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Effects of Grandchild Caregiving on Social Participation: Spillover or Competition?

Jianji Chen[1] jchen@ced.uab.es Sergi Vidal[1, 2] svidal@ced.uab.es Jeroen Spijker[1] jspijker@ced.uab.es

1 Centre d'Estudis Demogràfics (CED-CERCA), Universitat Autònoma de Barcelona

2 Departament de Sociologia, Universitat Autònoma de Barcelona

Abstract

Individual social participation tends to diminish and concentrate on the family setting in later life. While the "active aging" paradigm aims to activate older population' social participation and contributions, very few research has studied how older adults' family- and non-family-based social participations interact to each other especially in a context of the Global South. This study investigates the role of grandchild caregiving for non-family-based social participation among Chinese older adults. A sample of 12,007 grandparents aged 50-80 was drawn from the China Health and Retirement Longitudinal Study (2011-2018). We conducted individual fixed-effects regression models to examine the frequency of social participation among six social activities across major forms of grandchild care provision. Given the gender inequalities of grandchild care and the stratification of social participation by urbanicity in China, we also assess potential heterogeneous associations by gender and rural/ urban residence. The results show that providing grandchild care generally increases the frequency of social participation to a modest level, particularly when grandparents are the main care providers. This lends support to the spillover hypothesis, which proposes that caring responsibilities enhances opportunities for social interactions in school and other settings. Such association intersects with urbanicity and gender, with spillover effects being most pronounced among urban women. Overall, the findings suggest that grandchild caregiving might not undermine social life among Chinese grandparents, and that gender and rural/ urban inequalities need to be considered for "active ageing" policies.

Key words

Grandchild care; social participation; gender; rural/ urban inequalities

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1 Introduction

A general trend of "social disengagement" among older adults was observed across the world: individuals' later life stage tends to be a period of dependency on family and inactivity in productive (i.e., paid work, informal care giving) and social activities due to the decline of physical health conditions and social networks (Carr & Moorman, 2011; Pinto & Neri, 2017). To enhance the quality of life for older adults, the framework of "active aging" was developed by WHO. As a process of optimizing opportunities for health, participation and security, this scheme aims to encourage older people's continuing social participation – take part in social, economic, cultural, spiritual and civic activities (WHO, 2002) – because it can promote other dimensions of wellbeing such as physical and mental health (Gao et al., 2018; Sun & Lyu, 2020).

We consider social participation as an individual's involvement in activities that provide interactions with other people on a community level – such as family, friendship, neighborhood, or a larger scope of society. Such social activities are based on space and require available time and resources (Levasseur et al., 2022). We further differentiate social participation into two categories: family-based social participation which is focused on activities with family members (such as caring for or helping other family members), and non-family-based social participation which is focused on activities with people outside of the family despite it may indirectly involve family members. For our research interest, in this paper we focus the family-based social activity on grandchild caregiving. To avoid verbosity, hereafter we use the term "social participation" to refer to non-family-based social participation if not specified.

As a common family based social participation, grandchild care is comparable and relatable to non-family-based social participation. Older adults' social participation in both family and non-family affairs are important parts of the "active aging" because both contribute wellbeing to older people and the society in general. However, participation in caregiving inside the family – usually due to responsibilities – can limit older people's time and energies of participating in social activities outside the family (Arpino & Bordone, 2018; WTO, 2002). Nevertheless, family- and non-family-based social participations are not simply substitutive to each other, but instead possible to be complementary due to continuing social connectedness and resources through family relationships and informal caregiving (Kohli et al., 2009). However, how

grandchild care and social participation interact with each other remains a question. Moreover, research related to this interest in the Chinese context, where older adults' social participation is kinship- and informally oriented (Gao et al., 2018; Gold et al., 2002), is rare.

The aging policies in China used to emphasize on "active" approaches of governmental and societal work on aging population rather than active individual lifestyles among older adults (Chen & Chen, 2009). In recent years, the Chinese government has prompted policies to promote older adults' social participation with an emphasis of their continuous contributions to families and the society (Wang & Chen, 2022). Due to the family care responsibilities and limited community facilities, most of the Chinese older adults are engaged in grandchild care yet have a very low level of social participation outside the family (Lin, 2017; Xiong & Wiśniowski, 2018). In the past two decades, Chinese older adults have maintained high rates of grandchild caregiving (Wang & Zhang, 2018) while have been more sedentary and solitary with a declined trend of outdoor social activity participation (Feng et al., 2020; Fong et al., 2022). Among the older population, women take more grandchild care responsibilities than men (Wang & Zhang, 2018), while social activities are more participated among urban than rural older adults (Lin, 2017). Such gender and rural/ urban differences/ inequalities of family- and non-family-based social participation should be considered regarding the effects of grandchild care on non-family-based social participation.

In such a context, this paper focuses on the research questions: How does grandchild care affect social participation among Chinese older adults? How do the effects vary by gender and rural/ urban areas?

To answer these questions, we bring forward some assumptions based on spillover and competition hypotheses considering gender and rural-urban differences/ inequalities. We conduct empirical analysis with a sample of 12,007 grandparents aged 50-80 years old in 2011-2018 from the *China Health and Retirement Longitudinal Study* (CHARLS). We apply individual fixed-effects regressions to test our hypotheses on how grandchild caregiving affects individual social participation among Chinese older adults.

This paper contributes to the research gaps on three aspects: (1) the relationships between family and non-family social participation among older adults in the Chinese context, (2) considering

gender and (3) rural/ urban difference perspectives. Additionally, it provides implications for China's "active aging" policy.

2 Conceptual Framework & Hypotheses

How does grandchild care affect social participation is a part of the research area on how different types of social connectedness (family relations, and formal/ informal social relations) of older population are related to each other (Kohli et al., 2009). Such studies initiated from the discussions of how older adults selectively maintain social engagement in the context of deteriorative physical abilities, limited energies and losing social contacts as they age (Pino & Neri, 2017). Very few have investigated the relationships between grandchild care and social participation in the context of US (Bulanda & Jendrek, 2016) and European countries (Arpino & Bordone, 2017, 2018; Ates et al., 2022), but not yet in a Global South context such as China.

2.1 Spillover and Competition Hypotheses

The **spillover hypothesis** indicates that providing grandchild care promotes social participation. This is interpreted from two perspectives: opportunity and motivation. The opportunity comes from the enriched social roles and resources accompanied by caregiving: caregivers are exposed to larger social networks and contacts outside their family, which are important social capital for participating in both formal and informal social activities (Aalto et al., 2023; Burr et al., 2005; Kohli et al., 2009; Lancee et al., 2014; Quirke et al., 2019). Compared to those who do not provide care, caregivers of young children are more likely to connect with other caregivers, care receivers, and organizations through children and school, which is greater in cases of care for children with health problems (Gage, 2013; McCabe, 2008). With a wider social network, individuals have more potential to be able to and be asked to participate in social activities (Dury et al., 2020). In a reciprocal way, older adults who care for their grandchildren also receive more economic (and other forms of) support from their adult children (Hong et al., 2023; Tang et al., 2022), which can increase their economic capital for social participation. The social role enrichment of grandchild caregiving also combines the general motivation of active social participation (Hank & Stuck, 2008). Compared to non-caregivers, older adults who provide non-intensive grandchild care report feeling younger than their chronological ages (Bordone &

Arpino, 2016), less loneliness and isolation (Quirke et al., 2019; Yang et al., 2020), better health status (Chen & Liu, 2012), and a more meaningful and satisfying aging life (Lakomý, 2020). Consequently, such effects on a higher quality of physical and subjective wellbeing motivate older adults to be actively engaged in social activities (Aalto et al., 2023; Ye et al., 2020).

The spillover effects have been found among informal care providers who are more likely to volunteer or help others (Burr et al., 2005; Hank & Stuck, 2008) and meet friends and relatives (Glaser et al., 2006) than people who do not provide informal care to family members, friends or neighbors. Such effects can also specifically apply to grandparents who provide grandchild care. Using treatment effects regression models, Bulanda & Jendrek (2016) found that providing grandchild care increases the likelihood of doing volunteer activity among US grandparents. In Arpino & Bordone (2018)'s latent class analysis of social activities among older Europeans, they found the active aging population (24%) are those who provides grandchild care on a moderate level of intensity and actively participate in leisure activities. Similar finding was suggested by Ates et al. (2022)'s study on German older adults with fixed-effects regression models: grandparents participate in more social activities if they take care for their grandchildren.

In contrast, the **competition hypothesis** claims that grandchild care hinders social participation due to strained social roles (Goode, 1960) – the limits of personal time, energy and SES resources, especially when the care work is intensive (Arpino & Bordone, 2018). Intensive grandchild care (especially custodial care) forces older adults to change their lifestyles to serve as a full-time caregiver. Consequently, they experience social connectedness with their friends who used to share similar social lifestyles (Jendrek, 1993). As a type of unpaid caregiving, intensive grandchild care reduces older adults' opportunities of engaging in paid work (Di Gessa & Grundy, 2017) and may meet financial difficulty. Such financial problems are worse when custodial grandparents do not receive sufficient economic support from their adult children for meeting needs (Silverstein & Zuo, 2021), let alone to participate in social activities. Older adults who engage in intensive grandchild caregiving also feel higher levels of burdensome and obligation on their care work (Grünwald et al., 2022) and report worse health status (Chen & Liu, 2012) than those who provide non-intensive grandchild care or no care, which can squeeze out their motivation and energy of social participation outside the family.

The competition effects have been empirically found with intensive spousal caregiving related to lower likelihood of voluntary activities for women in US (Choi et al., 2007). As for grandchild care, intensive (custodial) caregiving was related to less contact with friends due to changing lifestyles among US grandparents (Jendrek, 1993). Arpino & Bordone's (2017, 2018) research showed that European grandparents who provide intensive care for their grandchildren tend to be inactive in social activities. Furthermore, Ates et al. (2022) found that German grandmothers who provide intensive grandchild care experience a decline of satisfaction for social activities.

Two studies used social activity participation as the mediator to examine the effects of grandchild care on depressive (Yang & Yin, 2022) and cognitive scores (Hou et al., 2023) among Chines older adults. They found social activity participation served as parts of explanations of lower depressive and higher cognitive scores because of giving grandchild care. However, they did not provide theoretical views on the relationship between grandchild care and social participation. They also did not consider the variations of grandchild care regarding levels of intensity and residence types, which might have different effects on social participation. Furthermore, they did not differentiate the types of social activities: social activities that are or might be involved with family care (including grandchild care) were all included in the variable of social participation in their studies, which could lead to a biased higher level of correlation. Nevertheless, evidence of grandchild care's spillover and competition effects on physical and subjective wellbeing has been found among Chinese older adults. Generally, grandparents who take care of their grandchildren have better physical and mental health status and higher level of life satisfaction (Chen & Liu, 2012; Luo et al., 2019; Xu, 2019). Intensive grandchild care, especially custodial care, however, has been found to accelerate physical and mental health declines among Chinese grandparents (Chen & Liu, 2012; Silverstein & Zuo, 2021).

Therefore, for this study we first test two general complementary hypotheses associated with spillover and competition effects: extensive grandchild caregiving increases social participation (**H1a**), while intensive grandchild caregiving decreases social participation (**H1b**).

2.2 Gender differences

Gender differences are found regarding grandchild care work. Grandmothers are perceived as primarily responsible and capable of grandchild care, and they tend to provide more types of care

work and more frequently than grandfathers (Hasmanová & Štípková, 2015). Grandmothers are also more likely to provide care and help for their children (cooking, feeding, cleaning, caring when sick, etc.) than grandfathers, while among grandfathers the most likely care work is combined with grandchildren's recreational activities (Di Gessa et al., 2020; Horsfall & Dempsey, 2015). Because of these gendered grandparenting roles, looking after grandchildren is more role-strained for grandmothers than grandfathers: they tend to have higher risks of leaving the labor market and dissatisfaction with free time (Horsfall & Dempsey, 2015; Lee & Tang, 2015). Such gendered effects have also been found in the relationship between grandchild care and social participation. For European grandmothers, regular grandchild care providing decreases the number of and possibility of doing social activities including volunteering, education and political/ organizational participation, while such effect was not found among grandfathers (Arpino & Bordone, 2017). German grandmothers also experience satisfaction loss due to intensive grandchild caregiving, which was not found for grandfathers (Ates et al., 2022).

Although there is not yet research recording what specific activities Chinese grandfathers and grandmothers do on grandchild care, gendered grandparenting roles have been also found. Grandchild care loads are adaptive to familial (adult children) needs for both grandfathers and grandmothers (Chen et al., 2011), yet are demand driven for grandfathers and supply driven for grandmothers (Feng & Zhang, 2018). Grandmothers' grandchild caregiving is taken for granted but financially undervalued with higher possibilities of dropping out of the labor market than grandfathers (Wang & Zhang, 2018). Such role-strained effects for grandmothers might be worsened given that the amount of pension received by older (60+) women on average is half of that by older men (Zhao & Zhao, 2018). Regarding the protective effects of grandchild care on grandparents' physical and subjective wellbeing, grandfathers have been found to benefit more than grandmothers, e.g.: reduced risks of cognitive decline (Luo et al., 2019), lower possibilities of depression and hypertension and greater life satisfaction (Hu, 2019).

Subsequently, for this study we hypothesize that grandmothers' care giving is more role-strained than grandfathers: spillover effects of grandchild care on social participation are greater among grandfathers (**H2a**) while competition effects are greater among grandmothers (**H2b**).

2.3 Rural/ urban differences

Rural/ urban differences regarding social participation among older adults are accounted. On the one hand, older rural residents may have more sense of trust and familiarity in their community where strong ties are maintained among neighbors than in urban communities. In such circumstances, older adults are more motivated to take part in community activities in rural areas than in urban areas. This is found in some developed rural societies such as rural Norway and Canada where older residents actively take part in volunteering for their communities (Carver et al., 2018). On the other hand, rural residents have less socioeconomic resources, such as income, transport and recreation infrastructures. Therefore, older adults in rural areas have less access to social participation than in urban areas, which is found in US, Canada and Australia where rural communities are usually sparsely populated, and in Global South such as China and Siri Lanka where public infrastructures are poorly built in rural areas (Carver et al., 2018). In China, urban older adults have a higher participation rate (52.5%) of entertainment activities than their rural counterparts (42.8%) (Lin, 2017).

Current studies have not considered whether the associations between grandchild care and social participation differ between rural and urban areas. One may presume that the effects of grand childcare on social participation are greater among rural grandparents because of more potential of social participation motivated from a much lower level than urban grandparents. However, we hold the opposite view in the Chinese context. First, social participation among older adults is more homogeneous – limited to informal activities with relatives and neighbors – in rural areas while more heterogenous in urban areas with various options of social activities. Formal (community and organization based) social activities have higher participation rates in urban than rural areas because of richer economic and social support (Feng et al., 2020; Lin, 2017; Sun & Lyu, 2020). By comparison, besides of lower level of social participation, in rural areas informal (kinship and village based) rather than formal social participation is more tightly connected due to close living arrangements and kinship traditions (Gold et al., 2002). Second, the long lasting rural-urban socioeconomic divide resulted in much lower income and pension of older adults in rural areas. Therefore, compared to urban grandparents, rural grandparents are more economically disadvantaged and dependent on their adult children, and grandchild caregiving can be more a sense of responsibility based on reciprocal elder care from their adult

children (Silverstein & Zuo, 2021). Studies have found that compared to rural grandparents, urban grandparents enjoy more health benefits from grandchild caregiving, such as higher levels of self-rated health and life satisfaction, and lower risks of depression, hypertension and diabetes (Chen & Liu, 2011; Xu, 2019).

Therefore, in this study we suppose that spillover effects of grandchild care on social participation are greater among urban grandparents (**H3a**), while competition effects are greater among rural grandparents (**H3b**).

3 Methods

3.1 Data & Sample

This study uses data from the *China Health and Retirement Longitudinal Study* (CHARLS) with older adults aged between 50 and 80 years old in each wave. CHARLS is a nationally representative sample of individuals aged 45 years or over and their spouses from 450 neighborhoods in China. The baseline wave contains about 17,500 individuals who are followed up every two or three years with new respondents recruited in every followed wave. The CHARLS dataset is useful to our study due to (1) its representation of Chinese older adults; (2) information of intergenerational transfers (including grandchild care), participation of social activities, and a series of demographic and socioeconomic status are regularly recorded (2011, 2013, 2015, and 2018).

For this study, we combine the dataset with necessary information from the 4 regular waves. In each household, although both the main respondent and their spouse (if applicable) were interviewed during the survey, only the main respondent was asked for information of family members and family transfers. For the information of children, grandchildren and co-residence, we treat them the same shared by both the main respondent and their spouse regardless types of children (biological, stepped, adopted, etc.). For grandchild care, we deprive the spouse's information of grandchild caregiving from the main respondent since they were asked how much time they and their spouses had respectively spent on grandchild care during the last year. We have the original sample with 25,588 individuals and 102,352 individual-wave observations. We

first exclude 28,715 individual-wave observations where individuals aged younger than 50 or older than 80 years old. Then we exclude 26,085 observations where individuals did not have grandchildren under 16 years old, and 888 observations where respondents did not reside in a family housing (i.e., in a nursing home or hospital). We further exclude 6,731 observations containing missing values, and 4,636 observations due to individuals' participating in less than 2 waves (attrition). The distributions of our variables do not change much after these 11,367 exclusions due to missing data and attrition (See ***table A1*** in Appendix, a comparison of two samples before and after these two exclusions). The final sample is made up of 12,007 individuals (3,723 rural men, 3,890 rural women, 2,087 urban men and 2,307 urban women) and 35,297 individual-wave observations (11,274 rural men, 11,487 rural women, 5,979 urban men and 6,557 urban women).

3.2 Variables

The **independent variable grandchild care** combines the information of caring hours and residential types to comprehensively differentiate the intensity of caregiving. CHARLS asks respondents how many weeks and how many hours each week they spent caring for every grandchild during the last year. We first compute the average amounts of weeks and hours each week for every grandchild. Then we multiply these two average amounts to get the caring hours per year on average for each grandparent. For the residence types, we consider if the respondents have any grandchildren or adult children (≥ 18 years old) or adult children's spouses living in the same household. Consequently, the grandchild care variable has five categories: *not providing grandchild care*, *non-coresidential extensive care* (≤ 2,080 hours care / year, do not live with any grandchildren), *non-coresidential intensive care* (> 2,080 hours care / year, do not live with any grandchildren), *multi-generational coresidential care* (> 0 hours care / year, live with any grandchildren and any children/ -in law) and *skipped-generational coresidential care* (> 0 hours care / year, live with any grandchildren but not any children/ -in law). We consider *skipped-generational coresidential care* and *non-coresidential intensive care* as ***intensive care*** because of the main responsibility and abundant time of the care work. By comparison, *multi-generational coresidential care* and *non-coresidential intensive care* are ***extensive care***.

For the **dependent variable social participation**, we use the indicator frequency of taking part in social activities. It has a continuous scale 0-18 indicating from never to most frequently participating in all social activities. In CHARLS respondents were asked how often they had taken part in each of 11 social activities in the last month. For this study, we use only 6 of the options that we clarify as non-family-based on-site social activities: (1) "interacted with friends" (henceforth labelled as meeting friends); (2) "Played Ma-jong, chess, cards, or went to community club" (card/ board games); (3) "Went to Dance, exercise or practice Qi Gong in the park or other places" (physical activities) [1]; (4) ("Took part in a community-related organization" (community activities); (5) "Done voluntary or charity work" (volunteering); (6) "Attended an educational or training course" (taking courses). For each activity, we record the answers on a 0-3 scale: 0 (never), 1 (not regularly), 2 (almost weekly), and 3 (almost daily). Then we sum up the frequencies of all 6 activities as a measurement of the total level of social participation (0-18).

Among the Chinese older adults, it is found the general decline trend of individual social participation in older ages, which is slightly adjusted by personal SES and health status (Ye et al., 2020). In this study, we control a series of demographic and SES variables as confounders in the effect of grandchild care on social participation: age, marital status (whether married or not), number of children over 18 years old, number of grandchildren under 16 years old, work status (whether with intensive work: > 2,080 hours/ year), and health conditions. Four indicators of health conditions are used: (1) depression level (0-30), which is the sum of scores (scale 0-3) from 10 questions followed the *Center for Epidemiologic Studies Depression Scale* (CES-D-10); (2) whether with disability problems: physical disabilities, brain damage/ mental retardation, vision problem, hearing problem, speech impediment; (3) number of chronic diseases (0-14): hypertension, dyslipidemia, diabetes, cancer, lung diseases, liver diseases, heart diseases, stroke, kidney diseases, digestive diseases, emotional or psychiatric problems, memory-related disease, arthritis or rheumatism, and asthma; (4) functional limitation level (0-60), which is the sum of scores (scale 0-3) from 20 types of difficulty performing daily activities. Table 1 presents the descriptive statistics of all the variables.

[1] In the questionnaire, CHARLS provides this option describing "Went to dance, exercise or practice Qi Gong in the park or other places" in Chinese "去公园或者其他场所跳舞、健身、练气功等" but "Went to a sport, social, or other kind of club" in English. These two descriptions do not have consistent meanings. Since the respondents were asked in Chinese, we adopt the description from the Chinese version rather than the English one.

3.3 Analytic approach

We use individual fixed-effects regression models to estimate the average effects of grandchild care on the frequency of participating in social activities within the same individual. In our study, fixed-effects estimations measure the average within-person differences in an individual's frequency of social participation when they provide different type of grandchild care compared to the same individual's frequency of social participation when they do not provide grandchild care. Such an approach controls the time-invariant factors, such as personality and personal beliefs, and education attainment (is constant in our study case), which may influence both grandchild caregiving and social participation. Individual fixed-effects estimations also control the initial level of frequency of social participation, and thus help remove possible selection biases of grandchild care's effects on frequency of social participation. To check gender and urbanicity variations, fixed-effects regressions are run first for the total sample, and then separately by four groups: rural men, rural women, urban men, and urban women. We deploy fixed-effects regressions on RStudio software (R version 4.2.2) using the package "fixest" (Berge, 2018).

Some sensitivity analyses are also designed to further explore and explain the research questions. We check if the results are robust even with a strict sample where all individuals participated in all four waves of the CHARLS survey. We also check if the results are robust when the social participation variable does not include "meeting friends", considering the possibility that the older adults' social participation might be based on doing together with friends.

4 Results

4.1 Descriptive results

Table A2 in appendix presents the sample characteristics by gender and rural/ urban residence. Nearly half (overall 46%) of the population provide grandchild care and mostly "extensive" care – non-coresidential intensive care and multi-generational coresidential care. The percentage of women engaging in grandchild care is 8% higher than that of men, which is in accordance with our knowledge regarding the gender difference of grandchild care. Similarly, the percentage of

providing grandchild care among urban grandparents is 8% higher than that among rural grandparents. Such difference is expected since many of the grandchildren originated from rural areas migrant to urban areas due to their parents' decisions for better opportunities in labor market. On the other hand, there are also many grandchildren who are separated from their migrating parents and living with grandparents in rural areas (the "left-behind") (Silverstein & Zuo, 2021). Therefore, rural grandparents are more likely to engage in skipped-generational coresidential grandchild care (1.4-1.9% more) while less likely in non-coresidential (7% less) and multi-generational coresidential care (2-3% less) than urban grandparents.

Compared to the high participation rate of grandchild care, the participation level of non-family social activities is very low among Chinese older adults. On average, the frequency of social participation among those grandparents is only 1.36 (out of the possible maximum 18). The most participated social activities are meeting friends and playing card/ board games, followed by doing physical activities: respectively 36%, 20% and 7% of grandparents participated in these three activities during the past month when they were interviewed. On the contrary, very few grandparents (less than 2%) had taken part in community activities, volunteering, and taking courses. Urban grandparents participate in social activities 0.5 more frequently than rural grandparents, which is mainly due to the participation differences in playing card/ board games and doing physical activities. There is very little gender difference observed regarding social participation level.

Table A3 in Appendix shows the sample characteristics by types of grandchild care. Compared to grandparents who take care of their grandchildren, those who do not provide grandchild care are 2-3 years older, having slightly less grandchild under 16 years old, and generally worse health conditions: higher percentages of having disability problems and chronic diseases and higher levels of depression and functional limitation. This "not providing grandchild care" group is also the only group where men are more representative than women (though only 2% more). The "non-coresidential intensive care" group is most female dominated (59%) with the lowest rate of engaging in intensive work (12%). The differences in frequency of social participation are very small by grandchild care provision: grandparents taking non-coresidential extensive care have the highest level (1.53) of social participation while those who do not provide care have the lowest level (1.30). The differences of social participation frequency by grandchild care are small

in four subgroups: rural men, rural women, urban men and urban women (Reference in ***Figure 1***). In all subgroups except among urban men, grandparents who provide non-coresidential extensive care participate in social activities the most frequently. In all subgroups except among urban women, those who do not provide grandchild care have the lowest frequency of social participation. While urban grandparents with all types of grandchild care have higher levels of social participation than rural urban grandparents, gender differences are very small in both rural and urban areas.

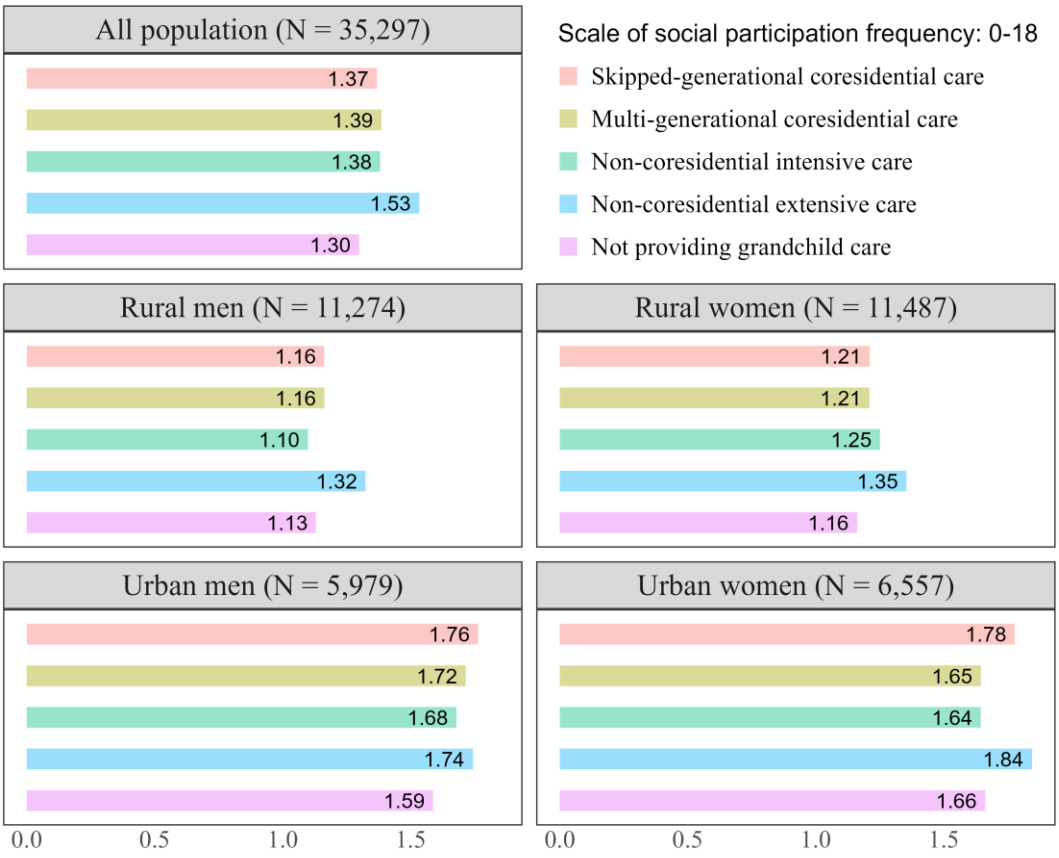

Figure 1. Frequencies of social participation (0-18) by grandchild care types.

4.2 The effects of grandchild care on social participation

Figure 2 presents the estimated effects of grandchild care provision on individuals' frequency of social participation based on the fixed-effects regressions, controlling for age, marital status, work status, pension participation, number of young grandchildren and health conditions. The details of the regressions results can be referred to in ***Table A4*** in appendix. In the total sample,

changes from not providing to all other types of grandchild care increase the frequency of social participation. Compared to no grandchild care, providing non-coresidential extensive care, multi-generational coresidential care and skipped-generational coresidential care respectively increase social participation frequency by 0.11 ($p < 0.01$), 0.07 ($p < 0.05$) and 0.20 ($p < 0.001$), while the effect of non-coresidential intensive care (increase by 0.04) is not significant.

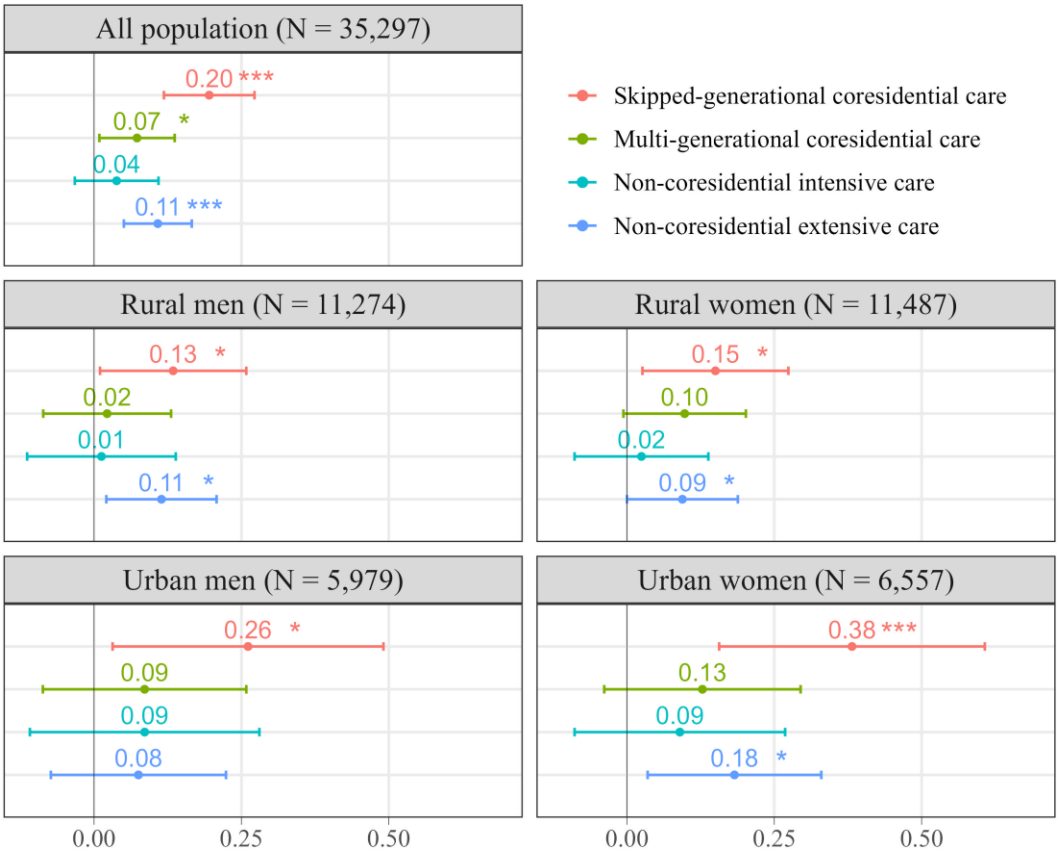

Figure 2. Estimates of Grandchild care's effects on frequency of social participation (0-18).

Notes: (1) The estimated values are the slops (betas) in individual fixed-effects regressions with control variables; (2) Reference group is "not providing grandchild care"; (3) Whiskers indicate 95% confidence intervals. (4) * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

By different subgroups, all types of grandchild care also increase grandparents' frequency of social participation compared to no care, with variations in different subgroups. Among rural men, changes from no grandchild care to non-coresidential extensive care, non-coresidential intensive care, multi-generational coresidential care and skipped-generational coresidential care respectively increase individual social participation frequency by 0.11, 0.01, 0.02, and 0.13, with the effects of non-coresidential extensive care and skipped-generational coresidential care being

significant ($p < 0.05$). The effects of grandchild care provision on frequency of social participation among rural women is similar as those among rural men.

Among urban men, changes from no grandchild care to non-coresidential extensive care, non-coresidential intensive care, multi-generational coresidential care and skipped-generational coresidential care respectively increase individual social participation frequency by 0.08, 0.09, 0.09, and 0.26, with only the effect of skipped-generational coresidential care being significant ($p < 0.05$). The effects are greatest among urban women. Compared to no grandchild caregiving, non-coresidential extensive care and skipped-generational coresidential care significantly promote urban grandmothers' social participation frequency respectively by 0.18 ($p < 0.05$) and 0.38 ($p < 0.001$), whereas the unsignificant effects of non-coresidential intensive care and multi-generational coresidential care are similar as those among urban men.

Although the positive effects of grandchild care on social participation are greater among urban than among rural grandparents, the variations are different among men and among women. While both non-coresidential extensive care and skipped-generational coresidential care provision significantly increase social participation level among rural grandfathers, the case for urban grandfathers is only significant in skipped-generational coresidential care though with greater effects across all types of grandchild care. As for women, non-coresidential extensive care and skipped-generational coresidential care greatly lead to higher frequency of social participation among urban grandmothers whereas such effects are much smaller among rural grandmothers.

Figure 3 presents the predicted frequencies of social participation by different types of grandchild caregiving based on the same fixed-effects regressions as in ***Figure 2***. In all subgroups, grandparents who do not provide grandchild care have the lowest levels of social participation while those who provide skipped-generational coresidential care participate in social activities the most frequently. However, even though the effects of grandchild care on social participation are significant especially the skipped-generational coresidential care, grandparents engaging in different types of grandchild caregiving do not differ much regarding the frequency of social participation. Instead, the levels of social participation are very low across all types of grandchild care provisions and in all subgroups. The gender variations of the

effects are also very small, including the greatest effects among urban women observed with the slopes in ***Figure 2***. Nevertheless, the inequalities of social participation level are notable between urban and rural grandparents. Compared to rural grandparents, urban grandparents have 0.5 level higher of social participation frequency on average and 1 level higher of the upper limit in a 95% confidence interval.

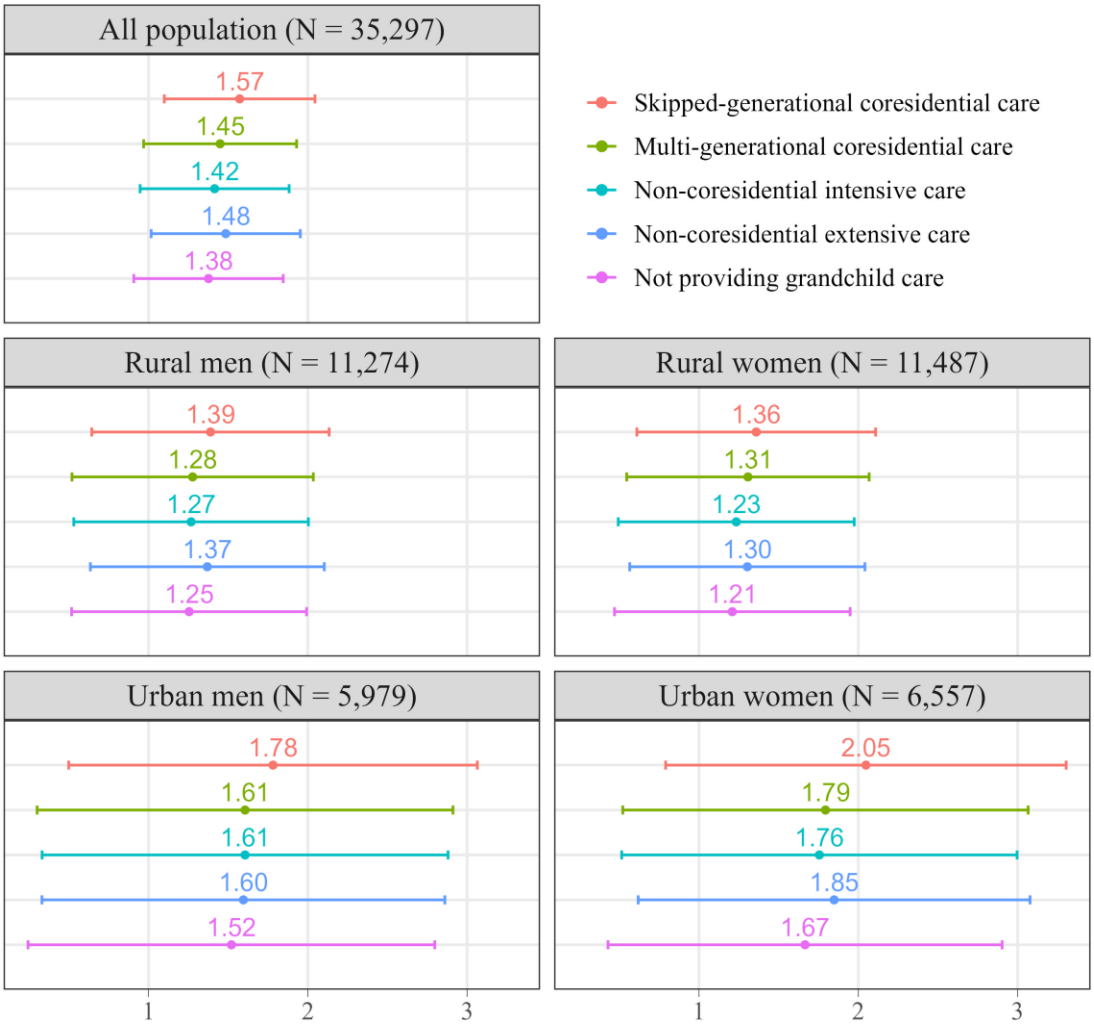

Figure 3. Predicted frequencies of social participation (0-18) by grandchild care provision.

Notes: (1) Predictive values are based on individual fixed-effects regressions with control variables; (2) Whiskers indicate 95% confidence intervals.

4.3 Sensitivity Analysis

To check the robustness of the results, we repeated the fixed-effects regressions: (1) in a strict sample where individuals took part in the CHARLS in all 4 waves; (2) in the same sample (as in Figure 2 and 3) but with "meeting friends" excluded from the social participation variable (scale 0-15). The results are referred to respectively in ***Figure A5*** and ***Figure A6*** in Appendix. With the strict sample, the results do not differ much from those in the previous section except the effect of non-coresidential intensive care on social participation being slightly negative (-0.02 compared to not providing grandchild care) among rural men and the effects of skipped-generational coresidential care being greater among urban men and urban women. Excluding "meeting friends" from the social participation variable, the results differ with smaller slopes, but the effects still stay positive except those of non-coresidential intensive care among rural men and those of multi-generational coresidential care among rural women being slightly negative (-0.01 compared to not providing grandchild care). Such smaller effects indicate that "meeting friends" is the key social activity promoted by grandchild care, which may be a result of easier access than to other social activities. Natheless, the effects are barely reduced among rural men, which implies that taking care for grandchild care may not provoke rural men to hang out with their friends more frequently.

5 Conclusion & Discussion

Chinese older adults have continued to provide significant grandchild care over the last 20 years, but their nonfamily social activities have declined, making them more sedentary and solitary. Previous studies have not explored how grandchild care interacts with social participation (except labor force participation) among Chinese older adults. In this study, we find that grandchild caregiving promotes Chinese grandparents' social participation outside the family. Our results show that Chinese grandparents who provide grandchild care take part in social activities more frequently than those who do not, and this spillover effect is the greatest when the grandparents are the custodians of their grandchildren (skipped-generational coresidential caregiving). Such spillover effects are the greatest among urban women. However, social participation levels across different groups of grandchild caregiving are similarly low without prominent gaps.

Our results verify the hypothesis of spillover effects of grandchild caregiving on nonfamily social participation (H1a) but does not support the hypotheses of competition effects (H1b, H2b, H3b). We do not find negative effects of intensive grandchild care on frequency of social participation. Instead, providing skipped-generational coresidential grandchild care makes grandparents take part in social activities the most frequently. These are different from the empirical results from US and European countries where intensive grandchild care generally undermines older adults' participation in social activities (Arpino & Bordone, 2017; Ates et al., 2021), which is especially prominent among the grandparents who are raising their grandchildren (Bulanda & Jendrek, 2016). One explanation to the spillover rather than competition effects of intensive grandchild caregiving for Chinese grandparents might be the low rates of social participation among older adults. Already with the considerably low level of participation in both informal (such as physical activities and card/ board games) and formal (such as taking courses and volunteering) social activities, there is not enough room to be squeezed by grandchild caregiving. The low participation in total also helps to explain why the effects of grandchild care on social participation do not vary much across different types of care provision.

We also find the spillover effects of grandchild care on social participation are greater for urban grandparents (H3a verified). This finding is consistent with previous studies that compared to rural older adults, urban older adults benefit more wellbeing advantages from grandchild care with more increase of physical and mental health and life satisfaction (Chen & Liu, 2011; Xu, 2019). This is related to the health stratification among older adults by rural-urban socioeconomic inequalities in China. Compared to urban older adults, those who reside in rural areas have significantly higher risk of hardships and worse health conditions through the life course and have higher possibility of suicide in their later life stage (Li & Katikireddi, 2019; Song & Smith, 2019). Similarly, reginal and individual economic inequalities lead to a lower level of social participation among older adults in rural areas (Lin, 2017). Our finding suggests the additional concern that the opportunities of promoting social participation for "active aging" are also less promising in rural communities from an induvial perspective – grandchild caregiving.

It is notable that the spillover effects of grandchild care on social participation are the greatest among urban women while the gender differences are very small in rural areas. Men do not

benefit more social participation from grandchild care as we expected (H2a). This may be due to the lower rate of labor force participation of older urban women, which gives urban women more available time to flexibly arrange their social activities inside and outside the family. In this study we only controlled whether the respondents are engaging in intensive work. This does not fully capture the time availability of older adults. According to China's current policy, the retirement ages are 60 for men, 55 for white collar women and 50 for blue collar women. Such policy does not practically apply to most rural older population since their (agricultural) work did not qualify them to participate in the occupation pension program and therefore, they were not eligible for public pension or only received very few amounts of pension in their later life stage. Consequently, rural older adults usually keep engaging in agricultural work even after age 60, and urban men tend to leave the labor market around 60 years old whereas most urban women stop working after age 55 (Feng, 2023; Xu et al., 2021). However, this does not simply mean that urban women benefit more than urban men because of leaving labor market earlier. Instead, it should be noted that women bear higher risks of financial problems and poverty in later life than men due to longer period of family caregiving and shorter period of paid work, and thus less pension (Feng, 2023; Wang & Zhang, 2018).

Our findings provide three policy implications for China's "active aging". First, more resources and community infrastructures need to be supported to encourage older adults to participate in social activities outside their families. Second, the rural-urban inequalities should be appropriately addressed to decrease the disadvantages of rural older adults regarding social participation. Third, gender differences need to be considered when encouraging older adults to jointly participate in family- and non-family-based social activities.

Finally, it is important to note that there are three potential methodological limitations in this study which need to be improved in future research. First, there might be a selection issue of our results. Since we do not have information on the respondents' social participation before they took part in the CHARLS survey, on the fixed-effects regressions we could not control their previous social participation especially the comparison between before and after having grandchildren. Hence, it is possible that those who take care of their grandchildren already have had a higher level of social participation before having grandchildren than those who do not provide grandchild care. Besides, although we identified if grandparents have any grandchildren

living in the same household, we do not have information on living arrangement of each grandchild because in CHARLS only the number of grandchildren is available (deprived from the information on respondents' children). Therefore, we could not identify the availability/ opportunity of grandchild care for older adults: if their grandchildren live nearby. Second, the dependent variable frequency of social participation may be biasedly measured. The CHARLS asked respondents to rate their social participation frequency during the last month instead of the whole year. The answers to social participation frequency may depend on the available holidays and vacations they had. At the same time, individuals were interviewed in different months during the year. Therefore, this variable may have measurement variations due to different interview dates both at the cross-sectional level and the longitudinal level. Third, due to the limited information on social participation, we could not take the quality of social participation into account. Although social participation can promote older people's wellbeing, participation and the result/ quality of participation are not necessarily consistent. For example, Ates and his colleagues (2022) found that intensive grandchild care promotes German grandmothers' participation in leisure activities but decreases their satisfaction of participation in these activities. To further comprehensively explore the relationships between grandchild care and social participation among older adults, future research needs to consider different dimensions of social participation.

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Appendix

Table A1. Comparison of samples.

Variables	Sample 0 Individuals aged 50-80 living in family house and having grandchildren under 16 years old (all observations, with missing values)	Sample 1 Sample 0 with attrition (individuals participating in at least 2 waves, without missing values)	Sample 2 Sample 0 with attrition (individuals participating in all 4 waves, without missing values) (for robust check)
	n (%) / Mean (SD)		
Number of waves in participation/ availability			
1	4,053 (8.7%)		
2	7,702 (17%)	8,496 (24%)	
3	12,657 (27%)	12,705 (36%)	
4	22,252 (48%)	14,096 (40%)	14,096 (100%)
Wave			
2011	10,535 (23%)	7,826 (22%)	3,524 (25%)
2013	11,456 (25%)	9,159 (26%)	3,524 (25%)
2015	12,062 (26%)	9,846 (28%)	3,524 (25%)
2018	12,611 (27%)	8,466 (24%)	3,524 (25%)
Men	22,433 (48%)	17,253 (49%)	7,076 (50%)
Urban residence	17,087 (37%)	12,536 (36%)	4,512 (32%)
Participation in Occupation Pension	5,229 (11%)	4,018 (11%)	1,395 (9.9%)
Age across all waves	62 (7)	62 (7)	63 (6)
With intensive work	7,414 (16%)	5,718 (16%)	2,238 (16%)
Married	41,120 (88%)	31,410 (89%)	12,640 (90%)
Number of grandchildren aged < 16	2.82 (2.03)	2.87 (2.01)	3.12 (2.07)
Depression Level (0-30)	8 (6)	8 (6)	8 (6)
With disability problems	6,979 (15%)	4,894 (14%)	1,821 (13%)
With chronic diseases	14,099 (30%)	9,914 (28%)	4,050 (29%)
Functional limitation level (0-60)	6 (8)	5.1 (6.9)	4.9 (6.4)
Grandchild care provision			

Variables	Sample 0 Individuals aged 50-80 living in family house and having grandchildren under 16 years old (all observations, with missing values)	Sample 1 Sample 0 with attrition (individuals participating in at least 2 waves, without missing values)	Sample 2 Sample 0 with attrition (individuals participating in all 4 waves, without missing values) (for robust check)
	n (%) / Mean (SD)		
Not providing grandchild care	26,188 (56%)	19,071 (54%)	7,418 (53%)
Non-coresidential extensive care	7,226 (15%)	5,647 (16%)	2,138 (15%)
Non-coresidential intensive care	4,101 (8.8%)	3,179 (9.0%)	1,246 (8.8%)
Multi-generational coresidential care	5,610 (12%)	4,532 (13%)	2,071 (15%)
Skipped-generational coresidential care	3,539 (7.6%)	2,868 (8.1%)	1,223 (8.7%)
Frequency of social activities (0-18)	1.27 (1.79)	1.36 (1.83)	1.38 (1.84)
Num. individual-wave observations	46,664	35,297	14,096
Num. individuals	17,686	12,007	3,524

Table A2. Descriptive statistics by gender and rural/ urban residence.

Variables	All	Rural women	Rural men	Urban women	Urban men
	n (%); Mean (SD)				
Age across all waves	62 (7)	61 (7)	63 (7)	62 (7)	63 (7)
Occupation Pension Program participation	4,018 (11%)	150 (1.3%)	790 (7.0%)	1,327 (20%)	1,751 (29%)
With intensive work	5,718 (16%)	1,532 (13%)	2,335 (21%)	681 (10%)	1,170 (20%)
Married	31,410 (89%)	9,843 (86%)	10,413 (92%)	5,506 (84%)	5,648 (94%)
Number of grandchildren aged < 16	2.87 (2.01)	3.14 (2.11)	3.11 (2.11)	2.40 (1.74)	2.42 (1.72)
Depression Level (0-30)	8 (6)	10 (7)	8 (6)	8.3 (6.2)	6.3 (5.3)
With disability problems	4,894 (14%)	1,681 (15%)	1,704 (15%)	753 (11%)	756 (13%)
With chronic diseases	9,914 (28%)	3,271 (28%)	2,979 (26%)	1,951 (30%)	1,713 (29%)
Functional limitation level (0-60)	5.1 (6.9)	7 (7)	4 (7)	5.2 (6.6)	3.3 (5.8)
Grandchild care provision					
Not providing grandchild care	19,071 (54%)	6,120 (53%)	6,826 (61%)	2,965 (45%)	3,160 (53%)
Non-coresidential extensive care	5,647 (16%)	1,692 (15%)	1,564 (14%)	1,283 (20%)	1,108 (19%)
Non-coresidential intensive care	3,179 (9.0%)	1,115 (9.7%)	766 (6.8%)	769 (12%)	529 (8.8%)
Multi-generational coresidential care	4,532 (13%)	1,500 (13%)	1,196 (11%)	1,060 (16%)	776 (13%)
Skipped-generational coresidential care	2,868 (8.1%)	1,060 (9.2%)	922 (8.2%)	480 (7.3%)	406 (6.8%)
Frequency of social activities (0-18)	1.36 (1.83)	1.21 (1.66)	1.16 (1.64)	1.70 (2.13)	1.65 (2.04)
Frequency of meeting friends (0-3)					
0	22,747 (64%)	7,161 (62%)	7,613 (68%)	4,133 (63%)	3,840 (64%)
1	4,188 (12%)	1,246 (11%)	1,328 (12%)	812 (12%)	802 (13%)
2	2,693 (7.6%)	850 (7.4%)	857 (7.6%)	466 (7.1%)	520 (8.7%)
3	5,669 (16%)	2,230 (19%)	1,476 (13%)	1,146 (17%)	817 (14%)
Frequency of card/ board games (0-3)					
0	28,373 (80%)	10,065 (88%)	8,797 (78%)	5,209 (79%)	4,302 (72%)
1	2,691 (7.6%)	568 (4.9%)	1,108 (9.8%)	473 (7.2%)	542 (9.1%)
2	2,112 (6.0%)	404 (3.5%)	777 (6.9%)	409 (6.2%)	522 (8.7%)
3	2,121 (6.0%)	450 (3.9%)	592 (5.3%)	466 (7.1%)	613 (10%)
Frequency of physical activities (0-3)					
0	32,781 (93%)	10,942 (95%)	10,989 (97%)	5,500 (84%)	5,350 (89%)

Variables	All	Rural women	Rural men	Urban women	Urban men
	n (%); Mean (SD)				
1	445 (1.3%)	143 (1.2%)	57 (0.5%)	161 (2.5%)	84 (1.4%)
2	355 (1.0%)	74 (0.6%)	44 (0.4%)	145 (2.2%)	92 (1.5%)
3	1,716 (4.9%)	328 (2.9%)	184 (1.6%)	751 (11%)	453 (7.6%)
Frequency of community activities (0-3)					
0	34,568 (98%)	11,382 (99%)	11,097 (98%)	6,339 (97%)	5,750 (96%)
1	427 (1.2%)	46 (0.4%)	113 (1.0%)	104 (1.6%)	164 (2.7%)
2	212 (0.6%)	49 (0.4%)	49 (0.4%)	66 (1.0%)	48 (0.8%)
3	90 (0.3%)	10 (<0.1%)	15 (0.1%)	48 (0.7%)	17 (0.3%)
Frequency of volunteering (0-3)					
0	34,884 (99%)	11,432 (100%)	11,154 (99%)	6,449 (98%)	5,849 (98%)
1	320 (0.9%)	46 (0.4%)	93 (0.8%)	76 (1.2%)	105 (1.8%)
2	62 (0.2%)	5 (<0.1%)	18 (0.2%)	22 (0.3%)	17 (0.3%)
3	31 (<0.1%)	4 (<0.1%)	9 (<0.1%)	10 (0.2%)	8 (0.1%)
Frequency of taking courses (0-3)					
0	35,162 (100%)	11,478 (100%)	11,218 (100%)	6,532 (100%)	5,934 (99%)
1	73 (0.2%)	3 (<0.1%)	38 (0.3%)	3 (<0.1%)	29 (0.5%)
2	54 (0.2%)	5 (<0.1%)	18 (0.2%)	18 (0.3%)	13 (0.2%)
3	8 (<0.1%)	1 (<0.1%)	0 (0%)	4 (<0.1%)	3 (<0.1%)
Num. individual-wave observations	35,297	11,487	11,274	6,557	5,979
Num. individuals	12,007	3,890	3,723	2,307	2,087

Table A3. Descriptive statistics by types of grandchild care.

Variables	Not providing grandchild care	Non-coresidential extensive care	Non-coresidential intensive care	Multi-generational coresidential care	Skipped-generational coresidential care
	n (%); Mean (SD)				
Frequency of social activities (0-18)	1.30 (1.79)	1.53 (1.93)	1.38 (1.86)	1.39 (1.83)	1.37 (1.84)
Men	9,986 (52%)	2,672 (47%)	1,295 (41%)	1,972 (44%)	1,328 (46%)
Urban residence	6,125 (32%)	2,391 (42%)	1,298 (41%)	1,836 (41%)	886 (31%)
Age across all waves	63 (7)	61 (6)	61 (6)	60 (6)	61 (6)
Occupation Pension Program participation	1,906 (10.0%)	909 (16%)	426 (13%)	463 (10%)	314 (11%)
With intensive work	3,276 (17%)	859 (15%)	366 (12%)	761 (17%)	456 (16%)
Married	16,724 (88%)	5,183 (92%)	2,935 (92%)	3,971 (88%)	2,597 (91%)
Number of grandchildren aged < 16	2.76 (2.02)	2.79 (1.97)	2.97 (1.97)	3.11 (1.96)	3.26 (2.10)
Depression Level (0-30)	9 (6)	8 (6)	8 (6)	8 (6)	9 (6)
With disability problems	2,851 (15%)	718 (13%)	391 (12%)	582 (13%)	352 (12%)
With chronic diseases	5,721 (30%)	1,383 (24%)	577 (18%)	1,541 (34%)	692 (24%)
Functional limitation level (0-60)	5.6 (7.5)	4.6 (6.3)	4.7 (6.3)	4.3 (5.6)	4.8 (6.0)
Num. individual-wave observations	19,071	5,647	3,179	4,532	2,868

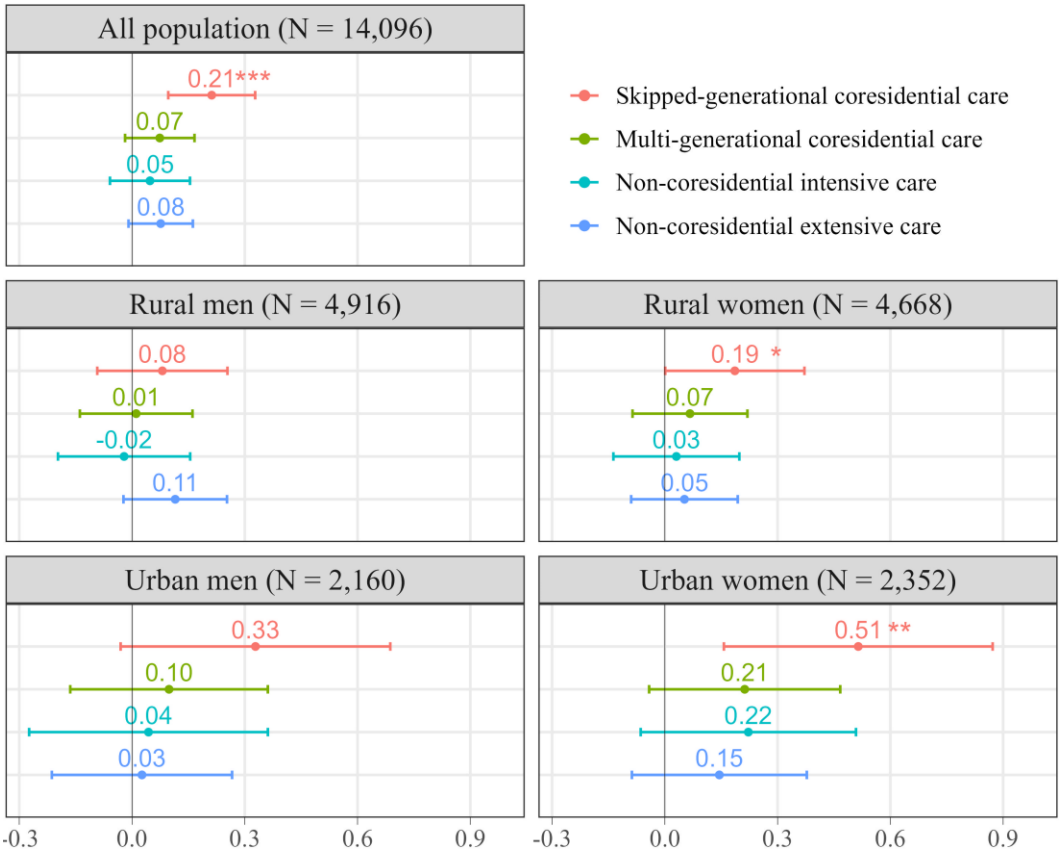
Table A4. Results of fixed-effects regressions.

Variables	All population	Rural men	Rural women	Urban men	Urban women
	Beta (SD)				
Grandchild care provision					
Not providing grandchild care (ref.)	--	--	--	--	--
Non-coresidential extensive care	0.108***	0.114*	0.094*	0.075	0.182*
	(0.029)	(0.048)	(0.048)	(0.076)	(0.075)
Non-coresidential intensive care	0.038	0.013	0.025	0.086	0.090
	(0.036)	(0.064)	(0.058)	(0.099)	(0.091)
Multi-generational coresidential care	0.073*	0.022	0.098+	0.086	0.128
	(0.033)	(0.055)	(0.053)	(0.088)	(0.085)
Skipped-generational coresidential care	0.195***	0.134*	0.150*	0.261*	0.382***
	(0.039)	(0.063)	(0.063)	(0.117)	(0.115)
Age across all waves	-0.026***	-0.038***	-0.003	-0.053***	-0.019+
	(0.004)	(0.006)	(0.006)	(0.010)	(0.010)
With intensive work	-0.115***	-0.128**	-0.076	-0.201*	-0.080
	(0.027)	(0.042)	(0.050)	(0.082)	(0.101)
Married	-0.304***	-0.455***	-0.235*	0.046	-0.371*
	(0.068)	(0.125)	(0.097)	(0.214)	(0.159)
Number of grandchildren aged < 16	-0.009	0.015	-0.018+	-0.011	-0.036+
	(0.007)	(0.011)	(0.011)	(0.022)	(0.021)
With disability problems	0.031	0.011	0.013	0.094	0.038
	(0.026)	(0.043)	(0.043)	(0.077)	(0.080)
With chronic diseases	-0.093***	-0.097**	-0.042	-0.107*	-0.150**
	(0.020)	(0.032)	(0.032)	(0.054)	(0.052)
Functional limitation level (0-60)	-0.011***	-0.008*	-0.009**	-0.017*	-0.021***
	(0.002)	(0.004)	(0.003)	(0.007)	(0.006)
Depression Level (0-30)	-0.010***	-0.005	-0.006*	-0.018**	-0.022***

Variables	All population	Rural men	Rural women	Urban men	Urban women
	Beta (SD)				
	(0.002)	(0.004)	(0.003)	(0.007)	(0.006)
Num. individual-wave observations	35,297	11,274	11,487	5,979	6,557
R2	0.604	0.575	0.586	0.608	0.629
R2 Adj.	0.400	0.365	0.373	0.396	0.426
R2 Within	0.009	0.011	0.005	0.016	0.017
R2 Within Adj.	0.008	0.010	0.003	0.013	0.014
AIC	134,156.2	40,896.8	41,915.6	24,080.6	26,641.2
BIC	235,975.8	68,275.3	70,591.3	38,135.5	42,383.2
RMSE	1.15	1.07	1.07	1.28	1.30
St. Errors	by: ID	IID	IID	IID	IID
FE: ID	X	X	X	X	X

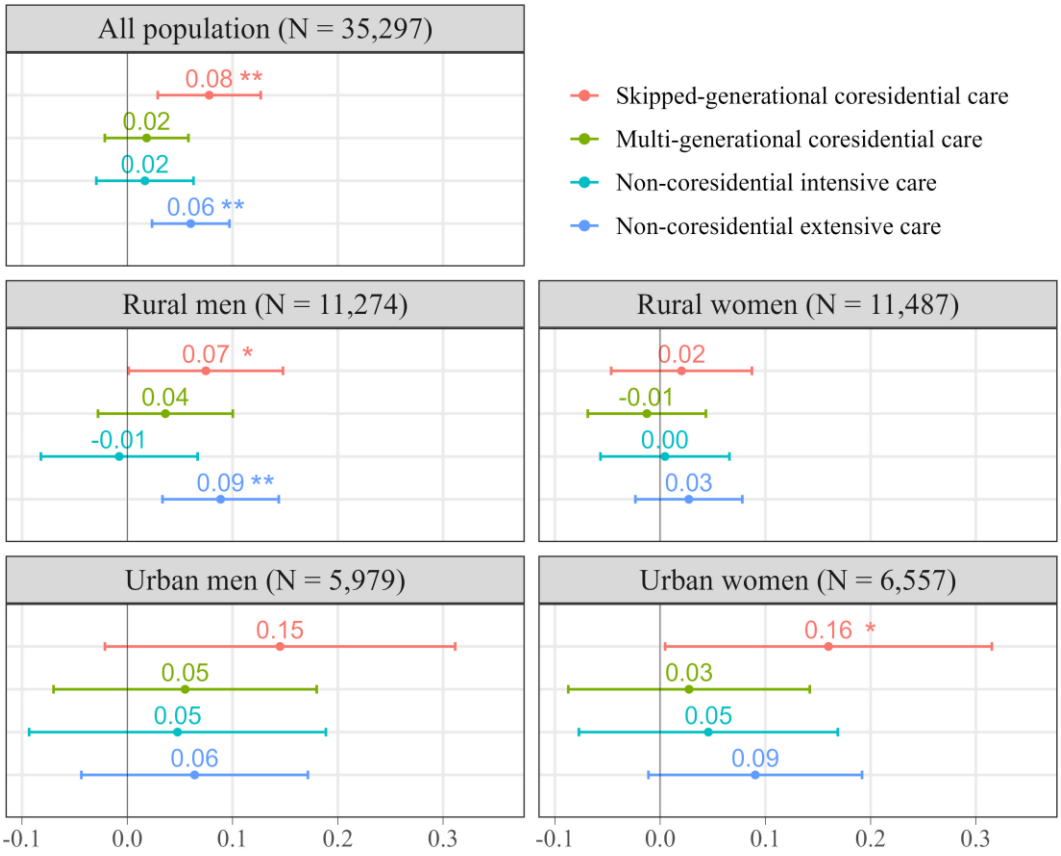
+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure A5. Estimates of Grandchild care's effects on frequency of social participation (0-18), with strict sample: individuals took part in all four waves of CHARLS.



Notes: (1) The estimated values are the slops (betas) in individual fixed-effects regressions with control variables; (2) Reference group is "not providing grandchild care"; (3) Whiskers indicate 95% confidence intervals. (4) * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Figure A6. Estimates of Grandchild care's effects on frequency of social participation (0-15), meeting friends excluded.



Notes: (1) The estimated values are the slops (betas) in individual fixed-effects regressions with control variables; (2) Reference group is "not providing grandchild care"; (3) Whiskers indicate 95% confidence intervals. (4) * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.