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Non-coresidential intergenerational relations from the perspective of adult children in China: typology and social welfare implications

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The social changes in the new century and the shifting concept of filial piety have jointly shaped the unique intergenerational relationships in China. Intergenerational relationships are closely connected to arrangements for care of the older adults, particularly those who live alone. Based on data from the 2017 China General Social Survey (CGSS), the latent profile analysis method was used to explore the profiles of intergenerational family relationships and their influencing factors in the context of “non-co-residence” based on the five dimensions of intergenerational solidarity theory and related indicators. The study found that family intergenerational relationships can be categorised into five profiles: distant-emotional, proximity-detached, proximity-loose, distant-support, and traditional-reciprocal, which share commonalities with previous studies and have their own characteristics. The results of the multiple regression analysis showed that gender, education level, annual personal income for the previous year, self-rated happiness, and self-rated health had significant effects on the latent profiles of intergenerational relationships. Specifically, adult children who are male, living in a rural area, no legal spouse, a primary school education or less, an annual income above 50,001 RMB in the last year (2016), low or average self-rated happiness, and good self-rated health are more likely to deviate from the traditional filial support track (i.e. they are less likely to be the traditional-reciprocal) than their counterparts in these profiles. In the future, it will be important to increase attention to those families in which older parent live apart from their adult child through relevant legislation, social welfare systems, and social older-care services. This will help ensure that adult children provide intergenerational support and will enable the normal functioning of home- and community-based older adults’ care.

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Introduction

Since the start of the century, global societies have experienced a significant demographic overhaul marked by declining birth rates and longer life expectancies. This shift has deeply influenced welfare states and their policies (Nauck et al. 2009). Demographic changes heighten uncertainty in family relationships, investigating intergenerational relationships and their dynamics within families should therefore become a vital and essential field of scientific enquiry (Nauck et al. 2009; Seltzer 2019).

Equally, social changes, aging, and factors such as smaller family sizes, nuclear family structures, diverse living arrangements, increased mobility have impacted China's traditional family care model, leading to a rise in the number of adult children living apart from their older parents (Zhao and Fan 2018). The possibility of parents living with their children is declining, and the safeguarding role of informal support in the family has been seriously weakened; as a result, intergenerational support has spilled over from the micro-family level to the macro-social level (Giles and Mu 2007). The tension between traditional culture and the dramatic transformation of society has made the living arrangements of Chinese families more complex than those in other countries, as modernisation has weakened the value of and need for intergenerational cohabitation, while also producing the decline of the immediate family and the rise of the intergenerationally separated nuclear family (Li and Hu 2021).

China became a “moderately ageing society” in 2022, and most of the generation that encountered the “3rd baby boom” (China experienced three baby booms starting from 1950, with the third occurring between 1981 and 1994, averaging 22.46 million births per year) and the “one-child policy” (a population planning initiative implemented between 1979 and 2015 to curb the country's population growth by restricting many families to a single child) will have single children or be empty nesters in their old age (Hu et al. 2012; Shi 2014). Based on the data of National Bureau of Statistics of China (2021), there are approximately 119 million empty-nesters in China, and the proportion of empty nesters' families reaches 44.82%. It is projected that by 2030, the number of empty-nest older adults in China will exceed 200 million, accounting for around 90% of the older population. Thus, the demand for chronic disease care and health care for these people is an opportunity and a challenge for the economic and social transformation of China (Mu 2017; Dong et al. 2022).

However, current research mostly concentrates on the general older population, neglecting the specific needs of empty-nest or solitary older adults who lack frequent interaction or cohabitation with their adult children (Huang 2015; Gui and Koropecjy-Cox 2016). It's undeniable that older adults living alone, when neglected, face heightened risks of developing multiple chronic diseases, experiencing depression or anxiety, facing increased mortality rates, and encountering reduced access to healthcare services (Newsom et al. 2005; Zhou et al. 2015; Thapa et al. 2018; Wu et al. 2022). Additionally, Chinese scholars found that urban older adults living alone in China are not satisfied with the use of family and community services (Du et al. 2022). Therefore, we have to ask: if older adults living alone in China can neither effectively receive community care services nor regular visits and attention from their adult children, how can the interests and health of this group be effectively safeguarded?

Specifically, on the one hand, the long-term separation of parents and children reduces the timeliness of providing services to the older adults in their daily lives (Du et al. 2022). The complex needs of older parents who suffer from multiple chronic diseases are also difficult to support in a timely manner, and relying solely on the social care and public service systems that are not yet fully developed is unrealistic and cannot satisfy the

emotional and psychological needs of the older adults (Wang 2014). Moreover, the tradition of filial piety in Asian countries and the implicit social contract that expects children to continue to provide care for their ageing parents have contributed to and strengthened the upward intergenerational support of children for their parents (Cao 2020). Especially in China, adult children remain the primary caregivers for older adults within the family (Gui and Koropecjy-Cox 2016). Throughout history, the family has been crucial for accessing welfare resources, and no formal or informal social security system can replace the functions and responsibilities of the family (Shi 2014). Chinese empty-nesters may experience greater emotional challenges because they have a strong emotional dependence on their children and a strong desire for intergenerational togetherness and co-residence compared to their counterparts in other countries (Wu et al. 2022). Given that family-based older adults care (rather than a nursing home) and “child feedback” remain the dominant mode in China and are likely to continue (Wang 2014). Therefore, it is particularly important to examine the “upward” intergenerational support of adult children to their older parents who living alone in terms of support concepts, behaviours, family values, and so on, as well as specific family care.

On the other hand, long-term implementation of the family planning policy places the burden of caring for multiple older relatives on a ‘one-child’ couple. Pressures like busy schedules, space constraints, and the complexities of raising the next generation push caregiving responsibilities of older parents beyond the family realm (Gui and Koropecjy-Cox 2016). Solely prioritising ‘familism’ or family care disregards the practical ability of adult children to support their parents. The significant tension between increasing care demands and limited resources raises questions on how the state, families, and individuals can effectively contribute to the sustainable development of high-quality long-term care services for older adults in China (Luo and Ding 2021). Therefore, it's essential to provide social welfare and practical assistance tailored to the specific circumstances of different families, based on an examination of intergenerational relations and older adults' care. The key priority is to avoid imposing heavier caregiving burdens on adult children (She and Man 2022).

Based on the foregoing, exploring how adult children, who do not live with their older parents, provide care and resources for their parents' later life, along with identifying the differences and similarities among such groups, is crucial in addressing the issue of older adults care during the current societal transition. This study based on the theory of intergenerational solidarity developed initially by Bengtson et al. (1976), further refined by Bengtson and Schrader (1982), and continuously applied. Its elements include emotional cohesion (affect), social contact (association), geographical distance (structure), support behaviours (function), filial obligations (norms), and attitudinal agreement (consensus), which provides a rational basis for our study of intergenerational relationships. Using data from the 2017 China General Social Survey (CGSS), we comprehensively consider adult children's concepts and behaviours of support and the degree of reciprocity and closeness between parents and adult children. We explore the latent profiles of intergenerational relationships when adult children live separately from their parents most of the time, and we identify the factors affecting the profiles of different intergenerational relationships through the construction of a multiclassification logistic regression model. Given China's distinctive emphasis on “kinship, geography, and bloodline”, such an approach enables a thorough analysis of the broader social environment within families and the intricate micro-social dynamics at play.

Living separately from older parents may become a predominant trend in East Asia (Yi and Lin 2009). It is imperative to consider the provision of public services and social security for older people not only at the macro or meso levels, but also by focusing on the specific demographics of the adult children in China who choose not to or cannot live with their older parents. This study serves as a reference for future research on social security and welfare among the older adults, typological research on intergenerational family relationships, and for the comprehensive establishment of China's 2030 vision of "home and community-based care" planning.

Literature review, theoretical framework and research questions

The development and influence of research on intergenerational relationships between older parents and adult children in Western academia has been far-reaching, with some scholars pointing out that it can be traced back as far as 1943 (Huang et al. 2017); in China, Fei Xiaotong classified the intergenerational relationship models in China and the West as a "feedback model" and "relay model", which highlights the link between intergenerational relationships and the issue of older care (Song and Fan 2016). A substantial body of domestic and international research has revealed that living arrangements (Ning and Wang 2014) and various intergenerational relationships (Li et al. 2009; Liu 2014) profoundly impact the physical and psychological well-being of older individuals and prompt changes in their caregiving methods, available resources, and welfare levels.

The theory of intergenerational solidarity. Since the proposal of the unverified intergenerational solidarity theory by Bengtson, Olander, and Haddad in 1976, scholars both domestic and international, including Bengtson himself, have been continuously validating and strengthening the theoretical model for decades (Bengtson and Roberts 1991; Ma 2016). The model initially comprising six dimensions, refers to the cohesion between parents after adult children have established their own lives, including their careers and families. This theory conceptualises intergenerational solidarity within families as a multifaceted, multidimensional structure manifested in six interactive elements: affection, association, consensus, resource sharing, the strength of familial norms, and the opportunity structure for parent-child interaction. Corresponding to these elements are the dimensions of affectual solidarity, association solidarity, consensual solidarity, functional solidarity, normative solidarity, and structural solidarity. Affectual solidarity refers to the level of emotional intimacy among family members; association solidarity pertains to the type and frequency of intergenerational interactions; consensual solidarity signifies alignment in opinions, values, and orientations between generations; functional solidarity involves the supply of economic resources and (care) services, and emotional support; normative solidarity concerns the fulfilment of filial obligations towards parents and the shouldering of family responsibilities; and structural solidarity relates to the geographical distance (proximity) between generations (Bengtson and Roberts 1991). It later evolved into the "solidarity-conflict" paradigm, signifying that, due to the rapid changes in modern society, individuals are constantly entangled in conflicting emotions, both positive and negative (Bengtson et al. 2002). Additionally, scholars have consistently been verifying and refining the model. For example, Atkinson et al. (1986) initiated a cycle of theoretical testing and improvement. Lüscher and Pillemer (1998), influenced by postmodern theory, attempted to establish ambivalence psychology as a concept that is theoretically and experientially more useful. Moreover, Timonen et al. (2013)

through a grounded theory approach, have reconceptualized intergenerational solidarity, verifying four hypotheses through the impact of socio-economic status (SES), intergenerational observations of each other's practices, the public domain (welfare state), and the background of a liberal welfare state (especially at a time of economic crisis). Furthermore, some scholars have integrated intergenerational solidarity theory with contemporary practical issues, expanding into the realm of digital solidarity (Peng et al. 2018; Hwang et al. 2022). However, the initial intergenerational model has proven its theoretical effectiveness in various contexts through extensive empirical research, solidifying its position as a crucial tool for studying intergenerational family relationships (Silverstein and Bengtson 1997; Ma 2016). Therefore, this study also utilises the original theory of intergenerational solidarity to analyse different types of intergenerational relationships in families where two generations live separately (Bengtson and Roberts 1991).

The intergenerational relationships and their structural manifestations of "non-cohabitation" in China. Typically, the living distance between two generations is defined as a structural measurement dimension or variable in the norms of filial piety and family intergenerational relationships (Zeng and Li 2020; Chen et al. 2021). The likelihood of adult children living with their parents decreases as the children's age increases, and only one in five adult children aged 25 or older was living in their family of origin's home in 2013 in the USA (Seltzer 2019). Similarly, influenced by Western culture and the global international context, the phenomenon of "non-co-residence" has become increasingly common in China in recent years (Chen 2006; Zhao and Fan 2018). Traditional moral norms (i.e., taking care of older parents by living with them) have become increasingly blurred. Consequently, some Chinese scholars have begun to explore intergenerational relationships or intergenerational support in "non-co-residence" scenarios, aiming to adopt various strategies for providing social support for different relations (Chen 1999; Chen 2006; Yi and Lin 2009). Upon further examination of intergenerational relationships where generations live close to each other but not together, scholars have observed that contemporary Chinese families now exhibit forms of non-traditional family arrangements previously identified by early international scholars. These include "modified extended family", "network family", "family-as-relationships", "quasi-cohabitation" (living in the same building), or "quasi-co-residence" (Chen 2005; Silverstein et al. 2006; Song and Li 2017; Chen et al. 2021; Shen et al. 2021; Song et al. 2023). Additionally, unique concepts like "a bowl of soup's distance" (living close enough that a bowl of hot soup can be delivered from one household to another without cooling down) have been summarised to describe phenomena specific to China in recent years (Chen et al. 2021). These phenomena indicate varying strengths of intergenerational relationships and levels of support among family members, affecting the welfare and impact on both generations differently. Furthermore, based on the assumptions of the "family bargaining model", Song et al. (2023) developed the concept of "extended living arrangements" (ELAs). While less attention has been paid to categorising long-distance living situations, contributions have been made in this area as well. Schmidt-Kallert and Franke (2012), focusing on China's migrant labour issues and extended families, introduced the concept of "multi-locational households" to explore intergenerational support, finding that economic reciprocity, especially remittances from urban to rural areas to regularly support older parents, appears to be the main purpose of multi-local family arrangements among China's migrant population.

Whether observed through social phenomena or empirical data, it is evident that modern Chinese people have gradually liberated themselves from the traditional cultural and familial ethics of filial piety, which mandated that adult children must live with their older parents. Structural changes in Chinese society have led to a significant number of older adults and adult children living apart (Silverstein et al. 2006). Traditional values and family living arrangement models have started to shift away from the gold standard of multigenerational households in China towards “empty nest” households for the older generation and “independent living” for the adult children generation.

Identification types of intergenerational relationships within families based on a ‘Person-centred’ approach. The different intergenerational relationships within the family are undoubtedly the result of a multidimensional and multifactorial approach. This strategy not only manifests itself in the flow of economic, emotional, and life-care resources between children and their parents, but also includes different directions and degrees of expectations and feelings, connectivity, and distance between the two generations, and filial values of the members of the family (Huang et al. 2017). Many scholars have begun to apply latent class analysis (LCA) or latent profile analysis (LPA), a person-centred approach, to explore and differentiate between types of intergenerational support and relationships (Silverstein and Bengtson 1997). LCA or LPA can identify subgroups of the population with common characteristics so that people within the subgroups have similar scores on the measured variables. These tools account for inter-individual differences and relationships between variables and assess the quality of the categorisation, approaches that are scientifically valid and effective (Collins & Lanza 2010).

Early adopters of this approach, Hogan et al. (1993) identified four categories – “low exchangers”, “high exchangers”, “givers”, and “receivers” – by focusing on functional solidarity between generations. They found that more than 50% of American families belonged to the “low exchange” category. Despite a later start, typological research on intergenerational relationships within Chinese families, grounded in the theory of intergenerational solidarity, has achieved notable advancements in recent years. To elaborate, intergenerational relationships between adult children and their older parents are classified into the three categories defined by Huang et al. (2017) and Guo et al. (2020): tight-knit, supportive but distant, and detached. However, sometimes this concept is grouped into four categories – receiving, detached, reciprocal, and giving – as derived by Xiong and Shi (2014) through a survey of older adults households in rural Hubei Province. Another four-category format is receiving, high exchange, giving, and low exchange, as identified by Liu (2014) using data from the 2006 CGSS. Zeng and Li (2020), based data from the 2015 China Health and Retirement Longitudinal Study and using LCA, considered the dimension of opportunity structures as one of the measures for intergenerational relationships (including those not living together but in frequent contact and those not living together and in infrequent contact), and identified four subtypes: tight-knit, instrumental, independent, and parental support. Five latent categories of intergenerational support for urban families in China are revealed in Ma’s (2016) study: “intimate and reciprocal”, “intimate but distant”, “utilitarian”, “emotional”, and “detached”. These studies reveal significant differences and commonalities. Many also treat “whether living together” as a crucial dimension for assessing intergenerational relationships. Terms such as “detached”, “distant” or “independent” are employed by these studies to characterise the intergenerational relationships where cohabitation does not

occur. Although the identified types encompass the scenario of “non-co-residence” intergenerational relationships, none of the studies have thoroughly investigated “non-co-residence” as a separate area of research. And most of the results are based on investigations from the perspective of the older adults, whereas research based on the view of adult children is limited.

While there is still insufficient typological research on “intergenerational relations of non-co-residence”, it has attracted attention from some scholars. Based on the intergenerational solidarity theory, Yi and Lin (2009) explored intergenerational relationships in East Asian society, specifically in Taiwan, examining five types from the perspective of adult children who not live together with their parents and using LCA: Normative, Detached, Tight-knit, Sociable, and Intimate but Distant. Considering the significant reduction in social interactions among family members during COVID-19, the psychological well-being of older parents living separately from their adult children may be adversely affected. Hwang et al. (2022) incorporated digital solidarity into the intergenerational solidarity model utilising data from the 2021 and 2022 Longitudinal Study of Generations (LSOG) to analyse and identify four types of interactions between older parents and adult children during the COVID-19 pandemic: “distant but digitally connected”, “tight-knit traditional”, “detached”, and “ambivalent”. These groups were found to be associated with the mental health of older parents, including depressive symptoms, psychological well-being, and self-esteem.

Due to the intergenerational solidarity theory encompassing three core dimensions, theoretically, there are eight possible subtypes; coupled with the six major measurement dimensions included in the intergenerational solidarity model, this leads to even more complex situations and classifications of subtypes (Song and Li 2017; Zeng and Li 2020). However, there is still a significant lack of typological research on intergenerational relationships in the context of non-cohabitation. Therefore, measuring “co-residence” and “non-co-residence” separately and focusing on “non-co-residence” can reveal new subtypes that differ from those identified in previous research. This approach is an important starting point for this study.

Influences on and differences in intergenerational family relationships. Due to the inherent heterogeneity of the population, it is not difficult to explain the phenomenon that different groups of children provide different forms of intergenerational support, and that different support leads to differences in intergenerational relationships and turnover. Firstly, scholars have increasingly noticed the supporter role taken on by women with the dual status of “daughter” and “daughter-in-law” (Cao 2020). Some studies have proved that there is a gender difference in the concept of support (Zhang and Yang 2015). And there is also a significant difference between sons’ and daughters’ perceptions of filial piety, with sons more likely to agree to live with the older adults and more in favour of married men paying for their parents’ living expenses and caring for them (Gan and Feng 2020). Surprisingly, however, previous studies have found that the role of offspring support is greater in rural areas than in urban areas, and intergenerational support is gradually disappearing in urban areas (Yu 2017). Thus, it is especially important to analyse urban–rural differences in family intergenerational relationships. The marital status of adult children has a significant effect on intergenerational support; specifically, married children are less likely to accept help from, but more likely to provide various support to, their parents (Wang 2014). Yi and Lin (2009) also found that when 756 Taiwanese adults did not co-residing with their parents, both gender and marriage affected intergenerational family relationships across potential categories.

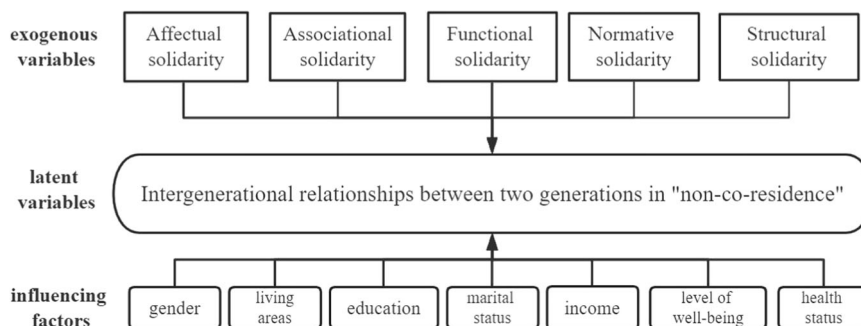


Fig. 1 Research analysis framework. The analytical framework of the study consists of three components: exogenous variables (five of the six dimensions of intergenerational solidarity theory), latent variables (latent profiles obtained through LPA) and influencing factors (consisting of demographic and personal characteristics).

In addition, adult children with higher incomes tend to be more willing to support their parents (Huang et al. 2017). Zhang et al. (2019) analysed CGSS 2015 data and found that job stability has a significant impact on attitudes toward older adults' care responsibility. Although few studies examine the impact of adult children's health on intergenerational support for older adults, some have demonstrated that, when an adult child's health is weak or excellent, the net monetary support that the older adults receive from their children decreases. However, the probability of receiving both net in-kind and total net financial support increases only when adult children have moderate health (Wang et al. 2018). Therefore, the impacts and differences in family intergenerational relationships arising from demographic characteristics, such as gender, education, residence, and marital status, and those stemming from personal social characteristics, such as annual income, self-assessed health, and self-assessed happiness, should be explored.

Problem formulation and analytical framework. Although there is a growing body of research on the topic of intergenerational family relationships, an overview of existing work reveals shortcomings. Firstly, most scholars' analyses focus on older people as the entry point, with less attention paid to adult children. Furthermore, "respect for older adults", "honouring older adults", and filial piety are often regarded as "common sense" rather than "issues" (Chen 2015); therefore, existing research is still limited in its consideration of the attitudes of the providers of older adults' care. Adult children are the main providers of this practice, and intergenerational support cannot be achieved without adult children's understanding of filial piety and assistance. There are, in fact, far more studies on filial piety behaviours than filial piety concepts (Gan and Feng 2020), and there is a lack of comprehensive consideration of adult children's views on these topics. Secondly, most studies often concentrate on the care given to the entire older population and often overlooking the challenges faced by those living alone who cannot receive immediate familial care. Thirdly, many studies are mostly use traditional, non-latent clustering methods (e.g., k-means clustering, hierarchical clustering), without taking into account the individual differences and heterogeneity of the groups (DoSpurk et al. 2020). Compared to traditional non-latent clustering methods, LPA offers notable advantages: it directly categorizes individuals into clusters using estimated latent class probabilities, accepts diverse variable types (continuous, categorical, count, or combinations), and allows the incorporation of demographic and other covariates for profile descriptions (Magidson and Vermunt 2002). The heterogeneity among the older adults and their adult children's situation determines the diversity of older adults care services, making homogeneous care policies and services often insufficient to meet

the effective needs of those who live alone or in empty-nest situations (Wang and Liu 2023). Moreover, the different dimensions of intergenerational solidarity cannot simply be summed up or form a single structure, classification analysis (leading to typologies) is more adept at illustrating the intricacies and contradictions of family life compared to additive models (Silverstein and Bengtson 1997). Therefore, using categorical analysis methods can better describe the complexity of family life (Ma 2016).

Examining aging within the context of family relationships helps rectify major inaccuracies in the broader public debate concerning population aging, the social status of older adults, and related social policies (Connidis and Barnett 2018). This paper focuses on the above three aspects and answers the following questions: 1) How many profiles of "non-co-residing" family intergenerational relationships are present between two generations?; 2) Which profile has the largest proportion, and what is the portrait of the group it represents?; and 3) What factors affect the different profiles of intergenerational family relationships?

In summary, this study explores the profiles of intergenerational relationships in Chinese families from the perspective of adult children through an LPA that examines five dimensions of intergenerational solidarity (affectual, associational, functional, normative, and structural). It further analyses the differences in intergenerational family relationships generated by demographic characteristics, such as gender, education, living areas, and marital status, as well as personal social characteristics, such as annual income, self-assessed health, and self-assessed well-being (Fig. 1).

Data sources and research methodology

The data used in this paper are from the 2017 CGSS (Chinese General Social Survey, project number: 94525591). The CGSS is the first nationwide, comprehensive, and continuous large-scale social survey conducted jointly by Renmin University of China and various academic institutions across China. Its purpose is to regularly and systematically collect data on various aspects of Chinese people and society to explore social issues of theoretical and practical significance, thereby promoting the openness and sharing of domestic social science research. In the CGSS2017 questionnaire, it includes Section A (Core and Socio-Demographic Module), Section C (ISSP Social Network Module), Section D (EASS Family Questionnaire Module), and Section Z (Respondents' Contact Information), encompassing 12,582 samples (Chinese National Survey Data Archive 2017). It identified residents age 18 years and older through stratified multi-stage probability sampling, covering 21 provinces, three autonomous regions, and four municipalities that are directly under the central government (Bian and Li 2012). The reason for

choosing the data in CGSS2017, there was a distinct “EASS Family Questionnaire” available under Section D, and the data was publicly accessible. Moreover, questions in the module of CGSS2017 were suitable for measuring intergenerational solidarity, while the publicly data from other years were insufficient as well as most of the questions are not consistent.

In Section D of the CGSS2017 questionnaire, the question “D6e. Who do your parents live with most of the time now?” included the responses “Partner”, “Living alone” and “Living in institutions such as nursing homes”; respondents who selected one of these options were the target sample population. After excluding participants who were living with older adults and those with missing key variables, the final study population consisted of 1270 adult children, meeting the previous rule of thumb, which states that a minimum sample size of approximately 500 can be sufficiently accurate in identifying the correct number of latent profiles (Nylund et al. 2007). There were 555 males and 715 females; 604 agricultural hukou (refers to household registration), 355 non-agricultural hukou, and 301 resident hukou (99 formerly agricultural and 202 formerly non-agricultural); the person in the sample was born in 1982 (35 years old as of 2017) in the highest number, with 53; 818 respondents had not attended university, while 452 had a university degree or higher; and 1199 were Han Chinese, and 71 were ethnic minorities (including Mongol, Manchu, Hui (‘回族’), Zhuang (‘壮族’), and other ethnic groups).

Variable selection

Dependent variable. This study began with a composite of 24 indicators in the five dimensions of affectual solidarity, associational solidarity, functional solidarity, normative solidarity, and structural solidarity to measure the profiles of intergenerational family relationships between the two generations living apart. Exclusion of consensual solidarity dimension was due to: 1) The study’s aim was solely to understand the attitudes and behaviours of adult children, not those of both adult children and their parents. Consensual solidarity primarily measures the consistency among family members concerning specific values, attitudes, and beliefs; 2) Attitudinal consensus, such as alignment on religious and political beliefs, may be relatively autonomous from other aspects of cohesion within aging families (Atkinson et al. 1986). And Bengtson and Roberts (1991) highlighted that consensus should be independent of other solidarity constructs; and 3) Limitations in the CGSS2017 questionnaire items and data, we were also unable to access suitable indicators that effectively measure “consensual solidarity”. Additionally, the reliability of the five dimensions is deemed acceptable but performs differently, as indicated by Cronbach’s alpha coefficients that range from 0.69 to 0.98.

Affectual solidarity involves scoring family members’ closeness, understanding, respect, etc. We referred to Guo et al. (2012), Yi and Lin (2009) to select two questions: “Do you often listen to what your parents have to say or think?” and “Do your parents often listen to what you have to say or think?” Answers were measured on a five-point scale (1 = very often, 2 = often, 3 = sometimes, 4 = rarely, 5 = not at all), and the coding for this dimension was reversed.

Associational solidarity was measured by the frequency of intergenerational interactions (such as meetings, phone calls, or emails) (Ma 2016) and was captured using 2 questions, “How often do you see them [your parents]?” and “How often do you contact them (by phone, letter, or email, etc.) in addition to meeting them?”, with answers to both questions coded on a seven-point scale (1 = almost every day, 2 = several times a

week, 3 = around once a week, 4 = around once a month, 5 = several times a year, 6 = around once a year, and 7 = less than once a year). The responses for this dimension were reverse-coded (the more frequent the contact, the higher the score).

Functional solidarity requires observation through measuring the instrumental support provided by adult children to their parents, primarily involving financial, physical assistance and help with household chores (Bengtson and Roberts 1991; Huang et al. 2017). It included 4 questions, “Do you often give money to your parents/do you often help your parents with household chores (e.g. cleaning, preparing dinner, grocery shopping, errands) or taking care of children or other family members?” and “Do your parents often give money/help with household chores (e.g. cleaning, preparing dinner, shopping, doing errands) or take care of children or other family members?” Answers were coded on a five-point scale (1 = very often, 2 = often, 3 = sometimes, 4 = rarely, and 5 = not at all), and the measure was reverse-coded.

Normative solidarity consists of 15 questions. Typically, normative solidarity needs to be measured in terms of agreement with norms about the importance of familialist values and ratings of filial responsibilities (Bengtson and Roberts 1991). Due to the internalisation of family norms affecting the selection of specific behaviour as well as on its evaluation, we also referred to Albert and Ferring’s (2018) study to select the necessary measurement indicators. Firstly, four questions were based on the statement, “Unmarried/married adult males/females should give money to their parents for living expenses”. The answers were coded on a seven-point scale (1 = strongly agree, 2 = quite agree, 3 = somewhat agree, 4 = neutral, 5 = somewhat disagree, 6 = quite disagree, 7 = strongly disagree), and the variable was reverse-coded. Secondly, adult children’s perceptions of the question, “The medical and care/living needs of older adults are the responsibility of the individual or family rather than the government” were examined, and response options included five categories (1 = all government responsibility, 2 = mostly government, 3 = half government and half individual/family, 4 = mostly individual/family, 5 = all individual/family). Seven additional statements were evaluated: “In any case, the father’s authority should be respected in the family”, “Children should do something to honour their parents”; “In order to carry on the family line, it is important to have at least one son”; “Be grateful to your parents for your upbringing”; “Treat your parents well, no matter how badly they treat you”; “Give up your personal ambitions to fulfil your parents’ wishes”; and “Supporting my parents to make their lives more comfortable”. The response options were coded on a five-point scale (1 = strongly disagree, 2 = somewhat disagree, 3 = doesn’t matter if you agree or disagree, 4 = somewhat agree, and 5 = strongly agree). Finally, family values were measured by the statements, “The happiness of the family should be prioritised over the interests of the individual”, and “Whoever takes care of their parents more among their children should inherit more from the family”, with the answers placed on a seven-point scale (1 = Strongly agree, 2 = Quite agree, 3 = Somewhat agree, 4 = Don’t care to agree or disagree, 5 = Somewhat agree, 6 = Quite disagree, 7 = Strongly disagree), and the measure was reverse-coded.

Structural solidarity was expressed through the geographical proximity of family members (Bengtson and Roberts 1991), including one question, “How far does [your parent] live from your home?” Answers were coded on a six-point scale (1 = neighbour, 2 = within 15 min’ walk, 3 = within 30 min’ drive, 4 = within 30 min’ to 1 h drive, 5 = within 1–3 h’ drive, and 6 = more than 3 h’ drive), with reverse coding (i.e. the closer the distance the higher the score).

Table 1 Independent variables and descriptive statistics.

Variables	Description of indicators	Frequency	Percentage (%)
Demographics			
Gender	Male = 1	555	43.7
	Female = 2	715	56.3
Type of living area	Urban = 1	757	59.6
	Rural = 2	513	40.4
Education level	Primary school and below = 1	191	15.0
	Junior high school = 2	364	28.7
	Senior high school (including vocational high school and general high school) = 3	263	20.7
	University and above = 4	452	35.5
Marital status	With legal spouse (first marriage with spouse, remarriage with spouse, separation without divorce) = 1	1008	79.4
	Without legal spouse (including unmarried, cohabitating, divorced, widowed) = 2	262	20.6
Personal characteristics			
Annual income for the previous year (RMB)	5000 and below = 1	246	19.4
	5001-20,000 = 2	224	17.6
	20,001-50,000 = 3	400	31.5
	50,001 and above = 4	400	31.5
Self-rated well-being	Unhappy = 1	88	6.9
	Average = 2	153	12.0
	Happy = 3	1026	80.8
Self-rated health status	Bad = 1	102	8.0
	Average = 2	298	23.5
	Good = 3	870	68.5

Independent variable. The independent variables were divided into two categories: the demographic and personal characteristics of the respondents. Demographic characteristics include gender, living area, education level, and marital status. Personal characteristics include the individual’s annual income in the previous year, self-rated well-being, and self-rated health status. Adult children with higher levels of economic status may strengthen intergenerational support for their parents, while those who perceive themselves to be unhappy and in poor health may weaken the strength and frequency of intergenerational support. Self-rated well-being was included due to the wealth of research on the impact of intergenerational support on older people’s well-being, but the paucity of work on whether children’s well-being influences their provision of support to older people. Table 1 describes the variables and offers descriptive statistics for the sample.

Statistical modelling and analytical strategies. LPA evolved from LCA, in which latent class variables are used to explain associations between exogenous indicators through the latent class model, which allows for the classification of individuals in heterogeneous populations into smaller homogeneous subgroups (Collins and Lanza 2010). The latent variables of both LCA and LPA are class variables, but the exogenous variables of LPA are continuous variables, which are mathematically modelled as:

$$f(I_k) = \sum_{t=1}^T P(C = t) f_t(I_k | \mu_t, \Sigma_t) \tag{1}$$

In Eq. (1), the distribution of the exogenous variables is assumed to be a mixed distribution with t potential profiles and each potential category having its own mean vector and covariance matrix, $f(I_k)$ represents the probability density function of the observed data I_k , $P(C = t)$ denotes the prior probability of latent class t , $f_t(I_k | \mu_t, \Sigma_t)$ is the multivariate normal distribution density function of latent class t with mean vector μ_t and covariance matrix Σ_t . Typically, the conditional distribution under each potential category is assumed to be normal since the exogenous variables of the LPA are continuous variables.

The fitness test of the LPA model is performed using the number of free parameters (nf), log likelihood, Akaike information criterion (AIC), Bayesian information criterion (BIC), sample-corrected BIC (aBIC), entropy, Lo–Mendell–Rubin (LMR), and bootstrap-based likelihood ratio test (BLRT). In general, the smaller the values of AIC, BIC, and aBIC, and the higher the entropy value, the better. Entropy represents the degree of accuracy of the classification and takes a value between 0 and 1. In this study, entropy equals 0.8, indicating that the classification accuracy is more than 90%. In addition, if the p -values of the LMR and BLRT are <0.001 , this indicates that the classification of this K-profile is better than that of the K-1 profile (Wang and Bi 2018). Mplus 8.0 software was used to conduct LPA.

We next identified the profiles of the intergenerational relationships and used this variable as the dependent variable. Multi-categorical logistic regression models were used to test the influence of adult children’s demographic and personal characteristics on intergenerational support. IBM SPSS 21.0 software was used to conduct this part.

Results

Determination of the latent profile and model selection. The results (Table 2) showed that the nf and entropy values are proportional to the number of latent profiles, and log(L), AIC, BIC, and aBIC all decrease as the number of latent profiles increases. The interpretability of the categories should also be integrated when determining the optimal model (Wang and Bi 2018). Although each information index was optimal when retaining the sixth profile (nf had the highest value; AIC, BIC, and aBIC all had the lowest values and the highest value of entropy), neither the LMR nor the BLRT was significant (i.e. the sixth profile was not better than the fifth profile). With the fifth profile retained, all tests classified better and more accurately than the fourth profile, and the LMR and BLRT also supported the fifth profile. Taken together, the fifth profile model was better for predicting the LPA model.

Table 2 Fit indicators for latent profile models of intergenerational relationships.

Model	nf	Log(L)	AIC	BIC	aBIC	Entropy	LMR	BLRT	categorical probability
P1	10	-8941.208	17902.416	17953.884	17922.119				1
P2	16	-8637.711	17307.421	17389.770	17338.946	0.627	0.0000	0.0000	0.494/0.506
P3	22	-8520.490	17084.980	17198.209	17128.327	0.708	0.0000	0.0000	0.254/0.584/0.162
P4	28	-8449.383	16954.767	17098.876	17009.935	0.723	0.0034	0.0030	0.211/0.214/0.206/ 0.369
P5	34	-8396.527	16861.054	17036.044	16928.043	0.760	0.0331	0.0309	0.229/0.060/0.402/ 0.172/0.137
P6	40	-8329.313	16738.626	16944.497	16817.437	0.805	0.1061	0.1021	0.201/0.123/0.156/ 0.239/0.127/0.155

Bold indices are for the selected model.

nf free parameters, log(L) model log likelihood, AIC Akaike's information criterion, BIC Bayesian information criterion, aBIC sample-size-adjusted BIC, LMR Lo-Mendell-Rubin, BLRT bootstrap likelihood ratio test.

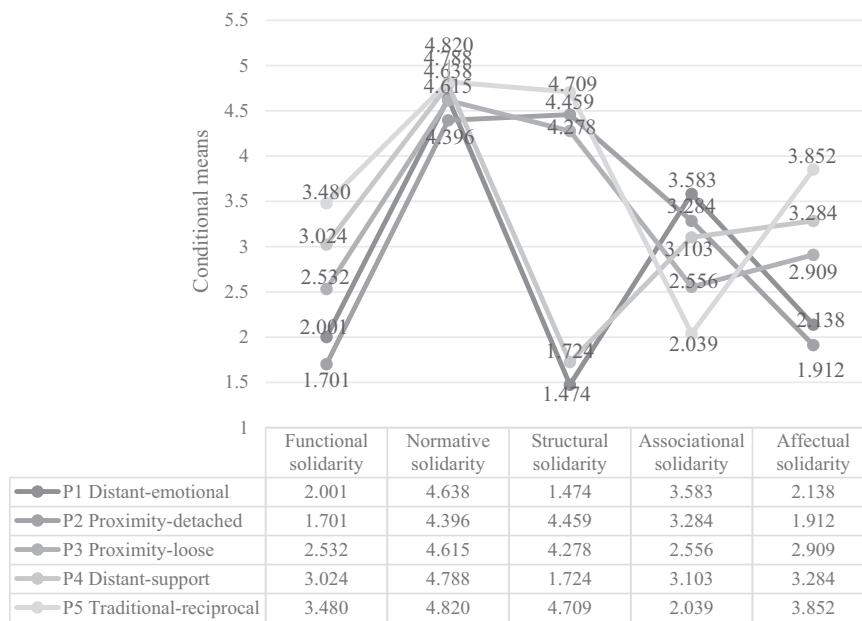


Fig. 2 Probability of scoring on each dimension for the latent profile. The conditional probability means and characteristics of five latent profiles, distant-emotional, proximity-detached, proximity-loose, distant-support, and traditional-reciprocal, across the five dimensions of family intergenerational relationships.

Profile composition and identification. As noted, the model that best fit the data indicates five profiles. The conditional probability means and the characteristics of the five latent profiles across the five dimensions of family intergenerational relationships were obtained (Fig. 2). Similarly, based on the intergenerational solidarity model and from the perspective of non-cohabiting adult children, Yi and Lin (2009) observed five types of intergenerational relationship patterns using LCA: Sociable, Tight-knit, Normative, Intimate but distant, and Detached. However, due to sample differences and times, the five intergenerational relationship types we obtained exhibit some variations. We will conduct a detailed comparative analysis in the following context.

Firstly, P1 is the distant-emotional group ($n = 291, 22.91\%$), a profile that scores highly on normative solidarity, and produces the highest mean scores on the associational solidarity dimension. However, it produces the lowest scores on structural solidarity (the most distant living arrangement relative to the two generations). At the same time, this profile did not earn the lowest functional solidarity scores due to the group's long-distance living arrangements. It is clear that, in this profile, both generations are willing to maintain high-frequency contact and provide appropriate support despite the distance. Furthermore,

the low reciprocity scores are the result of distance rather than a gradual erosion of emotional or filial values on both sides. This profile is similar in several ways to the “support but distant (mostly not living with parents but with high frequency of contact and reduced reciprocity)” (Huang et al. 2017) and the “intimate but distant (emotionally close, frequent contacts, providing a certain level of instrumental support but not living together)” (Yi and Lin 2009; Ma 2016).

Secondly, P2 is the proximity-detached group ($n = 76, 5.98\%$), which has the second-highest scores on the structural solidarity dimension (i.e. the two generations live relatively close to each other), but the lowest scores on functional solidarity, normative solidarity, and affectual solidarity. Older people in this profile are the least likely to receive specific old-age supports, and their children, who may be more interested in profit or more concerned with their own personal development as adults and the building of a new family than with the traditional filial piety and affection required by their family of origin, are also unable to receive high levels of downward support from their parents due to having fewer opportunities to meet and the weakening of the upwards-directed support. P2 shares similar characteristics with the “detached” type proposed by Yi and Lin (2009), as both

maintain a relatively high level of contact with older parents but receive the lowest scores in terms of norm, providing assistance, and emotionally close.

Thirdly, P3 is the proximity-loose group ($n = 510$, 40.16%), which is most clearly characterised by high scores on structural solidarity and is ranked third highest in terms of distance (meaning that the two generations do not live very far from each other). But the group does not score highly on the functional, association, or affective solidarity dimensions (i.e. fewer inter-generational reciprocal behaviours). Because the normative solidarity scores for this profile are moderate, they indicate that the adult children in this group still have a sense of filial piety, but not enough to act on it, which results in the older generation being visited and cared for by their children less frequently than those in other groups. In addition, the proportion of respondents falling into the P3 is the highest among all groups, suggesting that this profile is widespread and representative of China's inter-generational relationships today. From this perspective, it validates the previous conclusion that "while the trend of cohabitation between parents and adult children is declining, the trend of living in close proximity geographically is on the rise" (Kim et al. 2015) as well as a new type of living arrangement in Asia, "quasi-cohabitation" or "quasi-coresidence"—not living with family members, but having them nearby (Chan 2005; Chen 2005). However, we cannot equate the characteristics of P3 with any of the types obtained in the study by Yi and Lin (2009).

Fourth, P4 is the distant-support group ($n = 219$, 17.24%), which highlights the fact that, although the two generations live far apart, they are willing to give each other practical support in terms of emotions, finances, and tools. This type of family relationship is truly intergenerational in character, with a higher likelihood of older parents receiving financial and informal support from their children, thanks to the offspring's sense of responsibility to provide for them. This not only illustrates more "distant/supportive" characteristics (Zeng and Li 2020), but is also similar to the "extended families" (Song and Li 2017). This suggests that, for this group, intergenerational relationships still exist, but family members are geospatially dispersed. It's worth noting that both P4 and P1 exhibit certain characteristics of "intimate but distant" (Yi and Lin 2009). Although the normative solidarity scores for both profiles are in high level, the major difference between P4 and P1 lies in the fact that P1 provides support based on the dimensions of connection and emotions, whereas P4, in addition to having a high emotional connection with older parents, also provides more instrumental support.

Finally, P5 is the traditional-reciprocal group (174, 13.70%), which not only received the highest score for structural solidarity (where the two generations do not live in the same place but are closest in terms of distance relative to the other profiles of the relationship), but also for functional solidarity, normative solidarity, and affectual solidarity. Although the scores for associational solidarity were not the highest, the reason for this may be that the two generations live closer together, have more opportunities to reciprocate with each other, and are less likely to be in touch by means other than meeting in person (including phone calls, letters, email, etc.) relative to other profiles. It is apparent that even if they maintain a certain frequency of 'face-to-face' interaction, they may lower the average score of association solidarity due to infrequent contact through other means (such as phone, letter, or email). Traditional methods of face-to-face contact between older adults and their children have been replaced by distance contact such as phone calls, text messages and emails (Yang et al. 2023). This group is characteristic of 'networked families', where generations live in close proximity and remain physically and emotionally connected (Davis and Harrell 1993; Silverstein et al. 2006), and is consistent

with groups explored in studies such as Ma's (2016) study that examined the connotations of "intimate and reciprocal" urban families. P5 shares many similarities with the "normative" type identified by Yi and Lin (2009): frequent visits to parents, a higher likelihood of providing financial support, assisting with household chores, and adherence to relatively high filial norms. However, in our study, P5 differs from the "normative" type not only in terms of quantity (as P5 comprises only 13.70% of adult children, while "normative" type reached 49.21% in their study) but also demonstrates a higher level of intergenerational emotional connection. Importantly, we both acknowledge that this type of group conforms more to East Asian normative expectations in interacting with parents.

Social characteristics of the population in different profiles and the group portrait of "proximity-loose" (P3). Table 3 presents statistical analyses of the demographic and social characteristics of the relationship profiles. The chi-square test results indicate that there are significant differences between the profiles on all characteristics. Due to P3 constituting the largest sample ($n = 510$, 40.16%), it is necessary to delve deeper into the "portrait" of this latent profile: more than half of the offspring are female (54.7%), over half live in an urban area (58.8%), over three-quarters have a legal spouse (83.7%), and one-third (31.8%) have an education level of junior high school. Furthermore, during the previous year (2016), one-third of people in this profile had an annual income of 20,001 RMB to 50,000 RMB (34.5%), and about a quarter (27.3%) earned 50,001 or above. 81.9% of the people in this profile rated themselves as happy, and 63.9% rated themselves as healthy. Importantly, compared to the other profiles, adult children in the P3 have fewer barriers to providing intergenerational support to older persons in terms of "geographical distance" (while not as high as P5 in the dimension of structural solidarity, Fig. 2 clearly illustrates that the adult children of P3 are not too far geographically distant from their parents), and most of them have not fallen into a situation where they are unable to support their parents because of low income, poor health, or a less-than-enjoyable life. Thus, the values and needs of the new era have influenced intergenerational cohabitation, on the one hand, and weakened filial piety on the other. From this point of view, this study also supports the conclusion of previous research that "the function of intergenerational support in urban areas is gradually disappearing" (Yu 2017, p. 68) and "the likelihood of adult children in urban areas maintaining strong traditional relationships is lower than that of adult children in rural areas" (Park et al. 2005). It should be noted that other latent profiles are also important, but the significance of elaborating on each profile in this section is limited. Subsequent multivariate regression analyses will present more specific results.

Multinomial logistic regression analyses. Further, multivariate logistic regression analyses were conducted to test the effects of the demographic and personal characteristics on the different profiles. The reference category in the model is the traditional-reciprocity group (P5), and the results of the model estimation are shown in Table 4. Gender, type of living area, marital status, education level, annual income in the previous year, self-rated well-being, and self-rated health status all show significant effects. Observing the values of $\text{Exp}(B)$ and the significance helps clarify the comparative relationships of different latent profiles across various variables.

Specifically, men were more likely to be proximity-detached (P2) than women ($\text{Exp}(B) = 2.086$, $p < 0.05$). This contradicts Gan and Feng (2020) findings, which showed that women (but not men) transcended filial traditions and had lower standards of

Table 3 Social characteristics of the population in different profiles (n [%]).

Variables	Distant-emotional (P1)	Proximity-detached (P2)	Proximity-loose (P3)	Distant-support (P4)	Traditional-reciprocal (P5)
Gender					
Male	129(44.3)	38(50)	231(45.3)	87(39.7)	70(40.2)
Female	162(55.7)	38(50)	279(54.7)	132(60.3)	104(59.8)
Type of living area					
Urban	178(61.2)	31(40.8)	300(58.8)	130(59.4)	118(67.8)
Rural	113(38.8)	45(59.2)	210(41.2)	89(40.6)	56(32.2)
Marital status					
Without legal spouse	84(28.9)	12(15.8)	83(16.3)	58(26.5)	25(14.4)
With legal spouse	207(71.1)	64(84.2)	427(83.7)	161(73.5)	149(85.6)
Education level					
Primary schools and below	48(16.5)	24(31.6)	79(15.5)	22(10.1)	18(10.3)
Junior high school	78(26.8)	30(39.5)	162(31.8)	46(21.1)	48(27.6)
Senior high school	57(19.6)	11(14.5)	109(21.4)	50(22.9)	36(20.7)
University and above	108(37.1)	11(14.5)	160(31.4)	100(45.9)	72(41.4)
Annual income for the previous year (RMB)					
5000 and below	62(21.3)	25(14.7)	88(17.3)	45(20.5)	26(14.9)
5001–20,000	44(51.3)	20(26.3)	107(21.0)	25(11.4)	28(16.1)
20,001–50,000	86(29.6)	16(21.1)	176(34.5)	56(25.6)	66(37.9)
50,001 and above	99(34.0)	15(19.7)	139(27.3)	93(42.5)	54(31.0)
Self-rated well-being					
Unhappy	29(20.2)	7(9.2)	33(6.5)	10(4.6)	9(5.2)
Average	45(15.5)	12(15.8)	59(11.6)	26(11.9)	11(6.3)
Happy	217(74.6)	57(75.0)	416(81.9)	182(83.5)	154(88.5)
Self-rated health status					
Bad	17(5.8)	11(14.5)	51(10.0)	7(3.2)	16(9.2)
Average	61(21.0)	19(25.0)	133(26.1)	50(22.8)	35(20.1)
Good	213(73.2)	46(60.5)	326(63.9)	162(74.0)	123(70.7)

Results are all significant at the $p < 0.001$ level.

filial behaviour. However, previous studies analysing CGSS data from 2015 also found that an increase in the number of daughters rather than sons significantly improves the mental health of urban and rural widowed older adults (Sun and Zhang 2021), with daughters tending to provide more intergenerational support and practical day-to-day care for their older parents, and daughters also having a higher sense of filial responsibility and being more adept at expressing a sense of closeness to their parents relative to their sons. Next, adult children living in rural areas are more likely to be distant-supporters (P4) than those in urban areas ($\text{Exp}(B) = 0.531$, $p < 0.01$). This phenomenon may relate to the issue of migrant labours from rural areas working in different locations (Schmidt-Kallert and Franke 2012; He 2022).

In terms of marital status, adult children without a legal spouse have a higher chance to be the distant-emotional group ($\text{Exp}(B) = 2.434$, $p < 0.01$) and distant-support group ($\text{Exp}(B) = 1.999$, $p < 0.05$) than those with legal spouses, respectively. Conversely, those with legal spouses are more likely to become part of the traditional-reciprocity group. Unmarried youth—those without spouses—have transformed the traditional function of care for older adults, particularly in families with multiple children. This shift is evident as unmarried sons working away gradually separate from their family of origin, with their obligations to care for older parents transitioning to the families of their married siblings (Chen 2017). On the contrary, married children have a higher probability of forming a close relationship or being closer to their parents; that is, the main functions of the younger generation are maintained even though the offspring do not live with their parents, and marriage seems to be conducive to children supporting their parents, in terms of the feedback model (Zeng and Li 2020).

Compared with those who have a university education and above, adults with a primary education and below are more likely

to be distant-emotional ($\text{Exp}(B) = 2.756$, $p < 0.01$), proximity-detached ($\text{Exp}(B) = 8.075$, $p < 0.01$), and proximity-loose ($\text{Exp}(B) = 1.941$, $p < 0.1$) rather than traditional-reciprocal. To be distant-emotional may be a realistic choice based on going elsewhere to work, while those who are proximity-detached or proximity-loose are more likely to be driven by self-interest rather than filial piety. Meanwhile, the probability of becoming proximity-detached is 4.258 ($p < 0.01$) and 2.300 ($p < 0.1$) times higher, respectively, for those with a junior or senior high school education than for those with a university education or above. Thus, families with more educated children are relatively more likely to be traditional-reciprocal group. Park et al.'s (2005) study also demonstrated that individuals with higher levels of education exchange tools and economic support more frequently. From an income perspective, adult children with incomes of 5001–20,000 ($\text{Exp}(B) = 0.493$, $p < 0.1$) or 20,001–50,000 ($\text{Exp}(B) = 0.618$, $p < 0.1$; $\text{Exp}(B) = 0.477$, $p < 0.01$) are more likely than the highest-income cohort (with incomes of ≥ 50001) to be traditional-reciprocal group. This contradicts the conclusion drawn in previous studies that “lower income often leads to the ‘Detached’ type” (Yi and Lin 2009).

Finally, the results for self-rated happiness were significant in all models. In “P1/P5”, those who rated themselves as unhappy ($\text{Exp}(B) = 2.586$, $p < 0.05$) or average ($\text{Exp}(B) = 2.644$, $p < 0.01$) were more likely to be distant-emotional than those who rated themselves as happy. Working adults need to support their older parents and children at the same time, which creates a lot of pressure on them; thus, they have the lowest level of happiness during their middle-aged years (Zhang 2020), and these children might prefer to be closer to their parents to obtain the comfort of family. In both the “P3/P5” and “P4/P5” models, those who rated themselves as having average happiness ($\text{Exp}(B) = 1.784$, $p < 0.1$) were more likely to be proximity-loose than those who rated

Table 4 Multi-categorical logistic regression analyses, by profile (N = 1270).

Variables	P1/P5		P2/P5		P3/P5		P4/P5	
	Exp(B)	SE	Exp(B)	SE	Exp(B)	SE	Exp(B)	SE
Gender (Female)	1.141	0.208	2.086	0.304	1.296	0.188	0.940	0.221
Male								
Living area (Rural)	0.755	0.227	0.571	0.319	0.776	0.205	0.531	0.238
Urban								
Marital status (With legal spouse)	2.434	0.270	1.553	0.416	1.263	0.262	1.999	0.283
Without legal spouse								
Education level (University and above)	2.756	0.377	8.075	0.538	1.941	0.349	1.339	0.416
Primary school and below	1.524	0.275	4.258	0.454	1.503	0.248	1.007	0.294
Junior high school	1.390	0.281	2.300	0.498	1.411	0.253	1.351	0.286
Senior high school								
Annual income for the previous year (RMB) (50,001 and above)	1.029	0.336	2.085	0.481	1.120	0.318	1.010	0.347
5000 and below								
5001-20,000	0.607	0.337	1.197	0.472	1.140	0.302	0.493	0.363
20,001-50,000	0.618	0.254	0.567	0.430	0.898	0.231	0.477	0.267
Self-rated well-being (Happy)								
Unhappy	2.586	0.437	1.172	0.582	1.131	0.419	1.348	0.511
Average	2.644	0.363	2.390	0.460	1.784	0.349	2.032	0.387
Self-rated health status (Good)								
Bad	0.291	0.419	0.650	0.501	0.860	0.347	0.256	0.510
Average	0.967	0.250	1.148	0.347	1.305	0.223	1.176	0.259

Nagelkerke-pseudo-R² = 0.121, -2 Log Likelihood (-2LL) = 1721.897; The reference profile is traditional-reciprocity (P5) and the variables in parentheses are reference variables. *, **, and *** denote 10, 5, and 1% significance levels, respectively. P1 is distant-emotional, P2 is proximity-detached, P3 is proximity-loose, P4 is distant-support, and P5 is traditional-reciprocal.

themselves as happy; they were also 2.032 ($p < 0.1$) times more likely to be distant-support than those who rated themselves as happy. Finally, the probability of being distant-emotional group and distant-support group in poor health is 0.291 ($p < 0.01$) and 0.256 ($p < 0.01$) times higher, respectively, compared to those in good health. In other words, people in bad health are more likely to belong to traditional-reciprocal group instead of the group of distant-emotional or distant-support than their counterparts in good health. This may also effectively confirms why the features of P5 are “reciprocal”: Some offspring in P5, due to their own poor health conditions, at times seek assistance from their parents as well as engage in the exchange of resources. Moreover, the geographical proximity of the two generations in P5 makes it convenient for them to swap resources and assist each other.

Discussion

This paper is in line with Yi and Lin (2009), focuses more on the upward intergenerational support provided by adult children to their parents as well as the non-co-residing. In today’s rapidly ageing society, family care is still the most important mode of support for older adults in China. Exploring the intergenerational relationships within this group will not only contribute to our understanding of future intergenerational relationship patterns but also provide new insights for the development of social welfare and family policies in the evolving East Asian societies.

Therefore, based on the theory of intergenerational solidarity and CGSS 2017 data, this paper distinguishes profiles of intergenerational relationships between the two generations living apart and explores the influence of demographic and sociological factors on the profiles by means of LPA. We answer the 3 research questions proposed above and reach conclusions different from those of previous studies: 1) When two generations don’t live together, family intergenerational relationships can be categorised into five latent profiles: distant-emotional (P1), proximity-detached (P2), proximity-loose (P3), distant-support (P4), and traditional-reciprocal (P5); 2) The largest profile is proximity-loose (P3), which comprises more females, with over half residing in urban areas. Moreover, over three-quarters have a legal spouse (83.7%), and about one-third (31.8%) have completed junior high school. In the previous year (2016), a substantial portion of individuals in this profile reported a moderate annual income, while roughly a quarter (27.3%) earned a higher income. Within this profile, a significant majority of individuals rated themselves as happy (81.9%), and a considerable percentage (63.9%) perceived their health positively; and 3) Gender, education level, annual personal income for the previous year (2016), self-rated happiness, and self-rated health all had significant effects on the different latent profiles.

Foremost, intergenerational relationships between non-cohabitation older parents and their adult children are classified into five profiles (P1- P5) by LPA. The highest proportion of respondents in this study were classified as proximity-loose (P3), reflecting a shift in the traditional filial culture whereby, when two generations do not live together but are in close proximity, the children often do not provide intergenerational support in the form of economic, instrumental, and emotional support. The weakening of intergenerational bonds when families do not live together has become more common as a result of modernisation and the dramatic transformation of societies. Although the percentage of proximity-detached (P2) is only 5.98%, the presence of this profile reinforces the fact that a segment of the country’s older population lacks informal care. Even if there are relatively healthy older people in this group who are able to take care of themselves and their partners, multidimensional chronic diseases or other secondary illnesses will appear with time and age, so this

group should not be ignored due to the small size of the sample. The emergence of the distant-emotional (P1) and distant-support (P4) also illustrates that the turnover of intergenerational relationships is not only caused by the differences in the morphological structure within the family, but is also inextricably linked to factors such as the shrinking number of children and the frequent movement of populations in the broader context of overall societal changes (Guo et al. 2020). Although not predominant and not practicing intergenerational cohabitation, the emergence of the traditional-reciprocity group (P5) signals the continuation of the feedback model that is characteristic of Chinese culture.

Meanwhile, these five profiles of intergenerational relationships differed significantly in terms of their demographic and personal characteristics. Overall, adult children who are male, who live in a rural area, who have no legal spouse, who have a primary school education or below, whose annual income is higher than 50,001, who rate themselves as unhappy or average, and who consider themselves as being in good health are more likely to deviate from the traditional filial support track (i.e. they are less likely to be traditional-reciprocal) than their counterparts in each category. Unlike most previous studies that focus on the well-being and health of only one side of the relationship (older people), this study provides evidence on these factors among the adult children. Those who rated themselves as happy were more likely to belong to the traditional-reciprocal group, which shows that maintaining frequent and positive intergenerational support can be helpful for the mental health of both generations. Intergenerational support and resources flow in both directions, and even now, as the family's upward caregiving needs diminish, the children's need for downward support from their older parents intensifies (Li and Hu 2021), with the adult children providing emotional or instrumental support while receiving downward financial and instrumental (help with grandchildren, cooking and cleaning, etc.) help from their parents.

Based on the above findings, this paper makes the following recommendations. Firstly, since the "proximity-loose" (P3) adult children, constituted largest percentage and do not have a strong sense of responsibility, this should be given primary attention. Filial behaviours are driven by both affective (the offspring's motivation to maintain family harmony and respect for their parents) and behavioural (the motivation to sacrifice themselves, to take on responsibility, and to give back to their parents) factors (Sung 1995). Hence, while continuing to foster a culture of respect and care for older individuals on a broader scale, government departments should also extend their attention to adult children in pertinent legislation. The government should "adopt a multi-pronged approach" to urge adult children to fulfil the obligation of support for older people who are living alone (including those who are co-housed with an older married couple). Drawing on the practices of developed countries such as Sweden, it would be beneficial to legally specify emotional support for the older adults, define the frequency and duration of children's visits to their parents. Additionally, implementing policies supporting aging-in-place under the "Social Services Act" could provide home care services for the older adults. This would serve to complement and appropriately substitute the work of informal caregivers, including adult children working away from original home (Brändström et al. 2022). In accordance with traditional Chinese norms, regular face-to-face interactions and functional support are still considered obligations of adult children. Doing so may help prevent manifest generational conflict and negative social reactions, maintaining fundamental intergenerational relationships and communication (Yi and Lin 2009). Furthermore, through specific legislation and regulations, there can be better regulation of caregiving obligations for other types

of adult children, such as those who are "proximity-detached". In this way, for all profiles of adult children, at least in terms of association solidarity and emotional solidarity, corresponding safeguards can be provided for the older adults.

Secondly, as mentioned earlier, not living with parents is sometimes based on the need for adult children to work or study in different locations. Therefore, in addition to considering the obligations of adult children, we need to emphasise their interests and social welfare. Our study also demonstrates that adult children across all profiles score high on norms (implying that their traditional East Asian concept of filial piety remains strong), and that these profiles are affected by socio-demographic factors such as income, level of well-being, and level of health. And the vast majority of young and middle-aged people may have a strong willingness to support their parents, but their ability to do so is weak (Ouyang 2018). Considering how social welfare policies can assist them in caring for older adults is crucial, as this relates to adult children of different profiles continuing to provide ongoing economic and instrumental support for their older parents. The state should formulate relevant policies and give support to residents in terms of social welfare, such as children's education, childcare, labour rights, and a parental leave system. For example, they may pilot and promote a reverse mortgage loan ("Yifang yanglao", 以房养老) policy (Chen and Huang 2013). At the same time, direct assistance (e.g. monetary and material) is short-lived and does not allow for the continuation of the support function of such families. The East Asian government-led social security system needs broader recognition either on a family basis or through families (Zheng 2012). It is essential to construct family-oriented social security policies, continuously addressing the caregiving pressure faced by families. However, a balance must be struck between "familyism" "de-familialization" and "re-familialization" (Han 2014). The three basic elements of China's social security system—social insurance, social assistance, and social welfare—should be utilised to meet the survival and living needs of adults, ensuring their sustained ability to provide continuous support for the older adults (Wang and Yu 2021).

Specifically, efforts should be made to enhance social insurance coverage for laborers facing risks such as aging, illness, unemployment, childbirth, and work-related injuries. The focus of minimum living guarantees and social assistance should be determined through household economic surveys. Additionally, there should be an increase in various public welfare facilities, provision of subsidy allowances, and organisation of social services to ensure the effective delivery of social welfare. Paying attention to the development of the whole life-cycle and the whole family, to enhance the sense of adults' well-being, to achieve work-life balance, and to ensure that the family's care can continue to obtain new resources to enable the family to effectively perform its internal support function. In this way, regardless of the profile of adult children, they can possess the ability to provide economic and instrumental support to older adults through the government's and society's "empowerment" of families. This not only meets the functional solidarity within families but also strengthens normative solidarity further.

Thirdly, the "non-co-residing" issue resulting from economic globalisation and social changes is unavoidable (Goode 1970). It is unrealistic to mandate through either laws or policies that adult children must live with or near their parents. The Goode Family Modernisation Model emphasizes a balance between cultural values and practical constraints, implying that the actual living arrangements of older individuals are determined by a weighing of real conditions and cultural values. People may not necessarily desire things they cannot have (Sereny and Gu 2011). Adult children, who must distance themselves geographically and socially from their parents or face socio-economic stagnation if

they want to maximise their occupational mobility (Silverstein and Bengtson 1997). Therefore, the structural solidarity in intergenerational relationships is essentially beyond control and regulation through external forces. Since the spillover of intergenerational support from the micro-family level to the macro-social level is irreversible, moreover, aging at home or in a familiar community, rather than being transferred to nursing homes, is the preferred later-life living arrangement for the majority of older people in China (Wang 2014). Through the home and community-based environment, the government should continue to promote the integrated care (“*Yiyang Jiehe*”, 医养结合) model and community care services, vigorously develop social and private older adults’ care service organisations, and combine them with intelligent care and ageing-friendly technology, while gradually realising the desire of older people to live at home and age in place (Chen 2017; Wang and Liu 2023; Hu et al. 2023). At the same time, relying entirely on the support of the state, society, and adult children for health and livelihood is neither realistic nor sustainable. The primary responsibility for maintaining health lies with oneself. Human health is determined by their behaviours, diet, and the environment they inhabit (Knowles 1977). The concept of active ageing put forward by the World Health Organisation should be advocated to encourage the participation of older people in society and shift the concept of “ageing” to a positive dimension, gradually empowering older adults to provide for their own safety and security through the regular activities and services offered by the community and social organisations (Hu et al. 2023). This would also help those who do not have a serious illnesses to improve their health literacy and manage their health.

Forth, our study also found that males, those residing in rural areas, without a legal spouse, and with primary school or lower education levels are less likely to be “traditional-reciprocal (P5)”. While these influencing factors are often complex and uncontrollable, it is evident that future governments and scholars should consider the impact and implications of gender, urbanisation, marriage, and education on intergenerational relationships. Given that these more detailed branches are not the focus of this study, they will not be further discussed or provided with more specific recommendations.

In summary, intergenerational relationships within the family reflect a combination of individual perceptions of responsibility, filial piety and values, and their behavioural manifestations, along with social norms and realities. As emphasised by Bengtson (2001), the structure and function of families have undergone significant changes, and it is necessary and meaningful to shift the discussion from macro-level societal trends (aging population and intergenerational demographics) to the micro-level social dimension (types of solidarity and cross-generational relationships). Therefore, the problem of supporting older people who do not live with their children is a dynamic issue affected by multiple factors. How people treat the older adults is a compromise between cultural value directives and the pressures of reality. To solve this problem, it is necessary to redefine the tension between “filial piety” and “support” in this new era on the basis of adhering to the essence of traditional filial piety, effectively combining family care with social care and social welfare, and taking into account the needs of the family and the individual while adapting to the development of the times. This article does not criticise Chinese adult children who fail to fulfil their caregiving obligations or do not live together with older parents. Instead, it aims to discuss the issues behind the epoch social phenomenon of “non-co-residence”. Governments considering various aspects when formulating social policies, addressing both the healthcare needs of older adults and understanding the caregiving pressures faced by adult children, especially those from

the ‘one-child’ policy generation in China (Gui and Koropeckyj-Cox 2016).

This study still has some limitations that can be addressed in future research: Firstly, due to the research objective and sample population, questionnaire items and data, only five of the six dimensions of intergenerational solidarity theory were selected for this study. We were not able to measure “consensual solidarity” or examine whether there is a conflict of values between adult children and older parents. We also could not assess older people’s income, health care expenditures, or social security status. Secondly, this study is a cross-sectional survey, and because the CGSS questionnaire has not been consistent in its measurement of family situation over the years, it is not possible to use longitudinal panel data to understand the turnover and transformation of intergenerational relationships between the two generations living apart. Therefore, future research could incorporate the macro-social security system into the analysis and consider whether the consensual solidarity dimension affects the emergence of new intergenerational relationship categories through more cross-sectional and longitudinal data. It could also raise government and scholarly interest in people who do not reside with their children and their child support behaviours and perceptions.

Conclusion

This study, from the perspective of adult children in China and employing latent profile analysis (LPA), identified five distinct latent profiles of intergenerational relationships within non-co-residence and explored the factors influencing these latent profiles, and addresses the three research questions initially proposed. By employing rigorous theories and scientific methods, it addresses the shortcomings of previous research, such as focusing solely on the overall older population while overlooking those older adults who do not live with offering and receive immediate care from their children, concentrating only on older adults without considering the thoughts and behaviours of adult children, or neglecting a “person-centred” research approach and not emphasising the heterogeneity of the population. We aim to gain insight into the caregiving needs of different households from the perspective of adult children and provide differentiated social policy responses. Furthermore, the most significant innovation that sets our study apart from previous research is that all identified intergenerational relationship types in our study exhibit structural characteristics of “relative distance” (indicating which profiles of intergenerational relationships are geographically closer or farther away). This study also calls for attention to the significance of “non-co-residence” situations, even though cohabitation does not necessarily guarantee better care for older adults. However, for those lacking immediate support from their children and unable to access effective social or community-based safeguards, their welfare and interests still should be fully considered. Particularly in today’s Chinese society, where the proportion of multi-locational households is steadily increasing, considering social welfare policies for both generations is beneficial for the accumulation of family caregiving capital and the activation of intrinsic motivations.

Data availability

Publicly available datasets were analysed in this study. The datasets analysed for this study can be found in the <http://cgss.ruc.edu.cn/>.

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Competing interests

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Ethical approval

Ethical approval was not required as the study did not involve human participants

Informed consent

This article does not contain any studies with human participants performed by any of the authors.

Additional information

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