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Caring for Mom and Neglecting Yourself?
The Health Effects of Caring for an Elderly Parent

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Abstract

We examine the physical and mental health effects of providing care to an elderly mother on the adult child caregiver. We address the endogeneity of the selection in and out of caregiving using an instrumental variable approach, and carefully control for baseline health and work status of the adult child using fixed effects and Arellano-Bond estimation techniques. Continued caregiving over time increases depressive symptoms for married women and married men. In addition, the increase in depressive symptoms is persistent for married men. Depressive symptoms for single men and women are not affected by continued caregiving. There is a small protective effect on the likelihood (10%) of having any heart conditions among married women who continue caregiving. Robustness checks confirm that the increase in depressive symptoms and decrease in likelihood of heart conditions can be directly attributable to caregiving behavior, and not due to a direct effect of the death of the mother. The initial onset of caregiving, by contrast, has no immediate effects on physical or mental health for any subgroup of caregivers.

Introduction

For single elderly parents, adult children are by far the most common type of informal care providers, with daughters more frequent than sons (Spector *et al.* 2000). Due to differences in life expectancy, mothers are the most likely care recipient among single elderly, primarily due to widowhood (Van Houtven & Norton 2008). Furthermore, adult children will become an increasingly important source of informal care as the baby boomer generation ages, the number of divorcees increases, and the differential life expectancy between men and women results in a larger number of widowed elderly women. Since adult children are fundamentally different from spousal caregivers, in terms of their age profiles, the competing demands for their time, and the differences in their emotional and financial ties to their care recipient, understanding the long-term consequences of caregiving is an important policy issue.

This paper tests whether caregiving by adult children has adverse effects on their mental and physical health. The evidence is clear that providing informal care can cause adverse emotional and physical health effects on elderly spousal caregivers, at least in the short term, and even up to five years after a caregiving experience (Schulz *et al.* 2001). Less is known about care provided by relatively younger—50 to 70 years old on average—and healthier middle-aged and newly old adult children. We examine both the short-run and the persistence of caregiving effects by observing adult children over 12 years. We consider both the health effects of continuing caregiving over time as well as the initial health effects upon becoming a caregiver.

The decision to provide care to a parent is endogenous to one's own health, making estimates of the effects difficult to estimate without bias in observational studies. Using our long panel of caregivers and potential caregivers, we examine for both the start and the end of the caregiving episode, both of which are endogenous. We use death of the care recipient to control for the end of caregiving. Death of the care recipient serves as a sorting variable that allows us to compare health effects of caregivers who are still caregiving, caregivers who have stopped caregiving, and non-caregivers who have also experienced the death of a parent. To examine the effects of the initial selection into caregiving, we use sibling characteristics as instrumental variables, as has been done in the current literature focusing on the cross-section (Ettner 1995; Stern 1995; Heidemann & Stern 1999; Engers & Stern 2002; Holmes & Van Houtven 2002; Van Houtven & Norton 2004; Charles & Sevak 2005; Heitmuller 2007). By controlling for selection in and out of caregiving, this ensures that any observed health effects are not simply bereavement effects but can be attributed to caregiving, and will help ensure that our estimates are free of endogeneity bias or compounding factors.

The key contributions of this work are that we carefully control for the endogeneity of informal care and the outcomes of interest, we examine whether the health effects of caregiving are fleeting or persistent by using a long panel of longitudinal data, and we focus on adult children of the elderly, who are the most common source of informal care in the United States, for whom the long-term health effects of caregiving are not well understood. This work will help to extend existing knowledge about the health effects of caregiving, by examining the largest and predicted to be the fastest growing group of caregivers, adult children.

Background

Most of the studies on caregiver health effects have been either cross-sectional or have used selective samples, either through randomized control trials providing help to caregivers, by examining certain disease types such as dementia, or by use of small probability or convenience samples (Hirst 2004). Providing informal care can cause adverse emotional and physical health effects on elderly spousal caregivers over the short term (Sorensen *et al.* 2002; Brodaty *et al.* 2003), primarily by increasing depression risk. More intensive caregivers (Majerovitz 1995; Sansoni *et al.* 2004) and female spousal caregivers (Harwood *et al.* 1998; Thompson *et al.* 2004) are particularly prone to experiencing anxiety and depression (Majerovitz 1995; Sansoni *et al.* 2004). Others have found that there are blood pressure (Shaw *et al.* 1999; Grant *et al.* 2002) and coronary heart disease effects of caregiving, with blood pressure effects persisting at least a year after death of the spousal care recipient (Grant *et al.* 2002). In addition, the stress of caregiving has further been associated with the development of coronary heart disease (Lee *et al.* 2003; Mausbach *et al.* 2007).

Caregiving has also been found to increase mortality risk. Christakis and Allison (Christakis & Allison 2006) found that the hospitalization of a spouse significantly increased the one-year mortality of the non-hospitalized spouse, suggesting that either the strain of the hospitalization itself or the caregiving following the hospitalization increased the risk of death. One randomized control trial found that the health effects of caregiving persisted over time (Schulz & Beach 1999), with spousal caregivers under strain facing significantly higher mortality risks up to five years after ceasing caregiving. Other physical health effects have been found which include sleep disturbance, back injuries from transferring patients (Brown & Mulley 1997), and compromised immune system function, especially among caregivers reporting burden (Kiecolt-Glaser *et al.* 1991).

The longitudinal studies identified controlled for initial caregiver health and intensity of the caregiving time over time, but do not account for endogeneity between informal care and health (Kiecolt-Glaser *et al.* 1991; Hirst 2004). Hirst finds that duration of caregiving increases psychological distress and that psychological distress is highest at the start or at the end of a caregiving episode (Hirst 2004; Hirst 2005) . In this study, the researchers look at all caregiver types, spouses, children, and friends, but do not examine separately the effect on adult children.

Less is known, therefore, about the health effects of adult children who provide care to their parents. The health effects may be different for children compared to spouses, due to differences in age (Clipp & George 1993), due to less financial and emotional dependence on the care recipient (Norton & Van Houtven 2006) and due to differences in initial health and time constraints. Adult children are often torn between an obligation to parents and to their own careers and families, and such a dilemma does not often confront a spousal caregiver. Evidence from small studies have found that adult children showed a significantly higher degree of total caregiver burden, irrespective of age, compared to other related family caregivers (Andren & Elmstahl 2007). However, these findings are based on small, non-representative samples over a short window of time.

We know very little about whether emotional or physical health effects of caregiving persist for adult children. The time period over which many health outcomes are measured in most studies, 6 months to one year, do not capture the full effects because caregivers often have many more years of caregiving in front of them (Thompson *et al.* 2007). In addition, once a caregiver ceases being a caregiver, we know little about whether he or she will regain the health status lost due to caregiving, or whether the health effects will persist. One study showed that non-spouse caregivers experienced feelings of relief after stopping caregiving, whereas spouse caregivers tended to experience more negative life changes (Eloniemi-Sulkava *et al.* 2002).

Selection

Selection out. If providing care to an elderly parent has negative health consequences, one must be careful to take into account the selection bias when examining the effects of continued caregiving. Caregivers cease caregiving for a variety of reasons, some of which are due to their own health limitations. Depression, caregiver burden, and other health problems of the caregiver are significant contributing factors to stopping caregiving (Schulz & Beach 1999). Most commonly, ceasing caregiving is due to death or institutionalization of the care recipient (Mittelman *et al.* 1996). Although institutionalization is probably an endogenous decision, the death of the care recipient, or at least the exact timing of the death, is more plausibly exogenous. We use death of the mother to control for the endogeneity of the decision to stop caregiving.

Selection in. We know from cross-sectional studies that caregivers tend to be daughters, to be poorer, have lower opportunity cost of their time compared to siblings (Dwyer & Coward 1991), and live closer to parents compared to siblings, including being more likely to co-reside (see (McGarry 1998) for a review). Less is known about how health status affects selecting into caregiving. One must worry that the least healthy child, or the child with the lowest propensity for work becomes the caregiver, or conversely that a certain threshold of health is needed before becoming a caregiver, making it very important to control for initial health and economic endowments to understand the effects of informal care on health over time.

Another source of potential endogeneity bias comes from selection into caregiving among siblings. Children may act strategically or cooperatively in the decision to become a caregiver (Wolf *et al.* 1997; Heidemann & Stern 1999; Pezzin & Schone 1999; Checkovich & Stern 2002; Engers & Stern 2002; Neuharth & Stern 2002; Heitmuller 2007), and have been found generally to depend partially on the expected behavior of siblings. Generally, the more likely siblings are to care for a parent, the less likely a child him or herself is to take care of a parent (Checkovich & Stern 2002). Not considering dependence upon siblings may also introduce bias.

Data

We use data from 7 waves of the Health and Retirement Survey (HRS) (1992-2004). The HRS is a nationally representative sample of the near elderly in the United States (ages 50 to 64 entered the sample initially). The HRS collects information not only about the respondents and their spouses, but also information about siblings and parents.

Sample. We examine men and women separately, given their different propensities to provide informal care and given the different prevalence of depression between men and women. We further delineate the sample by marital status, since when an adult child is married there are two potential caregivers, the husband and the wife, and there may be joint-household production issues than means that caregiving has different costs and gains between single- and joint- households.

In order to make the sample as clean as possible, we first limit the sample to those individuals that have only a mother alive, since caregiving as an adult child could be very different if there is also a spouse care provider. Because most of the single elderly were mothers, we focus in this paper on single elderly mothers. We also limit the sample to non-co-residing adult children prior to the start of any caregiving episode, since it is much more difficult to measure the intensity or care provision, or even who is providing care for whom, in co-residing households. We also exclude those who we do not observe before they begin caregiving, since we cannot ascertain their cohabitation status.

In order to examine the effects of continued caregiving, our main sample consists of HRS respondents or their spouses who are caregivers. For this sample we also require they be observed in at least three waves. This sample consists of 2,557 observations in total; 1,270 married females, 347 single females, 817 married males, and 123 single male observations.

When we examine the effects of the initial selection into caregiving, we focus on the sample of non-caregivers. Since we stack the panel, and require they be observed in at least three waves, this sample consists of 8,092 observations. Overall, in the model of initial selection into caregiving, we have 3,082 married female observations, and 3,366 married males[1].

Sibling information. The HRS sibling-level files contain information about caregiving behavior of the adult child, and all of his or her siblings. There is complete information on siblings for a basic set of variables: a sibling's age, gender, marital status, and number of children and grand children that they have. There is additional information on up to four randomly drawn siblings. Of this additional information, only work behavior (full-time or part-time) is available for both the siblings and the HRS

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[1] As will be discussed later, the instruments typically used in the literature, and employed here, are weak for the samples of single men and single women, thus we only report the health effects of the samples where we have valid instruments.

respondents for all waves. Thus, for the selection model into caregiving, we consider the siblings' gender, marital status, age, number of kids they have, number of grand kids, and whether the sibling worked full- or part-time (using a lagged value for work status). Out of the sibling-level variables, only the number of children was important. We control for missing values and the random-selection process for the additional questions. Additional sibling variables, such as the sibling's relative financial position compared to the respondent, whether or not the sibling owns his/her own home, and the number of children at home under the age of 18, are also available, but because these are not available in all waves for both siblings and respondents, we do not include them in the model.

Mothers. Mothers are the care recipients in our sample. The survey collects information from the HRS respondent about the mother's age and whether or not she needs help with ADLs. We also have a measure of need, found in child-reported information on whether or not the mother needed ADL help or can be left alone for an hour or more at a time. We have no information about whether the mother used community-based long-term care, and only know if she was in a nursing home if she died. Information about diagnosis of a memory problem is available only in some of the later waves, and is excluded from our measures of parental health.

Dependent variables. Caregiver health is measured using both subjective and objective physical health measures (e.g., self-reported health on a 5-point scale ranging from excellent (1) to poor (5), any diagnosed heart condition, and ever told s/he has high blood pressure). To measure mental health we use the CES-D8 index (Blazer *et al.* 1991; Hays *et al.* 1993). Scores of 4 or 5 and above on this 8-point scale are consistent with probable clinical depression.

Primary explanatory variables. We use a discrete measure of caregiving as the main explanatory variables of interest. Specifically, the HRS asks[2],"Did you spend a total of 100 or more hours (since Previous Wave Interview Month-Year /in the last two years) helping your (parents/mother/father) with basic personal activities like dressing, eating, and bathing?" For those with a yes response, they are next asked, "Roughly how many hours did you yourself spend giving such assistance?" Preliminary analysis has raised concerns about the reporting accuracy for hours of assistance, thus we use only the indicator variable for providing any informal care. This means we are mixing both intensive caregivers and occasional caregivers, and measuring a lower-bound for the health effects for the intensive caregivers. The survey continues to ask if any siblings, and which ones, also provide help with these tasks. This is the definition of caregiving we use when predicting parental care among siblings.

The HRS also asks,

"Did you spend a total of 100 or more hours (since Previous Wave Interview Month- Year/in the last two years) helping your (parents/mother/father) with other things such as household chores, errands, transportation, etc.?" This type of care is not asked about any of the siblings. This is the measure we use when looking at respondents' health effects of initial and continued caregiving.

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[2] There are a few changes to this question during the survey. In 1994, the question asks about 50 or more hours of care instead of 100, and asks only about the previous 12 months instead of 2 years. We do not adjust the data for these differences.

Due to the differences in the caregiving measure between siblings, we use two different measures of caregiving depending on the level of analysis. For the sample of respondent caregivers, we use both the personal care and the help with chores questions. When we examine the effect of initially becoming a caregiver, we limit the definition to just personal care in the first stage when we use siblings and respondent data. Only in the second stage when measuring the health effects on the respondent-only panel do we use the combined measure of caregiving (personal care and chores).

Methods

Model

In order to examine the effect of caregiving on the health of the caregiver, we estimate the following regression:

$$H_{c,t+2} = \alpha + \beta_1 H_{c,t} + \beta_2 \mathrm{A}_{\mathrm{c,t+2,t}} + \beta_3 X_p + \beta_4 X_c + \theta_t + \mu \qquad (1)$$

where *H* is the health outcome, *A* is the informal care behavior, X_p are the characteristics of the parent, and X_c are individual-level characteristics. The individual-level characteristics included are age, age squared, number of children, race, being foreign-born, education categories (less than high school, high school, some college, 4-year degree or higher), and logged net worth. We also include indicator variables for having worked full-time or part-time in the previous interview. The parental variables include education of both the mother and the father as proxies for socio-economic status.

This equation is a reduced-form model of the Grossman health production function (Grossman 1972), where health is a function of previous health and health investments. β_1 in equation 1 provides an estimate of the natural rate of health deterioration, and the other control variables affect the health investments one makes. Caregiving might have an effect on the health investments made, if it directly affects the physical or mental demands or changes health-seeking behaviors. The goal of this paper is to determine the size and the direction of this health effect.

Estimation

We explore in our analysis whether using instrumental variables regression (IV), IV fixed effects (IV-FE) or an Arellano-Bond GMM estimator (A-B) best address the endogeneity due to the lagged dependent variable in equation (1). Arellano-Bond estimators use the two-period lagged health variable as an instrument for the difference between lagged health variable and current health (addressing the concern that the first difference in health (health *t* minus health *t-2*) is correlated with the individual specific part of the error term). For health conditions that are changeable over time, A-B may perform better than the first differenced approach of IV-FE estimation (Arellano & Bond 1991). Health conditions that are persistent, such as chronic diseases, might not perform as well due to the lack of variation in the lagged measure may cause the instruments to be weak. For A-B to be preferred to IV-FE, the sign of the AR(1) test statistic should be negative and significant, i.e. there is negative correlation between lagged health and current health, and the AR(2) test statistic should be insignificant, meaning that the twice-lagged health measure is not correlated with current health. If the error structure does not fit this description, we rely instead on the IV-FE estimates. Although IV-FE estimates will suffer from dynamic panel bias, this is preferred to the weak instrument case.

Selection out of Caregiving

To examine the selection out of caregiving, we create a respondent- and spouse-level dataset (N=74,220). Selecting only families that had only a mother alive, and did not co-reside before the caregiving episode, we then limit the sample to individuals who provided care at time t=0. We then stack the years of data, and limit the sample to those observed in three waves, bringing our total observations used in the regression analysis to 2,557.

Among current caregivers, continued caregiving is instrumented by the death of a parent. The validity of the instrument must create a significant exogenous change from caregiving to stopping caregiving. We also run a sensitivity test to make sure that the exclusion of our instrument is valid, i.e. the death of a parent does not have a direct effect on one's health (for example, through a bereavement effect)(Van den Berg *et al.* 2008) .

Selection Into Caregiving

To examine the selection into caregiving, we create a family-level dataset of all respondents, their spouses, and their siblings (N=151,890). Selecting only families that had only the mother alive, and who did not co-reside, we then stack the years of data, giving us a total of 60,272 observations from 1992-2002. The total observations are 8,092 because we run the model on 1994 to 2002 data so that we can examine behavior prior to selection into caregiving, and each individual must be observed in at least three waves.

We use two strategies to control for selection into caregiving, based on the previous literature. First, we estimate the probability of caring for a parent for each adult child in the family, depending on one's own characteristics and the characteristics of the family and the siblings (Holmes & Van Houtven 2002). We estimate the following logit model :

$$A_{j,t} = \alpha + \beta_1 X_f + \beta_2 X_s + \beta_3 X_j + \beta_4 W_{j,t-1} + \beta_5 R_c + \theta_t + \varepsilon \qquad (2)$$

Where *A* is any informal care provided by all adult children in the sample (*j*), in time *t*. X_f are family structure variables, including whether the family's eldest child is a daughter, as well as the numbers of daughters, and the number sons in the family. Also included in the vector X_f are parent-specific health characteristics, such as whether the respondent's mother needs help, or can be left alone for one hour. X_f also includes the number of siblings that had no contact with the parent in the prior wave, as reported by the respondent. The sibling characteristics, X_s are factors immutable to the child, and can differ within and across families, since they do not include the child's own behavior. After extensive sensitivity tests, this vector is limited to the total number of siblings' children and the total number of siblings' grandchildren.

An adult child's own characteristics are included in the vector of variables X_j, such as one's gender, marital status, age, age squared, whether the child is the oldest daughter, the number of children and grandchildren a child has, and years of education. In addition, $W_{j,t-1}$ includes controls for whether an adult child worked full or part-time in the previous wave. We are not able to measure health status of all of the adults in the sample as we only have measures of health on the HRS respondent, not the siblings. Thus, work behavior may also be partially an indicator of initial health status as well, and we are hesitant to interpret the coefficients as simply a work-effect.

Since the survey provides information on race, ethnicity, and whether or not a person was born in the U.S. only for the respondent and not his or her siblings, we include a family level control for these variables, R_c. Recall that *c* signifies the adult child within that family for whom we will be measuring the effects of caregiving behavior (the HRS respondent or spouse). R_c serves as an inexact proxy for the race of the family, ethnicity, and foreign-born status of the family.

We have controls for missing information on siblings (both due to item non-response and the randomization of the survey which only collects information for up to four siblings), parents, and the respondent, and we control for year of observation (θ_t).

From this estimation procedure, we estimate the predicted probabilities of providing any care for each adult child. Recall that the child's own propensity score is not included in the calculation of his or her sibling's propensity score calculation; hence, these scores vary within and across familiesWe use the expected number of caregivers among one’s siblings as an instrument for their own care behavior[3].

We examine two potential instrumenting strategies. The first involves using the sibling and family characteristics that are immutable to the individual. We explore using family structure characteristics such as number of girls in the family, number of boys, eldest child in the family is a daughter, number of siblings whom the respondent had no contact with in the wave prior to caregiving (non-varying within family), total number of kids among all siblings, total number of grand kids, and total number of siblings working in the wave prior to caregiving (varying within family). The second instrumental variable strategy involves using the expected number of siblings that will provide care. Choosing between the two approaches is based on the empirical performance of the propensity score measure versus the inclusion of the raw instruments.

Results

Descriptive Statistics

Table 1 presents the descriptive statistics of our two samples, recorded the first time we observe the individual. The sample of non-caregivers is slightly younger, has fewer children and grandchildren than the sample of caregivers, and has lower net worth.

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[3] We created four different propensity scores: the mean propensity score among siblings (not including child *j*), the maximum propensity score among siblings, the predicted probability that at least one sibling will care for the parent, and the predicted expected number of caregivers among siblings (Holmes and Van Houtven, 2003). We selected the propensity score measure which is empirically strongest, as measured by the significance in the first-stage regression.

Regarding the outcomes of interest, caregivers had higher depression (CESD8) scores and more had a heart condition. On the contrary, non-caregivers had higher reported prevalence of high blood pressure. Corresponding with the differences in health and age, non-caregivers were more likely to work at least part time and to work full time than caregivers.

Mothers of caregivers were older (conditional on being alive), more likely to have a memory problem, and more educated than mothers of non-caregivers. Key family structure characteristics show that non-caregivers had differing family composition, with more brothers and fewer sisters, and were less likely to have an eldest child who is a daughter in their family. The non-caregiver sample also has siblings with smaller families, with fewer children and grandchildren (i.e. nieces/nephews and grand nieces/nephews of the HRS respondent).

Continued Caregiving

The First Stage

Table 2 presents the transition probabilities of caring from one period to the next (two years later). Of the children providing care for a parent in time *t*, over half of them stop two years later. This trend switches among those whose parent is still alive two years later – over half of them continue to provide informal care. However, if the mother dies, there is, as expected, a zero percent chance that the mother who died will be cared for in the next period. The death of the care recipient acts as an important switching mechanism from caring to non-caring.

The first stage model (Table 3) confirms the strength of death of a mother beyond the univariate case. It is clear that the death of a mother is an important negative predictor of continuing caregiving. For married men (column 2), for example, an adult child is 46 percent less likely to continue caregiving if a mother passes away. The estimates are similar in magnitude for the other subsamples (columns 1-4). The *F*-test statistic is 36 for single men, statistically significant and comfortably over the threshold of 10 (Staiger & Stock 1997). The other subgroups have test statistics with magnitudes ranging from 167-535 and appear in Table 3.

There are other interesting patterns of personal characteristics that affect one's propensity to continue providing care for an elderly mother. Age has a non-linear effect for adult sons, while having no effect for adult daughters. Married sons and single daughters are responsive to their outside time commitments, with full-time working sons being more likely to stop providing care, as are those single daughters with more children. Education is a determinant for married individuals, with the less educated more likely to continue providing care. Note that these regressions also control for parent's education and the individual's net worth (both of which are insignificant), so this is not only a socio-economic effect. Unlike in the cross-sectional studies, race does not seem to be a determinant of continued caregiving for any of the subgroups except single men, with white single-men being over 24 percent more likely to stop caring for their parent than their minority counterparts.

Health Effects of Continued Caregiving

Table 4 presents the health effects of continued caregiving, showing all of the subsample groups separately. Each cell is an estimate of different regressions estimating the effect of continued caregiving on a different health outcome for a different subsample. We also control for other variables in the regression, as mentioned above. Although we do not find statistically significant results for all subsamples, even for very sensitive self-reported measures of health, we do find that continued caregiving has different impacts on two of our groups: married men and women.

Continued caregiving leads to mixed health effects for married women. Whereas there are more signs of depression, there are also signs of better heart function compared to caregivers who stop caregiving due to death of the mother. For married women, continued caregiving leads to a 0.6 point increase on the CESD8 scale. Since the average CES-D score is 1.26 point in this subsample, this represents over a 47 percent increase in baseline depression symptoms. We also find a significant decrease in the likelihood of having a new heart condition (10%) compared to caregivers who stop caregiving. This is a somewhat surprising effect; previous studies have found an increase in coronary heart disease for spousal caregivers (Grant *et al.* 2002; Lee *et al.* 2003; Mausbach *et al.* 2007). However, the measure is a rather broad category, including heart attacks, coronary heart disease, angina, congestive heart failure, and other heart problems, thus is not directly comparable to the previous coronary heart disease findings.

Continued caregiving also increases depression symptoms among married men, by .65 points on the CESD-8. Since the average number of depressive symptoms is even smaller among this subsample (.78), this is a large effect, increasing the number of depressive symptoms by over 83 percent.

A priori one might expect to see stronger health effects among single persons who continue caregiving since they do not have a spouse to help share the burden, yet our results do not indicate this is the case. We pooled the two subsamples and estimated the health effects of singles jointly, to see if our null-effects were due to limited sample size. The first stage is still strong, but pooling the sample did not greatly improve the estimates.

Robustness Checks

In order to test the validity of the exclusion restriction that the death of the mother does not have a direct impact on the health of the adult child, we have run the exact same regressions on the group of adult children that are never observed to be caregivers, including the death of the mother directly in the regression. As Table 5 illustrates, we find very little direct effects of the death of the mother among non-caregivers. For married women, we actually find the reverse effect for depression, suggesting that our measured effect for caregiving is a lower-bound. Although insignificant, the direct effect on heart conditions for married women and depression effects for married men are of the same sign as our estimated effect of caregiving. We take solace in the fact that the estimated coefficients are quite small (a factor of 10 smaller than our caregiving effects), with relatively small standard errors, in addition to the insignificance from zero.

Persistence of the Effects

In order to gauge the importance of the health impacts of caregiving, it is important to know if these health effects are temporary or persistent. We test for persistence by testing for health effects another two years after we observe a person providing informal care. Recall that the reference group are individuals that provided care in time t=0, and stopped in time t=2 due to the death of the mother, and now we are comparing health outcomes at t=4. We present in table 6 the results for depression and heart condition for married men and women, the categories that were significant when examining the effects immediately after the end of the caregiving episode[4].

Although the effects for married women appear short-lived, we find that the depressive effect for men who continue caregiving is persistent. Continuing to care at time t=2 increases the depressive symptoms for married men by .58 points (on an 8 point scale) even two years later. While the estimate is quantitatively smaller that the earlier estimate, the estimate is not precise enough for us to determine if the depression effects for married men diminish over an even longer time period or not. Our sample becomes too small to estimate effects four years after caregiving is stopped (t=6).

Initial Caregiving

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[4] There were no significant effects four years later for other health categories not reported. The sample size was too small to estimate on the single men and single women subsamples.

The First Stage:

Family structure characteristics such as the number of boys, number of girls, eldest child in the family is a daughter, predicts the first caregiving episode. The individual significance of the instruments and partial *F* statistics in Table 7 show the performance of these variables for each of the relevant subsamples examined. The propensity score model performed about as well for all of the subsamples of interest, except for single men, where it is insignificant to the decision to start providing care. For the other three subsamples, after controlling for individual characteristics and mother's health, expected number of siblings who would care for the mother was a significant predictor of a child's own caregiving behavior, and the sign was negative. The signage was consistent with earlier work (McGarry, 1998; Wolf, Freedman and Soldo, 1997, among others) that indicates that siblings crowd out each other's care, but it does lead to more total hours of care.

While the partial *F*-test statistics are always significant (with the one aforementioned exception), they are nevertheless rather small, indicating a weakly identified system of equations. Thus we limit our discussion in the next section to just the two subsamples were we have F-statistics above 10 (Staiger & Stock 1997): married women and married men.

Health Effects

Table 8 presents the IV fixed effects estimates of the health effects of beginning to provide care for one's mother. We find no immediate health effects of starting to provide care for an elderly mother. This may be due to limited instrument strength, though, since our standard errors are rather large. Thus we can only rule out large immediate health effects of beginning a caregiving episode, but not more subtle effects. It is worth noting that unlike the selection-out results, the tests for Arellano-Bond estimates suggest they are inappropriate, thus leaving us to rely on IV fixed effects estimates for all but 3 categories.

Conclusions

The literature on the effects of providing care has been dominated by the health effects of spouses providing care for each other or the work effects on adult children in the short term. We contribute a new strand to the literature, focusing on the physical and mental health effects of caregiving on adult children, controlling for both selection in and selection out of caregiving. Accounting for endogenous selection into caregiving and endogenous selection out of caregiving helps to provide a clearer picture of informal caregiving on key health outcomes of adult children than have been previously possible.

Importantly, we use a very strong and innovative instrumental variable that creates a switching mechanism from caregiving to non-caregiving—the death of a mother. This allows us to control for the inherent endogeneity in the decision to stop caregiving (perhaps due to one's poor health from caregiving). Empirically strong and theoretically convincing, this instrument may be useful for other applications in which the end of an episode of caregiving would be suspected to be endogenously determined.

Concerning initial selection into caregiving, there exists substantial anecdotal evidence that sibling characteristics predict who will provide care within a family. We know that family composition, such as the number of daughters and birth order are strong correlates to providing care for one's parents in the cross-section. For our longitudinal study, we use these findings to show that sibling characteristics are an important causal determinant in the caregiving decision.

We find different health effects of caregiving depending on the duration of caregiving, with key differences between caregivers who continue caregiving and initial caregivers. We also find effects only for certain subgroups of adult children, primarily for married women and married men.

We find that continued caregiving leads to a 47 percent increase in the depression index for married women (CES-D8) and an 83 percent increase for married men. We find there is persistence in the depressive symptoms effect for men, still significant and negative two years later, although slightly lower in magnitude. Whereas the mean CES-D8 score of these samples is below the clinical cut-off for probable depression at a score exceeding 4 or 5, a half-point increase in the CES-D8 score is large in magnitude. Paradoxically, married women caregivers experience a protective health effect of continued caregiving, being less likely (10%) to report a heart condition. This finding could be due to increased treatment of heart conditions as the caregiving tenure goes along, such as better control of congestive heart failure, perhaps due to more medical treatment.

In the current study and analysis of initial selection into caregiving, we find that while the instrumental variables on family structure and expected number of sibling caregivers are useful in describing the cross-section of caregivers, they are not successful in all subgroups (namely for single men) when examining the dynamics within a family. Future work should turn to creating time-varying instruments to identify initial selection into caregiving in the dynamic setting. This would help us understand whether our findings were due to true null effects or weak identification in the dynamic setting.

Beyond these important health effects, future studies should focus on how the health effects and time burden of caregiving translate into larger wealth effects. Many studies have examined a snapshot of short-term work effects (Ettner 1995; Lo Sasso & Johnson 2004; Crespo 2006; Heitmuller 2007; Heitmuller & Inglis 2007), along with one longitudinal study on work outcomes (McGarry 2003). It is well documented that health declines can lead to early retirement, thus considering broader wealth measures, such as early retirement, pension accrual and net worth changes over time, possibly due in part to increased expenditures on health care from caregiver health effects, are critical to understanding the full impact of caregiving on the care provider. Understanding health effects is the first step in completing the puzzle on the net benefits of informal caregiving to society.

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Table 1. Descriptive statistics of adult children and their families, by caregiver status

Dependent variables	Caregivers	Non- Caregivers
Health Measures		
Depressive symptoms	1.16	0.27
Heart condition	0.81	0.11
High Blood Pressure	0.22	0.36
Self-Reported Health (1=exc, 5=poor)	2.52	2.49
Explanatory variables		
Demographic characteristics		
Female	0.64	0.55
Is an eldest daughter	0.33	0.27
Married	0.73	0.75
Age	57.69	54.76
Education (years)	12.82	12.31
Number of children	3.42	3.38
Number of grandkids	4.28	2.32
Work/Wealth Measures		
Full-time work	0.45	0.51
At least part-time work	0.54	0.57
Net worth	297,869	249,864
Mother's characteristics		
Mother needs ADL help	0.30	0.23
Mother has doctor diagnosed memory problem	0.04	0.005
Mother's age	87.40	79.55
Mother's education (years)	10.04	9.73
Family Structure Instrument List		
Number of girls	2.19	2.43
Number of boys	1.60	1.82
Eldest child in family is female	0.55	0.53
Number of siblings' kids	6.46	6.39
Number of siblings' grand kids	5.50	4.84

* To be in sample, had to have only a surviving mother and no child could be living with the parent in the wave prior to the start of caregiving.

** Models also control for missing values and whether person was U.S. born, Race, categories, and Hispanic or non-Hispanic. **

Table 2: Continuing Care Among Caregivers

	Cared for Mother at Time t		
	Entire Sample	Mother Still Alive $_{t+2}$	Parent Dies $_{t+2}$
Cared for Mother$_{t+2}$	45%	52%	0%
Did Not Care for Mother$_{t+2}$	55%	48%	100%
N	2,709	2,316	393

Sample: Adult children who cared for a sole-surviving mother at time t, who did not coreside with her before the caregiving episode began.

Table 3: First Stage Results for Continued Caregiving

	Single Men	Married Men	Single Women	Married Women
Mother died	-0.3980***	-0.4625***	-0.5386***	-0.5531***
	(0.0974)	(0.0242)	(0.0404)	(0.0192)
Work full-time$_t$	-0.2141	-0.1598***	0.0630	-0.0138
	(0.1570)	(0.0553)	(0.0831)	(0.0438)
Work at least part-time$_t$	0.1547	0.2077***	-0.0466	0.0108
	(0.1570)	(0.0542)	(0.0824)	(0.0406)
Number of kids$_t$	0.0091	0.0013	-0.0288*	0.0058
	(0.0205)	(0.0083)	(0.0146)	(0.0062)
Age	0.6290***	0.1414***	-0.0835	0.0118
	(0.1407)	(0.0422)	(0.0576)	(0.0301)
Age squared	-0.0052***	-0.0012***	0.0007	-0.0001
	(0.0012)	(0.0003)	(0.0005)	(0.0003)
Educ < HS	0.1202	0.1497***	-0.0722	0.0928**
	(0.1305)	(0.0517)	(0.0642)	(0.0470)
HS degree	-0.1569	0.1667***	-0.0197	0.0450
	(0.1502)	(0.0559)	(0.0871)	(0.0529)
At least some College	0.0081	0.1130*	-0.0271	0.0686
	(0.1879)	(0.0603)	(0.0943)	(0.0620)
White/Caucasian	-0.2439**	0.0482	0.0286	0.0563
	(0.1122)	(0.2063)	(0.0735)	(0.0730)
Observations	123	817	347	1270
R-squared	0.46	0.17	0.25	0.21
Year fixed-effects	X	X	X	X
F-test on death variables	36.16***	263.89***	166.60***	535.39***

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Note: These regressions also include: log(net worth), education of the mother, education of the father, an indicator for whether the number of children is unreported, foreign-born and Hispanic indicators. The sample is of those providing care in the previous wave, not coresiding before the caregiving episode, and with only the mother alive.

Table 4: Health Effects of Continued Caregiving

	CESD8	Heart Condition	High Blood Pressure	Self-Reported Health
Married Women (N=1229)				
Care Giving$_{t2,t}$	0.5997**	-0.1041***	-0.0742	0.2022
	(0.2934)	(0.0339)	(0.0514)	(0.1311)
Specification	A-B (1)	IV-FE	IV-FE	A-B (1)
Single Women (N=316)				
Care Giving$_{t2,t}$	-0.7637	0.0219	-0.0765	-0.3888
	(0.6539)	(0.0655)	(0.0946)	(0.3053)
Specification	A-B (1)	A-B (1)	A-B (1)	A-B (1)
Married Men (N=807)				
Care Giving$_{t2,t}$	0.6463**	0.0446	-0.0116	-0.1109
	(0.3063)	(0.0489)	(0.0585)	(0.1827)
Specification	A-B (1)	A-B (1)	IV-FE	A-B (1)
Single Men (N=116)				
Care Giving$_{t2,t}$	-0.3725	0.0469	-0.1508	-0.0099
	(0.7735)	(0.1947)	(0.1491)	(0.5568)
Specification	A-B (1)	IV-FE	A-B (1)	A-B (1)

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Note: These regressions also include: log(net worth), education of the mother, education of the father, an indicator for whether the number of children is unreported, age, age squared, work in the previous wave, education categories, race, foreign-born and Hispanic indicators. The sample is of those providing care in the previous wave, not coresiding before the caregiving episode, and with only the mother alive.

Table 5: Exclusion Restriction Test: Health Effects of Mother's Death

	Heath Measure$_{t+2}$			
	CESD8	Heart Condition	High Blood Pressure	Self-Reported Health
Married Women (N=1507)				
Mother died $_{t2,t}$	-0.2343*	-0.0015	-0.0035	0.0256
	(0.1341)	(0.0170)	(0.0241)	(0.0658)
Specification	A-B (1)	IV-FE	IV-FE	OLS-FE
Married Men (N=1810)				
Mother died $_{t2,t}$	0.0285	0.0043	-0.0333	0.0491
	(0.0969)	(0.0163)	(0.0208)	(0.0626)
Specification	A-B (1)	OLS-FE	OLS-FE	OLS-FE

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Note: These regressions also include: log(net worth), education of the mother, education of the father, an indicator for whether the number of children is unreported, age, age squared, work in the previous wave, education categories, race, foreign-born and Hispanic indicators. The sample is of those adult chidren who never provide care during the 1992-2004 observation window, not coresiding, and with only the mother alive.

Table 6: Longer-Term Health Effects (Two years out)

	Heath Measure$_{t+4}$	
	CESD8	Heart Condition
Married Women (N=959)		
Care Giving $_{t2,t}$	-0.1875	-0.0401
	(0.3691)	(0.0431)
Specification	A-B (1)	IV-FE
Married Men (N=626)		
Care Giving $_{t2,t}$	0.5779*	
	(0.3475)	
Specification	IV-FE	

Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%
Note: These regressions also include: log(net worth), education of the mother, education of the father, an indicator for whether the number of children is unreported, age, age squared, work in the previous wave, education categories, race, foreign-born and Hispanic indicators. The sample is of those providing care in the previous wave, not coresiding before the caregiving episode, and with only the mother alive.

Table 7: First Stage: Selection Into Caregiving For the First Time

	Family Structure	Predicted Number of Siblings
Single Men		
Number of boys	-0.0321***	-0.123
	(0.0113)	(0.0854)
F-test	8.07 ***	2.07
Obs	504	504
R-squared	0.13	0.11
Married Men		
Number of girls	-0.0144***	-0.1136***
	(0.0041)	(0.0345)
F-test	12.49 ***	10.84 ***
Obs	3366	3366
R-squared	0.06	0.06
Single Women		
Number of boys	-0.0211***	-0.1479**
	(0.0080)	(0.0656)
Number of siblings' grandkids	0.0016	
	(0.0015)	
eldest sibling is female	-0.0311	
	(0.0403)	
F-test	2.45 *	5.08 **
Obs	1140	1140
R-squared	0.1	0.1
Married Women		
Number of girls	-0.0311***	-0.1695***
	(0.0063)	(0.0413)
Number of siblings' kids	0.0022	
	(0.0015)	
F-test	14.86 ***	16.85 ***
Obs	3082	3082
R-squared	0.08	0.07

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Note: These regressions also include: log(net worth), education of the mother, education of the father, an indicator for whether the number of children is unreported, age, age squared, work in the previous wave, education categories, race, foreign-born and Hispanic indicators. The sample is of adult children who are not providing care or coresiding at time t, and with only the mother alive.

Table 8: Health Effects of Beginning to Care for Ones Mother

	Heath Measure$_{t+2}$							
	CESD8		Heart Condition		High Blood Pressure		Self-Reported Health	
	Raw Instrument	Pscore	Raw Instrument	Pscore	Raw Instrument	Pscore	Raw Instrument	Pscore
Married Women (N=1759)								
Care Giving $_{t2,t}$	0.852	-1.7004	-0.1778	-0.07	0.3794	-0.713	-0.2616	1.2355
	(2.7849)	(2.6842)	(0.3267)	(0.6908)	(0.6031)	(1.5798)	(1.2671)	(3.5884)
Specification	IV-FE	A-B (1)	IV-FE	IV-FE	A-B (1)	IV-FE	IV-FE	IV-FE
Married Men (N=1622)								
Care Giving $_{t2,t}$	-0.9206	-5.2212	0.2768	-0.479	-0.9152	-0.456	-0.0147	-2.878
	(6.3091)	(9.3717)	(0.8101)	(1.1313)	(2.3897)	(1.3089)	(4.1678)	(4.9895)
Specification	IV-FE	IV-FE	IV-FE	IV-FE	A-B (1)	IV-FE	IV-FE	IV-FE

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Note: These regressions also include: log(net worth), education of the mother, education of the father, an indicator for whether the number of children is unreported, age, age squared, work in the previous wave, education categories, race, foreign-born and Hispanic indicators. The sample is of adult children who are not providing care or coresiding at time t, and with only the mother alive.