Grandparental co-residence, parental involvement, and educational outcomes among children

Antti O. Tanskanen, Mirkka Danielsbacka & Jani Erola

Turun yliopisto
University of Turku

Åbo Akademi
University

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Abstract

Grandparental co-residence is often found to associate with improved grandchild well-being. However, studies have shown that the effect is not always positive. This could be explained by the fact that in some circumstances grandparents compete with grandchildren over parental time and other resources. We studied the assumption using data from the Program for International Student Assessment (PISA) from 20 Western countries (n = 73,346 children at age 15). According to the results grandparental presence was associated with lower levels of parental involvement and decreased educational test scores among adolescents. Moreover, grandparental presence was more negatively associated with outcomes in adolescents when parental involvement was lower rather than higher. Finally, we found support that the grandparental co-residence is a mediator of the association between parental involvement and child outcomes. These results are discussed with the reference to local resource competition model.

Introduction

Due to increased life expectancy in Western societies the proportion of elderly adults and total number of grandparents are rising (OECD, 2014). Nowadays grandparents and grandchildren have more shared years than ever before (Coall & Hertwig, 2010; Mare, 2011). In addition, due to decreased fertility rates in modern Western countries (Billari & Kohler, 2004) grandparents today have fewer grandchildren, which means that they may be able to invest more resources in any particular grandchild. Thus, the grandparents have a great opportunity to influence on the life of their grandchildren. Indeed, there is a growing number of evidence showing that in contemporary Western societies grandparental involvement often correlate positively with grandchild development and well-being (e.g., Scholl Perry, 1996; Tanskanen & Danielsbacka, 2012).

However, not all studies have found the positive but rather a negative effect of grandparents. For instance, McLanahan and Sandefur (1994) found that grandparental presence was associated with decreased educational attainments among adolescents in the US. Similarly, using data from 32 countries, Kreidl and Hubatkova (2014) showed that adolescents living in three-generational households received lower educational scores than children from intact families.

A three-generational household refers to a living arrangement where children, parents and grandparents live with each other in the same household. Currently the amount of three generational households varies remarkably between Western countries. For instance, in Southern European countries approximately at least every fourth adolescent are living in the same household with grandparents, while the proportion of this type households is less than five per cent in Northern European counties (Kreidl & Hubatkova, 2014). Central European countries as well as the US, the UK, Australia and New Zealand are placed somewhere between these extremes (Kreidl & Hubatkova, 2014; see also Pilkauskas & Martinson, 2014). In the era of welfare state retrenchment there are growing demands to increase the responsibility of the family members to take care of each other's well-being in many Western countries. In practice, this means that three generational household may become more common again, as they were in the beginning of 20th century (Ruggles, 2003). If the negative child outcomes are commonplace among these households, this may reduce the child wellbeing in the

developed societies in general.

Previous studies on three generational households have shown mixed results on the effect of grandparental presence on child well-being (e.g., Deleire & Kalil, 2002; Dunifon & Kowaleski-Jones, 2007). One key factor explaining this is the varying age of the grandchildren and, as a consequence, the age of grandparents. The existing research suggests that grandparental presence may benefit more infants and toddlers than adolescent grandchildren (see Coall & Hertwig, 2010 and responses for discussion). Often this is an outcome of the grandparents' rather than grandchildren's age: when grandchild is older, also the co-residing grandparent is typically older. The younger grandparents possess more resources that can be invested on grandchildren, (e.g., Danielsbacka & Tanskanen, 2012; Hank & Buber, 2009), whereas the older grandparents are more likely dependent of help and care themselves and are rather help receivers than help providers (Pfeffer, 2014). Thus, one may expect that the grandparental presence may not benefit grandchildren when grandchildren are older because of the age of grandparents themselves.

In this paper we study whether the potential negative effect of grandparental presence can be explained by local resource competition model. The model predicts that in some cases grandparents may compete with grandchildren over limited parental resources. As we discuss below, the model has been previously applied in traditional or historical contexts, but to our knowledge there are no previous studies that have directly tested the model using data from contemporary Western societies.

With data from the Program for International Student Assessment (PISA) we investigate the educational achievements of 15-year-old children in 20 Western countries. We use cross-national data, because we expect that the local resource competition model is a general mechanism that should apply in different institutional settings (see Henrich, Heine & Norenzayan, 2010 for discussion). However, different social institutions may both moderate as well as mediate the effects of the local resource competition model, making it hard to identify its effects in different contexts. Because of this we employ country fixed effect models that allow us to control for the between-country variation.

The study has four goals. First, we are interested in whether living in three-generational

households is associated with the amount of parental involvement children receive. Second, we study whether grandparental presence is associated with adolescents' educational achievements. Third, we test whether the presence of grandparents is associated with poorer child outcomes more strongly when the level of parental involvement in children is lower rather than higher. Finally, we investigate whether the grandparental presence mediates the association between parental involvement and child educational outcomes. All assumptions are based on local resource competition model that can explain why in some circumstances grandparental presence have detrimental effects among grandchildren, while in other cases children may benefit from their presence.

Grandparental presence and competition over parental time

During the last decades the influence of grandparental presence on grandchild well-being has achieved increasing attention among sociologists, economists, psychologists and biologists (Coall & Hertwig, 2010; 2011). Grandparental presence can take two forms, namely custodial grandparent families and three-generational households. In custodial grandparent families (or grandparent headed families) children are living and raised by their grandparents without the parental presence. These family arrangements are often shown to be related to family poverty and instability. As a consequence studies have found that children living in custodial grandparent families have lower levels of well-being compared to children who are living in intact or even single-parent families (see Dunifon, 2013 for review). In three-generational households children are living with one or both of their parents and grandparent(s). In this study we concentrate on three-generational households, where grandparents may sometimes compete with grandchildren over parental resources.

When grandchildren are infants or toddlers the grandparental support is often found to be associated with improved child outcomes, measured by child development, health and psychological well-being (Sear & Coall, 2011). In traditional and historical populations the grandparental presence is even shown to correlate with increased grandchild survival (Sear & Mace, 2008). Studies have shown that the valuable role of grandparents does not restrict only past populations but is true also in present-day nations. In contemporary Western societies support received from non-resident grandparents is often found to be associated with improved health and development

among different aged grandchildren (Sear & Coall, 2011). However, grandparental presence in three-generational households may not have beneficial impact among grandchildren when they are adolescents, in particular.

Although the US evidence has shown that adolescent children who have lived with single mothers and grandparents in some point of their childhood receive higher educational attainments than children who lived all of their childhood with single mothers only (Aquilino, 1996), several studies have found that when children are adolescents, living with grandparents in three-generational households may not be beneficial for them (e.g. Kreidl & Hubatkova, 2014; McLanahan & Sandefur, 1994). The negative effects are not restricted to education alone: a previous US study showed that grandparental presence could have negative health outcomes among adolescent grandchildren (Krueger, Jutte, Franzini, Elo & Hayward, 2015).

One of the problems of these studies have been that the negative effects of grandparental presence have not been comprehensively theoretically explained. Here we test one potential explanation: that the negative effect may be explained by the local resource competition between grandparents and grandchildren. The local resource competition model emphasizes that family members who belong to the same household unit and who thus are dependent on the same resources may compete over those resources with each other (Strassmann, 2011). The basic assumption is that in three-generation families older grandparents may cease to be net producers, thereby competing for resources with their grandchildren. This competition can have detrimental effects for grandchildren.

Previously, the local resource competition between grandparents and grandchildren has been studied in historical and contemporary subsistence societies (e.g., Campbell & Lee, 1996; Strassmann, 2011; Voland & Beise, 2002). In subsistence societies the competition between grandparents and grandchildren over local resources have concerned mainly food and other vital resources and the outcome of this competition have been measured by child mortality. However, because of the decreased child mortality rates in modern Western societies the best child outcome indicator may not be anymore child mortality but rather some "softer" type of child outcome, such as developmental and educational achievement (Coall & Hertwig, 2010). Moreover, in contemporary affluent societies the resources over which to compete are not likely food

or other vital resources, but rather over a resource that still is and will remain as finite: parental time. Thus our first hypothesis goes as follows:

Hypothesis 1 (H1): Children who live in three generational households with grandparents receive lower levels of parental involvement than children who do not live with grandparents

Parental involvement is here defined as a time resource that represents a form of social capital that is comparable to other forms of social capital, namely economic and cultural capital (e.g., Furstenberg, 2005; McNeal, 1999; Parcel, Dufur & Zito, 2010). Parental involvement may take place either directly or indirectly. Indirect parental involvement include, for instance, parental attendance to school and community based activities (Borgonovi & Montt, 2012). In the present investigation we concentrate on direct parental involvement measured by the communication between parents and children. Previous studies have shown that parent-child communication have higher positive effect on the child's educational outcomes compared to indirect measures of parental involvement (see Castro, Expósito-Casas, López-Martín, Lizasoain, Navarro-Asencio & Gaviria, 2015 for review).

The earlier literature has consistently shown that greater parental involvement is associated with improved educational achievements among children both in different countries and among different aged children (e.g., Epstein, 2001; Fan & Chen, 2001; Hango, 2007; Park, 2008; Sénéchal & Young, 2008). However, if grandparents compete with grandchildren over parental time, the grandparental presence may diminish the time parents are able to invest in their children. Because of this the grandparental presence should also have negative influence on educational outcomes of the children. Our second prediction is that:

Hypothesis 2 (H2): Adolescent children living with grandparents in three-generational households receive lower educational test scores than children who are not living with grandparents

The local resource competition model predicts also that the competition between grandparents and grandchildren should be harder when the resources are lower rather than higher (Strassmann et al., 2006; Strassmann & Garrard, 2011). Consider the example of two families were parents have in the first case up to ten hours and in the

second case up to four hours spare time that they can invest entirely on their children if there are no dependent grandparents in the household. However, if there is a dependent grandparent living with them who necessarily needs two hours of parents' time, this means that in the first example parents have still eight hours to invest in the children whereas in the second example they have only two hours left. The loss of parental time is clearly more detrimental for the children in the latter case. Thereby we expect that:

Hypothesis 3 (H3): Grandparental presence is more negatively associated with outcomes in adolescents when parental involvement is lower than higher

Other relevant factors

Based on the local resource competition model, grandparental presence should influence both parental involvement and educational attainments among children. In previous studies several variables are shown to correlate with both parental involvement and educational achievements in children, and, thus, it is important to control for these potentially confounding variables to achieve more robust results.

With respect to gender, researches have consistently shown that girls receive higher scores in educational tests than boys (e.g., Hampden-Thompson, 2009; Kreidl & Hubatkova, 2014). Child's gender may also influence parental involvement (e.g., Lundberg, 2005; Raley & Bianchi, 2005). Older children are shown to receive higher educational scores than younger ones (e.g., Karwath et al., 2014) and children's age tend to influence also parental involvement (Waldfogel, 2006). When the number of siblings in household increases, the amount of time parents are able to invest in any particular child tends to decrease (e.g., Downey, 2001; Coleman, 1988). Increased number of siblings is also associated with decreased level of educational test scores (e.g., Jaeger, 2008; Sieben, Huinink & de Graaf, 2001). In addition, birth order has been shown to associate with educational achievements among children in the way that first born children (including children without siblings) tend to receive higher academic attainments compared to later born children (e.g., Blake, 1989; Conley & Glauber, 2006). Birth order may also influence the amount of parental involvement, although this may be related to the age and the gender of the children (e.g., Salmon, 1999; 2003).

In the case of children's educational attainments, the language spoken at home is a

relevant factor, because previous studies have shown that children who are speaking the test language in home receive higher scores than children who are not speaking the test language in their home (e.g., Hampden-Thompson, 2009). Moreover, language spoken at home may at least partly control for the ethnic background that is shown to associate with educational scores among adolescents in previous studies (Dunifon, 2013). Previous studies have shown that compared to two-parent families, in single parent families children tend to receive lower scores in educational tests (e.g. Astone & McLanahan, 1991; Biblarz & Gottainer, 2000). In addition, the family dynamics and the amount of parental involvement may significantly differ between single and two parent families (e.g., Amato, 2001; Anderson, 2011). Finally, parental socioeconomic and cultural resources are consistently shown to associate with both educational scores in children and parental involvement (e.g., Castro et al., 2015; Downey, 2001).

Study questions

In the present study, we investigate the association between grandparental co-residence and toddler injuries in the UK. We study two questions (Q):

Q1. Is grandparental co-residence associated with a decreased risk of injuries among toddlers?

Q2. Is grandparental co-residence more strongly associated with a decreased risk of injuries in different risk situations?

In the case of Q1, we compare injuries between children who live with and without grandparents. In the case of Q2, we detect the interactions between grandparental co-residence and family- and child-related risk factors. Family-related risk factors are decreased maternal age, low education, low family income, disadvantaged socioeconomic position, and single motherhood. Child-related risk factors are indicated by the child's gender (boys have a higher risk than girls), ethnicity (ethnic majority children have a higher risk than ethnic minority children) and number of siblings (the risk of injuries increases with the number of siblings).

Data and Methods

To study the three hypotheses derived from the local resource competition model we

use first-round data from the Program for International Student Assessment (PISA) that was collected in 2000. The goal of the PISA is to collect cross-national data on 15-year-old children's educational achievements. In our case we can only apply the first round of the PISA because only it contains information on the presence of grandparents.

In 2000, the PISA data were collected from 32 countries but in the present analyses we concentrate on 20 Western countries included. These countries are Italy, Spain, Greece, Portugal, Germany, Switzerland, Austria, Luxembourg, Belgium, France, the UK, Ireland, Finland, Norway, Sweden, Denmark, Australia, New Zealand, the US and Canada. The Netherlands was not included, because the Dutch data did not fulfill the PISA standards. We restricted the analyses to these industrialized Western countries in order to have societies with relatively similar rates of social, political and economic development as well several cultural similarities. In addition, since the PISA data included only the children who were in school at age 15 and in the developing countries only half of the population or less attend secondary schools at that age, by selecting only more developed industrial countries we should be able to avoid some issues related to background selection and response bias. Despite the country restrictions we were still left with data on 73,346 adolescents.

First we investigate whether children living with grandparents receive lower amount of parental involvement compared to children living without grandparents. In PISA direct parent-child communication is measured by five questions that indicated two dimensions of parental involvement, namely cultural and social communication. We use these direct measures of involvement because previous studies have shown that they tend to have higher positive effect on the child's educational outcomes compared to indirect measures of parental involvement (see Castro et al., 2015 for review). These measures of involvement require spending time with the child so they can be interpreted also as a use of time resources in favor of the child. In the questionnaire children were asked to report by five-point scale (ranging from 1 = never or hardly ever to 5 = several times a week): How often they have discussed social or political issues with parents? How often they have discussed about books, films or television programs with parents? How often they have discussed with parents how well they are doing at the school? How often they have eat the main meal together with parents around the table? How often they spend time to just talking with parents? The parental involvement variable was constructed by summing up the answers in these five questions (Cronbach's alpha

= 0.66).

Child outcomes are measured with educational test scores. One reason for looking children's educational performance is that previous studies have shown that higher educational test scores in childhood and adolescence strongly correlate with better salary and higher occupational status in adulthood (e.g., Card, 1999; Heckman, 2006), meaning the educational attainments in adolescence serve a fairly good proxy for the child's future success. Thus, adolescents' educational attainments provide a good ling term indicators of child well-being indicator.

In PISA, students' school attainments are measured through three indicators, namely reading literature, mathematical literacy and scientific literacy. In every PISA round, one of these themes is selected as the main theme. In PISA 2000, the main point was to measure students' reading literature skills. Mathematical and scientific literacy were also tested, although not all of the students participated in these tests. Reading skills are measured through students' capability to use, understand and reflect written text (OECD, 2001). The PISA sample contains five plausible values for reading literature for each respondent – also for those who have not actually taken that part of the test – with a mean score of 500 and a standard deviation of 100. These plausible values were constructed by the PISA project team by using Item Response Theory, and they represent a selection of probable attainment for the students. The estimation of the plausible reading literature scores was done five times, once for each variable (see Adams & Wu, 2002 for full information). The applied modeling technique described below takes into account the special manner how the data are constructed. In the sample, the mean score of reading literature was 528 (SD = 91.86).

The main independent variable measures whether children co-reside with grandparents. In the questionnaire, all students were asked to report whether grandparent(s) usually live in the same home with them. Unfortunately, the data does not include information on the number of co-residing grandparents or any characteristics on grandparental level (e.g., gender, age, or health). There are major differences in the amount of three generational households between countries. In our study sample the amount of co-residing grandparents varies from 2.6% in Finland to 31.6% in Italy (Appendix Table 1).

Table 1. Descriptive statistics

	%/mean	SD
Child's gender (%)		
Girl	49.9	
Boy	50.1	
Child's age in months (mean)	188.7	3.44
Child's number of siblings (mean)	1.7	1.18
Child's birth order (%)		
First born	42.1	
Later born	57.9	
Language spoken at home (%)		
Otherwise	10.1	
Speak test language at home	89.9	
Family structure (%)		
Intact	84.5	
Lone-parent	15.5	
Parental education (%)		
ISCED 1	0.6	
ISCED 2	5.8	
ISCED 3	12.1	
ISCED 4	13.6	
ISCED 5	22.0	
ISCED 6	45.9	
Parental occupation (mean)	50.2	16.47
Number of books at home (%)		
None	1.1	
1-10	6.5	
11-50	19.0	
51-100	21.5	
101-250	22.7	
251-500	16.8	
More than 500	12.5	

n = 73,346

In the analyses, we controlled for several potential confounding variables discussed above that have been shown to correlate with parental involvement and children's educational attainments in previous studies. These are children's gender, age (in months), number of siblings, birth order, the language spoken at home (i.e., whether the children were speaking the test language at home or otherwise), family structure (intact or lone-parent), parental education (i.e., the highest level of education between parents indicated by ISCED-97 classification where lower numbers indicate lower educational level, and higher numbers indicate the opposite), parental occupation (measured by the

highest status of occupation between the parents and the index ranged from 16 to 90 where lower scores indicate lower occupational status, and higher scores indicate the opposite) and number of books at home (i.e., cultural capital). The sample descriptive statistics are presented in Table 1.

We employ ordinary least squares regression models with fixed effects that controlled for between-country variation. While studying educational test scores among children we used the statistical software Stata's pv package to analyze the plausible values of reading literature ('pv' command in Stata; see Macdonald, 2014). In all analyses, several of the potential confounding variables that were described above were controlled for.

Results

Based on local resource competition model we expected that children who live in three generational households receive lower levels of parental involvement compared to children who do not live in three generational households (H1). In line with the prediction we found that children living with grandparents receive lower amount of parental involvement than children living without grandparents (Table 2).

Table 2 shows that also several other factors are associated with parental involvement. Girls and older children tend to receive higher levels of involvement than boys and younger children. When number of siblings increases parental involvement decrease. First born children report higher levels of parental involvement compared to later born children. Group "speaks test language at home" received higher amount of parental involvement than others. Moreover, children from intact families received higher level of involvement compared to children from lone-parent families. Finally, children from higher socio-economic and cultural status families received more involvement than children in lower status families.

Table 3 shows that children living in three generational households receive lower educational test scores than others. This finding is in line with our prediction based on local resource competition model (H2). Appendix Table 2 shows that in 19 countries out of 20 the grandparental presence is associated with decreased educational test scores among children. In these 19 countries the effect magnitudes varied from -65.3 (New

Zealand) to -8.5 (Spain). Only exception to this general trend was Finland, where we found a marginally significant effect showing that children living in three generational households received higher scores than children living only with their parents.

Table 2. Factors associated with parental involvement (country fixed effects)

	β	SE	t	p
Grandparent in household				
No	ref			
Yes	-0.14	0.04	-3.17	0.002
Child's gender				
Girl	ref			
Boy	-0.63	0.03	-22.84	< 0.001
Child's age in months	0.02	0.004	4.69	< 0.001
Child's number of siblings	-0.15	0.01	-11.54	< 0.001
Child's birth order				
First born	ref			
Later born	-0.47	0.03	-15.62	< 0.001
Language spoken at home				
Otherwise	ref			
Speak test language at home	0.10	0.05	2.06	0.040
Family structure				
Intact	ref			
Lone-parent	-0.57	0.04	-14.86	< 0.001
Parental education				
ISCED 1	ref			
ISCED 2	0.88	0.19	4.74	< 0.001
ISCED 3	0.92	0.18	5.09	< 0.001
ISCED 4	1.23	0.18	6.76	< 0.001
ISCED 5	1.14	0.18	6.30	< 0.001
ISCED 6	1.47	0.18	8.17	< 0.001
Parental occupation	0.02	0.001	16.36	< 0.001
Number of books at home				
None	ref			
1-10	1.59	0.15	10.98	< 0.001
11-50	2.47	0.14	17.84	< 0.001
51-100	3.06	0.14	22.11	< 0.001
101-250	3.50	0.14	25.27	< 0.001
251-500	3.96	0.14	28.33	< 0.001
More than 500	4.31	0.14	30.39	< 0.001
R^2	0.13			

n = 73,346

Table 3. Factors associated with children's reading literature scores (country fixed effects)

	β	SE	t	p
Grandparent in household				
No	ref			
Yes	-22.37	0.99	-22.62	< 0.001
Child's gender				
Girl	ref			
Boy	-29.06	0.61	-47.28	< 0.001
Child's age in months	1.77	0.09	18.83	< 0.001
Child's number of siblings	-4.65	0.30	-15.56	< 0.001
Child's birth order				
First born	ref			
Later born	-12.40	0.66	-18.74	< 0.001
Language spoken at home				
Otherwise	ref			
Speak test language at home	24.43	1.17	20.95	< 0.001
Family structure				
Intact	ref			
Lone-parent	-6.23	0.85	-7.30	< 0.001
Parental education				
ISCED 1	ref			
ISCED 2	22.03	4.31	5.11	< 0.001
ISCED 3	23.35	4.18	5.59	< 0.001
ISCED 4	37.49	4.29	8.75	< 0.001
ISCED 5	40.32	4.21	9.58	< 0.001
ISCED 6	41.22	4.29	9.61	< 0.001
Parental occupation	1.12	0.02	48.25	< 0.001
Number of books at home				
None	ref			
1-10	29.11	3.26	8.93	< 0.001
11-50	57.46	3.26	17.62	< 0.001
51-100	71.83	3.22	22.30	< 0.001
101-250	89.52	3.16	28.35	< 0.001
251-500	101.36	3.24	31.25	< 0.001
More than 500	103.58	3.36	30.86	< 0.001
R^2	0.26			

n = 73,346

Also several other factors were associated with reading literature test scores among children (Table 3). Girls received higher scores than boys and when the age of the children increased so did the educational test scores. Increased number of siblings correlated with decreased scores and first born children received higher scores than later born children. Children from intact families earned higher scores than children from

lone-parent families. Those who speak test language in home received higher scores than those who speak some other language. In addition, children with higher socio-economic and cultural status of families earned higher scores than children with lower family status.

We also expected that the grandparental presence is associated with child educational outcomes more negatively when parental involvement is lower rather than higher (H3). In Figure 1 we included interaction term between parental involvement and grandparental presence. We found that the gap in educational test scores between those who lived with their grandparents and those who did not was larger among children who received lower amount of parental involvement compared to those who received higher amount of involvement (β = 0.73, SE = 0.22, t = 3.37, p < 0.001, n = 73,346, R2 = 0.28). Figure 1 shows that, for instance, when children reported lowest level of parental involvement the gap between those who lived with grandparents and those who did not was 32 points. When the highest level of parental involvement existed the gap was 18 points. These findings were in accordance with our third hypothesis.
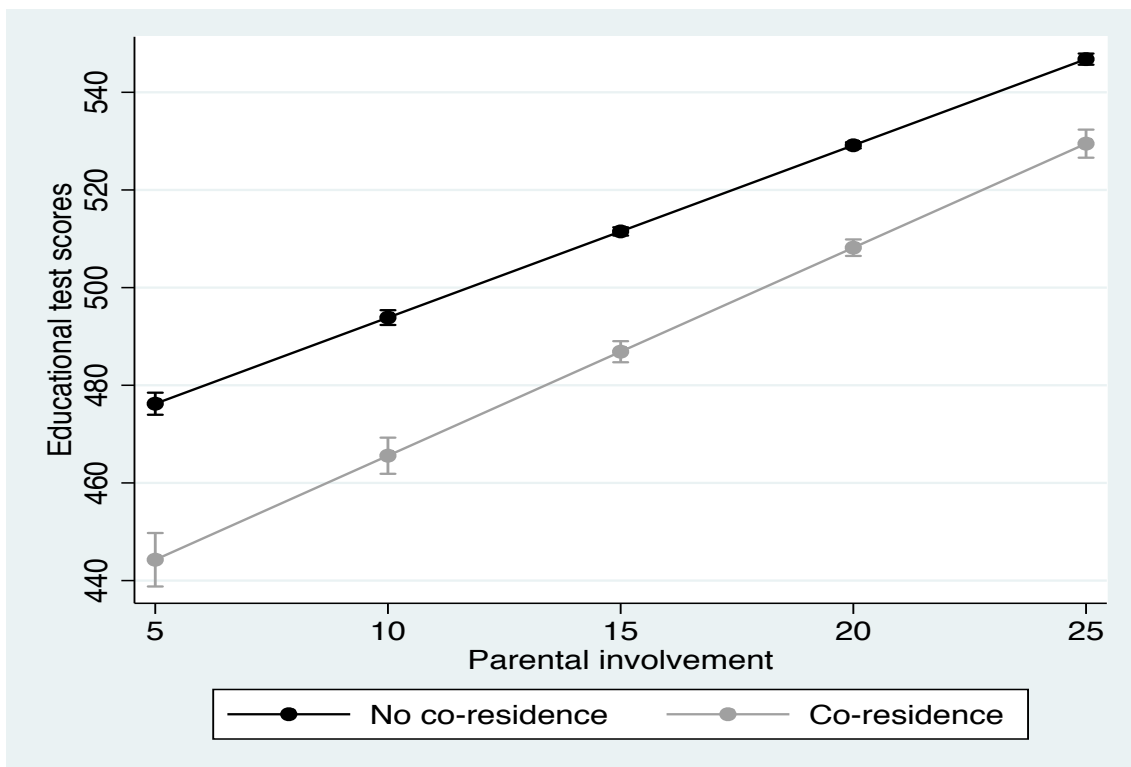

Figure 1. Association between children's educational scores and parental involvement by grandparental co-residence (predicted margins and 95% confidence intervals)

Finally, we investigated whether we can find evidence that co-resident grandparents distract parents from their children, lowering their involvement, and in turn lowering academic achievements among children (results not shown in tables or figures). We found that unadjusted β-coefficient between grandparental presence and educational scores in children decreased from -32.0 to -29.7 after parental involvement was controlled for. This indicates that grandparental co-residence could be a mediator. To formally test whether grandparental presence mediates the association between parental involvement and child educational scores a Sobel z-test for mediation was conducted. According to the test the grandparental co-residence is a mediator of the association between parental involvement and child outcomes (Coef. = 7.53; SE = 0.01; p < .001).

Conclusions

In the present study we have investigated the associations between grandparental presence and parental involvement as well as grandparental presence and educational outcomes among children. We have tested three hypotheses derived from the local resource competition model. In general, the model assumes that in three generational households grandparents can compete with grandchildren over parental time resources, which may cause detrimental effects for children. Based on the model this competition should be more severe when overall parental involvement is lower than higher. Our empirical analyses supported predictions derived from the local resource competition model.

First, we found that children who lived in three generational households with grandparents received lower levels of parental involvement than children who did not live in three generational households. This is in contrast with the finding by Pong and Chen (2010) who showed with Taiwanese data that parental involvement (measured by parent-child communication) was not lower or higher in three-generational than two-generational households. Second, our results showed that children who were living with their grandparents received lower educational test scores than children who were not living with grandparents. This finding is in line with two previous studies of the association between grandparental co-residence and educational scores among adolescents (Kreidl & Hubatkova, 2014; McLanahan & Sandefur, 1994).

Third, we found that grandparental presence was more negatively associated with

educational attainments in adolescents when parental involvement was lower than higher. The gap in educational attainments between those who lived with their grandparents and those who did not was larger among children who received lower amount of parental involvement compared to those who received higher amount of involvement. Moreover, according to the Sobel z-test for mediation, grandparental presence mediated the association between parental involvement and child educational test scores.

Even though we found that in general co-residing with grandparents is associated with lower educational test scores among 15-year-old children, several previous studies have shown that the involvement of non-resident grandparents often correlate with improved child outcomes also in the case of adolescent grandchildren (e.g., Attar-Schwartz et al., 2009; Tanskanen & Danielsbacka, 2012). The local resource competition model may provide an explanation for these seemingly conflicting findings. When grandparents do not live in the same household with grandchildren they could be "child saviors" in the sense that their involvement have beneficial outcomes for grandchildren (Arber & Timonen, 2012). In these circumstances they may endow resources to grandchildren, which in turn could improve the child well-being. In contrast, when grandparents (in their older age, in particular) live in the same household with grandchildren they can rather lessen the amount of resources than append them. Thus, grandparental presence can have detrimental effects for grandchildren.

In addition, the local resource competition model can explain the previous results, which have shown that the effect of grandparental resources on socioeconomic success of their grandchildren is often negligible once parental resources are taken into account (e.g., Erola & Moisio, 2007; Jaeger, 2012; Warren & Houser, 1997). These previous results are based on studies that have included both co-resident and non-resident grandparents. This may have had influence on the results, because co-residing and non-residing grandparents can have opposite impact on grandchild well-being. While investing resources in their offspring non-resident grandparents can improve adolescent grandchildren's well-being (Sear & Coall, 2011) but co-resident grandparents could rather diminish than improve the well-being, as we have been shown in the present study. Thus, we argue that in future studies it is important to investigate the effect of co-resident and non-resident grandparents separately.

Here we have used cross-national data from 20 Western countries and employed country fixed effect models controlling for between-country variation. This methodological approach was used because we wanted to find a general mechanism that is not associated only with some country-specific feature (see Henrich et al., 2010 for discussion). Although country comparison was not the focus here, we think that it is important to study resource competition also from comparative perspective. Thus, we call for future studies that would try to explain the between country differences more explicitly.

Limitations of the present study include that we do not know whether the grandparents are recent arrivals or whether they have been long standing members of households, which may influence resource competition. Moreover, the PISA data does not include grandparental level variables and, thus, we were unable to identify whether children co-resided with their grandmothers or grandfathers or maternal or paternal grandparents. This inability is a limitation because previous studies have shown that different grandparent types may affect child outcomes differently (e.g., Coall & Hertwig, 2010; Sear & Mace, 2008). In addition, the lack of grandparental level variables means that the PISA data does not have information on grandparental age or health, the factors that could potentially influence the resource competition. The older grandparents with poorer health may compete over parental time resources more than the younger and healthier ones. Moreover, the younger and healthier grandparents could be more able to provide support to other family members (e.g., Danielsbacka & Tanskanen, 2012; Hank & Buber, 2012). Finally, we have used here a snapshot rather than longitudinal data. Related to the cross-sectional nature of the data, we have studied the educational scores of 15-year-old children, but grandparental effect may vary between different-aged grandchildren. Thus, we call for future studies to analyze the effect of grandparental co-residence during the life course of their grandchildren.

To conclude, our results show that grandparental presence is associated with lower levels of parental involvement and decreased educational scores among adolescents. We also showed that grandparental presence may have more negative effect on child outcomes when the amount of parental involvement is lower rather than higher. Thus, our results showed support for the local resource competition model. We hope that these findings stimulate future studies to explore kin relations by considering the resource competition between family members over limited resources.

Acknowledgment

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Appendix Table 1. Per cent coresiding with grandparents by country

Italy	31.6
Austria	25.6
Spain	26.1
Portugal	25.3
Greece	24.9
Germany	20.7
United States	15.7
Luxembourg	15.4
Switzerland	11.6
Ireland	11.1
Canada	9.2
Norway	9.0
United Kingdom	6.8
France	6.7
Belgium	6.1
New Zealand	5.7
Australia	5.2
Denmark	4.1
Sweden	3.6
Finland	2.6
All	12.7

n = 73,346

Appendix Table 2. Associations between grandparental presence and children's reading literature scores by country

	β	SE	t	p	R2
Italy					
Grandparent in household	-11.37	2.92	-3.89	< 0.001	0.22
Austria					
Grandparent in household	-8.96	3.58	-2.50	0.013	0.26
Spain					
Grandparent in household	-8.48	2.67	-3.17	0.002	0.25
Portugal					
Grandparent in household	-18.14	3.82	-4.75	< 0.001	0.27
Greece					
Grandparent in household	-10.77	4.23	-2.54	0.012	0.21
Germany					
Grandparent in household	-10.28	3.88	-2.65	0.010	0.31
Luxembourg					
Grandparent in household	-33.94	5.05	-6.72	< 0.001	0.36
United States					
Grandparent in household	-34.16	6.00	-5.69	< 0.001	0.27
Switzerland					
Grandparent in household	-33.67	3.99	-8.44	< 0.001	0.32
Ireland					
Grandparent in household	27.89	6.36	-4.38	< 0.001	0.23
Canada					
Grandparent in household	-28.75	2.59	-11.09	< 0.001	0.20
Norway					
Grandparent in household	-30.13	7.31	-4.12	< 0.001	0.21
United Kingdom					
Grandparent in household	-41.01	5.26	-7.79	< 0.001	0.27
France					
Grandparent in household	-36.18	6.20	-5.83	< 0.001	0.31
Belgium					
Grandparent in household	-52.38	5.61	-9.33	< 0.001	0.30
New Zealand					
Grandparent in household	-65.31	9.25	-7.06	< 0.001	0.27
Australia					
Grandparent in household	-29.20	6.25	-4.68	< 0.001	0.23
Denmark					
Grandparent in household	-38.76	8.02	-4.83	< 0.001	0.25
Sweden					
Grandparent in household	-54.80	9.27	-5.91	< 0.001	0.25
Finland					
Grandparent in household	13.80	7.91	1.75	0.082	0.22

n = 73,346