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ABSTRACT

Using the China Health and Retirement Longitudinal Study (CHARLS) 2011–12 baseline data, this contribution explores to what extent taking care of grandchildren and frail parents influences rural middle-aged Chinese adults' off-farm employment. The findings show that, conditional on socioeconomic and demographic characteristics, taking care of grandchildren has a negative effect on rural middle-aged men's and women's off-farm job participation and hours worked. Caregiving for parents does not have the same negative effects on off-farm employment and hours worked. Furthermore, the study finds that annual earnings are also negatively affected by caregiving responsibilities, especially for women and men taking care of grandchildren.

KEYWORDS

Childcare, middle-aged, labor force participation, labor supply, rural economic development, eldercare

JEL Codes: J1, J01

INTRODUCTION

It is well-known that in every society both employment and caregiving patterns are gendered, with women spending more time caregiving and less time on income-generating work. Similarly, there are universal differences in time use by age, with the time devoted to income-generating work increasing with age for some number of years and then declining. But there is also tremendous variation in these age, sex, and time-use patterns across economies. Gender norms play a role in the variation, as do structural factors, such as the types of jobs available, the level of technology employed, and the location of employment; demographic factors, such as the age of family formation and who lives with whom; and community institutions and public policies, such as the availability and subsidy of childcare and eldercare, job protections, and safety policies, among many others. The implication of these many factors is that we must be cognizant of the

work and family environment we are studying and expect that patterns of caregiving and income-generating time use differ by gender, age, location, and time period.

One important margin of difference in a developing country context is whether the income-generating work is agricultural or nonagricultural (Wang and Dong 2010; Qiao et al. 2015). The work effort demands of agriculture differ substantially from the work demands of off-farm employment in the location where the work takes place, the total time demands, and the flexibility of time. Off-farm employment happens away from home and usually requires a high number of consistently committed hours every week. These requirements mean that off-farm employment is usually less conducive to joint production with care work than farm work is.

Care work differs along similar margins of total time, flexibility of time, and location of the work. A newborn baby requires substantial amounts of active care each day and supervisory care the rest of the day. A preschool child sleeps less than an infant, such that the time demands might even go up, though as children age, more of the time is supervisory as opposed to active. But young children are quite portable in terms of the location of care: they can be cared for in the caregiver's home, in their own home, or even outside for part of each day. School-age children are in school for large parts of each day. However, they may require help with their homework, which is more active than just "keeping an eye" on younger children.[1] Care work with elderly or disabled adults is more flexible in timing and usually less time consuming than the care of young children, but it is likely to be location inflexible as care must usually take place in the place of residence of the person needing care. These differences in care needs interact with the work time and place demands of income-generating work, leading to observable differences in the behavior of those most likely to be making the trade-offs between income-generating work and care work.

In this study, we examine the interrelationships between care work time and income-generating work time for a population of rural Chinese adults who are between ages 45 and 65. Adults in this age group are the most likely to move out of the formal labor market into care work or vice versa depending on market forces and family needs. Traditionally, employment in rural China was almost entirely agricultural, but more recently, there has been an increase in formal off-farm employment both local and via migration. Xiaobing Wang et al. (2016), using the nationally representative China National Rural Survey (CNRS) data, find that the off-farm employment rate of the rural labor force in the early 1980s was 15 percent. This rate increased to 45 percent in 2000 and 62 percent in 2008 (Wang et al. 2016). In the early 1980s, off-farm employment was mostly for young men. As it has expanded, the number of women employed off farm has increased substantially, and the average age of off-farm rural workers

has also increased. In 2008, the rates of off-farm employment were so high for younger workers that there was little trading-off happening (Wang et al. 2016). For example, the off-farm employment rate for those ages 21–25 is 92 percent for men and 84 percent for women (Wang et al. 2016). But for the generation ages 45–65, there is substantial choice between off-farm versus on-farm employment or care work. Adults of this generation, sometimes called the sandwich generation, are often already grandparents of young children and yet still have living parents of their own. Thus, they may be called on to care for their young grandchildren and their elderly parents. Childcare by grandparents is still the norm throughout China. In urban areas, most children are enrolled in preschool by age 3, but in rural China, preschools are not usually available and non-relative childcare is still rare. In addition, care by spouses or by adult children is also the norm for the elderly and disabled across China, where there are high co-residency rates, though declining over time (Zeng and Wang 2004; Connelly et al. 2015).

This study contributes to a growing literature on rural women's time use in China by distinguishing between farming and off-farm employment; by having explicit information on caregiving rather than relying on co-residence as a proxy for caregiving; and by being able to model the joint choices of caregiving and income-generating employment due to the availability of good instruments for determining care needs in the dataset. With large enough sample sizes in the relevant age and gender groups, the paper provides a full and robust examination of middle-aged men's and women's time use, caught between the demands for their time as caregivers and the opportunity cost of their time as off-farm workers. The heavy burden of this generation has important policy implications, as the future income of middle-aged workers will depend on their earnings over their paid working lives, and yet Chinese younger adults continue to migrate in large numbers, leaving their children in the rural areas to be cared for by grandparents.

The results show that while women are more likely to provide caregiving time for grandchildren, rural Chinese middle-aged men and women are equally likely to provide caregiving time for parents. However, it is caregiving time for grandchildren, in particular, that is shown to have a significant negative effect on the probability of off-farm employment and for the hours of off-farm employment for both men and women. Annual earnings are also impacted by caregiving, particularly by caregiving for grandchildren. These results confirm the hypothesized interrelationship among caregiving time, off-farm employment time, age, and gender. Because middle-aged women do more of the care of grandchildren, their employment and earnings are more likely to be negatively impacted by their care of grandchildren, especially given their longer life expectancy and more expected years as a widow. Social security systems in which

benefits are determined by previous earnings put women at a disadvantage due to their caregiving responsibilities during middle age.

BACKGROUND AND LITERATURE REVIEW

In the pre-reform period in rural China, people did not have much choice over their time use. Rural residents were organized into production teams, which managed the land and labor under their control. Migration to urban areas was essentially prohibited, both legally and effectively, due to the lack of markets for housing and basic goods (Maurer-Fazio 1995). These conditions radically changed with the implementation of the household responsibility system in the late 1970s and early 1980s, which allowed rural residents to contract land long term and to sell the output of their efforts. Later, in the 1980s, as other economic reforms expanded the demand for manufacturing workers and the availability of goods in urban markets, rural-to-urban labor migration blossomed. At the same time, local off-farm opportunities also increased, such that, according to Hongyong Lu (1994), by the end of 1993 more than one-fifth of China's labor force was employed by rural-based township and village enterprises.

The migration of younger adults coupled with new local employment opportunities has had a tremendous effect on the working behavior of older adults who have largely remained in rural areas. Rachel Connelly, Margaret Maurer-Fazio, and Dandan Zhang (2014) use the Chinese censuses of 1982, 1990, and 2000 to show that the labor force participation of rural women ages 50–74 rose from 28 percent in 1982 to 53 percent in 2000. Men's labor force participation levels for this age group were already high in 1982 at 71 percent. Their labor force participation rate rose to 78 percent in 2000.

The census-based labor force participation rates calculated by Connelly, Maurer-Fazio, and Zhang (2014) include both farming and nonfarming employment. As discussed above, it is important to distinguish between farming and off-farm employment as the location and flexibility of those two time uses differ substantially (Wang and Dong 2010; Cook and Dong 2011; Qiao et al. 2015). Wang and Dong (2010) make the distinction between farming and off-farm employment with a geographically limited dataset. Their sample includes 743 men and 702 women, ages 18–60, from four state-designated poor counties in 2001. They found that having a child under age 6 increases women's farm employment and decreases their off-farm employment. Similarly, Qiao et al. (2015) consider rural residents ages 15–60 and do not distinguish between parents and grandparents, except to add an additional dummy for those individuals over age 44. The presence of co-resident children is used as a proxy for the demand for child caregiving. They find that living with preschool-age children has no effect on adult household members' decisions to either migrate or to work locally off-farm,

while living with children who are old enough to be in school increases the likelihood of adult participation in local off-farm work, while decreasing the probability of migration.

A third study that distinguishes between farming and off-farm employment is Sai Ding, Xiao-yuan Dong, and Margaret Maurer-Fazio (2017). Using a sample of prime-age rural adults from the 2011 Chinese Household Ethnicity Survey (CHES), Ding, Dong, and Maurer-Fazio (2017) find that 43 percent of the non-migrant rural men and 21 percent of the non-migrant rural women aged 16–44 work off-farm jobs. The probability of working off-farm is lower for those prime-age adult women who co-reside with young children, but higher for prime-age adult men who co-reside with young children. For the age group they analyze, co-residing children are mostly their own children. In this paper, our focus is on adults ages 45–65, who are likely to be the grandparents of co-resident children. We expect that the behavior of parents and grandparents will be quite different with respect to the effect of caregiving needs on off-farm employment: participation, labor supply, and earnings.

There are many other studies analyzing the effect of caregiving time on middle-aged women's employment using data from different countries, but given the argument made above, we should not expect universality of impacts of either children or elders on middle-aged women's labor supply.[2] Much depends on the nature of employment and the institutional structure of both the labor market and childcare availability (Davis and Connelly 2005; Liu, Dong, and Zheng 2010).

The analysis below differs from previous work in that caregiving time is queried directly instead of being proxied by co-residence (except in Liu, Dong, and Zheng [2010]). We are also able to distinguish among caregiving for children, caregiving for elders, and caregiving for both elders and children. In addition, respondents are asked whether they have grandchildren under the age of 16. Information is also available on whether the respondent has parents who are in poor health. Finally, we are able to measure the marginal effect of additional time in caregiving on labor market outcomes. All of these features make the baseline China Health and Retirement Longitudinal Study (CHARLS) ideal for asking a full set of research questions to explore the relationship among age, gender, and time use of the rural sandwich generation of China in 2011 and 2012.

DATA AND DESCRIPTIVE STATISTICS

The CHARLS is a nationally representative survey of Chinese households with members ages 45 and above. We use data from the baseline survey, which was conducted in 2011–12. This dataset includes 10,257 households who were randomly selected from 150 counties/districts and 450 villages/urban communities in twenty-eight of the thirty-one

provinces.[3] The baseline survey contains detailed information about respondents and their living spouses, with responses for household information provided by one member of the couple.

For this study, we restrict our sample to rural respondents and their spouses ages 45–65. Excluding cases with missing values for analytic variables, the final sample includes 3,348 women and 2,929 men. Table 1 displays the mean and standard deviation of the variables used in this study. About 10 percent of the women have off-farm jobs, compared to 24 percent of the men.[4] Relatedly, these middle-aged men have higher average annual earnings than middle-aged women.[5] The average weekly hours of off-farm employment for those who engage in off-farm employment is high, at 47 hours for women and 43 for men, with a large standard deviation for both genders, slightly larger for women. Dividing the sample into those ages 45–54 and those ages 55–65, we find that the average weekly hours of off-farm employment for those who engage in off-farm employment is exactly the same for men, while the younger women work about 5 hours a week more than the older women with a higher variance. These results indicate that many of the off-farm jobs held by middle-aged rural men and women are quite demanding in terms of employment time. We cannot know how flexible the time of day or days of the week are from the questionnaire, but once one devotes that many hours to employment, there is not a lot of flexibility in terms of when one is working since one is working so much of the time.[6] It seems reasonable to expect that high off-farm work hours would interfere with those caring tasks that require long hours and are not divisible, such as caring for young children in the absence of their parents, while one could still perform care tasks that only require a few number of hours or are sub-dividable.

About 45 percent of women and 39 percent of the men report providing care for their grandchildren or their parents. Most of the caring is for grandchildren, with 33 percent of women caring for grandchildren only, and another 5 percent caring for both grandchildren and parents. The care of parents is much more evenly split between men and women, while care of grandchildren is 9 percentage points higher for women.

Of those who report some caregiving time, the average weekly time caring for children is quite high, 48 hours a week for women and 43 for men. The average time caring for just parents is much less, 16 and 14 hours per week for women and men, respectively. Those who care for both parents and grandchildren report an extremely high number of caregiving hours, 56 hours a week for both women and men.[7]

Demographically, the men's and women's samples are quite similar in age, but differ in educational level, which is expected in rural China, where there were large gender gaps in education in the past (Connelly and Zheng 2003). Approximately 30 percent of the women and 23 percent of the men report poor health status for themselves. Most of the women and men are

Table 1 Descriptive statistics

	Women	*Men*
	Mean (standard deviation)	
Time use:		
Work off-farm	0.10 (0.301)	0.24 (0.427)
Work farming	0.73 (0.442)	0.68 (0.466)
Off-farm annual earnings	1.35 (6.11)	6.26 (14.91)
Weekly hours of off-farm work excludes zeros	46.8 (25.89)	42.82 (23.04)
	$n = 323$	$n = 668$
Care for grandchildren or parents	0.45 (0.498)	0.39 (0.487)
Care for grandchildren and parents	0.05 (0.213)	0.04 (0.200)
Care for parents only	0.07 (0.263)	0.08 (0.275)
Care for grandchildren only	0.33 (0.469)	0.26 (0.440)
Weekly caring time for grandchildren and/or parents excludes zeros	43.55 (45.61)	38.50 (45.42)
	$n = 1{,}395$	$n = 1{,}010$
Weekly caring time for grandchildren only excludes zeros	47.80 (44.98)	42.95 (44.34)
	$n = 1{,}016$	$n = 687$
Weekly caring time for parents only excludes zeros	15.78 (30.43)	13.87 (27.52)
	$n = 225$	$n = 208$
Weekly caring time for grandchildren and parents excludes zeros	56.03 (52.55)	56.44 (59.16)
	$n = 154$	$n = 115$
Demographics:		
Age	54.44 (5.85)	55.04 (5.85)
Household size	3.37 (1.62)	3.29 (1.59)
Education categories:		
Illiterate	0.44 (0.496)	0.10 (0.293)
Did not finish primary	0.21 (0.406)	0.19 (0.395)
Finished primary	0.18 (0.386)	0.28 (0.449)
Middle school	0.14 (0.346)	0.30 (0.459)
High school and above	0.04 (0.186)	0.13 (0.335)
Poor health (self)	0.30 (0.460)	0.23 (0.422)
Per capita expenditure	8.41 (0.801)	8.46 (0.806)
Married	0.93 (0.259)	0.94 (0.233)
Have grandchild age < 16	0.78 (0.417)	0.72 (0.450)
Parents have poor health	0.27 (0.444)	0.30 (0.456)
Sample size	$n = 3{,}348$	$n = 2{,}929$

married as opposed to widowed. In terms of those potentially needing care, more than 70 percent of both women and men have at least one grandchild under the age of 16, and 30 percent have parents who are in poor health.

EMPIRICAL MODELS AND RESULTS

Predicting engagement in off-farm employment

Our main research objective is to explore the relationship between caregiving and employment for the sandwich generation in contemporary rural China. While we have self-reported time use in both caregiving and employment, the effects of one time use on the other is not expected to be a minute-for-minute trade-off, both because there are many other uses of time and because the respondents are estimating their answers with different time frames.[8] There is a large body of literature on women's labor supply that finds that most of the "action" is in whether one participates in the activity (Killingsworth and Heckman 1986; Mroz 1987; Blau and Kahn 2007; Liu, Dong, and Zheng 2010). There are many reasons why the opportunity costs of employment time are not expected to be smooth: there may be fixed money and time costs of employment, transaction costs in finding and keeping a job, transaction costs of renegotiating who will do remaining household tasks, and potential psychological costs to moving away from prescribed social norms in terms of who does what within the family. Similarly, there is no reason to expect that care time demands are continuous. It may be difficult to "sign up" for just part of a task. If there is a young baby in the household and both parents are contemplating migration to the city, then the grandparents are signing up for a large number of care hours. Offering 1 hour a day would be useless in this situation.

Given the expected unevenness of both care time and employment time demands, we first consider a model where the dichotomous decision to work off-farm is modeled as a function of the dichotomous decision to provide any care hours for grandchildren or parents and a set of other demographic variables.

$$\mathrm{Off_i} = \mathrm{B_0} + \mathrm{B_1 C_i} + \mathbf{X'B} + \mathrm{e_i} \tag{1}$$

where Off_i is a dichotomous variable that is coded 1 if the respondent works off farm, and C is a dichotomous variable that is coded 1 if the respondent engages in any care work for grandchildren or parents. The $\boldsymbol{X}$ vector includes other characteristics expected to affect off-farm employment: age in five-year categories, household size, educational dummies, self-reported health status of the respondent, the natural log of per capita household expenditures that proxies for wealth, and current marital status.

We estimate this model using a linear probability model to simplify the interpretation of results.

The main econometric concern with Equation 1 is that C_i and Off_i are jointly determined by a host of unobservable characteristics of the respondent and the respondent's other household members. Many studies use the presence of grandchildren or elders in the household to proxy for caring needs (for example, Chang, Dong, and MacPhail [2011]; Chen, Liu, and Mair [2011]; Connelly and Maurer-Fazio [2015]; Maurer-Fazio and Connelly [2017]), but co-residency is also a choice that should be modeled (Connelly et al. 2015). Just as importantly, caregiving for grandchildren and elders surely occurs in extended households who are not co-residing. Rachel Connelly and Margaret Maurer-Fazio (2016) found that 54 percent of the rural Chinese elders in their sample (ages 60 +) who lived separately from any of their adult children, had children living in the same village. These elders are living close enough to their adult children to receive or give care.

The CHARLS data provides a good econometric solution to this endogeneity problem, that is, two strong instruments that we can use to predict care demands on the middle-aged population: whether the respondent has a grandchild under the age of 16 and whether they have a parent who is alive but in poor health. Both of these variables have statistically significantly strong effects on the probability of engaging in care work, but are not expected to independently affect employment decision making.[9]

Thus, we can estimate Equation 1 as the second stage of a 2SLS model using having at least one grandchild under age 16 and having a parent in poor health as the first stage instruments.[10] Table 2 presents both the ordinary least squares (OLS) and the second stage of the 2SLS for Equation 1 separately for men and women. The key first stage coefficients, F statistic and Hansen J statistic are also included. The F statistic is large, showing that these instruments pass the Staiger and Stock (1997) weak instrument test. Having a grandchild or a parent in poor health increases the probability of providing care time for both men and women.

In both the OLS and the 2SLS model, we find that those men and women who engage in care work are less likely to engage in off-farm employment. The size of the effect increases substantially when the unobserved heterogeneity of needing care is controlled for with 2SLS. The size of the care effects are similar for men and women: middle-aged adults who engage in care work are about 20 percentage points less likely to work off farm.

The rest of Table 2 shows the other demographic characteristics that help predict off-farm employment. Off-farm employment is less likely for the older individuals in this age cohort, with the age gradient steeper for men than women (recall the level for men is higher overall). Those with

Table 2 Effect of caregiving on off-farm participation

	(1)	*(2)*	*(3)*	*(4)*
	Women		*Men*	
	OLS	*2SLS*	*OLS*	*2SLS*
Care for grandchildren/parents	− 0.025**	− 0.196***	− 0.042***	− 0.205***
	(0.010)	(0.052)	(0.016)	(0.075)
Age 50–54	− 0.022	− 0.002	− 0.085***	− 0.069**
	(0.017)	(0.019)	(0.025)	(0.027)
Age 55–59	− 0.057***	− 0.034**	− 0.136***	− 0.115***
	(0.014)	(0.015)	(0.023)	(0.026)
Age 60–65	− 0.073***	− 0.065***	− 0.188***	− 0.170***
	(0.015)	(0.015)	(0.023)	(0.025)
Household size	− 0.002	0.012**	0.005	0.020**
	(0.003)	(0.005)	(0.005)	(0.008)
Attended primary school	0.019	0.024*	0.002	0.012
	(0.012)	(0.013)	(0.027)	(0.028)
Finished primary	0.048***	0.039**	− 0.003	0.002
	(0.015)	(0.016)	(0.026)	(0.027)
Middle school	0.041**	0.042**	0.026	0.035
	(0.018)	(0.019)	(0.027)	(0.028)
High school and above	0.124***	0.114***	0.172***	0.183***
	(0.038)	(0.039)	(0.034)	(0.035)
Poor health (self)	− 0.064***	− 0.069***	− 0.098***	− 0.102***
	(0.010)	(0.010)	(0.016)	(0.016)
ln (per capita expenditure + 1)	0.034***	0.035***	0.052***	0.053***
	(0.006)	(0.007)	(0.009)	(0.010)
Married	− 0.003	− 0.014	0.053*	0.058*
	(0.018)	(0.019)	(0.028)	(0.030)
Constant	− 0.131**	− 0.107*	− 0.149	− 0.170*
	(0.058)	(0.061)	(0.091)	(0.095)
1st stage result				
Having grandchild age < 16		0.297***		0.256***
Parents have poor health		0.106***		0.103***
F statistic		130.3		98.3
Hansen *J* statistic (*p* value)		0.374		0.828
Observations	3,348	3,332	2,929	2,915

Notes: Robust standard errors are in parentheses. ***, **, * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

the highest levels of education are more likely to work off farm for both men and women, but the middle levels of education only differentiate women's off-farm employment probabilities, not men's. Higher levels of per capita expenditure increase the probability of off-farm employment.[11]

A larger number of individuals in the household increases the probability of working off farm in the 2SLS model for both men and women, with the size of the effect larger for men. Marriage, as opposed to widowhood, increases the probability that men work off farm, but has no effect for women. Finally, if one is in poor health (self-reported), he or she is less likely to work off farm. The effect of poor health is large (7 percentage points for women and 10 for men), but smaller than the 2SLS effect of caregiving.

In selecting the specification for Equation 1, we chose to represent caregiving time with the dichotomous decision of providing any care hours for grandchildren or parents. Alternatively, the CHARLS data allows us to estimate a model that considers how hours of caregiving time affects the decision to work off farm.

$$\mathrm{Off}_i = \mathrm{B}_0 + \mathrm{B}_1 \mathrm{CareHours}_i + \mathbf{X}'\mathbf{B} + \mathrm{e}_i \tag{2}$$

Equation 2 assumes a linear relationship between care hours and the probability of working off farm. Again, we have concerns that hours of caregiving time are jointly determined with the decision to participate in off-farm employment. 2SLS is still an option, though our instruments may be better at predicting whether one gives care than predicting how many hours one devotes to care. Table 3 presents only the caregiving hours coefficients from the second stage plus the key first-stage coefficients. The first-stage results in columns 2 and 4 show that having a grandchild under age 16 and having a parent in poor health do statistically significantly increase the caregiving hours for both men and women. Columns 1 and 3 show the OLS results on caregiving hours for comparison. The results in all four columns indicate that more caregiving time reduces the probability of working off farm for men and women. The marginal effects, though statistically significant for the 2SLS models only for women, are quantitatively small, smaller than we would expect based on Table 2's results if time use were linear. For example, based on Table 3 column 2, an increase in weekly time use from 0 to 50 hours a week would decrease the probability of off-farm employment for women by 0.2 percentage points, whereas based on Table 2, going from none to some caregiving leads to about a 20 percentage point decline in the probability of off-farm employment for women. This discrepancy of results provides support for the hypothesis that time is not linear in terms of a one-to-one trade-off of employment time for caring time. Instead, there is evidence of substantial fixed costs of engaging in each type of work.

Next, we consider possible differences between caring for children versus caring for infirmed parents. Recall that Table 1 shows that most of those reporting any caregiving time are providing care for grandchildren, and that the time commitments for caregiving time vary substantially for grandchildren versus parents. We also expect that the caregiving time

Table 3 Effect of the intensity of caring on the probability of off-farm employment

	Women		*Men*	
	OLS	*2SLS*	*OLS*	*2SLS*
Weekly care time for grandchildren/parents	−0.000***	−0.004***	−0.001***	−0.003
	(0.000)	(0.001)	(0.000)	(0.002)
1st stage result				
Having grandchild age < 16		15.34***		8.99***
Parents have poor health		4.95***		4.99***
F statistic		87.4		50.8
Hansen *J* statistic (*p* value)		0.530		0.997
Observations	3,729	3,645	3,580	3,412

Notes: Other variables included in the model are the same as in Table 2. Robust standard errors are in parentheses. ***, **, * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

demands for grandchildren are less flexible than the caregiving time demands for parents. As such, we estimated the OLS version of Equation 1 with three caregiving dummies instead of one, allowing us to distinguish among caregiving only for grandchildren, only for parents, or for both. Table 4 presents the coefficients for the three caregiving dummies.[12] Caregiving for grandchildren, with its much higher and presumably less flexible time demands, is shown to statistically significantly reduce the probability of off-farm employment for both men and women, with the size of the effect larger than the OLS coefficients in Table 2.[13] Caring for grandchildren only is shown to reduce the probability of off-farm employment for women by 4.3 percentage points and for men by 6.9 percentage points. Those who only care for parents are shown to have the same statistical probability of working off farm as those with no caring responsibilities.

Table 5 presents the results from a modification of Equation 1 in which Off_i is replaced with weekly hours of off-farm employment. The equation is estimated using a Tobit in order to acknowledge the large number of zeros. This specification provides insight into the degree of work-hour flexibility in rural off-farm employment.

The results in Table 5 columns 1 and 3 show that caring for grandchildren or parents reduces the weekly hours worked by 1.8 and 2.5 for men and women, respectively. Columns 2 and 4 divide the type of care into grandchildren only, parents only, and both grandchildren and parents. The large negative effect on hours worked comes from grandchildren only for women, reducing weekly work hours by 4.0 hours, and from both grandchildren only and grandchildren and parents for men, reducing weekly work hours by 3.9 hours for grandchildren only care, and

Table 4 Effect of different caring roles on off-farm participation

	Women	*Men*
Care for grandchildren and parents	0.011	− 0.078**
	(0.028)	(0.037)
Care for parents only	0.019	0.040
	(0.025)	(0.032)
Care for grandchildren only	− 0.043***	− 0.069***
	(0.010)	(0.017)
Observations	3,348	2,929

Notes: Estimated with OLS model. Other variables included in the model are the same as in Table 2. Robust standard errors are in parentheses. ***, **, * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

4.7 hours for care of both grandchildren and parents. The effects of the other variables are quite similar to those found in the linear model of Table 2. A large decline in hours worked is seen at age 55 for both men and women. Higher educational levels increase women's hours of off-farm employment with the largest increases for those with the highest education. For men, only those in the highest education category work significantly more hours per week than the rest of these rural middle-aged men.

Predicting the effect of caring roles on annual income

One of the reasons we care about gender differentials in care responsibilities is because of the concern that differences in labor force participation between men and women will lead to differences in earnings, both current and lifetime, that can reduce women's power within the household and can leave women particularly vulnerable as they age, given their long life expectancy and higher rate of widowhood. Though Chinese rural households still have a high rate of co-residency with widowed parents, issues of power differentials and spousal and elder abuse are nonetheless important areas of concern for Chinese rural women.

$$\text{Annual Earnings}_i = B_0 + B_1 C_i + \mathbf{X}'\mathbf{B} + e_i \quad (3)$$

Equation 3 captures the predicted relationship between caregiving and earnings. We estimated Equation 3 using a Tobit model to acknowledge that many of the respondents report zero annual money earnings.[14] Table 6 reports the marginal effects. Columns 1 and 3 report the models, which include a single indicator of any type of caregiving, while columns 2 and 4 present the results, which include the three types of caring disaggregated. We find that for both men and women, being a caregiver translates into

Table 5 Caring effects on weekly hours of off-farm employment

	(1)	*(2)*	*(3)*	*(4)*
	Women		*Men*	
Care for grandchildren/parents	− 1.80**		− 2.49***	
	(0.889)		(0.775)	
Care for grandchildren and parents	0.497		− 4.64***	
		(1.83)		(1.79)
Only care for parents		1.23		0.658
		(1.36)		(1.14)
Only care for grandchildren		− 3.97***		− 3.86***
		(1.08)		(0.969)
Age 50–54	− 0.940	− 0.499	− 2.83***	− 2.49**
	(1.12)	(1.11)	(0.981)	(0.983)
Age 55–59	− 4.42***	− 3.71***	− 5.20***	− 4.59***
	(1.15)	(1.17)	(0.993)	(1.00)
Age 60–65	− 6.49***	− 5.69***	− 8.50***	− 7.84***
	(1.33)	(1.34)	(1.10)	(1.12)
Household size	− 0.106	0.095	0.384	0.555**
	(0.277)	(0.277)	(0.236)	(0.238)
Attended primary school	1.56	1.48	0.442	0.614
	(1.17)	(1.17)	(1.63)	(1.63)
Finished primary	3.54***	3.55***	− 0.104	− 0.057
	(1.12)	(1.12)	(1.53)	(1.52)
Middle school	2.55**	2.40*	1.42	1.46
	(1.25)	(1.24)	(1.52)	(1.52)
High school and above	5.70***	5.36***	6.72***	6.65***
	(1.83)	(1.83)	(1.61)	(1.61)
Poor health (self)	− 6.54***	− 6.49***	− 5.50***	− 5.52***
	(1.06)	(1.06)	(0.970)	(0.968)
ln (per capita expenditure + 1)	3.12***	3.06***	3.12***	3.04***
	(0.569)	(0.569)	(0.506)	(0.501)
Married	− 0.768	− 1.00	3.51*	3.35*
	(1.81)	(1.80)	(1.83)	(1.83)
Observations	3,344	3,344	2,908	2,908

Notes: Estimated using a Tobit model, marginal effects presented. Robust standard errors are in parentheses. ***, **, * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

lower annual earnings. In columns 1 and 3, the negative effect of any form of caring on annual earnings is significant for both women and men, reducing annual earnings by 398 yuan for women and 1,130 yuan for men. The 398 yuan for women represents a reduction of 29 percent of mean annual earnings for women, while 1,130 yuan represents 18 percent of the mean annual earnings of the men in the sample. From columns 2 and 4,

Table 6 Caring effects on annual earnings/1,000

	(1)	*(2)*	*(3)*	*(4)*
	Women		*Men*	
Care for grandchildren/parents	− 0.398*		− 1.13***	
	(0.228)		(0.409)	
Care for grandchildren and parents		0.089		− 1.12
		(0.429)		(1.082)
Care for parents only		0.559		0.439
		(0.353)		(0.655)
Care for grandchildren only		− 0.945***		− 1.91***
		(0.297)		(0.490)
Age 50–54	− 0.202	− 0.068	− 1.95***	− 1.80***
	(0.275)	(0.276)	(0.561)	(0.562)
Age 55–59	− 0.937***	− 0.705**	− 2.25***	− 1.93***
	(0.293)	(0.292)	(0.529)	(0.539)
Age 60–65	− 1.97***	− 1.73***	− 5.41***	− 5.07***
	(0.341)	(0.340)	(0.587)	(0.592)
Household size	− 0.191**	− 0.137*	0.034	0.118
	(0.077)	(0.074)	(0.124)	(0.127)
Attended primary school	0.406	0.394	1.15	1.26
	(0.292)	(0.291)	(0.794)	(0.795)
Finished primary	0.557	0.566	1.98**	1.99**
	(0.361)	(0.362)	(0.792)	(0.790)
Middle school	0.787**	0.732**	2.29***	2.31***
	(0.338)	(0.333)	(0.796)	(0.795)
High school and above	2.45***	2.340***	4.98***	4.92***
	(0.547)	(0.539)	(0.855)	(0.853)
Poor health (self)	− 1.78***	− 1.77***	− 2.89***	− 2.93***
	(0.368)	(0.368)	(0.491)	(0.490)
Married	− 0.121	− 0.174	0.479	0.391
	(0.399)	(0.394)	(0.783)	(0.785)
Observations	3,349	3,349	2,931	2,931

Notes: Estimated using a Tobit model, marginal effects presented. Robust standard errors are in parentheses. ***, **, * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

we learn that the source of the negative effect is grandchildren care, which exerts significant and large negative effects on annual earnings for both men and women, with a predicted reduction of annual earnings of 945 yuan for women and 1,913 yuan for men. The reduction represents 70 percent of earnings for women whose average earnings are only 1,350 yuan and a 30 percent reduction for men whose average earnings are 6,260 yuan. These results are consistent with the time-use results presented in Table 5, which showed large negative effects on hours worked off farm for those men and

Table 7 Relative risk ratios of different caring roles on farming and off-farm participation

	Farming	*Off-farm*	*Farming*	*Off-farm*
	Women	*Women*	*Men*	*Men*
Care for grandchildren and parents	1.09	1.22	1.52	0.922
	(0.281)	(0.423)	(0.644)	(0.434)
Care for parents only	1.64**	1.75*	1.18	1.37
	(0.408)	(0.509)	(0.368)	(0.450)
Care for grandchildren only	0.811*	0.450***	1.52**	0.921
	(0.092)	(0.085)	(0.284)	(0.196)
Observations	3,348	3,348	2,929	2,929

Notes: Estimated using multinomial logit, relative risk ratios presented. Other variables include are the same as in Table 6. Robust standard errors are in parentheses. ***, **, * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

women caring for grandchildren. The size of the care effect is about the same size as being five years older, or about half of the size of being in poor health.

Does everyone farm?

Above, we argued that the effect of caregiving time on off-farm employment is expected to be different from the effect of caregiving time on farming, since farming happens close to home, the time demands are sporadic, and farming tasks are easier to divide among household members. Table 1 showed that the vast majority of middle-aged men and women in rural China engage in farming or off-farm employment, with relatively few reporting no income-generating activity. In order to consider the possibility that caregiving time has a different effect on farming status versus being "out of the labor market," we amend Equation 1 such that the dependent variable is now a trichotomous variable indicating off-farm employment, farming employment, or being not in the labor market. This modified model is estimated with a multinomial logit model and the resulting relative risk ratios of the care dummies only are presented in Table 7.

Table 7 presents an interesting pattern of difference by gender of the caregiver and the source of the need for care. For middle-aged rural women, those caring for grandchildren are more likely to categorize themselves as not in the labor force, as compared to categorizing themselves as farming or as engaging in off-farm employment. We learn this from the relative risk ratios of both farming and off-farm employment being less than 1.[15] However, for men, those caring for grandchildren are more likely to categorize themselves as farmers, in comparison to either being

not in the labor force or working off-farm. Men have a very low probability of being not in the labor force (8 percent of the men in this age group report being not in the labor force), and this status is almost exclusively determined by advanced age and poor health.[16] Any man who is younger and not in poor health appears to categorize himself as farming, even if he is also performing full-time grandchild care.

Table 7 shows that the relative risk ratio patterns for parent care are quite different than those for grandchild care. Those women caring for parents only are statistically significantly more likely to categorize themselves as farming and as being employed off-farm compared to being not in the labor force. We know that the time demands are less and more flexible when caring for parents. In addition, caring for parents may increase the household's demand for money to help pay for health care costs. The relative risk ratios for men of caring for parents are also greater than 1, but smaller (closer to 1) and estimated with more noise than those for women. If we were to control for the endogeneity of care in this three-way care model, we would expect that the magnitude of the effects would increase, as they did in Table 2.

CONCLUSIONS

Our goal for this study has been to explore the relationship between caregiving and off-farm employment for rural Chinese middle-aged men and women. These men and women are sandwiched between the needs of their elderly parents and the needs of their children, who themselves devote substantial numbers of hours to employment, but also are likely to have young children. This type of middle-aged time crunch is not unique to rural China, but their crunch is particularly extreme because of the confluence of a strong tradition of co-residency of extended families, the near-universality of the expectation that grandparents provide childcare of preschool children, and the high rates of rural-to-urban migration of prime-age men and women, which often leaves the grandparents in sole care of the grandchildren. Chinese rural villages also lack basic social institutions available in other locations, such as publicly supported daycare centers and old-age support. With the prime-age generation away, the middle-aged generation does most of the farming, as evidenced by the high rates of farming participation for both women and men and substantial amounts of childcare, with the mean hours of care for those providing any care being well over 40 hours a week.

Women perform more grandchild care than men, but the probabilities of providing eldercare is equal for these rural men and women. Also basically equal are the estimated marginal effects of caregiving on the probability of off-farm employment. Caregiving, particularly caregiving for grandchildren, reduces the probability of working off farm and the

hours of off-farm work for both men and women. Caregiving for parents does not have these same negative effects on off-farm employment. In addition, we find that annual earnings of both men and women are affected by caregiving responsibilities for grandchildren. The earnings effects are substantial and will cumulate over one's lifetime. We are especially concerned about the effects of grandchildren care on women's lifetime earnings, as women are more likely to provide care and more likely to live longer, thus needing to spread their lifetime earnings over a longer time period.

Lastly, we found that women who care for grandchildren are more likely to categorize themselves as "out of the labor market," while men who care for grandchildren are more likely to call themselves "farmers." Research from other sources shows that even much older rural Chinese respondents who claim to be out of the labor market do a substantial amount of farmwork each year (Connelly and Maurer-Fazio 2015), so that perhaps the distinction between farming and not in the labor force is not a substantive one in rural China. For women, those who care for parents only are statistically significantly more likely to work off farm or farm rather than be not in the labor market, perhaps because of the greater need for income to pay for healthcare costs.

As migration of prime-age rural couples increases in both incidence and duration, more middle-aged rural men and women find themselves in an extreme time crunch for the years when their grandchildren are young. While most households can "weather the storm" if anyone gets sick, the grandchildren have special needs, or the prime-age migrants are injured, the lack of social institutions can be particularly devastating. In addition, in recent years, the lure of urban jobs has reached the middle-agers themselves, which prompts the question: who will be left at home to care for the children and the elders?

Shangyi Mao
School of Finance, Guangdong University of Foreign Studies,
Panyu District, Guangzhou, 510006, China
e-mail: m.cherish@gmail.com

Rachel Connelly
Bowdoin College – Economics,
9700 College Station, Brunswick, Maine 04011, USA
e-mail: connelly@bowdoin.edu

Xinxin Chen
Peking University, Haidian District, Beijing, 100871, China
e-mail: xinxinchen.zjgsu@gmail.com

NOTES ON CONTRIBUTORS

Shangyi Mao is Assistant Professor at the School of Finance, Guangdong University of Foreign Studies in Guangzhou, China and formerly postdoctoral Research Fellow at National School of Development, Peking University in Peking, China. His research is focused on happiness, living arrangements, care economy, and health economics.

Rachel Connelly is Bion R. Cram Professor of Economics at Bowdoin College, Maine, United States and Research Fellow at the Institute of Labor Economics (IZA). Her research focus is on the economics of childcare broadly defined, with empirical applications in both the US and China.

Xinxin Chen is Research Scientist in the Institute of Social Science Surveys at Peking University. Her research interests include: gender, population aging, and eldercare provision, rural-to-urban migration and its impacts on rural households, and the economics of poverty with an emphasis on rural education.

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NOTES

[1] Rachel Connelly and Jean Kimmel (2015) find that in the United States, parents, especially mothers, find homework time more stressful and less happy than other child caregiving time.

[2] See, for example, recent papers by Van Houtven, Coe, and Skira (2013), Lee and Tang (2015), and Wiemers and Bianchi (2015), using data from the US; Yamada and Shimizutani (2015) using Japanese data; and Liu, Dong, and Zheng (2010) and Connelly, Maurer-Fazio, and Zhang (2014) using data on urban dwellers in China.

[3] Hainan, Ningxia, and Tibet are the missing provinces.

[4] In the CHARLS data, off-farm employment includes both local off-farm employment and migration. In a younger sample, this combination would be a problem as we are interested in trade-offs with daily caregiving tasks, but for the middle-aged population, almost all of the off-farm employment is local. However, as the age of migration continues to increase, future data collection efforts should distinguish between local off-farm versus migration employment.

[5] The mean earnings reported in Table 1 and used as a dependent variable in Table 6 are (annual earnings)/1,000.

[6] We do not know whether respondents include commuting time in response to the hours of work question. The question asks about average hours per day over the past year, excluding meal breaks but including overtime work. Average weekly hours were calculated as (average daily hours × average days per week × months worked)/52.

[7] Only one member of the couple answers the weekly caregiving time question for both of them. The correlation between the husband's and wife's hours of care in the same household is quite high, at 73 percent. It is unclear if this result is because they are doing care work together or if their answers reflect a preference for reporting an equality of time. In addition, the caregiving time answer covers all caregiving time so that it is unclear whether time is divided among various grandchildren or all children are cared for together. While the exact number of hours may not be accurate, we believe that higher numbers reflect a greater intensity of caregiving time, as evidenced by the differences in the mean hours for the three categories of care referenced in text. It makes sense that those caring for both parents and grandchildren spend the most time on caregiving per week, that care for children requires nearly as much time as off-farm employment time, and that care time for parents only is substantially less. However, because of the single responder "problem," we believe it would not be appropriate to engage in within-household models of time use. We did run all the models again using seemingly unrelated regression modes, and the results were almost indistinguishable from those presented here. Those studies that have done within-household time allocation have not found big effects of one spouse's time on the other's, though admittedly in very different cultural contexts (Connelly and Kimmel 2009; Bredtmann 2014).

[8] The question about care time asks for weekly time; the question about employment time asks for average daily time over the last year.

[9] They might be expected to affect migration choice, but the level of migration for rural 45- to 65-year-olds is low.

[10] An alternative approach would be to estimate what is essentially a reduced form model where the presence of the grandchild and the frail parent is the independent variable, instead of using the information on actual caregiving in the second stage. We prefer our more structural approach of the 2SLS, since caregiving is the time choice of focus. Not everyone who has a grandchild provides care for that child. In addition, we expect care needs to differ substantially by the age of the grandchild, but we only know the number of grandchildren under 16 years of age, not the age of the youngest grandchild.

[11] Out of concern for the potential endogeneity of wealth in reference to off-farm employment, we estimate this model and all subsequent models without the log of per capita expenditure, and the remaining coefficients are robust of the inclusion or exclusion of this particular variable. If there is any effect of excluding per capita expenditure, it seems to increase the marginal effects of education; but even these differences are quite small. Results are available from the authors.

[12] We cannot estimate the 2SLS model in this case, as we have only two instruments and three potentially endogenous care dummies.

[13] Full results tables are available from the authors. All the other coefficient estimates are robust to the addition of detail in the caregiving dummies.

[14] The survey asks, "What is the after-tax salary including bonus in the last year?" Those who are unable or unwilling to answer were asked a second question, which offered a choice of salary ranges. We use the mean of the salary range if the first question was not answered but the second was. We use the mean earnings in the community (obtained from the other survey respondents in the village) if neither question was answered. The X vector in this model excludes per capita expenditure, but the results including per capita expenditure are quite similar.

[15] A number greater than 1 means that being in that care category increases the probability of being in that labor market category, while a number less than 1 means that being in that care category reduces the probability of being in the labor market category compared to the probability of being not in the labor market.

[16] Full model results are available upon request.

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