How aunts and uncles compensate for low parental education in children's educational attainment?

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Introduction

Research on intergenerational effects of education has consistently confirmed the obvious: children of higher educated parents tend to attain higher education more likely than the children of the lower educated parents. As already shown by many earlier and more recent stratification studies higher education leads to higher occupational status and better income (e.g. Blau & Duncan 1967: Shavit & Blossfeld 1993; Becker 1993; Breen & Jonsson 2005; Björklund & Salvanes 2011). Thus, educational inheritance may be considered as the most important intervening factor that may amplify overall socioeconomic inheritance and reduce social mobility. Although educational inheritance is well established fact in all modern western societies, its intensity has been shown to vary between countries as well as over time (Pfeffer 2008; Shavit & Blossfeld 1993; Raftery & Hout 1993; Breen et al. 2009).

Traditionally literature on the equality of opportunities has concentrated only on intergenerational mobility across two generations within immediate family: parents and children (for example see Erikson & Goldthorpe 1992; Breen 2004; Shavit & Blossfeld 1993; Heckman 2006). More recently there has been a growing interest in social mobility across multiple generation (e.g. Warren & Hauser 1997; Erola & Moisio, 2007; Chan and Boliver 2013; Hertel and Groh-Samberg 2014; Mare 2011; Pfeffer 2014;). While these studies have mainly considered the effect of grandparents, they have also draw attention to the influence of the other extended family members, such as aunts and uncles (e.g. Mare 2011; Pfeffer 2014). Similarly to the arguments on the potentially increasing

influence of grandparents in intergenerational attainment (Mare 2011), it may be argued that also aunts and uncles play a more decisive role in attainment than they previously used to. The second demographic transition has lead to increasing divorce rates (Leasthaeghe 2010; van de Kaa 1987) and growing childlessness (Rowland 2007; Miettinen et al 2015). The higher prevalence of divorces has potentially reduced the direct effect of parents in attainment (see Boertien in this book), while the increasing number of the childless aunts and uncles may provide additional resources to nephews and nieces. The initial studies on the topic suggest that a substantial proportion of the multigenerational effects in stratification are mediated by parents' siblings (Modin & Fritzell 2009; Jaeger 2012).

Analytically, studying the familial influence of aunts and uncles can fill an important gap in our understanding on intergenerational attainment. While in two or three generation set-ups we normally need to restrict ourselves to a relatively small amount of observed family background variance observed through mothers and fathers or grandparents, being able to extend background information to cover also aunts and uncles increases this substantially. The quantity of aunts and uncles may vary whereas the number of (biological) parents and grandparents are always fixed. This allows us to empirically distinguish evidence for a much broader set of mechanisms on stratification than we are normally able to do.

Although many previous studies have found that educational inheritance is rather persistent phenomenon, comparative studies have shown that educational inheritance has been in fact decreased in the recent decades (e.g. Breen et al. 2009). Children of lower educated parents do not necessarily perform worse than their counterparts. This may partially be explained by another ignored aspect of intergenerational transmission that is part of the topic of this book: *interpersonal compensation*. In this chapter we study how it operates in education. Our main research question is simply: can aunts and uncles compensate low parental education in intergenerational attainment? We further analyse four mechanisms this can take place: by proving a pool of resources, contributing to the normative family environment, signalling for a feasible educational trajectory and by investing on nephews and nieces because of the kin selection based motives.

We use Finnish census panel data to estimate the importance aunts' and uncles' educational compensation in their nephews and nieces education at the age of 28-30. The register based census information is linked with administrative data from other sources, such as registers for educational qualifications and family structure. The analysis is restricted to include children born in 1972–1982, totalling 19233 children nested in 15111 families. In the analysis we employ multilevel linear probability models with individuals nested in immediate families (with siblings) to predict whether children continue their education beyond compulsory and whether they are able to acquire a higher tertiary level degree.

Intergenerational influences of extended family members

Studies on intergenerational attainment have shown that in its context more is better: parental resources correlate positively with children's adult educational and other socioeconomic outcomes. The effect of parents in attainment is undisputed in the literature – and in practise – thereby providing grounds for the arguments that intergenerational transmissions between generations largely follow the Markovian pattern: the first generation does not have much impact to the third generation directly but mainly through the second (Erola Moisio 2007; Lindahl et al 2011). But the Markovian process may involve all the effects of the second generation, not only those of parents but also the effects of aunts and uncles (Jaeger 2012). Extended family members can have influence on children's educational choices for many different ways. Here we consider four different mechanisms: pool of resources, normative environment, signalling and the kin selection of investments.

Pool of resources

One of the possible reasons for the effects of aunts and uncles is that they may provide to total amount of resources available for the children. For example, extended family members may contribute to socioeconomic attainment by being

part of the social capital available to families (Coleman 1988; Milardo 2010). Relying on the human capital of the extended family member, if available, may then compensate for having disadvantageous parental resources such as low parental education. Having more resources in your extended family network should increase one's chances to succeed, even if the immediate family members did not have them.

Aunts and uncles may provide different kinds of resources. The previous studies suggest that direct *monetary* assistance from aunts and uncles to nieces and nephews does take place when families pool economic resources in order to educate the next generation, though this is likely to be more typical for societies that do not have developed social welfare or credit institutions and where family sizes are large (Peterson 1990). The direct contribution of aunts and uncles may also take place in the form of *time* spent with nephews and nieces. Aunts and uncles may also have an impact on children's lives indirectly through parents, for instance by *helping* parents in different ways. In practice the different kinds of resources provided, such as time, money and helping, are likely to overlap with each other considerably and may be difficult to distinguish (c.f. Erola et al 2016).

The pool of resources may be helpful for the children also when the immediate family is not lacking them. It was suggested in the introductory chapter that multiplication of the family resources matters for those growing up in advantaged families, whereas interpersonal compensation of extended family members for those who are disadvantaged by some immediate family characteristic. The same distinction may also apply to outcomes. It appears likely that compensation matters in particular when some obvious socially disadvantageous outcomes should be avoided (Erola et. al 2016). In education a good example is the continuation of schooling beyond the compulsory level. In some institutional contexts, such as in the Nordic countries including Finland, it is rather unusual not to do this and it may require only a small push from the extended family members to make nephews and nieces to make sure this happens. Beyond that level of education compensation should be expected to become harder, and multiplication should begin to matter more.

Thereby our first hypothesis assumes the following:

H1: The extended family members contribute to the pool of resources available for children to exhaust (pool of resources hypothesis).

If this is the case, having more human capital in absolute terms among your extended family network should be advantageous for overcoming the lack of human capital in the immediate family.

Normative family environment

It may be argued that the extended family members influence children in unintended manner also otherwise than increasing the quantity of available resources. Together with immediate family members they may create a *normative* family environment providing guidelines for preferable life course choices concerning education, occupational careers and family formation (Elder & Rockwell 1979; Blossfeld & Huinink 1991). This extends the two often applied theories on family influence on educational choice, theory on cultural reproduction of education and relative risk aversion (RRA) (see e.g. van de Werfhorst & Hofstede 2007).

Cultural reproduction theory claims that the impact of parental education on next generation is channeled through cultural capital – the cultural habits, practices and tastes – that parents have (see Bourdieu 1977). On the other hand, RRA states that families do not try to maximise upward mobility of the children but rather to avoid downward mobility. The priority is in maintaining at least the same level of well-being that the parents have. Thus the emphasis of educational choice is in avoiding the risks of downward mobility, and concerning upward mobility only as a secondary choice (Breen & Goldthorpe 1997).

Both theories originally considered only the importance of immediate family relations. However, it can be expected that also the extended family members contribute to as well as change these preferences (Pfeffer 2014). Close relations with extended family members may help children to internalise alternative

cultural habits and practices as well as alter educational expectations in ways that may turn out to be advantageous in educational achievement. It follows that low educational immediate family background may be less disadvantageous if some extended family members are higher educated.

If the normative environment, created by this network, matters, the relative value suggested by the education of aunts and uncles should matter:

H2: The homogeneity in education among the extended family members matters for educational choice of the children (normative family environment hypothesis).

If this hypothesis applies, we should expect that the bigger the proportion of the aunts and uncles with a higher education degree, the higher the likelihood of nephews and nieces to overcome the negative educational effect of having low educated parents.

Signalling theory

Human capital theories are often contrasted with signalling theory, arguing the that the value of education in the job market is not that much in human capital it contributes to but rather in the way it signals for generally preferable attributes of an individual (Spence 2002; Bihagen et al 2014). In our context nephews and nieces can be seen as equivalents of employers, looking for a signal for a more intrinsic value of an educational decision. When this is the case, having only one highly educated extended family member may be sufficient to compensate and overcome the uncertainty caused by the mixed information on the value of a choice, and thereby provide that required extra push to educate further. Thus extended family education may be in a sense understood as being contagious, similarly to what in demography is reported in the case siblings' fertility (Balbo & Barban 2014).

One of the possible reasons for such a "sticky" influence of the extended family members is that they tend to come up rather high on the young people's lists of "Very Important non-parental Persons" – aunts and uncles are rated higher than

for example grandparents (Chang et al. 2010; Greenberger et al. 1998). This is not because of their normative, sometimes latent influence, but rather because of their more direct impact. Aunts and uncles are often reported as important mentors in variety key choices in life related to education and the labor market (Milardo 2010). Close relationship with only one higher educated aunt or uncle may be enough to provide salient information about education system expanding the opportunity horizon of the nephews and nieces and decreasing the relative risk they encounter.

The effects of aunts and uncles may not necessarily dependent on a direct contact or even a positive relationship between them. One way in which this effect may come about is that aunt or uncle acts as role model, for which they do not need to be present in their nieces' and nephews' lives. There is some previous evidence supporting the role model assumption: the geographical distance to aunts and uncles does not influence their effect on nephews and nieces (Jæger 2012).

If signalling theory mattered for compensation, we should expect a different kind of effect. The hypothesis in this case is:

H3: Having a single highly educated extended family member with higher education is sufficient to overcome the negative effect of having a low educated parent (signalling hypothesis).

As suggested above, having extended family members with mixed educational qualifications should not make a difference as contrasted to those having only one highly educated extended family member. To some extent, the role model assumption would predict similar outcomes. Thus the same empirical evidence should support (or refute) both theories.

Kin selection

The last possible explanation for the influence of extended family members is based on evolutionary principles. The arguments on *kin selection* claim that humans have a predisposition to sense positive emotions toward their kin, and

thus invest in them, because they share same genes with them. The evolutionary incentive of aunts and uncles to invest in nephews and nieces may be weaker than that of parents, because of the smaller proportion of shared genes compared to children's parents (Hamilton 1964). Yet investing in a kin rather is more reliable way of enhancing inclusive fitness of an individual (that is, proportion of genes transmitted to next generation) than investing in a non-kin (Astone et al. 1999; Coall and Hertwig 2010). Kin selection theory does not necessarily contradict with the sociological theories but rather provides an ultimate genetical explanation for altruism between (extended) family members through natural selection.

The studies on kin selection have concluded that humans practice cooperative breeding (Hrdy 2005). Children receive care not only from their biological parents but also from other individuals from their family network, such as grandparents and aunts and uncles. For example according to a review of 19 studies Sear and Coall (2011) grandparents have substantial impact on children's psychological well-being and academic achievement. The best strategy in child rearing for parents is a flexible one, where parents co-opt with a wide range of other individuals from both maternal and paternal side. However, due to sex differences in parental investments (females investing more by childbearing and breastfeeding), women encounter higher risks and costs in parenting. Thus extended family members may be especially important for mothers who must invest more in child care than fathers, especially during the very early childhood. Earlier studies have found support for this *matrilateral bias* mechanism (see e.g. Pashos & McBurney 2008; Tanskanen et al. 2014).

The same line of theories argues that because of *paternity uncertainty*. The father can be never as sure as the mother that a child is genetically related with him. Thereby – according to kin selection – the relatives of the mother have a higher incentive to invest in children. Some previous studies suggest that especially mother's mother provide help for parents (Sear & Coall 2001; Danielsbacka et al. 2015). Studies from traditional societies show that maternal grandparents improve child survival more than paternal grandparents (Sears & Coall 2011). In modern societies maternal kin has been shown to be beneficial for children's well-being

and decrease behaviour and emotional problems of children (Tanskanen & Danielsbacka 2012).

Thereby we posit the following hypothesis:

H4: The extended family members from maternal lineage are more likely to compensate for low parental education than paternal lineage (Kin selection hypothesis).

This should not be expected only because of the relatives trying to make sure that their own genes are passed on, but also because of the higher investments of the mothers on children. Mothers have more incentives to maximize the potential advantage and value of the extended family social network.

Institutional context

In this study the analyses is conducted by using Finnish register data. Finland is a very suitable institutional context for studying interpersonal compensation in education because the educational system – as in the Nordic countries in general – is fairly equal. For instance, in Pfeffer's study (2008) the association between parents' and children's education in Finland was weakest among the 20 studied industrialized countries.

Education in Finland is free of charge and higher education has been entirely tuition-free since 1974. The mandatory comprehensive school begins at the age of 7 and continues until the age of 16. The most significant transition occurs after this when children choose an academic (general upper secondary) or vocational track, both lasting for 3 years. It is also possible to drop out after comprehensive school and not to continue secondary education but only a few choose to do so. From the general upper secondary school, they often continue to study at the university (master or bachelor level courses) or polytechnic schools (bachelor level courses).

The education system does not have official dead ends: in principle, anyone can apply from secondary level education to university through an intake exam or

special targeted (but much smaller) quotas. The government of Finland also subsidises tertiary and secondary education by offering study allowance. (Ministry of education and culture, 2015.)

It is therefore not surprising that in country comparisons Finland appears to be a fairly open society in terms of equality of opportunity not only in education but also in occupational attainment and income (Erola, 2009; Jäntti et al., 2006). Because of the low level of socioeconomic inheritance compensation may be less important intergenerational mechanism than in the countries where educational system includes fees and has more dead ends that tend to increase inheritance. However, we may expect the opposite as well. Recent studies suggest that in Nordic countries the economic resources have a weak direct impact in intergenerational attainment but that the other parental resources matter more (c.f. Erola et al. 2016; Mollegaard & Jäeger 2015). In the Finnish context educational compensation may be relatively strong because financial barriers to education have been largely removed, thus emphasizing the benefits of parental and extended family member's education.

Data & methods

We apply register based *Finnish growth environment panel* (FinGEP) to our analysis. The data set has been constructed by Statistics Finland by taking a 10 % sample of all Finnish residents alive in 1980, which is then extended to cover their all family members and, perhaps even more importantly, their all existing or forthcoming children. Every person included to the data are followed until 2010 or to the latest available information - one only drops out from the data by dying or moving abroad (although those moving back to Finland before the end of follow-up will re-emerge). The census register data are combined with other available register sources so that the final data include detailed annual information on family structure, income, education and occupations, and other relevant demographic and socioeconomic factors. To our analyses we select children born 1972-1982, comprising 19233 children nested in 15111 families. All children are

matched with their aunts and uncles either from maternal, paternal or both sides, the number of them for an individual child ranging from none to eighteen.

Dependent variables

We select two outcome variables, 1) having an educational degree higher than compulsory level and 2) having a higher education degree (Bachelor level or higher). Our first dependent variable measures how aunts' and uncles compensation contributes to the probability avoiding dropping out from school when children are moving to secondary education (vocational or academic track). This can be considered as an indicator for marginalization experienced by 11 % of the children in our data. Our second dependent variable measures children's educational advantage by completing higher education, experienced by 36 % of the children. As noted above, it is expected that compensation effects are stronger in the first case. We run all analyses separately for both outcomes.

Independent variables

In order to study the different mechanisms compensation effect may take place we interact parental education with a set of variables constructed to measure extended family education. We distinguish three levels of *maternal and paternal education*: 1) compulsory schooling, vocational secondary or less; 2) general secondary, post-secondary and low tertiary; and 3) high tertiary (Bachelor or above, below referred also as higher education). For the sake of the clarity we only include the two extremes of the parental education categories to the figures reported in our results section.

In order to study the *pool of resources* hypothesis we computed a summary variable for the total number of years in education beyond compulsory schooling among aunts and uncles:

$$X = y_{au_1} + y_{au_2} + \ldots + y_{au_n} \quad (1)$$

The importance of *normative* (that is, homogeneity of) *family environment* is measured as a proportion of aunts and uncles having a higher tertiary degree:

$$X = 100 * (\frac{e_{au_1} + e_{au_2} + \ldots + e_{au_n}}{n_{au}}) \quad (2)$$

Signalling hypothesis is studied through a dummy indicating whether at least one of the extended family members have a higher tertiary degree:

$$X = D_{au} \quad (3)$$

The importance of *kin selection* hypothesis is considered by interacting each extended family member variable with both mother's and father's education separately while controlling for the education of another parent.

Education of the parents and aunts and uncles are measured when children were 15 years old. If these variables were missing at that age we have taken a value from a year before, going backwards until children were 10 years old.

Control variables

We control for a number of variables in our all models which previous studies have been shown to affect educational outcomes: gender, parental separation, cohort, number of siblings and cousins as well as the highest education level of grandmother and grandfather (measured as years). We observe parental separation before children were 18 years old and drop the children whose parents died before the same age (n = 212). Each model also includes an interaction term between maternal and paternal education to control for the potential bias caused by the homogamy by education. In the analyses we also control for the expansion of higher education in the mid-1990s with a cohort dummy for those born before 1978.

The data that are clustered according to (immediate) families, allowing us to apply multilevel linear probability models (i.e. random intercept models). We illustrate all the findings with plots for the marginal effects of interactions between parental

education and aunts' and uncles' educational variable in question. Regression estimates are available from the authors upon a request.

Results

Descriptive statistics

Table 1 reports the descriptive information on our dependent, independent and control variables. It indeed shows that not continuing to secondary or further education is relatively unusual but still an existing phenomenon in our data (about 11 % of all children). Also as already pointed out above, about one third has acquired a higher education degree. Among fathers higher tertiary education is somewhat more usual than among mothers, reflecting the educational structure of the previous generations, but having any degree higher than compulsory or vocational education is more usual among mothers. In our sample about 21 per cent have at least one aunt or uncle who has attained higher tertiary education. The mean of the proportion of higher educated aunts and uncles is approximately 11 per cent – so relatively low, reflecting a relatively big group of extended family members (similarly to the fathers and mothers from approximately the same birth cohorts) having no higher education degree.

The other continuous variables reveal that on the average aunts' and uncles' mean education after compulsory education is approximately 3.5 years. This equals having a secondary education degree. The average of aunts' and uncles' total education in years, indicating for the pool of resources, is a bit over 10 years, from the paternal side approximately 4.6 years and from the maternal side 5.5 years. Every fourth child (27 %) has experienced parental separation before age 18. On the average the highest educated grandparent has only one year education beyond compulsory schooling, both in maternal and paternal side. There are approximately 2 children in each family, each having 1.5 cousins on average within the extended family network in our final dataset.

Table 1.Descriptive statistics of applied variables

Dependent variables	%/Mean	Min	Max
Higher education	36 %		
Higher than compulsory education	89 %		
Independent variables			
Parental background variables			
Father higher education	16 %		
Father general secondary or post-sec,	16 %		
Father compulsory education	68 %		
Mother higher education	11 %		
Mother general secondary or post-sec,	23 %		
Mother compulsory education	66 %		
Aunts and uncles' background variables			
Any aunt or uncle has higher education (dummy)	21 %		
Proportion of higher educated aunts and uncles	11 %		
Mean of aunts and uncles education in years	3,52	0	10
Aunts' and uncles' total education in years	10,05	0	100
Total of paternal aunts and uncles education in years	4,58	0	67
Total of maternal aunts and uncles education in years	5,48	0	100
Control Variables			
Cohort 1972-1977 (dummy)	44 %		
Female	50 %		
Parental separation	27 %		
Aunts' and uncles' from both side	11 %		
Aunts' and uncles' from maternal side	48 %		
Aunts' and uncles' from paternal side	41 %		
Paternal grandparental education in years	1,03	0	10
Maternal grandparental education in years	1	0	10
Children in household	1,98	1	7
Number of cousins	1,51	0	46

Note: Education in years measured after compulsory education

General compensation effects

Before we proceed to test how compensation mechanisms take place, we tested the baseline effects (i.e. aunts and uncles average education in years) for maternal and paternal education. In the case of children continuation education beyond the compulsory level we found that the education of an extended family member may compensate entirely the lacking education of the father. We are not able to find any compensation effect for the children of low educated mothers rather aunts' and uncles' higher education benefits all children, despite of the educational level of a mother. In the case of children achieving a higher education degree we find that the compensatory effect is much weaker for the children of the lowest

educated fathers. For mothers we do not found compensation but an indication of the slight multiplication advantages, although the effect is not statistically significant.

Our baseline models support our initial expectations. We find educational compensation and it takes place between between father and aunts and uncles education. This allows us to continue to more detailed study of this relationship. Next we consider our hypotheses 1-3 closer.

Pool of resources

In order to test the pool of resources hypothesis, the extended family education is measured as the total number of years in education and interacted with father's education[1].

The left panel of Figure 1 reports results for continuation of education beyond compulsory schooling. The compensation effect appears to be clear and significant. Its overall scale does not seem be too large but it is large enough to compensate for low paternal education entirely, although the "pool" of aunts and uncles education needs to rise to 30 years in order to compensate that entirely.

One caveat of this finding, however, is the high likelihood of continuing education at this stage anyway. It could be argued that the compensation effect we observe is simply a ceiling effect - that the probability for the children with high educated parents cannot raise more if they all already continue their education. However, the left panel of Figure 2 shows that aunts' and uncles' total years spent in education matters in higher tertiary attainment as well. The probabilities of acquiring higher education between the children having a father with education less than high school and the children having a father with higher education decrease once the educational "pool" of aunts and uncles increase. However, in

[1] We observe only father's education in these models because we did not find any aunts' and uncles' educational compensation for mothers in our baseline models.

this case the effect is indeed much weaker – children with lower educated father are not able to catch the children whose father has higher tertiary education.

Further, Figure 2 show that aunts' and uncles' total years spent in education is not associated with the education of the children with highly educated father (flat predicted probability slope). There is no evidence on a multiplication effect: aunts' and uncles' years spent in education helps only the children with low paternal education. Note however that these results come from a model in which we also control for the normative educational family environment that we consider closer next with the signalling mechanism.

Normative family environment and signalling

The middle panel of Figure 1 and 2 reports the predicted probabilities for the proportion of aunts and uncles with higher education degree and its interaction terms with father's education for testing the hypothesis for the normative family environment. The right panel of figure 1 and 2 shows whether any of aunts or uncles had either a high school or a higher education degree, again with the interaction term for father's higher education, in order to test the signalling hypothesis Like pool of resources in figure 1 these both panels report the results for the continuation of education beyond the compulsory schooling and figure 2 for achieving a higher education degree. In both cases the effects are from a model in which we are already controlling for the total amount of years in education indicating for the pool of resources among the extended family network.

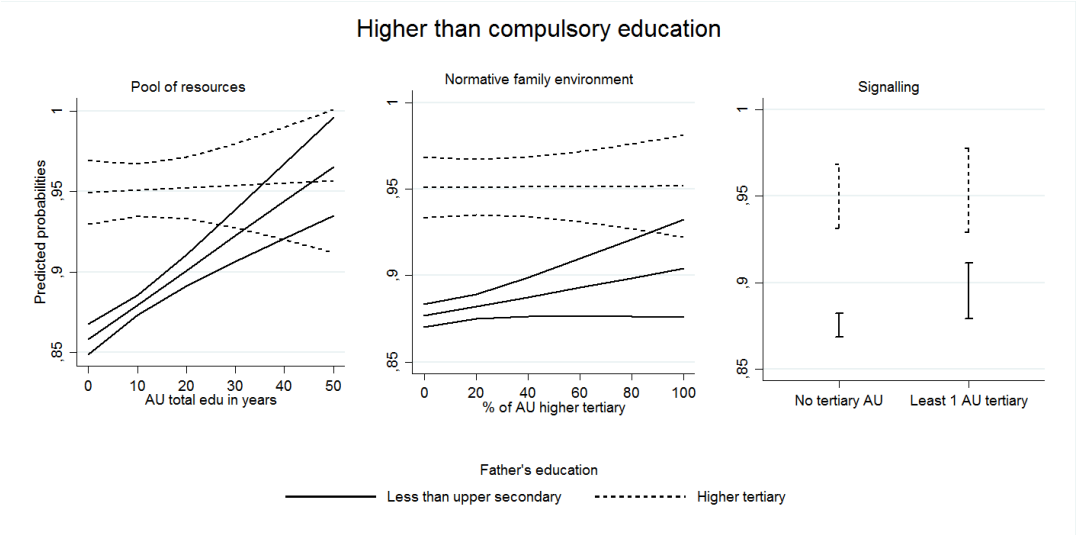

Figure 1. Predicted probabilities for the interaction between father's education and aunts' and uncles' total education in years (left panel), proportion of higher educated aunts and uncles (middle panel) and aunts' and uncles' dummy (0=No higher educated aunts/uncles 1=at least one higher educated) (right panel). Dependent variable: continuing beyond compulsory education.

In the both figures (1 and 2) , the effect aunts' and uncles' compensation is largely absent in the panels of normative family environment and signalling: a small but not statistically significant compensation effect can be observed for continuing education beyond compulsory level in the figure 1 for the both normative family environment and signalling effect. In the figure 2, which describes children's higher educational achievement, we do not observe any compensation effects for the normative family environment or signalling. However, these two mechanisms seem to benefit for all.

Thus the results suggest that our best candidate for the compensating mechanism is the *pool of resources* -hypothesis: in none of our analysis considering normative family environment or signalling we can observe a clear indication of compensatory effects, when the total amount of education among the extended family members is controlled for.

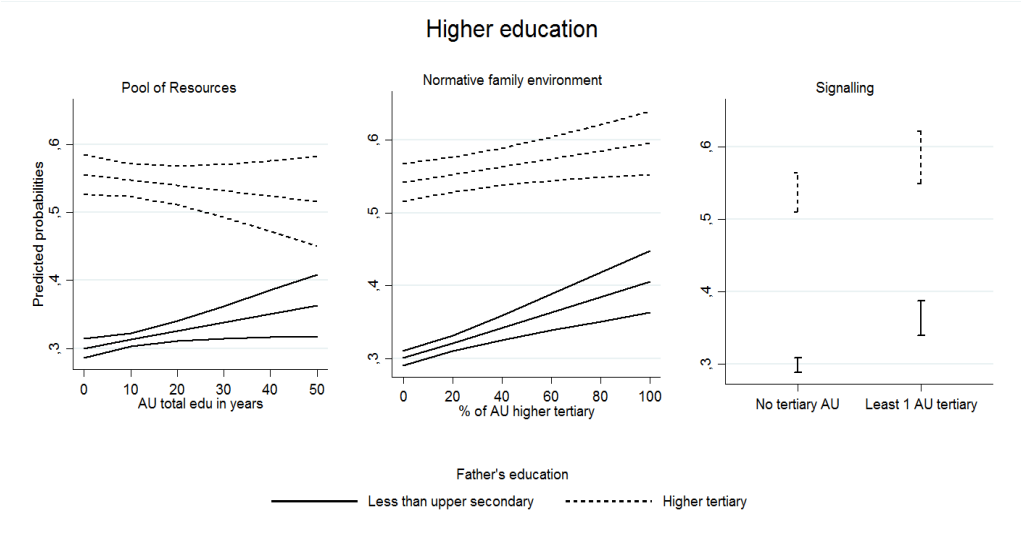

Figure 2. Predicted probabilities for the interaction between father's education and aunts' and uncles' total education in years (left panel), proportion of higher educated aunts and uncles (middle panel) and aunts' and uncles' dummy (0=No higher educated aunts/uncles 1=at least one higher educated) (right panel). Dependent variable: Higher education.

Kin selection effects

Finally we report the results on compensation according to maternal and paternal lineages (thus according to maternal and paternal aunts and uncles). Similarly to the results on pool of resources above, the main variable of interest is now aunts' and uncles' total education in years. However, the results would be identical if we applied the mean of aunts' and uncles' education instead (like in our baseline models).

In Figure 4 we show the results for the continuation of education beyond the compulsory level. Here we observe statistically significant compensation in two cases: maternal extended family members compensating low maternal or paternal education (panel 1). There does not appear to be much compensation taking place from father's side of the family. We observe a small compensation effect but this is not statistically significant result, if the confidence intervals are taken into account. These findings are in line with the kin selection as well as matrilateral and paternal uncertainty hypothesis. Children with lower parental educational background benefit more from the education of maternal lineage.

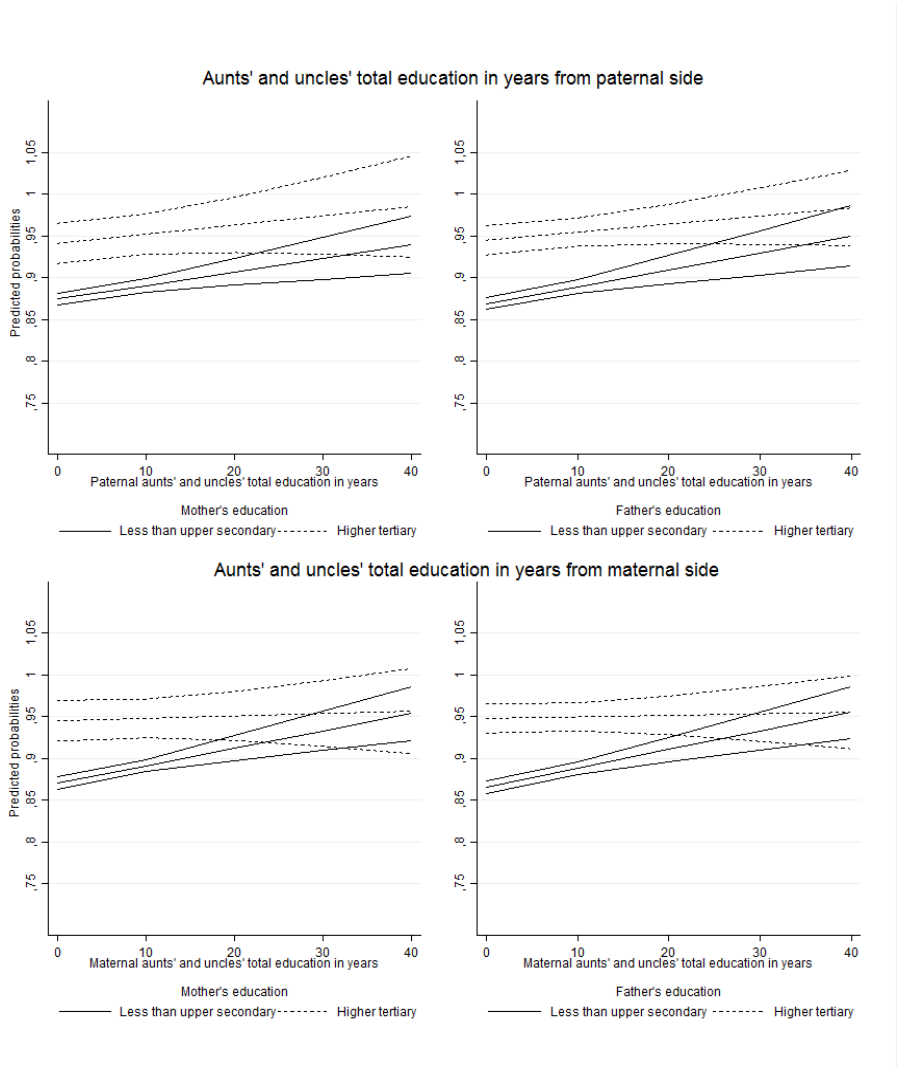

Figure 4. Predicted probabilities for the interaction between father's and mother's education and aunts' and uncles' average education in years from maternal and paternal lineage.

Figure 5 reports similar models for a higher education degree. In these models the compensatory effect can now only be observed for the maternal aunts and uncles compensating maternal low education (see lower panels). The finding further confirms the kin-specific hypothesis already supported by the findings of figure 4. Compensation is largely restricted to the maternal lineage. However, in the case of paternal relatives we now find the opposite effect (see upper panels). The positive interaction, although not statistically significant, between maternal education and the education of the paternal aunts and uncles in upper panel left corner, signals for the multiplication of advantages. This result may explain why

we did not observe the multiplication effect in our previous figures: the effect appears to be kin-side specific, but rather unexpectedly, limited to the influence of the paternal side relatives.

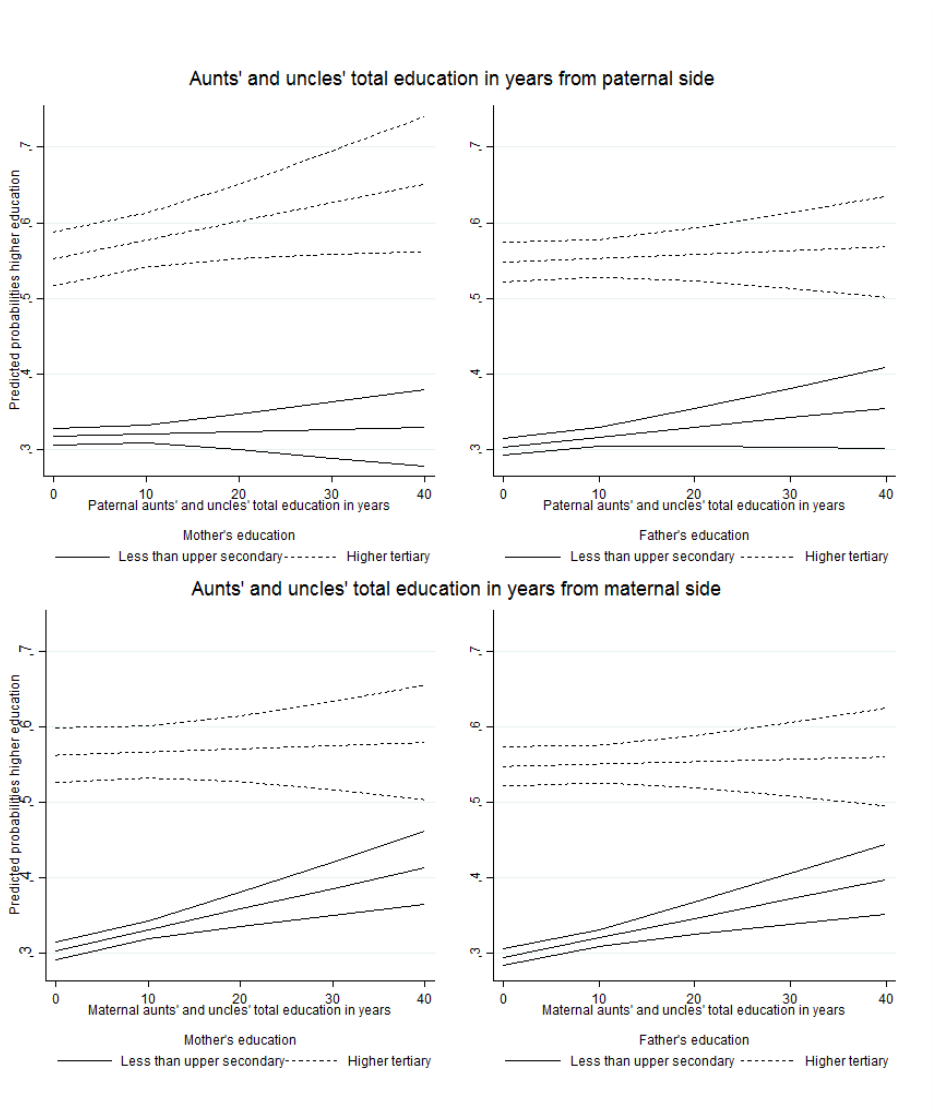

Figure 5. Predicted probabilities for the interaction between father's and mother's education and aunts' and uncles' average education in years from maternal and paternal lineage. Dependent variable: child completed higher education.

Tests of robustness

In addition to the analyses reported here we also tested various alternative versions of extended family educational variables. For instance, we applied different educational thresholds for measuring normative family background (e.g. the proportion of aunts and uncles having a general secondary degree or a Master's degree). The findings were similar, but the currently reported models show the most contrasted results.

We also conducted analyses separately for sons and daughters and sensitivity analysis with sample included only cases with both maternal and paternal aunts and uncles. The differences between the results for boys and girls were not statistically significant. The results for those having both maternal and paternal aunts and uncles did not differ from the results reported here. In addition to these robustness tests, we computed models just for the children with more than one aunt or uncle (thus omitting all the cases without aunts and uncles). The only difference we find is that variable measuring pool of resources compensation is not statistically significant anymore in children completing higher education, although the regression estimate being the same as in our initial analysis. Thus this finding is probably due to lack of statistical power by omitting too many cases (omitted cases = 1953) and increasing error term.

Further, it may be asked if we are in fact suppressing our extended family effects in an unnecessary manner when also controlling for grandparent education in our all models. However, the results were more or less the same even if grandparent's highest education was dropped from the models. This is in contrast with the previous results by Jaeger (2012) suggesting that the grandparent effect could largely consist of the unobserved aunt and uncle effects.

Conclusions and discussion

In this chapter we have studied in more detailed manner interpersonal compensation in education by analysing the association between the education of aunts and uncles and their nephews and nieces. We find support that that at least

in the Finnish context compensation does take place, stronger in the case of continuing education beyond compulsory schooling than in the case of acquiring a higher education degree. Although the extended family members may have a limited influence on children, their role appears to be very important in some cases; they are often able to provide the final extra push to avoid marginalisation in terms of getting more education that a compulsory degree, but also provide advantages for reaching a higher education degree. It seems that in many cases the educational resources of the extended family members help to fully overcome the disadvantage followed from the low immediate family education. Thus our results support the earlier findings that extended family members do compensate children's educational attainment (Jäeger 2012).

Our analyses suggest that the extended family members' *pool of resources* has the strongest and *educational signalling* the weakest effect on the education of nephews and nieces. This speaks generally for the importance of human capital within social networks for intergenerational attainment. The same also applies to the role model theory. In the studied birth cohorts the extended family members had a more profound influence on children than these models assume.

Further, it seems as well that the evolutionary hypothesis cannot be refuted. We find that only maternal aunts and uncles compensate for low parental education. This finding is fully in line with kin selection theories and is certainly worth a more detailed analysis in the future. For instance, does the number of aunts and uncles have an impact on compensation and exactly which of the aunts and uncles are the most beneficial for the children's educational attainment?

Although interpersonal compensation seems to decrease educational inequality at least to some extent in the Finnish context, we have to remember that there are still disadvantaged children who do not benefit from the extra push from their aunts and uncles. Further, our results show that conventional two generational model might be insufficient to capture some of the key effects of educational inheritance.

Our findings come from a Finnish birth cohort born 1972-1982. All children went through a nine-year compulsory schooling and have enjoyed relatively high

equality of opportunity, with a strong egalitarian welfare state supporting their families throughout their childhoods. Because of this it seems that we are only observing the lower-boundary effects of interpersonal compensation. The fact that we can find compensatory effects also in the Nordic context suggests that in other institutional environments the interpersonal compensatory effects form the extended family members could be much stronger. On the other hand interpersonal educational compensation in children's educational attainment in particular may be even more pronounced in the Nordic context because other barriers, such as education fees, have been removed and (extended) family members' financial assets are ineffective.

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