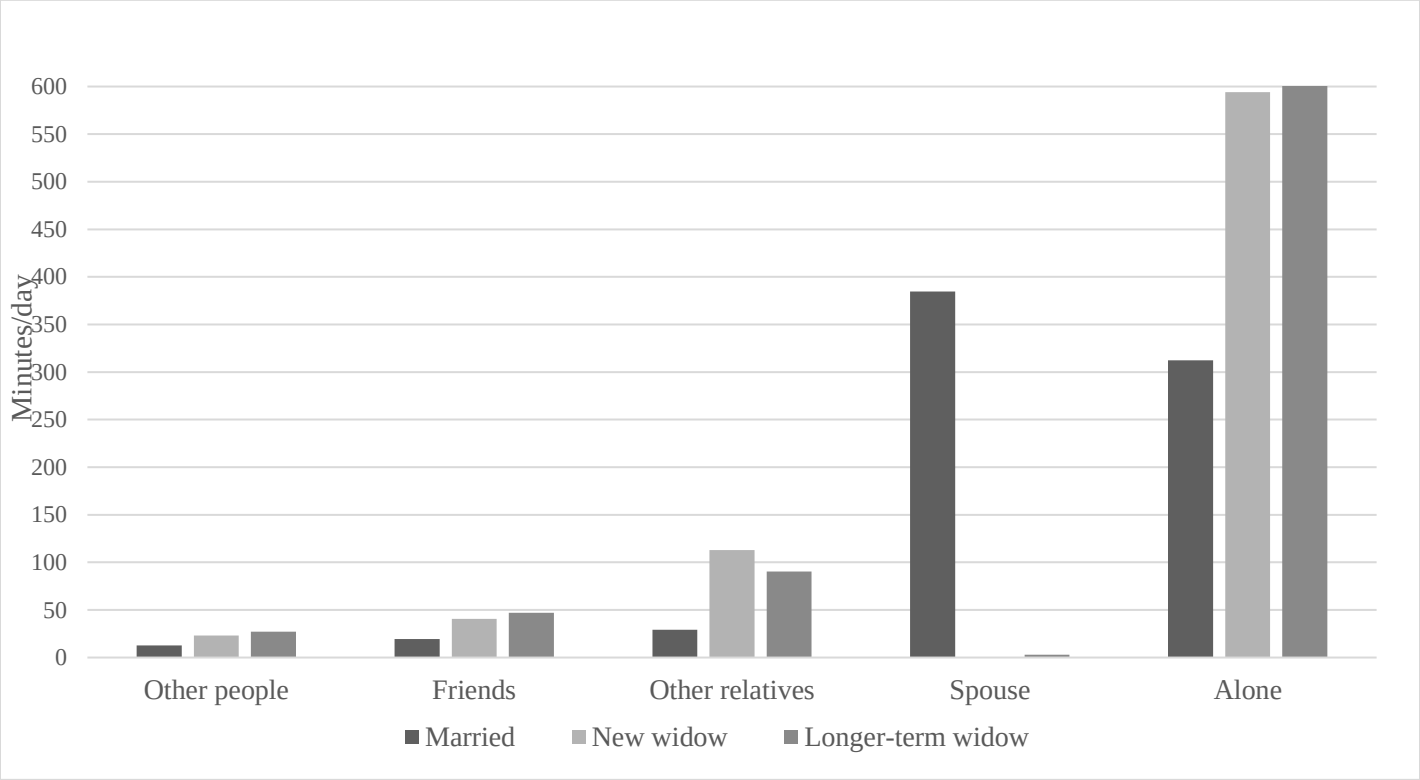
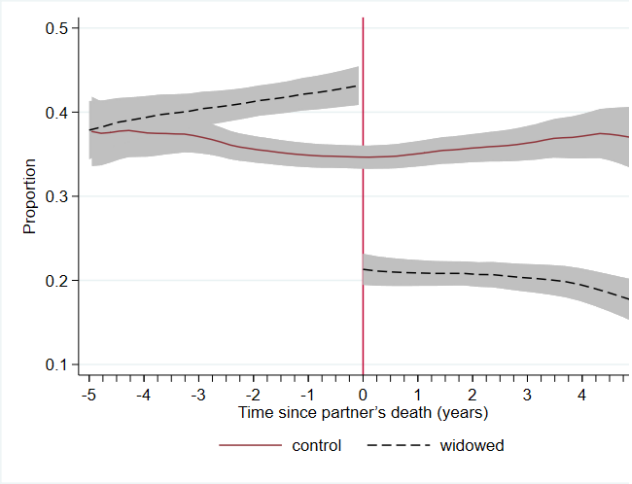


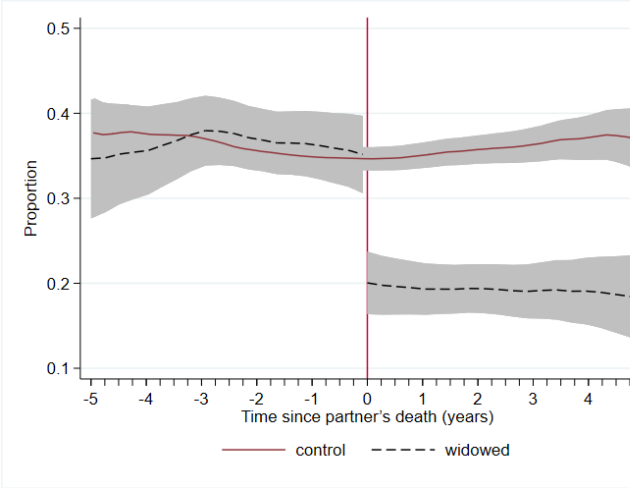
Figure 4. Dynamic Effects of Widowhood: Time Pressure, Life satisfaction and Depression

How often do you think that family responsibilities prevent you from doing what you want to do? (often or sometimes)

(a) All widows

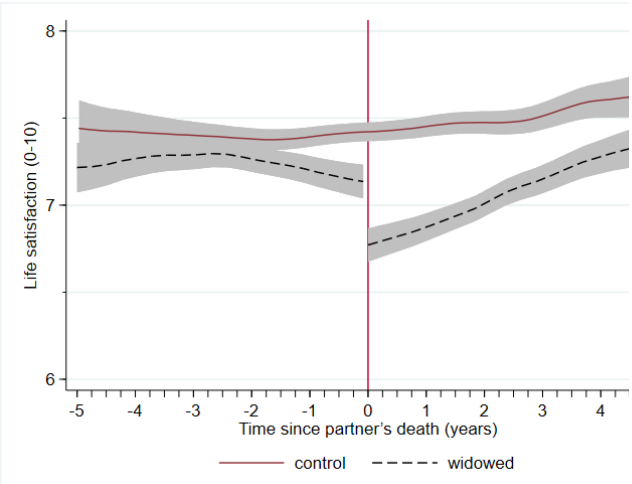


(b) Widows due to sudden death

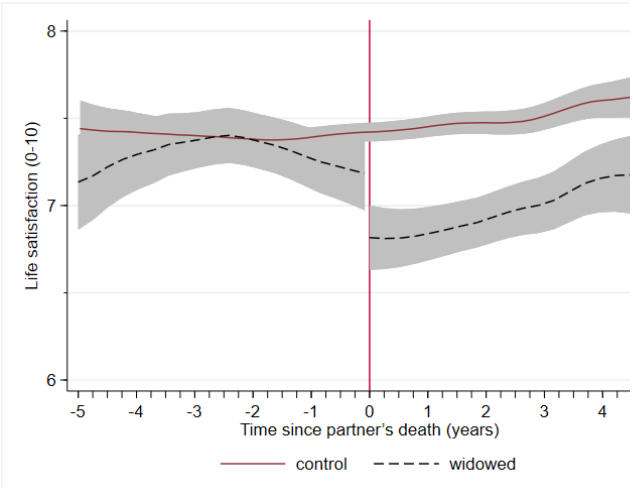


On a scale from 0 to 10 where 0 means completely dissatisfied and 10 means completely satisfied, how satisfied are you with your life?*

(c) All widows

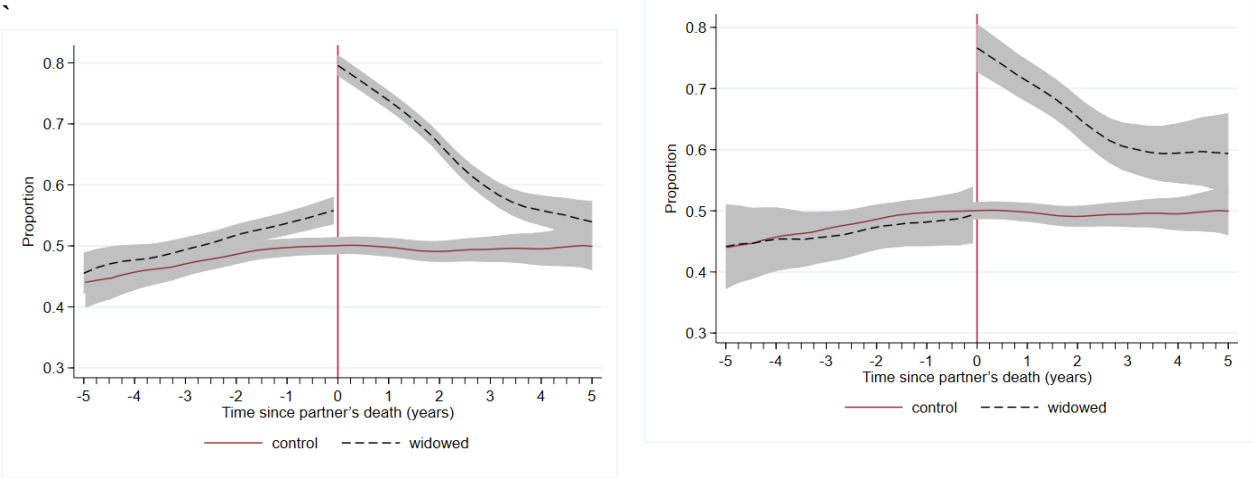


(d) Widows due to sudden death



In the last month, have you been sad or depressed?

(e) All widows **(f) Widows due to sudden death**



Note: For widows separate calculations for time preceding and following partners' death.

**In SHARE Wave 1 satisfaction with life was measured on a 4-point scale: very satisfied, somewhat satisfied, somewhat dissatisfied, very dissatisfied, which has been adapted to 0-10 scale based on frequencies of answers relative to SHARE Wave 2.*

Appendix A. The Time Use, "Who With" and Life Satisfaction of Divorcees and the Never Married

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 widows and married older women worthwhile. In what follows we therefore compare their time use, who they spend their time with, and their life satisfaction to those 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.[34] 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 Table 7 by adding older divorcees and including an indicator for them demonstrates that the identity of people with whom they spend time differs significantly from that of older widows. Divorcees 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 this deficit by spending 24 minutes more per day with other people than do widows. Although like widows divorced older women spend much more time alone than married older women, the difference between divorcees and widows is tiny and not statistically significant.

While the results in bottom panel of Table 8 show that longer-term widows are 10 percentage points less likely than otherwise identical married older women to respond that they are happy (life satisfaction at least 8 on a 10-to-0 scale), divorcees are 20 percentage points less likely than married older women to state that they are satisfied with their lives. Moreover, the difference between widows and divorcees is 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. The small sample of never-married older women in the two years in which information on life satisfaction is obtained precludes comparisons of their happiness to that of other older women.

[34]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)*.