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Co-resident Grandparents and Grandchildren's Academic Performance in Taiwan

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Abstract

Using the Taiwanese panel survey data, we investigate the consequences of children's co-residence with grandparents, and we find a positive effect on academic achievement. Further analysis reveals different types of effects among the various types of grandparent-grandchild co-residence. While long-term co-residence confers the most educational benefits, a recent transition into co-residence confers no such advantage. Compared to other co-resident situations, children who recently transition out of co-residence with grandparents are the most disadvantaged. Furthermore, we find educational benefits of co-resident grandparents in both single-parent and two-parent families, but long-term co-resident grandparents' positive association with grandchildren's academic achievement is the most pronounced in households where both parents are absent. We interpret these finding using a theoretical framework, and discuss their implications for policy and for other research.

Keywords: grandparents, co-residence, family structure, academic achievement

Co-resident Grandparents and Grandchildren's Academic Performance in Taiwan

A decade of research on the living arrangements of the elderly has produced ample evidence that co-residence between the elderly and their adult children remains common in Asia, despite concerns that industrialization and modernization in Asia has brought with them a preference towards smaller nuclear families (Frankenberg, Chan, and Ofstedal, 2002; Knodel and Ofstedal, 2002). According to the United Nations (2005), 74% of the elderly in Asia co-reside with their adult children. This is far greater than the 26% in Europe and 19% in North America. Asia also has a much higher prevalence rate of co-residence than do developing regions of Africa or Latin America (Bongaarts and Zimmer, 2002). While we know that Asian societies continue to house the elderly within the extended family, we know less about how elderly co-residence affects family processes and the development of children living in multigenerational households.

In this artice we examine whether co-residence between two generations—grandparents (G1) and grandchildren (G3) ("G1G3 co-residence" thereafter)—is linked to grandchildren's educational outcomes in Taiwan. Parents' generation (G2) may or may not be present in this G1G3 co-residence. We focus on educational outcomes among youth because education is consequential to their future life chances. Students' test scores are significant predictors of college attainment and achievement, as well as labor market earnings (Rosenbaum and Kariya, 1991; Jencks and Phillips, 1998). This study asks if G1G3 co-residence benefits children in Taiwan. We extend previous work on the effects of G1G3 co-residence in nonintact families to the effects of G1G3 co-residence in two-parent families. We also expand previous work on G1G3 co-residence at one point in time to include long-term G1G3 co-residence and transitions.

RELEVANT LITERATURE

Research on the effect of grandparents' co-residence on grandchildren is largely an outgrowth of studies of nonintact family structures in the U.S. This literature began in the early

1990s when researchers reported that better school conduct was evident in the 1st year of elementary school among black children with single mothers who shared residence with relatives (Thompson, Entwisle, and Alexander, 1992). First-grade black children in these extended households also obtained higher reading marks than did black children living in single-parent or married-parent families (Entwisle and Alexander, 1996). Younger minority children in preschool benefited from living with grandparents, too. Residence with grandmothers significantly reduced behavioral problems for black and Puerto Rican children who had teenage mothers (Leadbeater and Bishop, 1994). The benefits of co-resident grandparents were also found in adolescence. Co-resident grandparents are associated with higher educational attainment of adolescents born to single mothers (Aquilino, 1996). Using a sample of 8th graders, DeLeire and Kalil (2002) found that adolescents who live in mother-grandparent families have high school graduation and college attendance rates as high as or better than those for adolescents from families with married parents. Although their sample is nationally representative and includes adolescents of all racial groups, few non-black students were found in their sample of mother-grandparent homes. Therefore, the authors suggested that their results on the positive effects of co-resident grandparents may characterize only black children.

Different cultures give different social meanings of co-residence to families and children. Even in the U.S., Asian American children are more likely than other groups to live in homes that include their grandparents (Kamo, 2000). Like Asian Americans, many adult children in Asian countries view co-residence with elderly parents ("G1G2 co-residence" thereafter) as desirable. Likewise, Asian elderly people do not typically prefer living alone to living with their adult children. This is especially true for countries that follow the Confucius tradition of filial piety. In Japan, elderly persons consider it ideal to live with their married sons and to receive care from the daughters-in-law (Lebra, 1976; Tsuya and Martin, 1992). By contrast, leaving parents to live in a retirement home indicates children's failure to fulfill duties of filial piety (Bethel, 1992).

Previous research finds that the expectation to enter G1G2 co-residence declined over time in China, Japan, Korea, and Taiwan – countries with a strong Confucian tradition (Martin, 1990). Wealthier adult children prefer to support their parents with money rather than through co-residence (Lee, Parish & Willis, 1994). In order to maintain independent residence, wealthy children may purchase for their parents separate apartments, household amenities and even domestic service so their parents can live on their own. What, then, is the reason for the continuing trend toward a stable and high proportion of adult children sharing a residence with their elderly parents? From their study of China, John Logan and his colleagues (Logan, Bian, and Bian, 1998) suggest that the G1G2 co-residence decisions arise not so much from a traditional norm but stem from practical needs and challenges—shortages of housing for married couples, inadequate childcare, a poorly developed health care system for the elderly, and a gender-biased system. Similarly, Thai couples tend to co-reside with parents who can serve their needs, rather than the parents making a co-residence decision based on the couples' ability to care for them (Knodel, Chayovan, and Siriboon, 1992). Young couples believe there are many benefits in having parents in the household because parents can perform many useful tasks.

THEORETICAL CONSIDERATION AND HYPOTHESES

Co-resident grandparents can affect their grandchildren positively, and bring them benefits in several ways. Previous literature has shown the advantages of co-resident grandparents for children in households with single parents or without parents. For several reasons, co-resident grandparents can be beneficial to grandchildren even in a two-parent household.

Family relationships and socialization. First, a multigenerational family consists of greater and more varied adult-child relationships than do nuclear families. More and diverse relationships facilitate more adult-child emotional bonds, enabling a child to develop a sense of security for better adjustment in school. Also, the larger web of "intergenerational closure"

generates a higher level of social capital – the social relations between persons that help to facilitate the achievement of goals (Coleman, 1988). More adults in a family will increase the social capital that requires monitoring and supervision of a child. The amount of social control for children facilitates norms of school achievement among young people. Thus, when parents are absent, grandparents can play an important role in a child's development. One can imagine an idealized version of an extended family where grandparents provide support and connections between the grandchild and his/her parents. If wisdom comes with age, a grandparent's help may prove more useful than a parent's help.

Traditional norms and values. Co-resident grandparents' role in family socialization goes beyond promoting and enforcing norms that lead to grandchildren's successful upbringing. Highly-educated grandparents can serve as a child's home tutor. Co-resident grandparents are also likely to demand respect and stress seniority rule at home. A child who learns to be respectful to their grandparents is more likely to be respectful to other adults, including teachers and school administrators. Good behaviors can pay off at school in terms of grades (Jackson, 1968).

Educational expectations. Grandparents, educated or not, who speak to children about their life experiences can help them to place their current circumstances in perspective. By connecting with grandparents who are older than their parents, children can develop a longer perspective of life. The ability to look into the future may enable them to develop educational expectations and to make plans for achieving their ambitions. High educational expectations can buttress a child's current school performance (Entwisle, Alexander, and Olson, 1997).

Domestic services. Moreover, co-resident grandparents can provide many valuable services to the multigenerational family, including babysitting, cooking, errand running, and other household chores. In Taiwan and other parts of Asia, grandparents are preferred as childcare providers for grandchildren. Hermalin, Roan, and Perez (1998) found heavy grandparent involvement in care-taking of grandchildren in the Philippines: 30% of Filipino

grandparents who perform the childcare function take care of three or more grandchildren. For older grandchildren, co-resident grandparents can carry out many household chores for them, directly giving them more time to focus on school work.

Parental involvement. The domestic services offered by co-resident grandparents may change the activities by parents, which indirectly impact grandchildren's education. For example, grandparents' services can release additional time for parental involvement in their children's life. Children perform better in school when their parents discuss school matters with them, volunteer in school events, and participate in teacher-parent organizations (Epstein, 2001). Good parent-child relationships take time to develop, and one of many payoffs of parent-child closeness is higher school achievement of the child (Dornbusch et al., 1987).

Family conflicts. The above scenarios are the ideal for multigenerational families, but a caveat is in order. Co-resident grandparents may not invariably bring harmony to the family. Disagreements over childrearing practices between parents and grandparents may occur, and friction between mothers- and daughters-in-law is common in traditional Chinese societies. Children might be confused about who is in charge (Chase-Landsdale, Brooks-Gunn, and Zamsky, 1994) and develop psychological stress or a feeling of uncertainty about the future which in turn harms their school performance.

The conflict between Chinese mothers- and daughters-in-law reflects the traditional cultural value that gives preference to boys over girls. Girls are supposed to be the domestic-service provider in their maternal home and, after marriage, they are supposed to be the primary care-taker of their in-laws. Boys, on the other hand, are supposed to be the future bread-winner of their families. Therefore, boys and girls have been socialized differently from one another in traditional households. Children from traditional households may be penalized by teachers who represent modern values.

Illness care. In addition, grandparents who are in poor health or cannot afford nursing homes choose to reside with their adult children out of necessity rather than preference (Brown

et al., 2002). These grandparents' presence in the household could dilute parental resources for children, and the poor health of grandparents may also create stress and conflict in the household. In such cases, children could actually receive *less* time, attention, and funding for their schooling. Unfortunately the TEPS does not contain information about co-resident grandparents' health status. We must note that, without controlling for grandparents' health status, our estimate of G1G3 co-residence and children's education may be biased downward.

We test three main hypotheses based on the above discussions:

H1: G1G3 co-residence is positively associated with children's educational achievement.

H2: Higher children's educational achievement is associated with longer G1G3 co-residence.

H3: The positive association between G1G3 co-residence and children's educational achievement is greater with more parents in the household.

In addition to these three main hypotheses, we examine whether G1G3 co-residence is related to family processes that include family socialization and dynamics. Specifically, we ask the following questions: (1) Does G1G3 co-residence correlate with the child's educational expectations, traditional values and norms, and parental involvement in the child's schooling (family socialization)? (2) If so, do these family-socialization variables account for the correlation between G1G3 co-residence and children's educational achievement? (3) Does G1G3 co-residence correlate with moral and emotional support from, or conflict with parents (family dynamics)? (4) If so, do these family-dynamics variables account for the relationship between G1G3 co-residence and children's educational achievement?

TAIWAN AS A CASE STUDY

We study Taiwan because G2G3 co-residence rate is high and distributed across different types of families. Rooted in Confucian thought, the Chinese cultural heritage emphasizes filial piety. This is expressed in patrilocal, patrilineal, and patriarchal relations. It is the responsibility of sons, especially eldest sons, to support parents in their old age. Co-

residence signifies old age support, and sons, as much as daughter-in-laws, still consider the care for paternal elders to be an obligatory duty. The dominant form of G1G3 co-residence is an elderly parent (usually the grandmother) moving in with his/her married child's family (usually the son's family).[1] Such co-residence is typically unrelated to the elderly parents' physical health at the time of the move.

In 2002, 72.4% of Taiwanese women and 63.2% of Taiwanese men aged 60 and above lived with their married children or with grandchildren (Department of Interior, 2006). Only 7.2% of the Taiwanese elderly lived alone, compared with approximately 26% in Europe or North America. In contrast, 68% of the Taiwanese elderly aged 60 and above co-resided with their children or grandchildren, compared with 26% in Europe, 19% in North America, and 18% in the U.S.A. (R.O.C. Department of Interior, 2006; United Nations, 2005). However, because Taiwan's fertility transition came much later than that of Europe or North America, both the G2 and G3 generations are larger in number for Taiwan than for Europe or North America. As a result, there are more adult children (or grandchildren) with whom Taiwanese elderly can co-reside than is the case in Europe or North America. Because of this demographic difference, the co-residence rates among elderly are higher in Taiwan than in Europe or North America, even though the G1G3 co-residence rates in Taiwan are not too different from the G1G3 co-residence rates in Europe or North America.

DATA AND ANALYTIC STRATEGIES

We use data from the Taiwan Educational Panel Survey (TEPS) which was conducted under the auspices of Academica Sinica in Taiwan, the Ministry of Education, and Taiwan's National Science Council. Fielded in 2001, the first wave of the survey is a clustered multistage stratified probably sample of two populations: 7th and 11th graders (see Chang, 2003 for details).

[1] Our data do not distinguish grandparent-headed co-residence and parent-headed co-residence.

Our data are drawn from the Wave I (2001) public-released files which include seventh-grade students from 333 junior high schools.

Although TEPS is a longitudinal survey, the living arrangement and most other variables were not repeated in both waves I and II.[2] Thus we are unable to apply typical statistical methods for longitudinal data, such as child-fixed effects models, to better understand the causal relations between G1G3 co-residence and grandchildren's education. We can only apply the standard ordinary least square (OLS) method typically used for cross-sectional analysis. That said, our conceptual model has strong theoretical inference for causal relationships. Reverse causation is impossible because long-term G1G3 co-residence or long-term non-co-residence precede grandchildren's school performance. Our OLS model can be treated as a reduced form equation to predict the influence of G1G3 co-residence on grandchildren's schooling.

The long-term co-residence or non-co-residence is an important piece of information only available from the Wave II survey. All other variables come from the responses of the 7th graders and their parents in wave I. Our working sample is based on 11,914 7th graders in 2001, who gave valid responses on all variables used in this study. For missing values in dichotomous variables, dummy variables representing missing values are included in multivariate analysis but are not presented in the tables (results are available upon request). Because the survey over-sampled certain populations, such as the aborigines, we use the student weights to weigh all statistics presented here.

Variables and Measures

Dependent variables

Our dependent variable is *cognitive ability score.* It is a combined test score from four domains: math, language, science, and problem solving/logical reasoning. All four tests, except that of problem solving/logical reasoning, are curriculum-based. The combined score is

[2] Only two waves of data were available at the time of this study.

standardized and constructed based on Item Response Theory (IRT) and thus are comparable over time.[3]

G1G3 co-residence

Our major independent variable is grandchildren's co-residence with grandparents, i.e., G1G3 co-residence. Two measures are used. A dichotomous variable from the wave I survey indicates whether the 7th grader was currently living with the grandparents during 7th grade.

Another measure of G1G3 co-residence is constructed using both wave I and wave II information on G1G3 co-residence. In wave II, the child was asked whether he/she lived with his/her grandparent(s) most of the time before 7th grade (i.e., before wave I).[4] Combining information from both surveys, we created a variable measuring four situations in 7th grade: *never co-reside, transition into co-residence* (living with grandparents in 7th grade but not before), *transition out of co-residence* (not living with grandparents in 7th grade but did so most of the time before), and *long-term co-residence* (living with grandparents in 7th grade and most of the time before). Dummy variables are created with "never co-reside" as the reference category. Due to wave II sample attrition, 174 (1.3%) students have missing data on this variable. A dummy variable representing these missing values is included in multivariate analysis to indicate missing cases.

Family Structure and Processes

Previous literature has shown that G1G3 co-residence is unequally distributed in different family structures defined primarily by the parents' marital status and living

[3] The test scores are standardized in the original sample. Because we deleted some cases with missing values, the test scores do not have a mean of zero and standard deviation of one in our working sample.

[4] Before 7th grade, 2,109 lived most of the time with paternal grandparents, compared with only 473 with maternal grandparents (with 75 cases lived with both types of grandparents). This suggests that the traditional pattern of living with sons still common. Unfortunately, the variable indicating current co-residence in 7th grade does not specify whether grandparents are paternal or maternal.

arrangement with their children. *Family structure* variables are elicited via a question to the child about whom he/she lived with. We created dummy variables representing four family structures: two-parent family (reference group), stepfamily, single-parent family, and guardian family without any parents.

Children's educational expectations may reflect positive socialization by co-resident grandparents. The child's educational expectations were elicited with the following TEPS question: "Which educational level do you expect to reach?" Response options were: graduate from junior high school, senior high or vocational school, specialized or technical junior college, university, and graduate school. The distribution of this variable is skewed: over half of the students expected to graduate from the university or above. Thus we constructed a dichotomous variable, *expecting college*, to measure whether the child expected to graduate from college or above.[5]

Grandparents' role in a child's socialization is also indicated by three traditional values and norms: *seniority rule, preference toward boys,* and *authoritarianism*. Each child was asked to indicate on a scale from 1 to 4 his level of agreement with questions regarding family relationships at home. Seniority rule is derived from the question about whether family relations "are governed by a clear demarcation of age." Preference toward boys comes from the question asking if family relations "are governed by favoritism toward boys." Authoritarianism is taken from reversing the statement, "all important matters are discussed and decided upon together in the family."

Co-resident grandparents may release time for parents to involve more actively in their children's education. Three variables measure *parental involvement*: talk about future schooling

[5] The zero category of this variable includes students' responses of "don't know or never thought about it" – a sign that they did not expect to attend college at the time of the survey. Results eliminating this group are similar to the results presented here. The exception is that transitioning into co-residence is negatively associated with the child's expectations but transitioning out of co-residence is not.

and jobs, check homework, and parental participation or volunteering in school. Each of these variables has four values showing the frequency of involvement, ranging from least (1) to most frequent (4).

Family dynamics is measured by two variables. One is the child's report of any *conflict with parents*, measuring from 1 (never) to 4 (always) the frequency a child fights with his/her parents. Another variable is *family support*, also measuring from 1 (very much disagree) to 4 (very much agree) the statement posed to the child: "[my] family is my major force of support."

Other Independent Variables

Family socioeconomics status (SES) may determine whether the family can afford to support a grandparent. At the same time, SES is known to affect children's education. Therefore we need to include SES in our analysis to eliminate this potential spurious effect. Family SES is measured by both family income and parental education. *Family income* has five categories: less than NTD 20,000, NTD 20,000 - 50,000 (not including 50,000), NTD 50,000 - 100,000, NTD 100,000 - 150,000, NTD 150,000 - 200,000, and more than NTD 200,000.[6] *Parents' education* has four categories measuring the highest level of education attained: less than junior high (JH), high school graduate, junior college, and university degree or above. High school graduation is the reference group.

Finally, several demographic variables are used as controls. They include the child's age, gender, and ethnicity. Ethnicity has four categories: Hakka, Mainlander, Aborigine, and Minnan. The first three groups are minority populations; Minnan, the majority, is used as the reference in the multivariate analysis.

RESULTS

Descriptive Statistics: Two Types of G1G3 Co-residence

[6] The exchange rate is US$ 1 = NTD$ 30.35.

Table 1 shows basic demographic and SES characteristics for two groups of 7th graders in Taiwan. One group lived with grandparents; the other did not. Of the 11,914 7th graders in our study sample, 22% currently lived with grandparents and had significantly higher test scores in both waves than did the 78% who did not live with grandparents. Demographic characteristics are similar between these two groups of 7th graders. SES background is surprisingly similar as well, except for a higher likelihood of co-residing with grandparents among Taiwanese children in guardian families where both parents were absent. Thus we find no evidence of selectivity of G1G3 co-residence by SES.

(insert Table 1 about here)

Descriptive Statistics: Four Types of Co-residence

The single G1G3 co-residence category masks two types of G1G3 co-residence: long-term co-residence (12.8%) and recent transition into co-residence (9.7%). Similarly, the single non-co-residence category obscures two types of non-co-residence: never co-resided (70.9%) and recent transition out of co-residence with grandparents (6.6%). Table 2 shows that Taiwanese children cluster around two forms of G1G3 co-residence. Children who live with grandparents currently are about 32% more likely to be living with grandparents on a long-term basis. By contrast, the vast majority of Taiwanese children who did not co-reside with grandparents at the time of the survey had never co-resided with grandparents.

Long-term G1G3 co-residence correlates with higher test scores, followed by the never-co-reside group. Children who recently made transitions into G1G3 co-residence had lower test scores, and 7th graders who recently left G1G3 co-residence with a grandparent fared the worst of all. These results highlight the importance of considering a time measure – both the amount of time and timing – in the study of G1G3 co-residence. Previous research based on a single cross-sectional indicator of current G1G3 co-residence has missed important heterogeneity.

Noteworthy are several key differences between children in long-term co-residence and those who have never co-resided with a grandparent. In the long-term co-residence group there

are fewer male children and slightly better educated parents. Compared with other groups, the group in long-term co-residence is less likely to be in either the bottom or top income category. Here again, there is little evidence of selectivity by SES. However, a characteristic stands out among Taiwanese children in long-term co-residence: about 10% of these adolescents are from guardian families. By contrast, only 4% of Taiwanese adolescents who never lived with grandparents are from guardian families. These statistics for Taiwan corroborate findings in other countries relating to a common pattern, in which grandparents often substitute for parents when parents are unavailable.

The two groups of children who made a transition into or out of co-residence differ little in their demographic or SES backgrounds, except that fewer Taiwanese children who transitioned out of co-residence in 7th grade are from the top income group. This group, who lost a grandparent in the 7th grade, has higher representation in stepfamilies than any other groups, suggesting that grandparents might have exited when a new parent arrived.

In general, we do not see, in either Table 1 or Table 2, that the types of G1G3 co-residence vary systematically by children's demographic characteristics or SES background. The only exception is that grandparents are more likely to be found in non-parent guardian families.

(insert Table 2 about here)

Differences in Multigenerational Family Processes by G1G3 Co-residence

Table 3 presents mean values of variables of our indicators of multigenerational family processes. Positive socialization represented by the child's expectation to attain college is the highest among children in long-term co-residence with grandparents. Over half of the children in this group expect to finish college. However, Taiwanese children in newly established G1G3 co-residence have *lower* educational expectations than do those who never lived with grandparents. Whereas children's educational expectations are clearly different between

different co-residence groups, no systematic evidence links seniority rule, preference towards boys, and authoritarianism to grandparents' co-residence.

We also test whether there is any significant difference between the mean values for each pair of G1G3 co-residence type. Parental involvement in children's school does not vary by types of G1G3 co-residence, except that parents of children who recently moved out of co-residence with grandparents are less likely to check their homework.

Regarding family dynamics, the measure of family support does not vary significantly by the four types of G1G3 co-residence, but family conflict does. We found that Taiwanese children are *least* likely to report fighting with their parents when they are in long-term co-residence with their grandparents. Thus, family congruence is the highest in long-term G1G3 co-residence.

(insert Table 3 about here)

Multivariate Analysis of Test Scores

Two versus four types of G1G3 co-residence

OLS regression analysis of wave I test scores and logistic regression analysis of educational expectations are shown in Table 4. Model 1 shows what we typically find in studies of student achievement and educational expectations. Higher cognitive scores and greater odds of expecting a college degree are positively associated with parental education and family income, but negatively associated with children who are too young or too old for their grade. Males and minority ethnic Hakka children also are lower performers and have lower educational expectations. It is noteworthy that females are advantaged in both achievement and educational expectations, as has been found in the U.S. and other industrialized countries (Buchmann and DiPrete, 2006; Hout and DiPrete, 2004).

Our first hypothesis (H1) is supported by the result in Model 1 of Table 4 that shows current co-residence with grandparent to be positively associated with grandchildren's cognitive scores. This positive association persists after controlling for students' demographic and SES

background. When G1G3 co-residence is further broken down into four types, Model 2 shows that long-term co-residence is superior to other forms of living arrangements with grandparents in terms of children's academic achievement. Taiwanese children who transitioned out of co-residence in 7th grade have the lowest achievement scores. Taiwanese children who transitioned into co-residence in 7th grade do not differ from those who never lived with grandparents. To some degree, these results support our hypothesis H2 that children's educational achievement is higher with longer G1G3 co-residence. However, this positive association is not linear. If grandparents leave co-residence after a period of time, children tend to have lower level of achievement than do those who never have the co-residence experience.

The association between G1G3 co-residence and achievement scores persists after family structure is taken into account in Model 3. Children from non-two-parent families, especially stepparent or guardian families, have lower test scores for expecting to attend college than do children from two-parent families. Since children from guardian families are most likely to be in long-term co-residence with grandparents, adjusting for parental family structure leads to higher test scores (from .065 to .077) or odds of expecting to attend college (1.196 to 1.232) for children in long-term co-residence. The increases are not statistically significant, however.

Comparing the beta coefficients for test scores in Model 3, we can see the importance of long-term co-residence: it could close half of the test score gaps between children whose parents are high school graduates and children whose parents have junior college degrees. Long-term co-residence could completely close the gap between children from low-income households with annual family income of 20,000-49,999 and children from high-income households with annual family income of 50,000 or more.

(insert Table 4 about here)

To detect potential interaction effects between G1G3 co-residence and family structure, we include in the regression model a set of 16 variables that cross-classified G1G3 co-residence and family structure. In Table 5, each cell represents a family situation, such as never-co-

resided-two-parent family, long-term co-residence with single parents, and so on. For each family structure type, long-term co-residence is consistently associated with the highest level of achievement or educational expectations. Co-resident grandparents on a long-term basis completely compensate for any disadvantage associated with any type of non-two-parent families. Among all 16 categories, the most advantageous family structure is the two-parent family with long-term co-resident grandparent(s), while the most disadvantaged structure is guardian families without grandparents' presence. These results are consistent with our hypothesis H3 that the positive effect of G1G3 co-residence on children's achievement is larger with more parents in the household.

(insert Table 5 about here)

Multigenerational family processes

Our exploratory analysis on the role of family processes in accounting for the effects of G1G3 co-residence is shown in Table 6. Our measure of positive socialization, educational expectations, is positively associated with student test score, as is well known in the sociology of education literature. Taiwanese students who expect to attain a college degree have .376 points (beta coefficient is .202) higher achievement than do those who have lower educational expectations. This amounts to almost 40% of a standard deviation higher test score (.376/.97=.39) – a large increase. However, educational expectations do not account for the benefits of long-term co-residing with grandparents. Although the size of the coefficients of long-term co-residence from the previous model, i.e., Model 3 in Table 4, the amount of the decrease is too small to be statistically significant. Thus differences in educational expectations cannot explain the association between G1G3 co-residence and students' test scores.

The findings for all other multigenerational processes are noteworthy. Negative socialization measured by seniority rule, authoritarianism and preference toward boys is non-linearly related to test scores. Some amount of seniority norms or authoritarianism at home is good, but too much is harmful to children's cognitive achievement. Preference for boys is

negatively and linearly related to test scores. In the exploratory analysis we find no difference in this negative effect by gender, suggesting that Taiwanese boys and girls are equally harmed by this traditional norm.

As for family dynamics, support from family members always helps. The results for the flow of domestic services, as proxied by parental involvement, are consistent with previous research. Parents' talking with the child about their future schooling and job prospects, checking homework, and participating in activities at the child's school all contribute to higher student achievement.

Entering all variables indicating the multigenerational family processes of socialization and family dynamics does not change the G1G3 co-residence coefficient. On the whole, multigenerational processes do not account for the relationship between grandparents' co-residence and grandchildren's academic performance.

SUMMARY AND CONCLUSION

Evidence from the Taiwanese Educational Panel Survey can illuminate the role of co-resident grandparents on grandchildren's academic performance. As we have shown, G1G3 co-residence is associated with higher academic achievement of grandchildren. However, the dichotomous measure of G1G3 co-residence misses important heterogeneity. Although Taiwanese children who co-reside with their grandparents have higher academic performance, long-term co-residence matters most. Recent transition into co-residence with grandparents does not differ from never living with grandparents at all, in terms of children's achievement. The most educationally disadvantaged children are not those who never lived with grandparents. Rather, they are children who once lived most of the time with grandparents but recently transitioned out of G1G3 co-residence. This result is consistent with family stress theory, which postulates that a stressful life event leads to role strain, self-doubt, and eventually negative child outcomes (Amato, 2000; Pearlin et al., 1981). Stability in family structure, whether grandparents are present or not, helps children's development, whereas changes in family

structure can be stressful to children (Wojtkiewicz, 1993). Leaving a grandparent whom a child trusts could conceivably be as damaging as experiencing parental union dissolutions.

Second, we find no educational difference between the achievement of those who recently transitioned into G1G3 co-residence and those without the experience of G1G3 co-residence at all. It is likely that recent transitioning into G1G3 co-residence is related to grandparents' needing long-term care. Co-resident Grandparents' poor health is a burden to the nuclear family and may cause stress to grandchildren. Taken together, our results extend previous research that typically relies on static assessments of G1G3 co-residence in cross-sectional studies. Prior experience of G1G3 co-residence and its duration are both important for child outcomes.

Why does long-term co-residence with grandparents lead to positive child outcomes? As discussed in the theoretical section above, long-term co-residence may support parents and children through various mechanisms, such as the forms of substitution for parents when both parents work, moderating G1G2 conflict, and fostering higher educational expectations for children. However, we are limited by our data in detecting all these mechanisms. Many variables of family processes may be proxies for factors unrelated to grandparents. For example, we do not directly know whether children's expectations or parental involvement reflect co-resident grandparents' influence. Future researchers need to develop data more closely measuring grandparent-specific relations and exchanges in order to investigate the mechanism by which G1G3 co-residence affects children.

Unlike the U.S. and other industrialized western countries, the educational benefits of co-resident grandparents in Taiwan are found not only in single-parent families and guardian families, but also in two-parent families. To date, the multigenerational two-parent family is an under-studied subject because it is a rare form of living arrangement in the western world. Our result suggests that the multigenerational two-parent family brings even greater educational benefits to children than does the nuclear two-parent family. Social changes in countries that

have largely eliminated grandparents from two-parent households may bring negative consequences for children in terms of academic achievement and educational expectations and, perhaps, in other ways that are still unknown.

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Table 1. Descriptive Statistics for Test Score, Demographic Characteristics, and SES Background, by Two Types of G1G3 Co-residence

Variable	Do not currently co-reside	Currently co-reside	Total Sample	Diff
Outcomes (mean)				
Wave I test score	.04	.13	.06	**
Demographic Characteristics (%)				
Male	50.2	46.9	49.5	
Age 11-12	62.1	61.2	61.9	
Age 13	36.0	37.3	36.2	
Age 14-15	1.9	1.5	1.8	
Ethnic Minnan	73.3	71.0	72.8	*
Ethnic Hakka	12.7	13.3	12.8	
Mainlander	10.8	12.6	11.2	*
Other ethnicity	3.1	3.1	3.1	
SES Background (%)				
Parental Education				
Less than junior high	26.9	23.5	26.2	**
High school graduate	43.5	46.7	44.1	
Junior college	16.8	17.7	17.0	
University +	12.9	12.1	12.7	
Family Income (NTD$)				
0-20,000	9.5	10.7	9.8	
20,000-50,000	41.4	41.9	41.5	
50,000-100,000	35.7	35.7	35.7	
100,000-150,000	8.3	8.1	8.2	
150,000-200,000	2.7	1.6	2.5	**
200,000+	1.9	1.4	1.8	
Family Structure (%)				
Two-parent family	83.0	76.9	81.7	
Stepfamily	1.6	1.6	1.6	
Single-parent family	11.3	12.8	11.6	*
Guardian family	4.1	8.7	5.1	**
Observations	9,239 (78%)	2,675 (22%)	11,914 (100%)	

Diff: Test of: differences between two types of G1G3 co-residence. All statistics except number of observations are weighted. **p<.01, *p<.05.

Table 2. Descriptive Statistics for Test Score, Demographic Characteristics, and SES Background, by Four Types of G1G3 Co-residence

Variable	Never co-resided	Transition out of co-residence	Transition into co-residence	Long-term co-residence	Difference
Outcomes (mean)					
Wave I scores	.06	-.14	-.06	.28	a,b,c,d,e,f
Demographic Characteristics (%)					
Male	49.8	51.9	52.2	43.1	
Age 11-12	62.2	60.2	60.2	61.8	
Age 13	35.8	38.8	37.9	37.0	
Age 14-15	2.0	1.1	1.8	1.3	
Ethnic Minnan	73.7	69.8	69.2	72.3	a
Ethnic Hakka	12.4	14.6	14.4	12.7	
Mainlander	10.9	10.7	12.6	12.6	
Other ethnicity	3.0	4.9	3.8	2.5	b,f
SES Background (%)					
Parental Education					
Less than junior high	26.8	26.3	26.8	20.8	c,e,f
High school graduate	43.3	46.1	45.5	47.7	
Junior college	16.9	16.2	16.6	18.7	
University +	13.0	11.4	11.1	12.9	
Family Income (NTD$)					
0-20,000	9.4	10.6	11.0	10.3	
20,000-50,000	41.4	41.7	41.0	42.8	
50,000-100,000	35.7	36.6	36.3	35.2	
100,000-150,000	8.4	7.0	7.4	8.8	
150,000-200,000	2.7	2.3	2.1	1.2	c
200,000+	2.0	.7	1.6	1.3	
Family Structure (%)					
Two-parent family	84.2	72.0	77.7	76.4	
Stepfamily	1.4	3.6	1.6	1.6	b,d,f
Single-parent family	10.7	16.9	13.9	12.0	a,b,f
Guardian family	3.8	7.6	6.9	10.1	a,b,c,e
Observations	8,342 (70.9%)	777 (6.6%)	1,139 (9.7%)	1,508 (12.8%)	

a = significant difference ($p<.05$) between “never” and “transition in”

b = significant difference ($p<.05$) between “never” and “transition out”

c = significant difference ($p<.05$) between “never” and “long-term”

d = significant difference ($p<.05$) between “transition in” and “transition out”

e = significant difference ($p<.05$) between “transition in” and “long-term”

f = significant difference ($p<.05$) between “transition out” and “long-term”
N=11,914

Table 3. Mean Values of Variables measuring Multigenerational Family Processes, by Four Types of G1G3 Co-residence

Variable	Never co-resided	Transition out of co-residence	Transition into co-residence	Long-term co-residence	Difference
Socialization					
Expecting college	.46	.40	.42	.51	b,c,e,f
Seniority rule	3.18	3.16	3.22	3.23	
Preference toward boy	1.81	1.90	1.84	1.84	b
Authoritarianism	2.08	2.16	2.09	2.14	
Parental Involvement					
talk about school & job	2.63	2.57	2.65	2.57	
check homework	3.03	2.95	3.04	3.07	b,f
school participation	1.96	1.93	1.98	1.97	
Family Dynamics					
Family support	3.10	3.07	3.05	3.12	
Conflict with parents	1.85	1.86	1.83	1.76	c,e,f

a = significant difference ($p<.05$) between "never" and "transition in"

b = significant difference ($p<.05$) between "never" and "transition out"

c = significant difference ($p<.05$) between "never" and "long-term"

d = significant difference ($p<.05$) between "transition in" and "transition out"

e = significant difference ($p<.05$) between "transition in" and "long-term"

f = significant difference ($p<.05$) between "transition out" and "long-term"

N=11,914.

Table 4. Analysis of the Association between Test Scores and SES, Demographic Characteristics, Types of G1G3 Co-residence, and Family Structure

	Test Score (Beta coefficients)		
	Model 1	Model 2	Model 3
Demographic Characteristics			
Male	-0.033**	-0.029**	-0.020*
Age 11-12	-0.038**	-0.038**	-0.041**
Age 14-15	-0.094**	-0.094**	-0.082**
Ethnic Hakka	-0.053**	-0.051**	-0.048**
Mainlander	-0.014	-0.014	-0.008
Other ethnicity	-0.118**	-0.115**	-0.104**
SES Background			
Parental Education			
Less than junior high	-0.134**	-0.132**	-0.129**
Junior college	0.143**	0.142**	0.138**
University +	0.213**	0.212**	0.210**
Family Income (NTD$)			
0-20,000	-0.061**	-0.060**	-0.046**
50,000-100,000	0.082**	0.084**	0.072**
100,000-150,000	0.080**	0.079**	0.068**
150,000-200,000	0.046**	0.048**	0.041**
200,000+	0.054**	0.054**	0.049**
Types of G1G3 co-residence			
Current co-residence (ref: not currently)	0.043**		
transition out of co-residence (ref: never)		-0.043**	-0.032**
transition into co-residence (ref: never)		-0.014	-0.008
long-term co-residence (ref: never)		0.065**	0.077**
Family Structure			
Stepfamily			-0.067**
Single-parent family			-0.084**
Guardian family			-0.163**
R-square	.20	.20	0.23
Observations	11914	11914	11914

Note: Dummy variables indicating missing data for co-residence, age, parental education, and family structure are included in each model but not presented here. **p<.01, *p<.05.

Table 5. Interaction Effects of G1G3 Co-residence and Family Structure on Grandchildren's Test Scores

Types of G1G3 co-residence	Two-parent Family	Stepfamily	Single-parent Family	Guardian Family
Never	Reference group	-.057**	-.089**	-.145**
	(6,934)	(1230)	(929)	(356)
Transition in	-.015	-.004	-.033**	-.054**
	(882)	(21)	(152)	(84)
Transition out	-.039**	-.037+	-.017	-.017**
	(552)	(23)	(134)	(68)
Long-term	.068**	-.043	.008	-.010
	(1,141)	(25)	(187)	(155)

Note: The beta coefficient in each cell is taken from a regression with 16 dummy variables representing each
cell and the missing cases. All demographic and SES variables are also included in the model. Numbers of observations are in parentheses. *N*=11,914.

Table 6. Multivariate Analysis of Test Scores

	Model 4	Model 5
Types of G1G3 Co-residence (ref: never)		
Transition out of co-residence	-.005	-.002
Transition into co-residence	-.027*	-.022+
Long-term co-residence	.070**	.071**
Family Structure (ref: two-parent)		
Stepfamily	-.062**	-.056**
Single-parent family	-.079**	-.066**
Guardian family	-.151**	-.133**
Socialization		
Expecting college	.202**	.185**
Seniority rule		.383**
Seniority rule – squared		-.417**
Authoritarianism		.338**
Authoritarianism – squared		-.258**
Preference toward boy		-.109**
Parental Involvement		
talk about school & job		.034**
check homework		.066**
school participation		.021*
Family Dynamics		
Family support		.059**
Conflict with parents		.107*
Conflict with parents -squared		-.089+

Note: Demographic characteristics, SES background, and the dummy variables for missing data are included in each model here but not shown.
**p<.01, *p<.05

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