Ageing and Society (2026), **46**, e82, 1–23
doi:10.1017/S0144686X26101056

ARTICLE

Can two-way intergenerational support better protect cognitive function in Chinese older adults? A nationally representative study

Sunxi Mao, Tianyu Wang, Xinyi Wang, Zinan Zhang and Zhonghua Wang

Nanjing Medical University, China
Corresponding author: Zhonghua Wang; Email: wzh04@njmu.edu.cn

(accepted 10 August 2026 UTC)

Abstract

Intergenerational support plays a vital role in maintaining cognitive health among older adults. However, whether two-way intergenerational support offers greater protection of cognitive function compared with one-way support – either provided or received – remains poorly understood. Data were obtained from the Chinese Longitudinal Healthy Longevity Survey (CLHLS, 2011–2018). An ordered probit (Oprobit) model was used to estimate the effect of intergenerational support on cognitive function. Robustness was assessed using the instrumental variables with conditional mixed process (IV-CMP) method, and heterogeneity was examined by stratifying the data by residence and gender. Two-way financial, care-giving and emotional support significantly reduced the risk of cognitive impairment in older adults, particularly in severe cases. Two-way financial support was more effective than either support provided or received alone in reducing the risk of cognitive impairment, whereas two-way care-giving was less effective than providing care-giving support alone. Among the three types of two-way intergenerational support, two-way care-giving demonstrated the strongest protective effect against cognitive impairment in older adults, whereas two-way financial support exhibited the weakest. Finally, notable rural–urban and gender disparities were observed to influence intergenerational support on the risk of cognitive impairment, underscoring the need for targeted interventions to address cognitive decline across diverse demographic groups.The study highlights the protective effects of two-way intergenerational support on cognitive function among older Chinese adults and reveals variations across support types and demographic groups. The findings offer invaluable insights for promoting cognitive health in older adults.

Keywords: cognitive impairment; conditional mixed process; one-way intergenerational support; ordered probit; two-way intergenerational support

Introduction

Rapid economic development is expected to gradually shift the global age structure from a pyramid to an olive shape (Zhang et al. 2015). Owing to the acceleration of

© The Author(s), 2026. Published by Cambridge University Press.

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 15 Nov 2026 at 04:05:12, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0144686X26101056

population ageing in Japan, South Korea and European countries, these regions were estimated to evolve into some of the world's most super-aged areas by 2025. Data from China's Seventh Population Census (2020) (Akimov et al. 2021) suggest that the proportion of the population aged ≥ 65 increased by 4.63 per cent between 2010 and 2020. This rise is 2.72 per cent higher than the previous decade; it is anticipated that the degree of population ageing in China will continue to escalate in the future, surpassing the average level observed in developed countries (The Lancet 2022).

The ageing process is marked by a deterioration in functional capabilities and a weakening of social support networks for older adults (Deary et al. 2009). Cognitive impairment is frequently highlighted as one of the most severe functional impairments experienced by older adults. It refers to a condition that significantly impacts essential functions such as learning, language acquisition and memory retention. China has emerged as the country with the highest number of patients experiencing cognitive impairment worldwide. Approximately one in seven older people experience cognitive impairment, which significantly impacts the quality of life and the level of social engagement (Campos et al. 2024). Therefore, with the growing ageing population in China, prevention and management of cognitive impairment in older adults has become a critical public health priority. In response, the Healthy China 2030 initiative designates enhancing cognitive health and preventing or delaying the onset of cognitive impairments in older adults as key objectives. In this context, identifying protective factors against cognitive impairment in older adults and exploring the underlying mechanisms will aid in the prevention of cognitive decline, thereby contributing to healthy ageing.

A large corpus of literature posits that social networks and social support are important for health in old age (Jeon et al. 2016; Bhatia et al. 2023), and support from family and society exerts a profound influence on cognitive function (Sims et al. 2014; Fan et al. 2021). As individuals age, their social support network tends to shrink, with external sources of support, such as relationships with co-workers and friends, gradually weakening. Consequently, the role of intergenerational support within the family becomes increasingly prominent (Li et al. 2019). According to the traditional 'nurture–support' feedback model (Fingerman et al. 2013), intergenerational support involves a reciprocal exchange, with support flowing both from the child to the parent and vice versa (Chen et al. 2011). Intergenerational support takes two forms: one-way support, provided solely by either the offspring or the parent, and two-way support, involving reciprocal exchanges (Wang 2024). Furthermore, three main types of intergenerational support have been identified: financial, care-giving and emotional support (Liao et al. 2020; Yang and Jia 2022).

Existing evidence has linked intergenerational support to cognitive function in later life, yet the conceptual distinction between one-way and two-way support remains insufficiently examined. From a theoretical perspective, these two forms reflect different relational dynamics. Social exchange theory suggests that one-way support, whether given or received, may create asymmetrical dependence or burden, potentially inducing stress that is detrimental to cognitive health (Lupien et al. 2009). By contrast, two-way support reflects a more balanced exchange that may enhance relational stability and social integration. Reciprocity theory further suggests that the opportunity to both provide and receive support reinforces older adults' sense of social value and

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 15 Nov 2026 at 04:05:12, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0144686X26101056

generativity, thereby contributing to cognitive reserve (Stern 2012). In addition, role theory proposes that maintaining multiple family roles may promote active engagement and mental stimulation (Sieber 1974). Taken together, these perspectives suggest that two-way intergenerational support may be more protective of cognitive function than one-way support.

Although existing research has explored the relationship between intergenerational support and cognitive function in older adults, significant limitations remain in this area. First, most of the existing studies have focused on the effects of a single specific type of intergenerational support on cognitive function. For example, older adults with financial support from their adult children are less likely to develop cognitive impairment (Deng et al. 2010; Wang et al. 2015; Xu et al. 2019). According to Sims et al. (2014), receiving financial support from children without the ability to make financial rewards may be negatively associated with cognitive performance in older people. Liao et al. (2020) revealed that moderate intensity and frequency of care-giving was associated with better cognitive function in a Chinese middle-aged and older population. Bon Sanga and Bordoneb (2013) argued that informal care provided by children has a significant negative impact on mothers' cognitive function. Furthermore, Eisele et al. (2012) discovered that emotional support had no effect on cognition; the findings of Xu and Luo (2022) confirmed that emotional support greatly contributed to the cognitive health of middle-aged and older parents. Despite existing literature exploring the relationship between various forms of intergenerational support and cognitive function, the field lacks a comprehensive analysis and comparative study of these different forms of support.

Second, most existing research has focused on one-way intergenerational support. Indeed, older adults with higher levels of family support from their children have better cognitive function and slower cognitive decline (Ping and Bei 2011; Zhu et al. 2012; Kelly et al. 2017). Peng et al. (2023) revealed that receiving financial or care-giving support from children promoted cognitive performance in rural China. However, the provision of primary financial support by the offspring may also increase the risk of cognitive impairment in older adults (Yang and Jia 2022). Sharma et al. (2016) and Zwar et al. (2018) collectively discovered that both sharing household chores and providing informal care-giving support to children can have a protective effect on the cognitive function of older adults, with a particular benefit observed in female care-givers. Older parents who provide support to their children are more likely to have cognitive impairment because informal care-givers are under more stress than non-care-givers (Minkler 1997; Pinquart and Sörensen 2003; Lupien et al. 2009). Although previous research has investigated the effect of intergenerational support on cognitive function in older adults, limited attention has been given to the reciprocal nature of intergenerational support. Two-way intergenerational support, characterized by the reciprocal exchange of resources and emotions, may exert a more pronounced influence on cognitive health in older adults by fostering intergenerational balance. Therefore, the association between two-way intergenerational support and cognitive function in older adults warrants further investigation.

In summary, although some studies have explored the relationship between intergenerational support and cognitive function in older adults, they have not offered a comparative analysis of different types of intergenerational support. More importantly,

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 15 Nov 2026 at 04:05:12, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0144686X26101056

there is a notable gap in the literature regarding the effect of two-way intergenerational support, as compared to one-way support, on cognitive function in older adults. In this study, based on a nationally representative survey from China, we first used the ordered probit (Oprobit) model and marginal effects to examine the effects of different types of two-way and one-way intergenerational support on cognitive function in older adults. Subsequently, we applied the instrumental variable with conditional mixed process (IV-CMP) estimation method to test the robustness between intergenerational support and cognitive function. Finally, to account for potential differences between urban and rural areas in China, as well as gender disparities, we stratified the extracted data by geographic region and gender to analyse heterogeneity.

Methods

Data source

The data utilized in this study derived from the Chinese Longitudinal Healthy Longevity Survey (CLHLS) (Center for Healthy Aging and Development Studies 2020), which was conducted by Peking University and the Chinese Center for Disease Control and Prevention, spanning the years 2011, 2014 and 2018. In the survey, a random selection of half the total number of counties and cities from 22 Chinese provinces served as survey sites, thereby covering approximately 85 per cent of the country's population. Unequally proportional random sampling and multi-stage sampling methods were used to survey adults aged $\geq$ 65 years. The original dataset consisted of 32,831 observations. After excluding cases with missing data, the final sample included 21,528 individuals: 7,771 individuals in 2011, 4,667 in 2014 and 9,090 in 2018. The CLHLS dataset provides comprehensive data on demographics, family structure, economic status, lifestyle, intergenerational support, health and cognitive function. Statistical analysis was performed using Stata software (v.14.0; Stata Corp., College Station, TX, USA).

Data analysis

Oprobit model

The dependent variable in this study is the cognitive function of older adults, which is measured on a discrete ordinal scale ranging from 0 to 3, with 0, 1, 2 and 3 representing 'No cognitive impairment', 'Mild cognitive impairment', 'Moderate cognitive impairment' and 'Severe cognitive impairment', respectively. Given the ordinal nature of the data, the Oprobit model was deemed more appropriate for analysis, formulated as follows:

$$mmse^{*} = F\left(\alpha + \beta support_i + \gamma control_i + \varepsilon_i\right)$$

where $mmse^{*}$ represents the latent variable of cognitive function of the ith older adult; $support_i$ represents the intergenerational support; $control_i$ represents a series of control variables including socio-demographic characteristics, lifestyle habits, health status and social security; and ε_i is the random error term. The function F(.) represents a non-linear mapping. The coefficients of the Oprobit model denote the direction of change in the underlying latent variable rather than directly influencing the probability of the outcome. Consequently, these coefficients are not immediately interpretable,

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 15 Nov 2026 at 04:05:12, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0144686X26101056

necessitating the computation of marginal effects to elucidate the impact of independent variables on the dependent variable. Marginal effects quantify the average shift in the dependent variable in response to a minute change in the independent variable, formulated as follows:

$$\begin{aligned} ME\left(support_i\right) &= \Phi ME\left(support_i\right) \\ &= \Phi\left(\beta_0 + \beta_1 support_i + \beta_2 control_i + \sigma_j\right) \\ &\quad \cdot \phi\left(\beta_0 + \beta_1 support_i + \beta_2 control_i + \sigma_{j-1}\right) \cdot \beta_{j-1} \end{aligned}$$

where $ME\left(support_i\right)$ represents the marginal effect of the independent variable $support_i$ and denotes the probability of change in the dependent variable $mmse_j$ across categories when $support_i$ is increased by one unit; Φ is the cumulative distribution function of the standard normal distribution; ϕ is the probability density function of the standard normal distribution; and $\sigma_j$is the delimitation threshold parameter, which is used to identify different categories of the dependent variable.

Robust test model

To address endogeneity issues, including self-selection bias and collider bias in the Oprobit model, this study employed an IV-CMP estimation method, as developed by Roodman (2011), to ensure robust analysis. This approach optimizes the treatment effect of intergenerational support, verifies the causal relationship between intergenerational support and cognitive function, and provides more robust conclusions. Using IV-CMP requires prioritizing the identification of appropriate instrumental variables. To ensure their validity, we conducted a weak instrumental variable test for linear models to scrutinize the regression outcomes (Chyi and Mao 2012).

Variable selection

Cognitive function

The Mini-Mental State Examination (MMSE) was employed to evaluate the cognitive function of the respondents. The MMSE consists of five dimensions: orientation, memory, attention and calculation, recall, and language ability, with a total of 30 items. The overall score ranges from 0 to 30, with higher scores indicating better cognitive function. Following established clinical conventions, the MMSE score was further categorized into four ordered groups to capture the severity of cognitive impairment (Folstein et al. 1975): no impairment (24–30 points), mild impairment (18–23 points), moderate impairment (10–17 points) and severe impairment (0–9 points). To ensure consistency, higher levels of the categorical variable correspond to lower MMSE scores, indicating worse cognitive function.

Intergenerational support

A total of three independent variables were established from the three types of intergenerational support:

(i) Intergenerational financial support: The intergenerational financial support variable derived from the questionnaire items 'In the past year, how much money in cash (or in kind) did your children give you?' and 'In the past year, how much money

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 15 Nov 2026 at 04:05:12, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0144686X26101056

in cash (or in kind) did you give your children?'. The responses to these questions were used to categorize the receipt and provision of financial support, respectively. In our study, intergenerational financial support was categorized into four distinct classifications: 'No support' if neither providing nor receiving exceeded $0 per year; 'Provided financial support alone' if the older adult provided more than $0 per year but did not receive any support; 'Received financial support alone' if the older adult received over $0 per year but did not provide any support; and 'Two-way financial support' if the older adult both provided and received support exceeding $0 per year.

(ii) Intergenerational care-giving support: The intergenerational care-giving support variable derived from the questionnaire items 'Who primarily cares for you when you are not feeling well or when you are sick?' and 'Are you currently engaged/participating in any of the following activities: housework, cooking, childcare, etc.?'. The responses to these questions were used to categorize the receipt and provision of care-giving support, respectively. The receipt of care-giving support was categorized as 'Yes' if the answer to the first question was children, grandchildren or similar relatives, and 'No' for all other responses. The provision of care-giving support was defined as 'Yes' if the second question was answered affirmatively, and 'No' in all other cases. Intergenerational care-giving support was classified into four categories: 'No support', defined as the absence of both providing and receiving care; 'Provided care-giving support alone', when the older adult provided childcare exclusively to their children; 'Received care-giving support alone', when the older adult received informal care exclusively from their children; and 'Two-way care-giving support', when the older adult both provided and received care-giving support.

(iii) Intergenerational emotional support: Intergenerational emotional support is inherently reciprocal and bidirectional (Sommer and Buhl 2018). It was defined using the questionnaire item 'Who do you talk to the most in your spare time?'. Responses were coded as 'Intergenerational emotional support exists' if participants selected 'son, daughter, daughter-in-law, son-in-law, grandchildren or spouse', and as 'No intergenerational emotional support exists' for all other responses. Therefore, 0 signified the absence of intergenerational emotional support, whereas 1 indicated the presence of such support. This measure captures the primary channel of emotional interaction within the family and is aligned with the study's focus on the direction and reciprocity of intergenerational support rather than its intensity.

Instrumental variable selection in the IV-CMP model

A valid instrumental variable in the IV-CMP model must satisfy two fundamental conditions: it must be correlated with the endogenous explanatory variable and it must be uncorrelated with the dependent variable. The instrumental variable selected for this study was the number of children, as identified in a previous study (Bolin et al. 2008). Intergenerational support is strongly correlated with the number of children older adults have (Zhang et al. 2025). A greater number of children can increase the demands on older parents to provide financial, care-giving and emotional support. Meanwhile, older adults with more children are likely to receive greater resources and emotional support from their offspring.

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 15 Nov 2026 at 04:05:12, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0144686X26101056

Although the number of children may potentially affect cognitive function through other pathways, such as economic resources, psychological stress or social engagement, we minimize these concerns by controlling for a comprehensive set of demographic, socio-economic and health-related characteristics. After accounting for these factors, the remaining variation in the number of children is more plausibly associated with intergenerational support rather than directly affecting cognitive function. Therefore, the exclusion restriction is reasonably satisfied in the present study, although it cannot be directly tested.

To examine the validity of the instrumental variable, we conducted weak instrument tests, and the first-stage F-statistics indicate that the instrument is sufficiently strong. As only one instrumental variable (number of children) is employed, the model is exactly identified, and over-identification tests are not applicable. We adopt a single-instrument approach to avoid introducing potentially invalid instruments that may violate the exclusion restriction.

Other control variables

Other control variables included socio-demographic characteristics, lifestyle habits, health status and social security. Socio-demographic characteristics variables included age, gender, duration of formal education, residential area, marital status and income. Income level in yuan was categorized based on annual household earnings as $\leq$ 30,000, 30,001–50,000, 50,001–100,000 and $>$ 100,000. Lifestyle habit variables included smoking, drinking and daily exercise. Health status variables referred to hearing impairment, self-reported health, chronic disease, depression and ability to perform activities of daily living (ADLs). Ability to perform ADLs was assessed using the Katz scale (Katz 1963) and categorized into three groups based on scores: no, low and high disability. Social security variables included participation in insurance and community services.

Results

Basic characteristics of participants

Table 1 provides a detailed description of the samples. Overall, 79.3 per cent of individuals were aged $\geq$ 75 years and 43.6 per cent of the participants were male. Half of the older adults (51.6%) lived in the urban areas and 86.2 per cent of the participants reported $\leq$ 6 years of formal education. Furthermore, more than half of the participants had no spouse (59.8%), reported no hearing impairment (56.8%) and had an annual income of $\leq$ 30,000 yuan (62.3%). Less than one-third participated in daily exercise (31.0%), and 83.5 per cent and 84.5 per cent of the participants were non-smokers and non-drinkers, respectively. Approximately 24.6 per cent of the participants reported a disability, and more than half reported diagnosis with at least one chronic disease (62.4%). Furthermore, 12.7 per cent of older adults in this study experienced symptoms of depression. The majority of participants in the sample (81.8%) have social insurance.

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 15 Nov 2026 at 04:05:12, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0144686X26101056

Table 1. Basic characterization of included subjects

Variables	Value
Socio-demographic characteristics	
Age (years)	4,466 (20.7%)
65–74	6,066 (28.2%)
75–84	5,719 (26.6%)
85–94	5,277 (24.5%)
≥ 95	
Gender	9,390 (43.6%)
Male	12,138 (56.4%)
Female	4,466 (20.7%)
Duration of formal education	
0 years	11,790 (54.8%)
1–6 years	6,763 (31.4%)
7–9 years	1,589 (7.4%)
≥ 10 years	1,386 (6.4%)
Residential area	
Urban	11,102 (51.6%)
Rural	10,426 (48.4%)
Marital status	
Without spouse	12,877 (59.8%)
With spouse	8,651 (40.2%)
Number of children	4.2 (2.0)
Income	
≤ 30,000 **yuan**	13,417 (62.3%)
30,001–50,000 **yuan**	3,220 (15.0%)
50,001–100,000 **yuan**	4,243 (19.7%)
> 100,000	648 (3.0%)
Lifestyle habits	
Smoke	
No	17,974 (83.5%)
Yes	3,554 (16.5%)
Drinking alcohol	
No	18,187 (84.5%)
Yes	3,341 (15.5%)
Exercise	
No	14,850 (69.0%)
Yes	6,678 (31.0%)

(*Continued*)

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 15 Nov 2026 at 04:05:12, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0144686X26101056

Table 1. (*Continued.*)

Variables	Value
Health status	
Hearing impairment	
No	12,226 (56.8%)
Yes	9,302 (43.2%)
Self-reported health	
Bad	4,622 (21.5%)
Moderate	7,761 (36.1%)
Good	9,145 (42.4%)
Chronic disease	
No chronic disease	8,089 (37.6%)
One chronic disease	5,885 (27.3%)
Multiple chronic diseases	7,554 (35.1%)
Depression	
No	18,788 (87.3%)
Yes	2,740 (12.7%)
ADL	
No disability	16,110 (74.8%)
Low disability	3,411 (15.9%)
High disability	2,007 (9.3%)
Social security	
Participation in insurance	
No	3,923 (18.2%)
Yes	17,605 (81.8%)
Community services	
No	9,220 (42.8%)
Yes	12,308 (57.2%)
Observations	21,528

Intergenerational support and cognitive function among the older adults

Table 2 shows the status of intergenerational support and cognitive function. In terms of financial support, ~45.0 per cent of older adults received financial support alone from their children, 4.0 per cent provided financial support alone to their children and 34.1 per cent of older adults experienced a two-way financial support arrangement with their children. Regarding care-giving support, 20.7 per cent of older adults provided care-giving alone to their children, 35.1 per cent received care-giving alone from their children and 35.0 per cent of older adults engaged in two-way intergenerational care-giving. With regard to intergenerational emotional support, 75.2 per cent of older participants reported sharing intergenerational emotional support with

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 15 Nov 2026 at 04:05:12, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0144686X26101056

Table 2. Intergenerational support and cognitive function among older adults

Variables	Value
Intergenerational financial support	
None	3,636 (16.9%)
Provided alone	856 (4.0%)
Received alone	9,688 (45.0%)
Two-way	7,348 (34.1%)
Intergenerational care-giving support	
None	1,980 (9.2%)
Provided alone	4,457 (20.7%)
Received alone	7,561 (35.1%)
Two-way	7,530 (35.0%)
Intergenerational emotional support	
None	5,348 (24.8%)
Two-way	16,180 (75.2%)
Cognitive function	
No impairment	14,164 (65.8%)
Mild impairment	2,931 (13.6%)
Moderate impairment	1,968 (9.1%)
Severe impairment	2,465 (11.5%)
Observations	21,528

their children. As shown in Table 2, 34.2 per cent of older adults in the sample experienced cognitive impairment. Specifically, 13.6 per cent, 9.1 per cent and 11.5 per cent of the older demographic exhibited mild, moderate and severe cognitive impairment, respectively.

Effects of intergenerational support on cognitive function among the older adults

Supplementary Table 2 shows the association between intergenerational support and cognitive function. After controlling for socio-demographic factors, older adults who provided financial support alone (Coef. = −0.164), received financial support alone (Coef. = −0.080) and engaged in two-way financial support with their children (Coef. = −0.197) were all significantly associated with a lower risk of cognitive impairment. Regarding intergenerational care-giving support, providing care-giving alone was significantly associated with a lower risk of cognitive impairment in older adults (Coef. = −0.374), as was two-way care-giving support (Coef. = −0.267). In contrast, having received care-giving alone was significantly associated with a higher risk of cognitive impairment in older adults (Coef. = 0.112). Furthermore, a significant negative correlation between intergenerational emotional support and cognitive impairment was observed in older adults (Coef. = −0.241). Other socio-demographic factors, including age, gender, duration of formal education, residential area, marital status,

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 15 Nov 2026 at 04:05:12, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0144686X26101056

Table 3. Results of marginal effects

	Cognitive function			
	No cognitive impairment	Mild cognitive impairment	Moderate cognitive impairment	Severe cognitive impairment
Intergenerational financial support, ref.: None				
Provided alone	0.036*** (0.014)	−0.009** (0.003)	−0.009*** (0.003)	−0.018*** (0.007)
Received alone	0.018*** (0.006)	−0.004 *** (0.001)	−0. 004*** (0.001)	−0.009 *** (0.003)
Two-way	0.044*** (0.006)	−0.011 *** (0.002)	−0. 011*** (0.002)	−0. 022*** (0.003)
Intergenerational care-giving support, ref.: None				
Provided alone	0.086*** (0.011)	−0. 024*** (0.003)	−0. 023*** (0.003)	−0.038 *** (0.005)
Received alone	−0.028 *** (0.010)	0.007*** (0.002)	0.007*** (0.003)	0.014*** (0.005)
Two-way	0.063*** (0.010)	−0.017*** (0.003)	−0.017*** (0.003)	−0.029*** (0.005)
Intergenerational emotional support, ref.: None				
Two-way	0.053*** (0.005)	−0.012*** (0.001)	−0.013*** (0.001)	−0.028*** (0.003)
Age(years), ref.:65–74				
75–84	−0.071***(0.008)	0.027*** (0.003)	0.021***(0.002)	0.023***(0.003)
85–94	−0.168***(0.009)	0.058***(0.004)	0.048***(0.003)	0.061***(0.003)
≥ 95	−0.268***(0.011)	0.082***(0.004)	0.076***(0.004)	0.109***(0.004)
Gender, ref.:Male				
Female	−0.049***(0.005)	0.012***(0.001)	0.012***(0.001)	0.024***(0.003)
Duration of formal education, ref.:0 years				
1–6 years	0.080***(0.006)	−0.022***(0.002)	−0.021***(0.002)	−0.038***(0.003)
7–9 years	0.121***(0.011)	−0.034***(0.004)	−0.032***(0.003)	−0.055***(0.005)
≥ 10 years	0.081***(0.011)	−0.022 ***(0.003)	−0.021***(0.003)	−0.038***(0.005)
Residential area, ref.:Urban				
Rural	−0.015***(0.004)	0.004***(0.001)	0.004***(0.001)	0.008***(0.002)
Marital status, ref.:Without spouse				
With spouse	0.031***(0.006)	−0.008***(0.002)	−0.008***(0.002)	−0.015***(0.003)
Income, ref.: ≤ 30,000				
30,001–50,000	0.018***(0.006)	−0.004***(0.002)	−0.004***(0.002)	−0.009***(0.003)
50,001–100,000	0.008(0.006)	−0.002(0.001)	−0.002(0.001)	−0.004(0.003)
> 100,000	0.011(0.012)	−0.003(0.003)	−0.003(0.003)	−0.006(0.006)
Smoke, ref.:No				
Yes	0.008(0.007)	−0.002(0.002)	−0.002(0.002)	−0.004(0.003)
Drinking alcohol, ref.:No				
Yes	0.004(0.007)	−0.001(0.002)	−0.001(0.002)	−0.002(0.003)

(*Continued*)

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 15 Nov 2026 at 04:05:12, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0144686X26101056

Table 3. (*Continued.*)

	Cognitive function			
	No cognitive impairment	Mild cognitive impairment	Moderate cognitive impairment	Severe cognitive impairment
Exercise, ref.:No				
Yes	0.035***(0.005)	−0.009***(0.001)	−0.009***(0.001)	−0.017***(0.003)
Hearing impairment, ref.:No				
Yes	−0.127***(0.005)	0.035***(0.002)	0.034***(0.002)	0.059***(0.002)
Self-reported health, ref.:Bad				
Moderate	0.153***(0.006)	−0.031***(0.001)	−0.038***(0.002)	−0.084***(0.004)
Good	0.193***(0.007)	−0.042***(0.002)	−0.049***(0.002)	−0.102***(0.004)
Chronic disease, ref.:No chronic disease				
One chronic disease	0.024***(0.005)	−0.006***(0.001)	−0.006***(0.001)	−0.012***(0.003)
Multiple chronic diseases	0.044***(0.005)	−0.011***(0.001)	−0.011***(0.001)	−0.022***(0.003)
Depression, ref.:No				
Yes	0.031***(0.006)	−0.008***(0.002)	−0.008***(0.002)	−0.015***(0.003)
ADL, ref.:No disability				
Low disability	−0.094***(0.007)	0.023***(0.002)	0.027***(0.002)	0.044***(0.003)
High disability	−0.285***(0.010)	0.046***(0.002)	0.073***(0.003)	0.166***(0.007)
Participation in insurance, ref.:No				
Yes	−0.024***(0.007)	0.006***(0.002)	0.006***(0.002)	0.012***(0.003)
Community services, ref.:No				
Yes	0.016***(0.004)	−0.004***(0.001)	−0.004***(0.001)	−0.008***(0.002)

Note: *p ≤ 0.1, **p ≤ 0.05, ***p ≤ 0.01

exercise, hearing impairment, self-reported health, chronic disease, depression, ability to perform ADLs, having insurance and community services, were significantly associated with cognitive function.

Table 3 summarizes the results of the marginal effects analysis, which revealed that intergenerational support had significant effects on cognitive function. Across most types of intergenerational support, positive marginal effects were observed for the 'No cognitive impairment' category, indicating that intergenerational support increased the probability of older adults maintaining intact cognitive function, while correspondingly reducing the probabilities of mild, moderate and severe cognitive impairment.

Specifically, older adults who provided financial support alone were associated with a 3.6 per cent higher probability of having no cognitive impairment and

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 15 Nov 2026 at 04:05:12, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0144686X26101056

a 0.9 per cent, 0.9 per cent and 1.8 per cent lower likelihood of mild, moderate and severe cognitive impairment, respectively. Similarly, having received financial support alone was associated with a 1.8 per cent increase in the probability of having no cognitive impairment, accompanied by reductions of 0.4 per cent, 0.4 per cent and 0.9 per cent in the likelihood of mild, moderate and severe cognitive impairment, respectively. In contrast, two-way financial support showed stronger protective effects, increasing the probability of having no cognitive impairment by 4.4 per cent, while reducing the likelihood of mild, moderate and severe cognitive impairment by 1.1 per cent, 1.1 per cent and 2.2 per cent, respectively.

Regarding care-giving support, having provided care-giving support alone increased the probability of having no cognitive impairment by 8.6 per cent, while reducing the likelihood of mild, moderate and severe cognitive impairment by 2.4 per cent, 2.3 per cent and 3.8 per cent, respectively. Two-way care-giving support increased the probability of having no cognitive impairment by 6.3 per cent, accompanied by reductions of 1.7 per cent, 1.7 per cent and 2.9 per cent in the likelihood of cognitive impairment. However, having received care-giving support alone had a detrimental effect, decreasing the probability of having no cognitive impairment by 2.8 per cent and increasing the likelihood of mild, moderate and severe cognitive impairment by 0.7 per cent, 0.7 per cent and 1.4 per cent, respectively.

Furthermore, intergenerational emotional support increased the probability of having no cognitive impairment by 5.3 per cent, while reducing the likelihood of mild, moderate and severe cognitive impairment by 1.2 per cent, 1.3 per cent and 2.8 per cent, respectively.

Robustness test based on the IV-CMP estimation

The results of the IV-CMP analysis provided robust evidence of the significant effect of intergenerational support on cognitive function (Table 4). The Atanhrho_12 parameters (0.641, 0.284, 0.567) were all significant at the 1 per cent level, indicating that intergenerational financial, care-giving and emotional support are endogenous variables, supporting the reliability of the IV-CMP model. The number of children correlated with all three endogenous variables (financial: 0.065; care-giving: 0.089; emotional: 0.024), confirming the validity of the instrumental variable in addressing endogeneity.

The IV-CMP results revealed that intergenerational support – both one-way and two-way – significantly mitigated cognitive impairment. These findings were consistent with the Oprobit model analyses, except for the case of having received care-giving support alone, indicating the robustness of the results. The mitigating effects of intergenerational support on cognitive impairment in the IV-CMP model were as follows: provided financial support alone (−0.451), received financial support alone (−0.794), two-way financial support (−1.617), provided care-giving support alone (−0.605), received care-giving support alone (−0.468), two-way care-giving support (−1.121) and intergenerational emotional support (−1.047). In addition, we conducted the weak instrumental variable test (Supplementary Table 3); the F-statistics for all columns were > 10 and were considered significant at the 1 per cent level (financial: $F = 1282.81$;

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 15 Nov 2026 at 04:05:12, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0144686X26101056

Table 4. Robust test based on IV-CMP

	Oprobit model		IV-CMP model	
	Cognitive function	IV: Number of children	Cognitive function	Atanhro_12
Intergenerational financial support, ref.: None				
Provided alone	−0.164*** (0.063)		−0.451*** (0.057)	
Received alone	−0.080*** (0.027)	0.065*** (0.004)	−0.794*** (0.041)	0.641*** (0.044)
Two-way	−0.197*** (0.029)		−1.617*** (0.074)	
Intergenerational care-giving support, ref.: None				
Provided alone	−0.374*** (0.046)		−0.605*** (0.043)	
Received alone	0.112*** (0.040)	0.089*** (0.003)	−0.468*** (0.058)	0.284*** (0.038)
Two-way	−0.327*** (0.043)		−1.121*** (0.088)	
Intergenerational emotional support, ref.: None				
Two-way	**−0.241*** (0.024)**	**0.024*** (0.001)**	**−1.047*** (0.062)**	**0.567*** (0.049)**
Control variables	Control	Control	Control	Control

Note: *p ≤ 0.1, **p ≤ 0.05, ***p ≤ 0.01

care-giving: F = 1326.77; emotional: F = 1991.74); the Wald test also revealed that the smallest eigenvalue statistic exceeded the 10 per cent critical value, providing strong evidence that number of children is not a weak instrument.

Heterogeneity analysis

Urban–rural heterogeneity

Figure 1 summarizes the urban–rural disparities in the marginal effect of intergenerational support on cognitive function in older adults. All the regression estimates were controlled for socio-demographic factors. The Chow test was used to examine differences in the formation coefficients (Chow test = 2.89, P < 0.01). Having provided financial support alone reduced the risk of mild, moderate and severe cognitive impairment by 0.8 per cent, 0.8 per cent and 1.6 per cent in urban-living older adults, which was significantly lower than that in their rural counterparts (1.2 per cent, 1.3 per cent and 2.5 per cent, respectively), whereas having received financial support alone reduced the risk by 0.5 per cent, 0.5 per cent and 1.1 per cent in urban older adults but had no significant effect in rural populations. Two-way financial support reduced the risk of mild, moderate and severe cognitive impairment by 1.3 per cent, 1.2 per cent and 2.5 per cent in urban older adults, which was significantly higher than that of their rural counterparts (0.8 per cent, 0.9 per cent and 1.8 per cent). Regarding intergenerational care-giving support, having provided care-giving support alone reduced

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 15 Nov 2026 at 04:05:12, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0144686X26101056

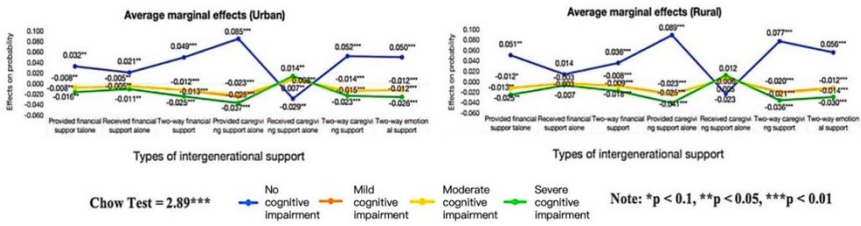


Figure 1. Results of the marginal effects for estimating urban–rural heterogeneity.

the risk of moderate and severe cognitive impairment by 2.3 per cent and 3.7 per cent in urban older adults, significantly lower than in rural areas (2.5% and 4.1%). However, having received care-giving support alone increased the risk of mild, moderate and severe cognitive impairment by 0.7 per cent, 0.8 per cent and 1.4 per cent in urban older adults, with no significant effect in rural counterparts. Two-way care-giving support reduced the risk of mild, moderate and severe cognitive impairment by 1.5 per cent, 1.4 per cent and 2.3 per cent, respectively, in urban older adults, which was significantly lower than that in rural areas (2.0%, 2.1% and 3.6%, respectively). In addition, having received intergenerational emotional support significantly reduced the risk of moderate and severe cognitive impairment by 1.2 per cent and 2.6 per cent, respectively, in urban-living older adults, which was significantly lower than the rates observed in rural counterparts (1.4% and 3.0%, respectively).

Gender-based heterogeneity

Figure 2 presents findings supporting gender-based disparities in the marginal effect of intergenerational support on cognitive function among older adults (Chow test = 9.26, $p < 0.01$). Having provided financial support alone reduced the risk of mild, moderate and severe cognitive impairment by 0.7 per cent, 1.0 per cent and 2.5 per cent in older females, with no significant effect observed in older men; a similar pattern was observed in adults having received financial support alone (0.5%, 0.7%, 1.9%, respectively). Two-way financial support reduced the risk of mild, moderate and severe cognitive impairment by 0.8 per cent, 0.6 per cent and 0.9 per cent, respectively, in older men, which was significantly lower than that observed in older women (0.9%, 1.4% and 3.4%, respectively). Having provided care-giving support alone reduced the risk of moderate and severe cognitive impairment in older men by 1.7 per cent and 2.3 per cent, respectively, which was significantly lower than that observed in older women (2.8% and 5.2%, respectively). Having received care-giving support alone reduced the risk of mild, moderate and severe cognitive impairment in older men by 1.0 per cent, 0.8 per cent and 1.2 per cent, respectively, whereas in older women it had no significant effect on mild or moderate impairment but increased the risk of severe cognitive impairment by 1.5 per cent. Two-way care-giving support reduced the risk of moderate and severe cognitive impairment in older men by 1.2 per cent and 1.6 per cent, respectively, which was lower than the reductions observed in older women (2.1% and 4.1%, respectively). Similarly, intergenerational emotional support reduced the risk of moderate and severe cognitive impairment in older men by 1.0 per cent and 1.7 per

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 15 Nov 2026 at 04:05:12, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0144686X26101056

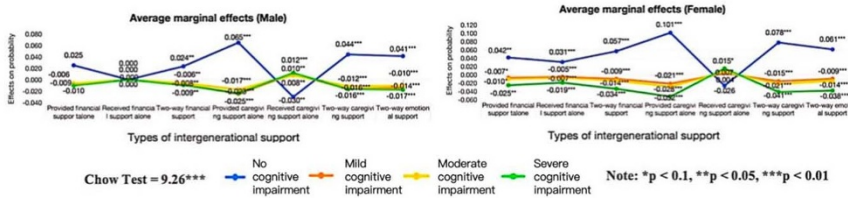


Figure 2. Results of the marginal effects for estimating gender-based heterogeneity.

cent, respectively, which was significantly lower than the corresponding reductions in women (1.4% and 3.8%).

To formally assess whether the effects of intergenerational support differ across subgroups, we conducted heterogeneity tests by estimating interaction terms between intergenerational support variables and subgroup indicators (urban–rural residence and gender). The results are presented in Supplementary Table 4.

For urban–rural differences, the joint tests of interaction terms are not statistically significant for intergenerational financial support ($\chi^2 = 3.11$, $p = 0.375$), care-giving support ($\chi^2 = 0.68$, $p = 0.878$) or emotional support ($\chi^2 = 0.03$, $p = 0.872$). Similarly, for gender differences, none of the interaction terms reach statistical significance (financial support: $\chi^2 = 3.76$, $p = 0.288$; care-giving support: $\chi^2 = 1.71$, $p = 0.634$; emotional support: $\chi^2 = 0.76$, $p = 0.385$).

These findings indicate that, although subgroup analyses suggest some variation in the estimated effects, the differences across urban–rural and gender groups are not statistically significant. Overall, the effects of intergenerational support on cognitive function appear to be broadly consistent across sub-populations.

Discussion

Intergenerational support plays a crucial role in mitigating cognitive impairment (Sharifi et al. 2023). However, the effect of two-way intergenerational support on cognitive function in older adults remains insufficiently understood. Our study conducted a comparative analysis of the effects of two-way and one-way intergenerational support on cognitive function among older Chinese adults. Additionally, robustness checks and heterogeneity analyses were performed, stratifying the data by geographic region and gender.

The marginal effects analysis revealed that two-way financial support, two-way care-giving support and intergenerational emotional support all had a significant mitigating effect on varying degrees of cognitive impairment risk, particularly for severe patients. These findings were further validated through robustness tests. Regarding one-way intergenerational support, having provided financial support alone, having received financial support alone and having provided care-giving support alone were also significantly associated with a reduced risk of varying degrees of cognitive impairment. These findings aligned with existing research (Deng et al. 2010; Wang et al. 2015; Xu et al. 2019). Therefore, fostering intergenerational support may be an effective strategy for mitigating cognitive impairment risk in older adults. Furthermore, our study found

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 15 Nov 2026 at 04:05:12, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0144686X26101056

that two-way financial support was more effective than one-way support in reducing the risk of cognitive impairment of varying degrees. This result supports the view that reciprocal financial exchanges not only involve the transfer of financial resources but also foster a sense of mutual responsibility and contribution, as well as active communication and engagement between the giver and the receiver (Sharifi et al. 2023). This reciprocal interaction may play a more effective protective role in preserving cognitive health in older adults. In contrast, although receiving or providing financial support alone may reduce the risk of cognitive impairment in older adults, it offers less interaction and feedback, thereby limiting its protective effects on cognitive function (Shu et al. 2021). Hence, strategies that encourage reciprocal financial exchanges between older adults and their families, such as establishing a shared family financial support system, should be promoted to effectively enhance cognitive wellbeing for older adults.

Unexpectedly, two-way care-giving support had a weaker effect on reducing the risk of cognitive impairment in older adults compared with having provided care-giving support alone in older adults. Two-way care-giving involves frequent role switching and responsibility sharing, requiring older adults to alternate between being care-givers and care recipients. This role conflict may lead to distraction and depletion of cognitive resources (Yoo et al. 2023), which could diminish the protective effect of intergenerational support on cognitive impairment. In contrast, previous studies have shown that when older adults provided care-giving alone to their children, the roles were clearer and tasks more defined, allowing for better cognitive resource allocation (Yang and Jia 2022). Moreover, when older adults provide care-giving alone, it may maximize their self-worth and sense of accomplishment (Adam et al. 2013), thereby better supporting cognitive health. Our findings also indicated that emotional support, as a form of two-way intergenerational support, was also significantly associated with a reduced risk of cognitive impairment in older adults, particularly for severe cases, which is in agreement with a previous report (Sharifi et al. 2023). Therefore, targeted interventions should promote intergenerational emotional support through family engagement, strengthening family cohesion, enhancing emotional bonds and reducing risk of cognitive impairment.

Our findings indicate that, among the three types of two-way intergenerational support, two-way care-giving support exhibited the most significant mitigating effect on the risk of cognitive impairment by varying degrees in older adults, while two-way financial support had the weakest effect. This may be attributed to the fact that, in contrast with financial support, two-way care-giving support requires more direct involvement in the daily lives of older adults. It not only addresses their physical needs but also fosters meaningful interactions between care-givers and recipients. Providing and receiving care-giving requires problem-solving, decision-making and active communication (Zwar et al. 2018), which play a crucial role in promoting mental wellbeing and preserving cognitive function in older adults. Meanwhile, having provided care-giving support alone had the most significant effect on mitigating the risk of cognitive impairment among the three types of one-way intergenerational support. It also demonstrated a stronger effect on reducing cognitive impairment risk compared with the two-way care-giving support, as noted earlier. Therefore, interventions to prevent cognitive impairment should prioritize encouraging older adults to assume

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 15 Nov 2026 at 04:05:12, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0144686X26101056

appropriate care-giving responsibilities and promote reciprocal care-giving relationships, as these may enhance cognitive engagement, emotional connection and social interaction.

Rural China is typically characterized by multigenerational family structures and close intergenerational bonds, whereas urban areas increasingly consist of smaller, more variable nuclear family units (Liu 2014). Our findings indicate that rural older adults may derive greater cognitive benefits from providing financial support alone to their offspring compared with their urban counterparts, which is consistent with previous studies (Peng et al. 2023). Meanwhile, having received financial support alone had no significant effect on adult cognition in rural areas. Given the more homogeneous social structures and traditional cultural norms in rural China, such as filial piety, patriarchal family structure and family collectivism (Yuan and Wang 2011; Yan 2016), older adults living in a rural setting may view providing – rather than receiving – financial support as a key way to affirm their social value and autonomy, which may contribute to a greater sense of self-worth and, in turn, result in enhanced cognitive benefits. However, our study showed that two-way financial support acted as a stronger protective factor against cognitive impairment among urban older adults than among their rural counterparts. This may be owing to the weaker influence of traditional norms in urban areas (Liu 2014), where both providing and receiving financial support benefit cognition health. Additionally, urban environments offer better health-care access, social participation and promotion of healthy behaviour (Sarkar and Webster 2017), enhancing the efficacy of intergenerational financial support in protecting cognitive health. In terms of intergenerational care-giving support, our findings revealed that both two-way care-giving support and providing care-giving alone were more effective in reducing the risk of cognitive impairment among rural older adults than among their urban counterparts. A possible explanation is that multigenerational family structures, stronger intergenerational ties and traditional care-giving roles in rural China provide a greater sense of fulfilment and family engagement (Shi 2017), which better protects the cognitive health of older adults. Finally, our study indicates that intergenerational emotional support was linked to a reduced risk of moderate and severe cognitive impairment in both urban and rural areas, with a stronger impact in rural settings. This finding may be attributed to the relatively stable family structures, stronger intergenerational ties, deeper cultural continuity and reduced environmental stress present in rural communities (Wu and Yuan 2023), which together enhance the buffering effects of emotional support on cognitive impairment.

Regarding gender disparities on the effects of intergenerational support on cognitive function among older adults, our study found that two-way financial support was more beneficial for women than men, especially in reducing the risk of moderate and severe cognitive impairment. Meanwhile, both providing and receiving financial support alone have stronger effects on reducing the risk of cognitive impairment in older women than in older men, which is in accordance with previous studies (Okamoto and Tanaka 2004; Sharma et al. 2016; Zwar et al. 2018). In addition, both care-giving support – whether provided alone or two-way – and intergenerational emotional support showed stronger protective effects among older women than men, especially in reducing moderate and severe cognitive impairment risk, which contrasts with the findings of recent research (Yang and Jia 2022). These gender-based disparities may stem from

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 15 Nov 2026 at 04:05:12, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0144686X26101056

the traditional care-giving role of the woman, stronger emotional engagement in family relationships, greater sensitivity to reciprocity and heightened psychological gains from support exchanges (Glauber 2017; Tavero et al. 2018). These factors may enhance their sense of self-worth and emotional wellbeing, thereby contributing more significantly to cognitive health. Therefore, it is essential to implement gender-based sensitive strategies that promote flexible care-giving roles, challenge traditional gender-based norms and ensure access to mental health support, thereby enabling both men and women to benefit fully from intergenerational support and maintain cognitive health in later life.

Our study was subject to certain limitations that should be acknowledged. Firstly, the absence of unified criteria for selecting measurement indicators in current research on intergenerational support may constrain the generalizability and comparability of our findings. Relatedly, our classification of two-way support relied on binary indicators of provision and receipt, which cannot capture variation in the intensity, frequency or quality of support. Future research with continuous or ordinal measures is needed to further refine this relationship. Secondly, the reliance on self-reported data in the questionnaire design introduces the potential for recall bias, which may compromise the accuracy and validity of the data. Thirdly, although we utilized three waves of data from the CLHLS (2011, 2014, 2018), our main analytical approach treated these as pooled cross-sections rather than a true panel. Consequently, our models did not account for within-individual correlations over time through individual-level random effects, fixed effects or cluster-robust standard errors. This may lead to under-estimated standard errors and overly optimistic p-values. Future studies with panel data models or more sophisticated longitudinal techniques would enable stronger causal inference and a more nuanced understanding of cognitive trajectories over time. Fourthly, the selection of control variables may lack sufficient comprehensiveness, potentially limiting the scope and robustness of the study findings.

Conclusion

Our study suggested that, in China, two-way financial, care-giving and emotional support significantly reduced the risk of cognitive impairment, especially for more severe patients. Moreover, two-way financial support was more effective than one-way support in reducing the risk of cognitive impairment by varying degrees. However, two-way care-giving support had a weaker effect on reducing cognitive impairment risk in older adults compared with having provided care-giving support alone. Furthermore, our data showed that two-way care-giving had the strongest effect in reducing the risk of cognitive impairment among the three types of two-way intergenerational support, whereas two-way financial support had the weakest. Finally, our findings revealed disparities in the effect of intergenerational support on cognitive function comparing older adults from rural and urban areas and between men and women; this provides a scientific basis for designing tailored intervention strategies to address cognitive impairment risks in different demographic groups.

Supplementary material. The supplementary material for this article can be found at https://doi.org/10.1017/S0144686X26101056

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 15 Nov 2026 at 04:05:12, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0144686X26101056

Acknowledgements. Thanks to all participants for their support and assistance with our research.

Author contributions. Sunxi Mao led the analysis of the data and the writing of the draft manuscript; Tianyu Wang participated in the data analysis and writing; Xinyi Wang contributed to the writing; and Zinan Zhang and Zhonghua Wang contributed equally to the study design and interpretation of the data and helped in the writing of the final draft manuscript. All authors read and approved the final manuscript.

Financial support. This study was funded by the National Natural Science Foundation of China (No. 72374108). The funding body was not involved in the design of the study, in the data collection, analysis and interpretation or in the writing of the manuscript.

Competing interests. The authors declare no conflict of interest.

Ethical standards. This study was approved by the Academic Research Ethics Committee of Nanjing Medical University (Reference No. 2,022,460). All procedures were carried out in accordance with the ethical standards of the Helsinki Declaration. Participants provided informed consent prior to the data collection. The study utilized data from the Chinese Longitudinal Healthy Longevity Survey (CLHLS), which is publicly available in the CLHLS repository, http://opendata.pku.edu.cn/dataset.xhtml?persistentId=10.18170/DVN/WBO7LK.

Reference

Adam S, Bonsang E, Grotz C and Perelman S (2013) Occupational activity and cognitive reserve: Implications in terms of prevention of cognitive aging and Alzheimer's disease. *Clinical Interventions in Aging* **8**, 377–390. https://doi.org/10.2147/CIA.S39921.

Akimov AV, Gemueva KA and Semenova NK (2021) The seventh population census in the PRC: Results and prospects of the country's demographic development. *Herald of the Russian Academy of Sciences* **91**, 724–735. https://doi.org/10.1134/S1019331621060083.

Bhatia R, Hirsch C, Arnold A, Newman A and Mukamal K (2023) Social networks, social support, and life expectancy in older adults: The cardiovascular health study. *Archives of Gerontology and Geriatrics* **111**, 104981. https://doi.org/10.1016/j.archger.2023.104981.

Bolin K, Lindgren B and Lundborg P (2008) Informal and formal care among single-living elderly in Europe. *Health Economics* **17**, 393–409. https://doi.org/10.1002/hec.1275.

Bonsang E and Bordone V (2013) The effect of informal care from children on cognitive functioning of older parents. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.2251784.

Campos ACBF, Teixeira IG, Moraes NDS, Cadorin IDJ, Morelli PM, Lidio AV, Medeiros EB, Garcez ML, Keller GS, Kucharska E, Da Rosa MI, Ceretta LB, Quevedo J and Budni J (2024) Prevalence of cognitive impairment and associated factors in older people. *Journal of Affective Disorders* **355**, 283–289. https://doi.org/10.1016/j.jad.2024.03.072.

Center for Healthy Aging and Development Studies (2020). The Chinese Longitudinal Healthy Longevity Survey (CLHLS) – Longitudinal data (1998–2018) (Version 2) [Dataset]. Peking University Open Research Data Platform. https://doi.org/10.18170/DVN/WBO7LK.

Chen F, Liu G and Mair CA (2011) Intergenerational ties in context: Grandparents caring for grandchildren in China. *Social Forces* **90**, 571–594. https://doi.org/10.1093/sf/sor012.

Chyi H and Mao S (2012) The determinants of happiness of China's elderly population. *Journal of Happiness Studies* **13**, 167–185. https://doi.org/10.1007/s10902-011-9256-8.

Deary IJ, Corley J, Gow AJ, Harris SE, Houlihan LM, Marioni RE, Penke L, Rafnsson SB and Starr JM (2009) Age-associated cognitive decline. *British Medical Bulletin* **92**, 135–152. https://doi.org/10.1093/bmb/ldp033.

Deng J, Hu J, Wu W, Dong B and Wu H (2010) Subjective well-being, social support, and age-related functioning among the very old in China. *International Journal of Geriatric Psychiatry* **25**, 697–703. https://doi.org/10.1002/gps.2410.

Eisele M, Zimmermann T, Köhler M, Wiese B, Heser K, Tebarth F, Weeg D, Olbrich J, Pentzek M, Fuchs A, Weyerer S, Werle J, Leicht H, König HH, Luppa M, Riedel-Heller S, Maier W, Scherer M and **AgeCoDe Study Group** (2012) Influence of social support on cognitive change and mortality in old

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 15 Nov 2026 at 04:05:12, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0144686X26101056

age: Results from the prospective multicentre cohort study AgeCoDe. *BMC (BioMed Central) Geriatrics* **12**, 9. https://doi.org/10.1186/1471-2318-12-9.

Fan Z, Lv X, Tu L, Zhang M, Yu X and Wang H (2021) Reduced social activities and networks, but not social support, are associated with cognitive decline among older Chinese adults: A prospective study. *Social Science and Medicine* **289**, 114423. https://doi.org/10.1016/j.socscimed.2021.114423.

Fingerman KL, Sechrist J and Birditt K (2013) Changing views on intergenerational ties. *Gerontology* **59**, 64–70. https://doi.org/10.1159/000342211.

Folstein MF, Folstein SE and McHugh PR (1975) 'Mini-mental state': A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research* **12**, 189–198. https://doi.org/10.1016/0022-3956(75)90026-6.

Glauber R (2017) Gender differences in spousal care across the later life course. *Research on Aging* **39**, 934–959. https://doi.org/10.1177/0164027516644503.

Jeon H, Chung Y, Chung S and Song A (2016) The influence of social networks and social support on health among older Koreans at high risk of depression. *Care Management Journals* **17**, 70–80. https://doi.org/10.1891/1521-0987.17.2.70.

Katz S (1963) Studies of illness in the aged: The index of ADL – A standardized measure of biological and psychosocial function. *JAMA (Journal of the American Medical Association)* **185**, 914. https://doi.org/10.1001/jama.1963.03060120024016.

Kelly ME, Duff H, Kelly S, McHugh Power JE, Brennan S, Lawlor BA and Loughrey DG (2017) The impact of social activities, social networks, social support and social relationships on the cognitive functioning of healthy older adults: A systematic review. *Systematic Reviews* **6**, 259. https://doi.org/10.1186/s13643-017-0632-2.

The Lancet (2022) Population ageing in China: Crisis or opportunity? *The Lancet* **400**, 1821. https://doi.org/10.1016/S0140-6736(22)02410-2.

Li C, Jiang S and Zhang X (2019) Intergenerational relationship, family social support, and depression among Chinese elderly: A structural equation modeling analysis. *Journal of Affective Disorders* **248**, 73–80. https://doi.org/10.1016/j.jad.2019.01.032.

Liao S, Qi L, Xiong J, Yan J and Wang R (2020) Intergenerational ties in context: Association between caring for grandchildren and cognitive function in middle-aged and older Chinese. *International Journal of Environmental Research and Public Health* **18**, 21. https://doi.org/10.3390/ijerph18010021.

Liu J (2014) Ageing, migration and familial support in rural China. *Geoforum; Journal of Physical, Human, and Regional Geosciences* **51**, 305–312. https://doi.org/10.1016/j.geoforum.2013.04.013.

Lupien SJ, McEwen BS, Gunnar MR and Heim C (2009) Effects of stress throughout the lifespan on the brain, behaviour and cognition. *Nature Reviews Neuroscience* **10**, 434–445. https://doi.org/10.1038/nrn2639.

Minkler M (1997) Depression in grandparents raising grandchildren: Results of a national longitudinal study. *Archives of Family Medicine* **6**, 445–452. https://doi.org/10.1001/archfami.6.5.445.

Okamoto K and Tanaka Y (2004) Gender differences in the relationship between social support and subjective health among elderly persons in Japan. *Preventive Medicine* **38**, 318–322. https://doi.org/10.1016/j.ypmed.2003.10.010.

Peng C, Burr JA and Han SH (2023) Cognitive function and cognitive decline among older rural Chinese adults: The roles of social support, pension benefits, and medical insurance. *Aging and Mental Health* **27**, 771–779. https://doi.org/10.1080/13607863.2022.2088693.

Ping W and Bei G (2011) A longitudinal study of the effect of intergenerational support on cognitive function of rural elderly. *Population Journal*. https://xueshu.baidu.com/usercenter/paper/show?paperid=31fe69064e91295867e3bc0ee78dc518.

Pinquart M and Sörensen S (2003) Differences between caregivers and noncaregivers in psychological health and physical health: A meta-analysis. *Psychology and Aging* **18**, 250–267. https://doi.org/10.1037/0882-7974.18.2.250.

Roodman D (2011) Fitting fully observed recursive mixed-process models with CMP. *Stata Journal: Promoting Communications on Statistics and Stata* **11**, 159–206. https://doi.org/10.1177/1536867X1101100202.

Sarkar C and Webster C (2017) Urban environments and human health: Current trends and future directions. *Current Opinion in Environmental Sustainability, Sustainability Challenges* **25**, 33–44. https://doi.org/10.1016/j.cosust.2017.06.001.

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 15 Nov 2026 at 04:05:12, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0144686X26101056

Sharifi S, Babaei Khorzoughi K, Khaledi-Paveh B and Rahmati M (2023) Association of intergenerational relationship and supports with cognitive performance in older adults: A systematic review. *Geriatric Nursing* **52**, 146–151. https://doi.org/10.1016/j.gerinurse.2023.05.014.

Sharma N, Chakrabarti S and Grover S (2016) Gender differences in caregiving among family – Caregivers of people with mental illnesses. *World Journal of Psychiatry* **6**, 7. https://doi.org/10.5498/wjp.v6.i1.7.

Shi J (2017) The evolvement of family intergenerational relationship in transition: Mechanism, logic, and tension. *Journal of Chinese Sociology* **4**, 20. https://doi.org/10.1186/s40711-017-0068-z.

Shu Z, Xiao J, Dai X, Han Y and Liu Y (2021) Effect of family 'upward' intergenerational support on the health of rural elderly in China: Evidence from Chinese longitudinal healthy longevity survey. *PLoS (Public Library of Science) One* **16**, e0253131. https://doi.org/10.1371/journal.pone.0253131.

Sieber SD (1974) Toward a theory of role accumulation. *American Sociological Review* **39**, 567. https://doi.org/10.2307/2094422.

Sims RC, Hosey M, Levy S-A, Whitfield KE, Katzel LI and Waldstein SR (2014) Distinct functions of social support and cognitive function among older adults. *Experimental Aging Research* **40**, 40–59. https://doi.org/10.1080/0361073X.2014.857551.

Sommer S and Buhl HM (2018) Intergenerational transfers: Associations with adult children's emotional support of their parents. *Journal of Adult Development* **25**, 286–296. https://doi.org/10.1007/s10804-018-9296-y.

Stern Y (2012) Cognitive reserve in ageing and Alzheimer's disease. *The Lancet Neurology* **11**, 1006–1012. https://doi.org/10.1016/S1474-4422(12)70191-6.

Tavero IL, García EG, Seda JM, Serrano RR, Cabrera IMC and Rodríguez AA (2018) The gender perspective in the opinions and discourse of women about caregiving. *Revista da Escola de Enfermagem da Uspekhi* **52**, e03370. https://doi.org/10.1590/s1980-220x2017009403370.

Wang B, He P and Dong B (2015) Association between family functioning and cognitive impairment among Chinese nonagenarians/centenarians. *Geriatrics and Gerontology International* **15**, 1135–1142. https://doi.org/10.1111/ggi.12410.

Wang P (2024) The influence of intergenerational support on cognitive functioning among middle-aged Chinese: Moderation by personal income. *Archives of Gerontology and Geriatrics* **122**, 105393. https://doi.org/10.1016/j.archger.2024.105393.

Wu X and Yuan Z (2023) Understanding the socio-cultural resilience of rural areas through the intergenerational relationship in transitional China: Case studies from Guangdong. *Journal of Rural Studies* **97**, 303–313. https://doi.org/10.1016/j.jrurstud.2022.12.001.

Xu P, Burr JA, Kim K and Cong Z (2019) Intergenerational financial exchange and cognitive impairment among older adults in China. *Aging and Mental Health* **23**, 1209–1217. https://doi.org/10.1080/13607863.2018.1481930.

Xu Y and Luo Y (2022) The effect of adult children's education attainment on their parents' cognitive health: An intergenerational support perspective. *Frontiers in Public Health* **10**, 744333. https://doi.org/10.3389/fpubh.2022.744333.

Yan Y (2016) Intergenerational intimacy and descending familism in rural north China. *American Anthropologist* **118**, 244–257. https://doi.org/10.1111/aman.12527.

Yang Q and Jia J (2022) Association of intergenerational relationships with cognitive impairment among Chinese adults 80 years of age or older: Prospective cohort study. *BMC (BioMed Central) Geriatrics* **22**, 838. https://doi.org/10.1186/s12877-022-03529-y.

Yoo L, Moon CS, Park I, Lee M and Choi GE (2023) Dual caregiving burden for older parents and grandchildren in middle-aged and older adults: A concept analysis. *Journal of Korean Gerontological Nursing* **25**, 335–345. https://doi.org/10.17079/jkgn.2023.00178.

Yuan X and Wang Q (2011) A tentative study on differences and integration of Sino-Western filial piety culture. *Asian Social Science* **7**, 97. https://doi.org/10.5539/ass.v7n8p97.

Zhang H, Zhang H and Zhang J (2015) Demographic age structure and economic development: Evidence from Chinese provinces. *Journal of Comparative Economics* **43**, 170–185. https://doi.org/10.1016/j.jce.2014.07.002.

Zhang J, Li J, Li C and Wang J (2025) The impact of intergenerational support on older adults' life satisfaction in China: Rural–urban differences. *Healthcare and Rehabilitation* **1**, 100011. https://doi.org/10.1016/j.hcr.2024.100011.

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 15 Nov 2026 at 04:05:12, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0144686X26101056

Zhu S, Hu J and Efird JT (2012) Role of social support in cognitive function among elders. *Journal of Clinical Nursing* **21**, 2118–2125. https://doi.org/10.1111/j.1365-2702.2012.04178.x.

Zwar L, König H-H and Hajek A (2018) The impact of different types of informal caregiving on cognitive functioning of older caregivers: Evidence from a longitudinal, population-based study in Germany. *Social Science and Medicine* **214**, 12–19. https://doi.org/10.1016/j.socscimed.2018.07.048.

Cite this article: Mao S, Wang T, Wang X, Zhang Z and Wang Z (2026) Can two-way intergenerational support better protect cognitive function in Chinese older adults? A nationally representative study. *Ageing and Society* **46**, e82, 1–23. https://doi.org/10.1017/S0144686X26101056

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 15 Nov 2026 at 04:05:12, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S0144686X26101056