Living Near Grandma: Spatial Proximity and the Intergenerational Transmission of Educational Advantage

Introduction

Until Mare's (2011) PAA address that challenged the two-generation view of intergenerational transmission processes, it was widely thought among social stratification scholars that family influence only operated across two generations, from parents to children (Song et al. 2020; Warren and Hauser 1997). Any benefits that grandparents could offer their grandchildren were thought to be entirely mediated by the parental generation. Over the last decade, however, a growing body of research has demonstrated that in some contexts the transmission of advantage extends to three generations through three broad mechanisms (Anderson, Sheppard, and Monden 2018; Daw, Gaddis, and Morse 2020; Evans, Daw, and Gaddis 2021). The first is the direct transfer of resources, including economic, social, and cultural capital. Grandparents might provide additional resources to the ones that parents are providing, augmenting the intergenerational transfer of advantage, or provide support when parents are unable to, in a compensating fashion. The second is the indirect transfer of resources through how grandparents have passed on advantages to their own children, the parents. For example, even when parents do not achieve higher levels of education, they often marry individuals who are of higher social status because of the cultural and social connections their own parents provided them (Gaddis and Daw 2017). The third mechanism is through genetic transmission as grandparents and their grandchildren share 25 percent of their DNA and some traits like education are moderately heritable (Clark 2014; Daw et al. 2020; Zeng and Xie 2014). Despite the growing number of scholarly articles investigating the relationship between grandparents and their grandchildren's life chances, the findings remain remarkably mixed.

Scholars suspect that the mixed findings could be due to data quality, the outcome under study, the social context of the population or subpopulations, as well as the grandparent-grandchild lineage investigated (Anderson et al. 2018; Daw et al. 2020; Lehti, Erola, and Tanskanen 2019; Li 2023). When it comes to direct resource transfer, especially, both lifespan overlap and the dilution of grandparents' resources across grandchildren are also important determinants of the ability to transfer resources in the first place (Braun and Stuhler 2018; Daw et al. 2020; Ferguson and Ready 2011; Li 2023; Zeng and Xie 2014). Exposure to grandparents, in particular, often proxied as lifespan overlap, is of particular interest given increasing life expectancy among aging grandparents (Lehti et al. 2019; Li 2023). However, critical, yet understudied for understanding exposure, is spatial proximity. Spatial proximity allows for more quality time spent together and would lend to more care and supervision of grandchildren by their grandparents. Grandparents and grandchildren who live closer to one another report having stronger relationships (Rossi and Rossi 1990). The degree of exposure could lead to variation in the ability or even willingness of grandparents to transfer forms of social and cultural capital, especially, but also economic capital. It may be the case that spatial proximity can act as a proxy for the quality or intensity of the relationship between grandparents and their grandchildren which could have its own direct effect on the educational outcomes of grandchildren, as well as moderate the relationship between grandparents' social status and that of their grandchildren.

To our knowledge, there are two studies that have investigated the role of spatial proximity in the intergenerational transmission of advantage. In the U.S. context using the Health and Retirement Study, spatial proximity, as measured as living greater than 10 miles from one's grandparents at a single point in time did not influence the educational attainment of grandchildren (Li 2023). Similarly, research in Norway using the Longitudinal Internet Studies for the Social Sciences finds spatial proximity, as measured as distance in minutes when the grandchild was 6, does not moderate or directly influence the educational attainment of grandchildren (Bol and Kalmijn 2016). This study expands upon past research by investigating whether spatial proximity in the Finnish context influences the intergenerational transmission of advantage. Our study advances upon prior work by using national register data that follows an entire cohort of Finnish permanent residents born between 1987 and 1999 with complete intergenerational linkages. Moreover, this study expands upon past research by investigating the nuances of timing and distance to grandparents during the grandchild's entire childhood, while also comparing gender and lineage differences.

This study aims to advance our understanding the mechanisms underlying the intergenerational transmission of educational advantage from grandparents to their grandchildren. We propose that spatial proximity may play both a moderating as well as direct role in the intergenerational transmission of advantage. To conduct this study, we investigate the Finnish context using Finnish registry data examining the academic achievement, proxied by high school GPA, of grandchildren born between 1987 and 1999. As past research on Finland has identified the importance of maternal grandmothers in the transmission of advantage (Lehti et al. 2019), our preliminary results start here. The full analyses, however, will compare spatial proximity and the transmission of advantage to the paternal lineage and grandfathers as well.

Methods

Data

This study uses data from the Finnish population register. Statistics Finland maintains the population register, creating family linkages using personal identification codes of all of Finland's permanent residents (the Ethic Committee of Statistics Finland's permission TK-53-1121-18). The data includes sociodemographic characteristics, including the postcode of residence and high school GPA, for every individual sampled annually between 1987 and 2018. We restrict our sample to all maternal grandmothers (G1) who have biologically related grandchildren (G3) born between 1987 and 1999[1]. While the data is longitudinal, our analysis is based on a cross-sectional sample of the reported high school GPA of G3s at the age of 16.

Measures

Our analysis investigates the social status of G3 as represented by their high school GPA at age 16. We operationalize GPA as a continuous variable ranging from 4 to 10[2].

We investigate spatial proximity between a grandchild (G3) and their maternal grandmother (G1) by measuring the distance between their postcodes of residence. Postcode of residence is available annually for G3s and G1s between 1987 and 2018. We calculate distance by locating the centroid of each Finnish postal code (N = 3,026) with the *geofi* package in R (Kainu et al., 2024), which uses open-source geospatial data from Statistics Finland. In preliminary analyses presented here, we calculate distance in kilometers as the Euclidean distance between the centroids of the postcodes of residence for each year of lifespan overlap[3]. We recognize that the influence of spatial proximity to G1 on G3's educational prospect may be sensitive to the age of G3 during exposure to G1. To capture potential variation, we create three unique distance measures. First, we create an average distance between G1 and G3 between the ages of 0 and 14. Then we create an average distance measure between the ages of 0 and 5; and 6 and 12. Finally, for each age range we treat distance in kilometers as a categorical measure representing whether, on average, G1 and G3 live in the same postcode = 0, less than 25km away from each other, or greater than 25km away.

We also investigate G1 education as a dichotomous indicator representing whether they graduated from college (=1). We consider both the direct and potential moderating influence of spatial proximity on the relationship between G1 education and G3 educational achievement.

We account for several important controls which may influence the intergenerational transmission of educational advantage, including the G3's gender (female=1), age, number of siblings, and whether they live in a rural area (=1). We also account for whether G2 received a college degree or higher education as a dichotomous indicator to investigate whether spatial proximity to G1s has a direct influence on G3 educational achievement, net of G2 educational characteristics.

Analytic Strategy

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[1] Future analyses will also investigate maternal grandfathers, paternal grandmothers, and paternal grandfathers.

[2] Supplementary analyses will investigate the educational attainment of G3s beyond high school, including if they entered college or obtained a college degree or higher.

[3] Supplementary analyses will calculate distance using the shortest travel time by car using the *osrm* package in R (Giraud et al., 2024), which uses data from OpenStreetMap.

We present preliminary analyses applying ordinary least squares (OLS) regression models clustering standard errors by the G1 identifier. Our future analysis will also attempt to isolate the effect of spatial proximity to G1 on G3 educational achievement by presenting cousin fixed effects models.

Preliminary Results

For data protection, the preliminary results presented below only indicate the direction and significance of the results. Due to time constraints, the coefficients and standard errors could not be taken out of the secure data environment in time for abstract submission. Nonetheless, Table 1 presents the results from the OLS regression models predicting G3 high school GPA. All models include controls for G3 age, gender, number of siblings, and urbanicity. Model 1 presents the association between distance from G1 while also account for G1 college education. Model 2 includes G2 college education, and model 3 includes the interaction between G1 college education and distance. The table presents 3 sets of results based on whether distance from G1 was operationalized as average distance when G3 was aged 0 to 14; average distance when G3 was aged 0 to 5; and average distance when G3 was aged 6 to 12.

Table 1. Summary of Preliminary Regression Models Predicting High School GPA by Distance from G1 and G1 Education

	Average Distance Aged 0 to 14			Average Distance Aged 0 to 5			Average Distance Aged 6 to 12		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Distance (ref. Same Postcode)									
Within 25 KM	-*	-*	-*	-*	-*	-*	-*	-*	-*
Greater than 25 KM	+*	+	+	+*	+*	+*	+*	+*	+*
G1 College Education	+*	+*	+*	+*	+*	+*	+*	+*	+*
G2 College Education		+*	+*		+*	+*		+*	+*
Interaction (ref Same Postcode#No G1 College Education)									
Within 25 KM#G1 College Education			+			+			+
Greater than 25 KM#G1 College Education			-			+			+

Note: All models include controls for G3 age, gender, number of siblings, and urbanicity. Direction and significance of coefficient indicated. Coefficients and standard errors could not be included in the preliminary abstract due to data protection, as they were not approved to be taken out of the secure data environment in time for submission to IPC.

The first set of results investigating distance from G1 during G3's entire childhood suggests that living in the same postcode is associated with a higher GPA than living within 25 kilometers. However, living greater than 25 kilometers from G1 is associated with the highest predicted G3 GPA, even compared to living in the same postcode. Including the G2 education in model 2 helped to attenuate this relationship, suggesting that the residential mobility often associated with G2 college education may help account for greater spatial distance between G1s and G3s. Model 3 suggests that distance does not moderate the relationship between G1 education and G3 academic achievement. Rather, model 3 finds a strong consistent direct relationship between G3 GPA and G1 education. As expected, the inclusion of G2 education in model 2 reduced the magnitude of the association between G1 education and G3 GPA by approximately half.

The second set of models investigating distance to G1 during early childhood and middle childhood find similar results. However, unlike in the first set of models, when only accounting for distance between the ages of 0 and 5 or 6 and 12, there continues to be a strong positive association with living greater than 25 km from G1 on GPA compared to living in the same postcode, even after accounting for G2 education.

Discussion

The preliminary results suggest that spatial proximity to maternal grandmothers influences grandchildren's academic achievement, albeit in a more nuanced way than initially expected.

Grandchildren living in the same postcode as their maternal grandmothers throughout their childhood have a higher predicted high school GPA at age 16 than grandchildren living within 25 kilometers of their maternal grandmothers. Interestingly, however, grandchildren who live more than 25 kilometers than their maternal grandmothers are at more of an advantage in their predicted high school GPA than grandchildren living in the same postcode. These results may reflect the residential mobility of the parent generation when they receive their college degree. Overall, the results suggest that spatial proximity to G1 is an understudied mechanism that directly influences G3 academic achievement. These results have important implications for understanding the intergenerational transmission of advantage as well as the role grandparents play in influencing their grandchildren's academic achievement.

The full paper will further investigate the underlying mechanisms explaining this relationship. The full paper will also investigate alternative definitions of spatial proximity; the paternal lineage; the grandchild-grandfather association; as well as alternative definitions of educational advantage such as entrance into college or college completion. Future analyses will also investigate more robust analyses, including cousin fixed effects models.

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