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The Grandparents Effect in Social Mobility: Evidence from British Birth Cohort Studies

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Abstract

Using data from three British birth cohort studies, we examine patterns of social mobility over three generations of family members. For both men and women, absolute mobility rates (i.e., total, upward, downward, and outflow mobility rates) in the partial parents-children mobility tables vary substantially by grandparents' social class. In terms of relative mobility patterns, we find a statistically significant association between grandparents' and grandchildren's class positions, after parents' social class is taken into account. The net grandparents-grandchildren association can be summarized by a single uniform association parameter. Net of parents' social class, the odds of grandchildren entering the professional-managerial class rather than the unskilled manual class are at least two and a half times better if the grandparents were themselves in professional-managerial rather than unskilled manual-class positions. This grandparents effect in social mobility persists even when parents' education, income, and wealth are taken into account.

Keywords

social mobility, grandparents effect, log-linear models, prospective cohort studies

Social mobility research has a long and esteemed history (e.g., Blau and Duncan 1967; Glass 1954; Goldthorpe, Llewellyn, and Payne 1980). Without exception, numerous empirical studies demonstrate that social origins are strong predictors of social destinations. Surveying this voluminous literature, it is remarkable that almost all mobility studies rely on data for just two generations of family members: parents and children. Only a handful of studies explore mobility patterns over three generations (Beck 1983; Erola and Moisio 2007; Goyder and Curtis 1977; Mukherjee 1954; Ridge 1973; Warren and Hauser 1997).

This two-generation focus is partly a matter of practical constraint, because three-generation social mobility data are less commonly available. Some scholars have argued, though, with some empirical support, that grandparents have no direct effect on grandchildren's mobility outcomes once parents' characteristics are taken into account (e.g., Erola and Moisio 2007; Hodge 1966; Ridge 1973; Warren and Hauser 1997).

But there are good reasons to expect the opposite. To begin with, it is reasonable to assume grandparents have strong interests in promoting their grandchildren's socioeconomic success. And socioeconomically successful grandparents are well-placed to pass

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this success onto their grandchildren given that, as Mare (2011) argues, many (although not all) mobility-relevant resources (e.g., financial wealth) are quite durable and directly transmissible across multiple generations. Furthermore, many social institutions—such as Ivy League colleges' legacy admissions and generation-skipping trusts—contribute to status inheritance over multiple generations, especially at the top and bottom of the hierarchy. As Mare (2011:7) puts it, "the usual models of two-generation association may apply to families in the middle of the socioeconomic distribution, but at the extremes, an individual's fortune may depend on the actions and experiences of a more distant ancestor who was lucky or unlucky enough to achieve great wealth or abject poverty."

In addition, as Bengtson (2001:1) observes, one implication of population aging is the "longer years of shared lives between generations." Today's grandparents are often healthier, more active, and financially more secure than were grandparents in the past. Family forms and conditions are also now much more diverse. These social changes might have led to a greater role for grandparents in their grandchildren's lives, especially for children with divorced parents (Bengtson, Biblarz, and Roberts 2002).

If grandparents live with or close to grandchildren, they might be directly involved in childrearing (for the Chinese case, see Zeng and Xie 2011). Where multigenerational coresidence is rare, grandparents often still play a significant role in grandchildren's lives. For example, in Britain around half of all grandparents of very young grandchildren see them at least once a week (Hawkes and Joshi 2007); and around one-third of all families with employed mothers rely on grandparents for informal childcare (Office for National Statistics 2011). Beyond grandchildren's formative years, wealthy grandparents might make monetary transfers to help finance their grandchildren's education. For example, Arrondel and Masson (2001, Table 2) estimate that in France, 22 percent of grandchildren receive direct financial transfer from grandparents. Well-connected grandparents could also use their social contacts to help grandchildren with job searches.

Systematic survey evidence on mechanisms of the grandparents effect is scant. But suggestive ideas can be gleaned from case studies. For example, Bertaux and Bertaux-Wiame (1997:86) describe the social mobility experience of a French family over five generations: although this is not a straightforward story of dynastic inheritance of a family business, there is a "connection between the accumulation of a heritage of real estate over three generations . . . and the profession of the great-grandson . . . through a series of metamorphoses of the heritage."

Second, parents' social class might not fully capture all the advantages and disadvantages transmitted between generations. That is, people from the same class origin might experience considerable heterogeneity in the availability of mobility-relevant resources. Parents' own mobility experiences are a likely source of such within-class-origin heterogeneity. Compared to parents who achieved upward mobility into professional-managerial occupations, intergenerationally stable parents in advantaged class positions might have more resources (e.g., financial wealth and social contacts) to pass on to their children. Similarly, compared to second-generation working-class parents, parents who experienced downward mobility to the working class might be better positioned, or perhaps more motivated, to help their children achieve upward counter-mobility (Girod, Fricker, and Körffy 1972). For instance, Jackson and Marsden's (1962:67–70) study of children attending academically selective grammar schools in early postwar Britain found that more than a quarter of students from nominally working-class backgrounds were in fact from families better described as "sunken middle class," possessing notably higher than average material and cultural resources.

Andorka (1997) vividly describes a Hungarian family's intergenerational counter-mobility experience. The grandparents of this Jewish professional/bourgeois family had

become *déclassée* during the Second World War and the Stalinist period of the postwar communist regime. But their grandchildren "were able—mostly thanks to their knowledge of foreign languages and other cultural resources—to come back to their class of origin at the top of Hungarian society" (Andorka 1997:269).

Whether grandparents have direct effects on grandchildren's social mobility outcomes is of course a matter for empirical investigation. But results of the limited research in this area are mixed. Supporting evidence has been reported for Australia (Allingham 1967), Canada (Goyder and Curtis 1977), France (Pohl and Soleihavoup 1982), and the United States (Beck 1983). In a recent paper, Lindahl and colleagues (2012:20) used linked Swedish survey and register data on education and earnings from multiple years and reported a "surprisingly strong association between grandparental education/earnings and education/earnings of grandchildren." They estimated that earnings elasticity between the first and second generations was .356 and that between the second and third generations was .303. If earnings mobility follows a Markovian process,[1] the earnings elasticity between the first and third generations should be .108, which is "substantially lower than the estimate of 0.184 obtained from [the] data." Overall, they conclude that "two-generation studies . . . severely under-predict intergenerational persistence in earnings and educational attainment over three generations" (Lindahl et al. 2012:1). However, they also note that a "*t*-test of equality between the predicted and the estimated three-generation mobility measure gives a *t*-statistic between 1.47 and 1.58, i.e., indicating a marginally significant difference" (Lindahl et al. 2012:18).

Other researchers report different findings. For example, Warren and Hauser (1997:561) analyzed data from the Wisconsin Longitudinal Survey and concluded that "the schooling, occupational status, and income of grandparents have few significant effects on the educational attainment or occupational status of their grandchildren when parents' characteristics are controlled." Similarly, Erola and Moisio (2007:169) analyzed Finnish mobility data with log-linear models and maintain that "after controlling for parents' social class, . . . grandchildren's social class is almost conditionally independent from . . . grandparents' social class." These findings must be taken seriously. It is certainly possible that a two-generation, Markovian mobility process operates in some contexts but not in others. As Mare (2011:16) points out, "mid-twentieth century Wisconsin families may be a population in which multigenerational effects are unusually weak." As regards the Finnish findings, Erola and Moisio's (2007:169) conclusion of "almost conditional independence" belies the fact that their own results reveal a very large and significant improvement in model fit when the grandparents-grandchildren association is taken into account (for further details, see Chan and Boliver forthcoming).

In this article, we bring fresh empirical evidence to the debate on the grandparents effect in social mobility. We draw on data from three British birth cohort studies and establish that there is indeed a net association between grandparents' and grandchildren's class positions in contemporary Britain. Furthermore, by comparing the fit of several log-linear and related models, we are able to describe the nature of this net association in some detail. To test the robustness of our log-linear results, we then shift our analysis to the individual level. We introduce several key covariates and explore the grandparents effect in an ordered logit framework. We show that the grandparents effect remains significant and substantial even when parents' education, wealth, and income are taken into account.

DATA, CLASS SCHEME, AND ANALYTIC STRATEGY

Data and the Registrar General Class Scheme

The three birth cohort studies we used followed large and nationally representative samples of British-born men and women

from birth into adulthood. The first of these, the National Study of Health and Development (NSHD), followed a sample of respondents born in one week in March 1946. The second study, the National Child Development Study (NCDS), followed individuals born in one week in March 1958. And the third, the British Cohort Study (BCS), followed people born in one week in April 1970. (See the Appendix for a discussion of sample attrition and missing data issues in the three studies.)

All three studies collected a wealth of information about cohort members, including their occupations as adults.[2] Interviews with cohort members' mothers in early sweeps collected occupational information about cohort members' fathers.[3] Each cohort member's mother also answered questions about her father's and father-in-law's occupation (i.e., cohort members' maternal and paternal grandfathers) when cohort members were 8 years old, in the NSHD, or as she and her husband were leaving school, in the case of NCDS and BCS. There is no reason to think that in contemporary Britain social advantages and disadvantages are transmitted on either the patrilineal or matrilineal line alone. However, because cohort members' mothers answered questions about grandparents' occupation, measurement error should be smaller for maternal grandfathers' class position. In addition, evolutionary theory predicts that, due to paternity uncertainty and sex-specific reproductive strategies, maternal grandparents invest more in grandchildren than do paternal grandparents (Coall and Hertwig 2010). Given these considerations, we used maternal grandparents' social class in the following analyses.[4]

We coded these occupational data according to the UK Register General (RG) social class scheme. The RG class scheme is based on the notion of occupational skills, such that "occupations are allocated to social classes commensurate with the degree of expertise involved in carrying out their associated tasks" (Marshall et al. 1989:18). The RG scheme has six classes. Due to cell size considerations, we combined them to form the following four categories: class I+II, representing professional and managerial occupations; class IIIn, skilled non-manual occupations; class IIIm, skilled manual occupations; and class IV+V, unskilled manual occupations.[5]

To illustrate some properties of the RG classes, Figure 1 shows their association with homeownership (left panel) and educational attainment (right panel) among cohort members' parents. The left panel shows homeownership has become more common between cohorts (especially for BCS). Within each cohort, however, there is a fairly linear relationship between homeownership rate and the four RG classes. For most people, homeownership is the main vehicle of wealth accumulation, so this provides preliminary evidence that household wealth is rather well ordered by RG classes. The same applies to educational attainment. The right panel of Figure 1 shows fairly linear class gradients in educational attainment, as indexed by the proportion of fathers who remained in school beyond the minimum school-leaving age.[6]

Analytic Strategy

We explored the association between grandparents' class (G), parents' class (P), and children's class (C) with log-linear and related models. Because separate analyses of the three surveys yield very similar results, the log-linear analyses we report here are based on pooled data.[7] However, given the long-standing debate on gender and class analysis (Beller 2009; Sørensen 1994), we analyze and report men's and women's three-generation mobility experiences separately.

Our mobility table analysis shows that, for both men and women, there is a strong and statistically significant net association between grandparents' and grandchildren's class positions. Because the four RG classes are rather broad groupings, one could argue that the net GC association is largely due to measurement error and could be accounted for with more detailed parental information. To address this concern, we regressed grandchildren's class position on grandparents' class, while controlling for parents' social class, educational attainment, wealth, and income.

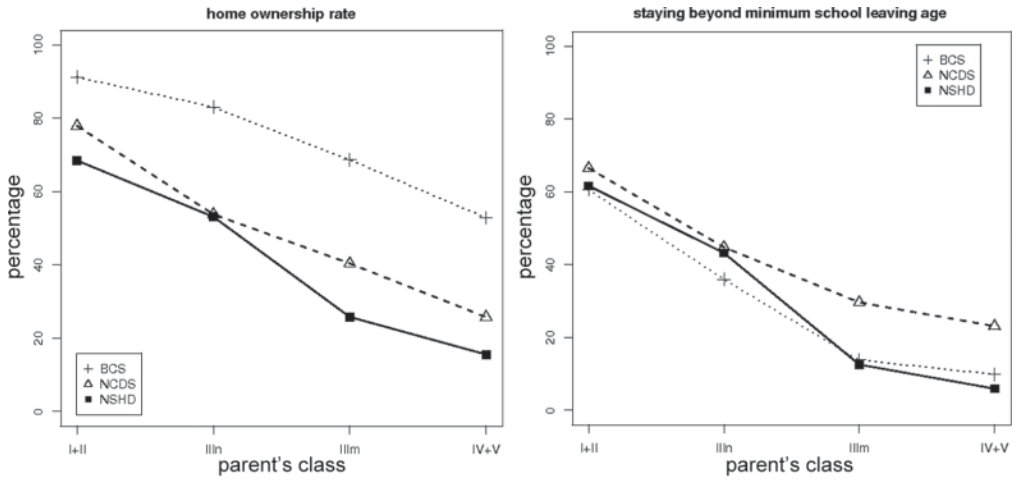

Figure 1. Homeownership and Educational Attainment of Cohort Members' Parents by Registrar General Social Class

Table 1. Marginal Distribution of Respondents by Grandparents' Social Class (G), Parents' Social Class (P), and Their Own Social Class (C); and Marginal Distribution of Respondents by Parents' Class Given Grandparents' Social Class

	Men				Women				
	I+II	IIIn	IIIm	IV+V	I+II	IIIn	IIIm	IV+V	Δ
G	19.5	7.5	45.2	27.8	18.9	8.3	44.8	28.0	1.0
P	32.9	11.5	41.7	13.9	33.1	11.2	41.8	13.9	.3
C	51.9	9.3	30.0	8.8	44.5	33.8	6.6	15.1	30.8
P | G = I+II	57.5	10.6	24.0	7.9	57.8	10.9	23.5	7.8	.6
P | G = IIIn	50.1	15.3	28.8	5.9	45.8	16.7	27.9	9.6	5.2
P | G = IIIm	28.0	12.5	46.0	13.5	29.4	11.3	46.4	12.8	1.9
P | G = IV+V	19.1	9.5	50.6	20.9	18.8	9.4	50.8	21.0	.4

Note: Δ = index of dissimilarity between genders.

RESULTS

Marginal Distributions

The top panel of Table 1 shows marginal distributions of respondents by grandparents' class (G), parents' class (P), and their own class (C). In general, the professional and managerial class (class I+II) expands across generations. Averaging over the three surveys, 52 percent of male cohort members are found in class I+II, compared to 33 percent of their parents and 20 percent of their grandparents. As the room at the top expanded, the manual classes shrunk: 28 percent of male cohort members' grandparents held semi-skilled or unskilled manual occupations, compared to 14 percent of their parents and 9 percent of male cohort members themselves.[8] Upgrading of the occupational structure in Britain (and in other industrial societies) over the twentieth century and its implications for generating upward structural mobility are well understood (Goldthorpe et al. 1980).

Occupational upgrading also affects women. For both male and female cohort members, however, the grandparents and parents referred to here are maternal grandfathers and fathers, so there is very little

between-gender difference in marginal distributions of G and P, as can be seen from the relevant indices of dissimilarity (see the last column of Table 1). However, because of occupational sex segregation, the marginal distribution of C for women is quite different from that for men. In particular, averaged over the three surveys, 34 percent of women, but only 9 percent of men, are found in skilled non-manual occupations (class IIIn).[9]

The bottom panel of Table 1 reports marginal distributions of parents' social class given grandparents' class position. Not surprisingly, individuals with advantaged grandparents tend to have advantaged parents. For example, 58 percent of cohort members with professional and managerial grandparents had parents in class I+II, compared to 19 percent of members with unskilled manual grandparents.

Absolute Mobility Rates

Well over half of all cohort members were intergenerationally mobile. Specifically, 57 percent of men and 69 percent of women are found in cells off the main diagonal of the marginal parents-children (PC) mobility table.[10] Consistent with the upgrading trend of the occupational structure, much of the overall mobility was due to upward rather than downward mobility: 39 percent of men and 46 percent of women achieved upward mobility (i.e., are found in cells below the main diagonal of the PC table), compared to 17 percent of men and 23 percent of women who experienced downward mobility (i.e., are found above the main diagonal).

Figure 2 shows how total, upward, and downward mobility rates in the partial PC tables vary by grandparents' class position. Three points are notable here. First, women were invariably more mobile than men. Indeed, total mobility rates are 11 to 15 percentage points higher for women. Second, for both men and women, total and upward mobility rates are higher for cohort members with less advantaged grandparents. Among women with class I+II grandparents, 32 percent achieved upward mobility, compared to 54 percent of women with class IV+V grandparents. This is partly due to a ceiling effect. As noted earlier, individuals with advantaged grandparents are more likely to have parents in an advantaged social class too. As a result, they have less room for further upward mobility. Third, there is an opposite (although weaker) gradient in downward mobility rates by grandparents' class that, to some degree, can be attributed to a floor effect.

Figure 3 shows indicative outflow mobility rates in partial PC mobility tables (i.e., distribution of cohort members by their own social class given parents' class). Cohort members depicted in Figure 3 all have parents in class I+II. The four rows within each panel refer to grandparents' social class, and the four blocks within each row refer to class destination (i.e., children's class). Among men with an intergenerationally stable class I+II background (i.e., both parents and grandparents were in class I+II), 80 percent stayed in class I+II, and only 3 percent slid down to class IV+V. In contrast, among cohort members with long-range upwardly mobile parents (i.e., class IV+V grandparents and class I+II parents), 61 percent stayed in class I+II and 5 percent experienced downward counter-mobility and returned to class IV+V. Women experienced a very similar pattern of outflow rates by parents' and grandparents' class. One notable feature of the right panel of Figure 3 is that many more women are found in class IIIn. This is expected, because this class contains many female-dominated occupations. Overall, it is clear that outflow rates in the partial PC tables depend on grandparents' class.[11]

Relative Mobility Rates

Having seen evidence that grandparents' social class matters for absolute mobility rates, we now turn to relative mobility patterns using log-linear and related models.[12] We start with the conditional independence model:

$$\log F_{ijk} = \lambda + \lambda^{G}_{i} + \lambda^{P}_{j} + \lambda^{C}_{k} + \lambda^{GP}_{ij} + \lambda^{PC}_{jk}, \quad (1)$$

where F_{ijk} is the expected frequency of the ijk^{th} cell; λ is the grand mean; λ^{G}_{i}, λ^{P}_{j}, and λ^{C}_{k}

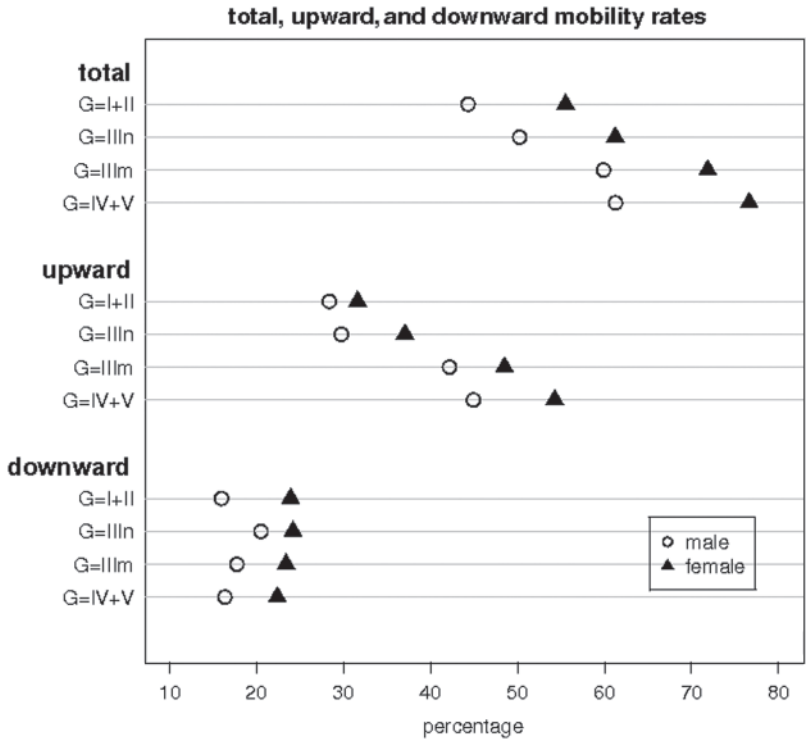

Figure 2. Total, Upward, and Downward Mobility Rates in Partial Parents-Children Mobility Tables by Gender and Grandparents' Class

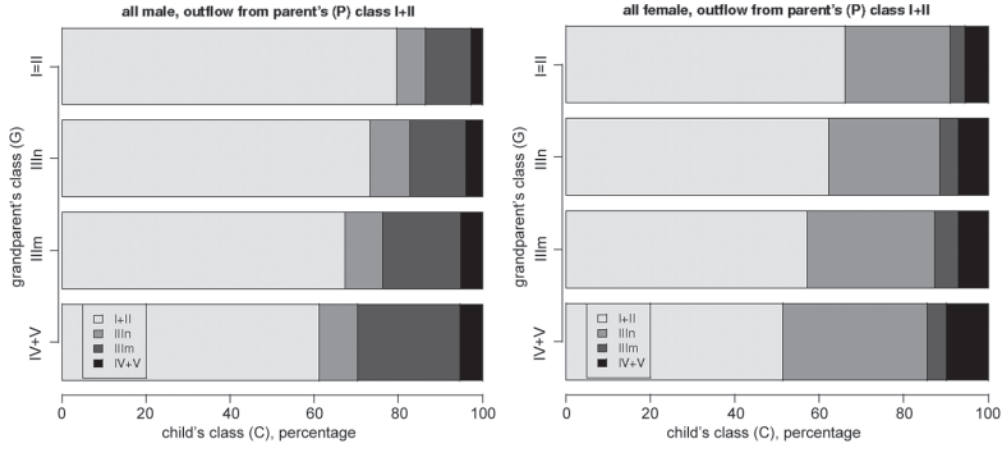

Figure 3. Outflow Rates from Class I+II (P) in Partial Parents-Children Mobility Tables by Grandparents' Class and Gender

Table 2. Goodness-of-Fit Statistics of Models to Explore Net GC Association

Model		G^2	df	*p*	Δ	BIC	Model Comparison	rG	rdf	*p*
Men										
1	Conditional Independence	147.28	36	.000	4.6	–179.17	1 v 2	115.24	9	.000
2	Full GC Association	32.04	27	.231	1.8	–212.80	1 v 3	102.26	4	.000
3	Quasi-independence	45.02	32	.063	2.1	–245.16	3 v 2	12.98	5	.024
							1 v 4	104.61	1	.000
4	Uniform Association	42.67	35	.175	2.1	–274.72	4 v 2	10.63	8	.223
Women										
1	Conditional Independence	113.39	36	.000	4.4	–211.94	1 v 2	90.00	9	.000
2	Full GC Association	23.39	27	.664	1.6	–220.61	1 v 3	72.99	4	.000
3	Quasi-independence	40.40	32	.146	2.5	–248.78	3 v 2	17.02	5	.004
							1 v 4	81.48	1	.000
4	Uniform Association	31.91	35	.618	2.1	–284.38	4 v 2	8.53	8	.384

are the main effects for grandparents', parents', and children's class, respectively; and λ^{GP}_{ij} and λ^{PC}_{jk} refer to the two-way associations between grandparents' and parents' class, and between parents' and children's class.[13] Because Model 1 does not contain the λ^{GC}_{ik} term, it posits there is no net GC association once the GP and PC associations are taken into account. If this model fits the data, there would be support for the Markovian view of social mobility. Table 2 shows that the deviance (G^2) of Model 1 is 147.28 for men and 113.39 for women. Given that Model 1 has 36 degrees of freedom, it clearly fails to fit the data.[14]

$$\log F_{ijk} = \lambda + \lambda^{G}_{i} + \lambda^{P}_{j} + \lambda^{C}_{k} + \lambda^{GP}_{ij} + \lambda^{PC}_{jk} + \lambda^{GC}_{ik}, \quad (2)$$

We then added to Model 1 the term representing net GC association (λ^{GC}_{ik}). Table 2 shows that the resulting Model 2 fits the data well by the conventional criterion of 5 percent type I error. Moreover, because Models 1 and 2 are nested, we can compare their fit to the data using the likelihood ratio test. For nine degrees of freedom, Model 2 reduces the deviance of Model 1 by 115.24 for men and 90 for women; these are large and statistically significant improvements in model fit. Furthermore, the percentage of cases misclassified (Δ) under Model 2 is only about a third of that under Model 1. Finally, BIC would also suggest choosing Model 2 over Model 1.[15] Overall, there is quite strong evidence against the null hypothesis of no net GC association. Put differently, grandparents' class does have direct net effects on grandchildren's mobility outcomes.

Model 2 does not constrain the net GC association at all. To find out how grandparents' class matters, we explored the net GC association further. Our goal was to find a more parsimonious model than Model 2 that would still fit the data. With this in mind, we first explored the quasi-independence (QI) model. QI posits that, net of other factors, grandchildren tend to stay in their grandparents' class, but otherwise C is independent of G. Formally, this can be represented as follows:

$$\log F_{ijk} = \lambda + \lambda^{G}_{i} + \lambda^{P}_{j} + \lambda^{C}_{k} + \lambda^{GP}_{ij} + \lambda^{PC}_{jk} + \lambda^{GC}_{ik}\,\delta \quad (3)$$

where $\delta = 1$ if $i = k$, otherwise $\delta = 0$. Table 2 shows QI cannot be rejected for women (p = .15) but its fit for men is rather marginal (p = .06). Using the likelihood ratio test to compare QI with Model 1, we see that QI significantly improves on the conditional independence model (for four degrees of freedom, QI reduces the G^2 of Model 1 by 102.26 for men and 72.99 for women; these are both statistically significant, see the 1 v 3 contrast). But

Table 3. Goodness-of-Fit Statistics of Models to Explore the Net GP and PC Associations for Men and Women

		GP Association			PC Association		
		G^2	df	*p*	G^2	df	*p*
Men							
1	Conditional Independence	717.22	36	.000	730.54	36	.000
2	Full GP/PC Association	32.04	27	.231	32.04	27	.231
3	Quasi-independence	260.69	32	.000	210.13	32	.000
4	Uniform association	109.69	35	.000	92.56	35	.000
5	QI+UA	91.93	31	.000	47.25	31	.031
Women							
1	Conditional Independence	730.89	36	.000	426.30	36	.000
2	Full GP/PC Association	23.39	27	.664	23.39	27	.664
3	Quasi-independence	244.82	32	.000	118.91	32	.000
4	Uniform Association	88.61	35	.000	54.01	35	.021
5	QI+UA	61.72	31	.001	29.80	31	.528

the full GC interaction model also fits the data better than QI (see the 3 v 2 contrast). This means QI, which posits that the grandparents effect takes place on the main diagonal only, fails to capture all of the net GC association in the data.[16]

Next, we considered the uniform association (UA) model (Duncan 1979; Goodman 1979). UA is a linear-by-linear model. It assumes class categories are ordered and evenly spaced (these are reasonable assumptions for RG classes given Figure 1). Given these assumptions, UA posits that the GC association can be summarized as the product of a uniform association parameter (β^{GC}) and the scale scores of the class categories:[17]

$$\log F_{ijk} = \lambda + \lambda^{G}_{i} + \lambda^{P}_{j} + \lambda^{C}_{k} + \lambda^{GP}_{ij} + \lambda^{PC}_{jk} + \beta^{GC}ik \qquad (4)$$

Compared to the conditional independence model, UA uses just one extra parameter, namely, β^{GC}. Table 2 shows that UA also fits the data well. Although QI and UA both fit the data, the interpretation they give of the GC association is very different. QI suggests the net GC association is found on the main diagonal only. By comparison, UA gives no special status to the main diagonal. Instead, it suggests the same social force, scaled by the distance between class categories, operates throughout the partial GC table. Because UA and QI are not nested models, we cannot compare their fit to the data formally. Nevertheless, for the following reasons, we prefer UA to QI. First, the deviance of UA is actually smaller than that of QI, despite UA's greater parsimony.[18] Second, although the full GC association model improves on QI (see the 3 v 2 contrast noted earlier), it does not improve on UA (see the 4 v 2 contrast). Finally, inspection of residuals of the UA model does not suggest any particular lack of fit along the main diagonal.

It is quite remarkable that a simple model such as UA could provide a satisfactory description of the net GC association, especially because UA and QI, suitably modified, fail to describe the net GP association or the net PC association (see Models 3 and 4 in Table 3). Table 3 also shows that a QI plus UA model fits the data for the net PC association for women but not for the other cases. It is beyond the scope of this article to find the best fitting model for the net PC or net GP association. Suffice it to say that the manner in which grandparents directly affect grandchildren's mobility outcomes is quite different from the relative mobility pattern found in parents-children mobility tables.

Substantive Magnitude of the Grandparents Effect

How strong is the grandparents effect in social mobility? The point estimate of β^{GC} is .111 for men and .102 for women (*se* = .011 in both cases). For men, under the UA model, the local odds ratio for the four cells formed by any adjacent rows and any adjacent columns in the partial GC table is 1.12 ($e^{.111}$) and the odds ratio for the four corner cells is 2.72 ($e^{.111(4-1)(4-1)}$). For women, the corresponding odds ratios are 1.11 ($e^{.102}$) and 2.50 ($e^{.102(4-1)(4-1)}$), respectively. That is, controlling for parents' social class, the odds of cohort members entering class I+II rather than class IV+V are at least two and a half times better if their grandparents were in class I+II rather than class IV+V.

Some counterfactual comparisons would also illustrate the magnitude and pattern of the grandparents effect in social mobility. In particular, we are interested in the contrast between the UA model that fits the data and the conditional independence model that posits no grandparents effect. Figure 4 reports some indicative outflow rates in partial PC tables. The left panel shows class immobility over three generations. For cohort members with class I+II grandparents and parents, the UA model predicts that 77 percent of men and 65 percent of women would end up in class I+II themselves. Under the conditional independence model, these percentages would be slightly lower at 71 and 60 percent, respectively.

At the other end of the class hierarchy, for cohort members with class IV+V grandparents and parents, the UA model predicts that 19 percent of men and 28 percent of women would stay in class IV+V. Under the conditional independence model, three-generation immobility in class IV+V would again be slightly lower at 16 percent for men and 25 percent for women.

The right panel of Figure 4 concerns counter-mobility over three generations between class I+II and class IV+V. Under the UA model, 47 percent of men and 41 percent of women would move from class IV+V (P) to class I+II (C) if they had class I+II grandparents. Under the conditional independence model, the corresponding figures are 35 and 32 percent. Looking at downward counter-mobility, that is, moving from class IV+V (G) to I+II (P) and then back to class IV+V (C), rates under the UA model are 6 percent for men and 10 percent for women. Had conditional independence prevailed, these rates would be about a third lower at 4 and 7 percent, respectively.

Overall, the grandparents effect seems to operate as follows. The conditional independence model consistently under-predicts the outflow rates considered earlier. When grandparents and parents are in the same social class, the grandparents effect leads us to expect slightly more three-generational class immobility. But in cases where grandparents and parents are in different social classes, the grandparents effect is often larger, in proportional if not absolute terms, and leads to a higher level of counter-mobility, as though grandparents' class background is correcting the "mobility mistake" made by the parents.[19]

Ordered Logit Analyses

Figure 5 plots homeownership rates (left panel) and staying-in-school rates (right panel) by parents' and grandparents' class. Within each panel, the line for parents in class I+II is above that for parents in class IIIn which, in turn, is above the line of class IIIm, and so on. This is consistent with what we saw in Figure 1. But the slope of the lines in Figure 5 further suggests that parents in the same social class have different amounts of resources available to them, depending on grandparents' class. For example, 87 percent of intergenerationally stable parents in class I+II were homeowners, compared to 73 percent of parents who achieved upward mobility from class IV+V to class I+II.[20]

This is prima facie evidence for one of the motivations of this article: the availability of mobility-relevant resources to parents is related to their own mobility experiences. Equally, however, one might turn the argument around and suggest that the net grandparents-grandchildren association reported earlier is an artifact. That is, once more detailed parental characteristics are brought

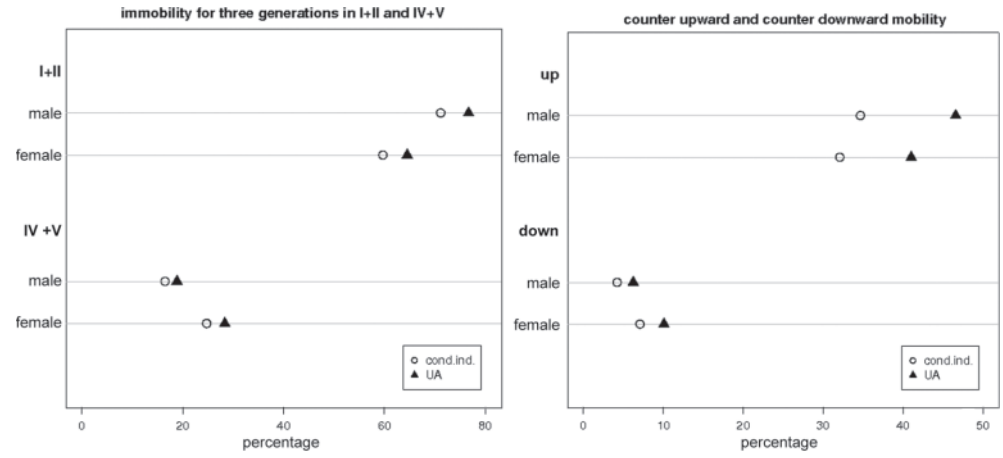

Figure 4. Expected Three-Generation Immobility Rates (left panel) and Expected Upward and Downward Counter-Mobility Rates (right panel) under Conditional Independence and Uniform Association Models

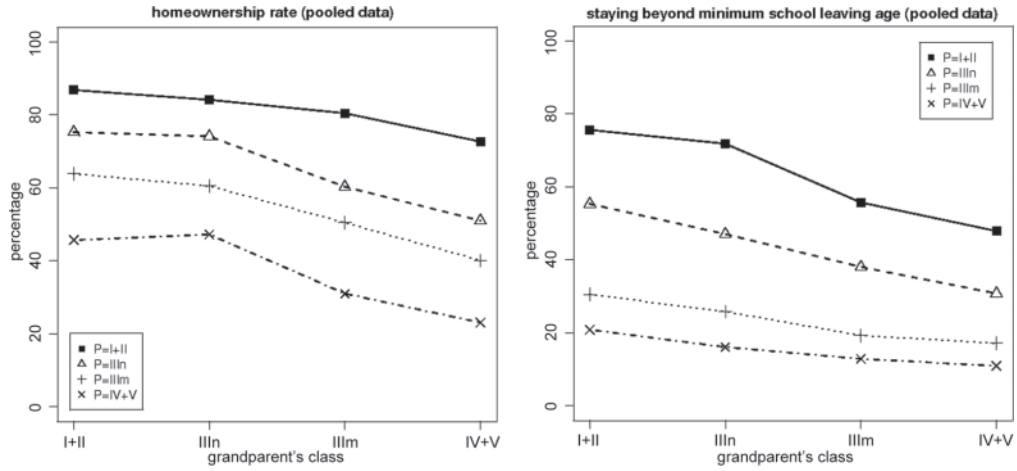

Figure 5. Homeownership and Educational Attainment of Cohort Members' Parents by Parents' and Grandparents' Social Class

into the analysis, the grandparents effect might be explained away.

To address this concern, we shifted our analysis from the aggregate to the individual level and regressed grandchildren's class on grandparents' class. The question is whether the grandparents effect remains statistically significant after we control not only for parents' social class but also for the following parental characteristics: (1) educational attainment, measured by the age at which cohort members' fathers and mothers left school, (2) parental wealth, proxied by whether cohort members' parents were homeowners when cohort members were 15 (NSHD) or 16 (NCDS and BCS) years old, and (3) family income. Because the UA model fits the data well in the log-linear analysis, we used ordered logistic regression[21] and entered all class variables as interval level measures.[22]

Table 4. Descriptive Statistics of Covariates in Ordered Logit Regression

		NSHD		NCDS		BCS	
		Men	Women	Men	Women	Men	Women
N in Mobility Table		1,304	1,248	4,411	4,329	2,960	2,831
Father's School-Leaving Age	mean	14.6	14.7	15.9	16.0	15.5	15.5
	sd	1.3	1.3	1.6	1.6	1.1	1.2
	N	1,223	1,170	3,370	3,294	2,882	2,751
Mother's School-Leaving Age	mean	14.6	14.5	15.9	16.0	15.5	15.5
	sd	1.2	1.2	1.3	1.4	1.1	1.2
	N	1,242	1,175	3,400	3,362	2,947	2,825
Annual Household Income[a]	mean			2.4	2.4	12.9	12.7
	sd			1.2	1.2	8.2	8.1
	N			3,129	3,068	1,601	1,573
Homeowner	%	40.8	40.0	54.0	52.2	81.6	80.2
	N	1,228	1,186	3,463	3,419	2,071	2,099

Note: NSHD = National Study of Health and Development; NCDS = National Child Development Study; BCS = British Cohort Study.
[a]Household income (in thousands of pounds) refers to net household income in the NCDS but gross household income in the BCS. See text for details.

Unfortunately, parental income data are not available in the NSHD, and the NCDS and BCS measured income very differently. The BCS had a single question on gross household income. The NCDS had separate questions on net income from the father, mother, and other sources. We combined these questions and derived a variable of annual net household income for NCDS.[23] Given the divergent income measures, we fitted separate models to the three studies. Table 4 reports some basic descriptive statistics of the covariates. The most notable thing here is the fair amount of missing data, especially for income. We thus carried out multiple imputation for each survey. We imputed 20 datasets for each of the birth cohort studies based on known covariates. We then aggregated the ordered logit results from these imputed data (see Table 5).

Mother's education and homeownership are statistically significant predictors, in the expected direction, of children's class attainment in all six cases. For example, other things being equal, at each of the three contrasts shown by the fourfold class scheme,[24] the odds of male NSHD cohort members reaching the higher rather than lower set of class destinations were 1.7 ($e^{.542}$) times better if their parents were homeowners. If their mothers stayed in school for one more year, the odds would increase by 24 percent ($e^{.213} - 1$). Father's education and family income also predict children's class attainment in the expected direction. But father's education is insignificant for female cohort members of NSHD ($p = .10$) and BCS ($p = .13$), and income is insignificant for female cohort members of NCDS ($p = .13$) and BCS ($p = .07$). As expected, parents' social class is a strong predictor of children's class attainment. For example, the odds of male NSHD cohort members reaching the higher rather than lower set of class destinations were 2.9 times ($e^{.353 \times 3}$) better if their parents were in class I+II rather than class IV+V.

Net of parents' social class and other parental characteristics, the grandparents effect remains statistically significant, except for female NSHD cohort members where it is marginally insignificant ($p = .09$).[25] The absolute magnitude of the parameter for grandparents' class is smaller than that for parents' class, but it is nevertheless substantial. For example, net of other predictors included in

Table 5. Ordered Logit Regression Predicting Class Destination of Grandchildren

	NSHD		NCDS		BCS	
	β	se	β	se	β	se
Men						
G	.130*	.060	.171**	.032	.109**	.039
P	.353**	.062	.408**	.034	.311**	.043
Father's education	.212**	.063	.082**	.028	.141**	.042
Mother's education	.213**	.072	.094**	.034	.158**	.043
Income			.069*	.033	.014*	.007
Homeowner	.542**	.133	.259**	.068	.344**	.104
Cut 1	4.757	1.094	2.126	.514	3.607	.713
Cut 2	6.997	1.097	4.141	.515	5.575	.714
Cut 3	7.383	1.099	4.554	.516	6.051	.715
Women						
G	.096	.056	.124**	.031	.138**	.038
P	.315**	.060	.254**	.032	.184**	.043
Father's education	.089	.054	.075**	.026	.058	.039
Mother's education	.239**	.062	.081**	.030	.138**	.038
Income			.044	.029	.013	.007
Homeowner	.288*	.123	.352**	.071	.300**	.101
Cut 1	4.168	.879	1.986	.434	2.245	.642
Cut 2	4.589	.879	2.432	.434	2.770	.642
Cut 3	6.464	.888	4.080	.436	4.220	.644

*$p < .05$; **$p < .01$ (two-tailed test).

the model, the odds of male NSHD cohort members reaching the higher rather than lower class destination are 48 percent ($e^{.129 \times 3}$) better if they have class I+II rather than class IV+V grandparents. Overall, the net GC association reported in our log-linear analysis cannot be explained away by including further parental characteristics.

SUMMARY AND DISCUSSION

In this article, we used data from three British birth cohort studies to investigate patterns of social mobility over three generations of family members. We reported quite substantial change in the class structure over generations, and clear evidence of the dependence of grandparents' social class on absolute mobility rates in the parents-children mobility tables. In particular, respondents with more advantaged grandparents had lower rates of total and upward mobility, in the absolute sense. We also found clear gradients in outflow mobility rates by grandparents' social class.

Turning to relative mobility patterns, there was consistent and strong evidence that, net of parents' social class, grandparents' class position had a direct effect on grandchildren's mobility outcomes. This net grandparents-grandchildren association can be summarized by a single uniform association parameter, suggesting the grandparents effect in social mobility is quite a general social force, operating throughout the class hierarchy, and is not restricted to the two ends, as Mare (2011) suggests. Note, however, that most members of RG class I+II did not have great wealth. Likewise, most members of RG class IV+V were not in abject poverty. In other words, our data are not best suited to testing Mare's argument, and it is possible that at the top and bottom 1 percent of the population, even stronger and qualitatively different multigenerational effects are at work. Finally, we showed that this net association between grandparents' and grandchildren's class positions remained even after other parental characteristics, such as wealth, years of schooling,

and, in the case of NCDS and BCS, household income, were taken into account.

The grandparents effect in social mobility was most striking in cases of upward countermobility. Although it is possible, as one reviewer suggests, to interpret these as examples of regression to the mean, our view is that the grandparents effect reported here is too large and systematic to be attributed entirely to random processes. After all, the improvement in fit of the uniform association model over the conditional independence model goes well beyond what one would expect from chance difference alone. Having said that, further data, perhaps involving social mobility over four generations, would help us resolve this issue with even greater confidence.

Results reported here are consistent with those reported for Finland by Erola and Moisio (2007). But, as noted earlier, we do not agree with the conclusion they draw. As regards Warren and Hauser's (1997) findings, it is indeed possible that a three-generation mobility process applies in Britain, but a two-generation Markovian mobility process operated in Wisconsin in the mid-twentieth century (Mare 2011). Clearly, we need evidence from more countries to form a view on just how common the grandparents effect is in social mobility.

Finally, note that the grandparents effect reported here is a weighted average of such effects found in different types of households. The strength of the grandparents effect will probably vary by other sociodemographic variables. For example, Zeng and Xie (2011) show that in rural China, grandparents affect grandchildren's schooling only when they live together. Their argument is that with multigenerational coresidence, grandparents are more likely to be involved in childrearing, supervising grandchildren's schoolwork, and other household activities that would benefit grandchildren. Multigenerational coresidence is very rare in Britain and other Western societies, but the nature and strength of the grandparents effect likely depends on relationships within the extended family. The British Household Panel Survey has some information on intergenerational contact and support. In future work, we intend to exploit such information to explore the three-generation mobility process further.

APPENDIX

Data and Sample Attrition

Sample attrition and non-response are potentially important issues for the cohort studies we analyzed, just as they are for any longitudinal survey. Wadsworth and colleagues (1992) examined the NSHD's pattern of non-response and found that 74 percent of the target sample was interviewed after 43 years. (The target sample refers to all members of the original longitudinal sample until they die or permanently emigrate from Britain.) Given that the "response rates from the population resident in Britain have remained high, and the responding population is in most respects representative of the native population born in the early postwar years" (Wadsworth et al. 1992:300), it would seem sample attrition is not a serious problem for the NSHD.

Broadly the same can be said of the NCDS: 71 percent of the target sample was interviewed after 42 years (Hawkes and Plewis 2006). Although there are "systematic differences between respondents and non-respondents at every sweep" (Hawkes and Plewis 2006: 489), such differences tend to be small. Furthermore, "the propensity not to respond at sweep 6 [2000] is not strongly related to social class." Overall, Hawkes and Plewis (2006:489) conclude there is "support for [treating the missing data] as ignorable non-response."

By comparison, sample attrition is a more serious problem for the BCS. Ketende, McDonald, and Dex (2010) estimate that only 61 percent of the target sample were interviewed after 34 years. The higher sample attrition rate is due to a number of factors, including (1) sweep 3's fieldwork, which was partly school-based, was hampered by the national teachers' strike of 1986; (2) a lengthy gap of 10 years between sweep 3 and sweep 4 when, for the first time, cohort members became primary respondents and had to opt-in to the survey, and (3) that sweep 4 was a postal survey. We

would argue that because some of these factors, especially the teachers' strike, are orthogonal to the social processes under investigation, the resulting attrition, although regrettable, might be less serious in terms of bias. Indeed, contact rates in sweep 5 (2000) and sweep 6 (2004) improved, and refusal rates in the face-to-face interviews at those two sweeps are at a modest level of 7.3 and 7.6 percent, respectively (Elliott and Shepherd 2006).

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Notes

1. If mobility follows a first-order Markovian process, grandparents would still matter for grandchildren's outcomes, but all such effects would be mediated by parents' class.
2. To minimize missing data, we extracted cohort members' occupational data from two sweeps of each survey. For the NSHD, we refer to cohort members' occupation at age 36 or 43 years; for NCDS respondents, age 33 or 37; and for BCS respondents, age 34 or 38. Where two different occupations were reported, we refer to the higher occupation.
3. Specifically, we refer to father's occupation when cohort members were aged 10 to 11 and 15 to 16, whichever was higher.
4. We repeated our analyses using paternal grandfathers' class, or the higher of paternal versus maternal social classes. These choices did not affect results of our log-linear analyses, although there is evidence that measurement error is indeed smaller for maternal grandfathers' class (see note 14).
5. In 2001, the National Statistics Socio-Economic Classification (NS-SEC) replaced the RG as the UK official social classification. NS-SEC is, in turn, based on the Goldthorpe class scheme. We regard NS-SEC as superior to the RG class scheme. Unfortunately, grandparents' social class data in publicly available versions of the cohort surveys datasets are coded to the RG class scheme only.
6. Between-cohort comparison of the staying-in-school rate is difficult, partly because the policy for minimum school-leaving age changed over time: from 14 years in 1921 (the policy most NSHD fathers faced), to 15 years in 1944 (for NCDS and BCS fathers), and then 16 years in 1972. Furthermore, there is much variation in child-bearing age over time and within cohort.
7. We obtained the same results by modelling a four-way G x P x C x S table, where S refers to the three studies. Details of the analysis of this four-way table can be found in the online supplement (http://asr.sagepub.com/supplemental).
8. Because the oldest and youngest cohorts were born only 24 years apart, there is relatively little between-cohort difference in marginal distributions, except for the C distribution for women (see note 9). Details are available on request. Note that, strictly speaking, the marginal distributions of G and P do not represent the class structure of British society at a particular time in the past (see Duncan 1966). There are various reasons for this, including the fact that childless people in the grandparent and parent generations are not represented in the cohort studies. Also, because members of our three birth cohorts reached their mid-30s at different historical times, the marginal distribution of C in Table 1 does not represent the class structure at a particular time. Having stated these caveats, the change in marginal distributions seen in Table 1 does broadly reflect historical change in the occupational structure over time.
9. As more women entered professional and managerial occupations (class I+II), the level of occupational sex segregation among cohort members (i.e., the C marginal) declined between surveys: from 41 (NSHD) to 33 (NCDS) and 23 (BCS). Note that cohort-specific tables and figures are not shown here but are available from the authors on request.
10. The marginal parents-children table is the PC table summed over all grandparents' class categories. The partial parent-children tables are stratified by grandparents' class, that is, there is one partial table for each grandparents' class.
11. Inflow mobility rates in partial PC tables also vary substantially by grandparents' class. Details are available on request.
12. All models were fitted with R package gnm (Turner and Firth 2011). The observed cell count of the mobility tables and the R codes we used to analyze these tables are available in the online supplement.
13. We used the ANOVA identifying convention: $\Sigma_i\lambda^G{}_i = \Sigma_j\lambda^P{}_j = \Sigma_k\lambda^C{}_k = 0$; $\Sigma_i\lambda^{GP}{}_{ij} = \Sigma_j\lambda^{GP}{}_{ij} = \Sigma_j\lambda^{PC}{}_{jk} = \Sigma_k\lambda^{PC}{}_{jk} = 0$.
14. If we use paternal grandfathers' class (rather than maternal grandfathers' class) in the construction of the three-way mobility tables, the G^2 for Model 1 are 92.84 for men and 53.00 for women, which are still large enough to reject Model 1. These smaller G^2 are consistent with our argument that paternal grandfathers' class has more measurement error.

15. BIC stands for the Bayesian Information Criterion and is given by the following expression: BIC = G^2 – *df* x log *N* (see, e.g., Raftery 1986).
16. We also considered a variant of QI that we call the corners model. This model is the same as QI, but δ = 1 if i = k = 1 or i = k = 4, otherwise δ = 0. Thus, the corners model corresponds to Mare's suggestion that the net grandparents' effect is most likely found at the top and bottom of the class hierarchy. The deviance of this model (df = 34) is 52.04 for men (p = .025) and 41.04 for women (p = .189). When compared to the corners model, QI uses two more parameters, but the deviance of QI is also smaller, with rG^2 = 7.02 for men and rG^2 = .63 for women. For two degrees of freedom, only the former is a statistically significant change. In other words, we would prefer the corners model to QI for women but not for men.
17. We used the simplest integer scoring for i and k, that is, we entered scale scores for the four RG classes as 1, 2, 3, and 4, respectively.
18. This also holds when comparing UA to the corners model.
19. Neither UA nor the conditional independence model contains the three-way GPC interaction term. We calculated the outflow rates discussed here from the expected frequencies of these models.
20. Consistent with the rest of this article, Figure 5 refers to maternal grandparents; we obtain a very similar picture if we use paternal grandparents.
21. Brant tests suggest the proportional odds assumption of the ordered logit models reported in Table 5 cannot, in most cases, be rejected. The exceptions are the covariate of parents' class for male cohort members of NCDS and BCS.
22. To aid interpretation, we reversed the coding of class categories, that is, class I+II was coded 4; class IIIn, 3; class IIIm, 2; and class IV+V, 1.
23. Income data for both the NCDS and BCS come from their respective sweep 3, when cohort members were 16 years old. In both studies, answer categories to the income questions were banded. To compute an interval-level income variable, we assigned all individuals in each band to the mid-point of the respective band or, for the top category, 1.5 times its lower limit.
24. The three contrasts are (1) class I+II versus the rest, (2) class I+II or class IIIn versus class IIIm or class IV+V, and (3) the rest versus class IV+V.
25. If parents' school-leaving age, homeownership status, and income were dropped from the model, the magnitude of the grandparents effect in Table 5 would increase by 44 to 97 percent, and that for parents' class would increase by 32 to 70 percent. For details, see the online supplement.

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