Sociology Working Papers

Paper Number 2011-04

Social Mobility over three generations in Britain

Tak Wing Chan

Vikki Boliver

Department of Sociology
University of Oxford
Manor Road
Oxford OX1 3UQ
www.sociology.ox.ac.uk/swp.html

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Tak Wing Chan
Department of Sociology
University of Oxford

Vikki Boliver
School of Applied Social Sciences
Durham University

September 21, 2011

Abstract

We examine social mobility patterns over three generations of family members, using data collected in three British birth cohort studies. We show that for both men and women, and for all three birth cohorts, absolute mobility rates (i.e. total, upward and downward mobility rates, and inflow and outflow mobility patterns) in the partial parents–children mobility tables vary substantially by grandparents' social class position. As regards relative mobility pattern, we show, again for all cases that we consider, that there is a statistically significant net association between grandparents' and grandchildren's class positions, after parents' social class has been taken into account. Unlike the more complex association between the class positions of grandparents and parents, or between parents and children, the net grandparents–grandchildren association can be summarised by a single uniform association parameter. Net of parents' class position, the odds of grandchildren entering professional–managerial class rather than unskilled manual class is between two and three times better if their grandparents were in professional–managerial rather than unskilled manual class position.

*We thank David Firth and Louis-André Vallet for helpful advice and suggestion. An early version of this paper was presented at the 2011 spring meeting of the ISA RC28 in Essex.

1 Introduction

Social mobility research has a long and esteemed history in Sociology (Glass, 1954; Lipset and Zetterberg, 1959; Blau and Duncan, 1967; Goldthorpe, 1980; Erikson and Goldthorpe, 1992). Taken together, these studies demonstrate that, notwithstanding some interesting cross-national and temporal variations (Breen, 2004), social origins are strong predictors of social destinations. Surveying this voluminous literature, it is remarkable that almost all mobility studies make use of data for just two generations of family members: parents and children. Only a handful of studies have explored mobility patterns over three (or, even more rarely, four) generations (Mukherjee, 1954; Ridge, 1973; Goyder and Curtis, 1977; Beck, 1983; Warren and Hauser, 1997; Erola and Moisio, 2007).

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

But there are good reasons to expect that grandparents matter in social mobility. As Mare (2011) has recently argued, some forms of capital are less perishable than others (e.g. financial wealth compared with human capital), and those less perishable kinds of capital are more easily and directly transmissible across multiple generations.[1] More generally, Mare argues that many durable social institutions contribute to 'status inheritance' over multiple generations, especially at the top and the bottom of the hierarchy: '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' (Mare, 2011, p.7).

Also, parent's social class (and other socioeconomic markers, such as educational attainment) might not *fully* capture all of the advantages and disadvantages that are passed on between generations. In other words, there might be considerable heterogeneity in the availability of mobility-relevant resouces to people from the same class origin. A likely source of such within-class-origin heterogeneity is parents' own mobility experiences. For example, compared to people who are intergenerationally stable in an advantaged class

[1] See also the discussion by Bowles *et al.* (2010) on the durability of different kinds of 'wealth', and its implications for inequality in premodern societies.

position, those who have achieved upwardly mobility might have fewer resources to pass on to their children. Similarly, compared to second generation working class parents, those who have experienced downward mobility to the working class might be better positioned, or perhaps more motivated, to help their children to achieve counter upward mobility.

2 Past research

Whether grandparents directly influence grandchildren's mobility outcome, *net* of parents' social class, is of course a matter for empirical investigation. But the 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; Gollac and Laulhé, 1987), and the US (Beck, 1983).

But other researchers have reported negative findings. For example, Warren and Hauser (1997, p.561) have analysed data from the Wisconsin Longitudinal Survey with structural equation models, and their conclusion is 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, based on a loglinear analysis of Finnish census data, Erola and Moisio (2007, p.169) maintain that '[a]fter controlling for parents' social class, ... grandchildren's social class is almost conditionally independent from ... grandparents' social class'.

These negative findings need to be taken seriously. It is certainly possible that a two-generation, Markovian mobility process operates in some social contexts but not in others. As Mare (2011, p.16) points out, 'mid-twentieth century Wisconsin families may be a population in which multigenerational effects are unusually weak'. As regards the Finnish paper, we would argue that the results reported by Erola and Moisio (2007) actually do *not* support their conclusion. An extract of their Table 3, which contains the key evidence, is reproduced in Table 1 here.

Model I of Erola and Moisio (2007) contains the main effects of grandparents' class (G), parents' class (P) and children' class (C) only. As this model precludes all two-way associations, it is highly unrealistic. No one would expect this model to fit the data, and it clearly fails to do so.

Their model IV is the conditional independence model, which takes into account the association between grandparents' class and parents' class (GP) and the association between parents' class and children's class (PC). It also postulates that, conditional on the GP and PC associations, there is no net

Table 1: Goodness of fit statistics of three loglinear models reported in Erola and Moisio (2007, p.176, Table 3)

model		G^2	*df*	rG^2	Δ	BIC
I	G, P, C	15425.7	324	.00	17.1	11874.3
IV	GP, PC	750.7	252	.94	3.8	-2011.4
IX	GP, PC, GC	296.4	216	.97	2.0	-2071.0

GC association. This model does not fit the data. But it accounts for 94% of the deviance (G^2) of model I, and it reduces the index of dissimilarity (i.e. percentage of misclassified observations) from 17.1 to 3.8.

Erola and Moisio (2007) then add the GC term to their analysis. The resulting model (model IX) still does not fit the data. But compared to model IV, G^2 is reduced by 454.3 for 36 degrees of freedom, which is a highly significant improvement in model fit. In other words, there is very strong evidence against the null hypothesis of no net GC association. Furthermore, BIC would also suggest choosing model IX over model IV.

So how do Erola and Moisio (2007) come to the view of 'almost conditional independence'? The discussion in their paper suggests that they have abandoned the likelihood ratio test or BIC as criteria for model selection. Instead, they have relied entirely on the index of dissimilarity.[2] This seems inappropriate to us because although the index of dissimilarity has its role in the assessment of model fit, it is meant to be used 'as a supplement to, rather than a replacement for, model-selection criteria such as those based on the log likelihood' (Kuha and Firth, 2010, p.375). Furthermore, even if we were to compare models IV and IX on Erola and Moisio's terms, it should be noted that the GC term accounts for almost half (1.8/3.8) of the misclassified cases of model IV, and 60% of its deviance (454.3/750.7). It is only by reference to the completely unrealistic model I could Erola and Moisio (2007) claim that the contribution of the GC term is modest. Given these considerations, their conclusion of 'almost conditional independence' seems unjustified.[3] In the remainder of this paper we examine whether a net GC association is also present in the British case.

[2]Private correspondence between the authors and Jani Erola confirms this.

[3]We note that the qualifier 'almost' might provide some room for manoeuvre. This would be the case if the type I error associated with the null hypothesis of no net GC association is close to the conventional 5% cutoff, say $p \approx .04$. But for 36 degrees of freedom, the p-value for a reduction in G^2 of 454.3 is vanishingly small, rendering the qualifier unconvincing.

3 Data and class scheme

In this paper, we examine the pattern of social mobility over three generations of family members with data collected in three British birth cohort studies. These studies have 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), follows a sample of those born in one week in March 1946. The second study, the National Child Development Study (NCDS), follows all those born in one week in March 1958. And the third, the British Cohort Study (BCS), follows all those born in one week in April 1970. These birth cohort studies, and especially the last two, have been used extensively in social mobility research (see e.g. Goldthorpe and Jackson, 2007; Erikson and Goldthorpe, 2010; Boliver and Swift, 2011).

All three studies have collected a wealth of information about cohort members, including their occupation as adults.[4] And in interviews with cohort members' mothers in early survey waves, occupational information about cohort members' fathers was collected.[5] Furthermore, cohort member's mothers also answered questions about the occupation of their father and father-in-law (i.e. cohort members' maternal and paternal grandfathers) when cohort members were 8 years old in the case of NSHD, or as they and their husband were leaving school in the case of NCDS and BCS.[6]

These occupational data have been coded according to the UK Register General (RG) social class scheme. The RG class scheme is based on the notion of occupational skills, i.e. '[o]ccupations are allocated to social classes commensurate with the degree of expertise involved in carrying out their associated tasks' (Marshall *et al.*, 1989, p.18). There are six RG classes. But because of cell size considerations, they are combined 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 jobs.[7]

[4]To minimise missing data, we extract occupational data of cohort members from two waves of each survey. For NSHD, we refer to the occupation when cohort members were aged 36 or 43; for NCDS respondents, aged 33 or 37, and for BCS respondents, aged 34 or 38. Where two different occupations are reported, we refer to the higher occuaption.

[5]Specifically, we refer to father's occupation when cohort members were 10–11 and 15–16 years old, whichever was higher.

[6]Again, where occupational data is available for both paternal grandfather and maternal grandfather, we refer to the higher one.

[7]The RG class scehme was replaced in 2001 by the National Statistics Socio-Economic Classification (NS-SEC) 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.

In the next section, we will first report some descriptive statistics on absolute mobility rates, before turning to examine relative mobility rates using loglinear and linear-by-linear models. We analyse the data for the three birth cohort studies separately but we do not expect to find large differences in relative mobility patterns between studies given that previous two-generation mobility studies for Britain have reported little or no systematic change in relative mobility rates over time (e.g. Goldthorpe and Mills, 2008), and given that the respondents of the first and third cohort studies (i.e. NSHD and BCS) were born only 24 years apart. However, to the extent that our findings from the three surveys are consistent with each other, we could be more confident of our results. We also analyse the data for men and women separately. Thus, in what follows, we will carry out parallel analyses of six $4 \times 4 \times 4$ tables.

4 Results

4.1 Absolute mobility rates

4.1.1 Marginal distributions

Table 2 reports the marginal distributions of male (upper panel) and female (lower panel) respondents by grandparents' class (G), parents' class (P), and their own class (C). It can be seen that, for men, there is a general trend for the professional and managerial class (class I+II) to expand across generations. For example, 47% of BCS men are found in class I+II, compared to 33% of their parents, and 29% of their grandparents. Corresponding to the expanding room at the top, the skilled manual class (class IIIm) has shrunk between generations: for BCS men, from 47% (G) to 43% (P) and 31% (C). The 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, 1980; Goldthorpe and Mills, 2008).

Occupational upgrading also affects women. But since, for both male and female respondents, the grandparents and parents that are referred to in Table 2 are grandfathers and fathers, there is very little *between*-gender difference in the marginal distributions of G and P, as can be seen from the relevant indices of dissimilarity in the bottom row of Table 2. However, because of occupational sex segregation, the marginal distribution of

But, unfortunately, social class data in publicly available versions of the cohort surveys data sets are coded to the RG class scheme only.

Table 2: Marginal distribution of respondents by grandparents' social class (G), parents' social class (P) and their own social class (C)

	NSHD			NCDS			BCS		
male	G	P	C	G	P	C	G	P	C
I+II	29.3	27.0	45.9	25.5	25.6	39.3	29.1	33.4	46.6
IIIn	11.1	16.4	9.8	10.1	11.9	10.0	11.1	9.9	11.1
IIIm	43.2	33.2	32.4	46.9	42.6	35.2	46.7	42.9	30.9
IV+V	16.4	23.4	11.9	17.5	19.9	15.5	13.1	13.8	11.4
N		1285			4068			2732	
female	G	P	C	G	P	C	G	P	C
I+II	30.3	24.7	29.0	25.1	25.6	32.4	29.2	34.9	46.8
IIIn	10.5	15.4	37.1	11.0	11.6	36.3	10.7	9.4	32.7
IIIm	41.8	33.5	7.4	45.9	42.7	6.9	47.4	42.5	5.8
IV+V	17.5	26.4	26.6	18.1	20.2	24.3	12.7	13.1	14.8
N		1031			4111			2417	
Δ_{mf}	2.1	3.3	42.0	1.4	0.4	35.2	0.8	1.6	25.2

Note: Δ_{mf}: index of dissimilarity, between gender, but within survey and generation.

C for women is quite different to that for men. Thus, in all three surveys, at least a third of women, as compared to about 10% of men, are found in skilled non-manual occupations (class IIIn). Having said that, as more women enter professional and managerial occuaptions (class I+II), the level of occupational sex segregation has declined over time. This can be seen in the downward trend of the index of dissimilarity for C: from 42 for NSHD to 35 for NCDS, and then to 25 for BCS (see the bottom row of Table 2).

In Figure 1, we compare the marginal distribution of neighbouring generations. Since the index of dissimilarity for P v C is always greater than that for G v P, it would seem that the pace of change in the occupational structure has increased over generations, especially for the women of the last two cohorts.

4.1.2 Total, upward and downward mobility rates

In Figure 2, we report the rates of total, upward and downward mobility that are observed in parents–children mobility tables, stratified by grandparents' social class. Starting with the top panel, it can be seen that total mobility rates (i.e. percentage of respondents found in off-diagonal cells of the partial P–C tables) are invariably higher for women than for men. This gender difference is in places substantial, reaching a maximum of 17% for the NCDS

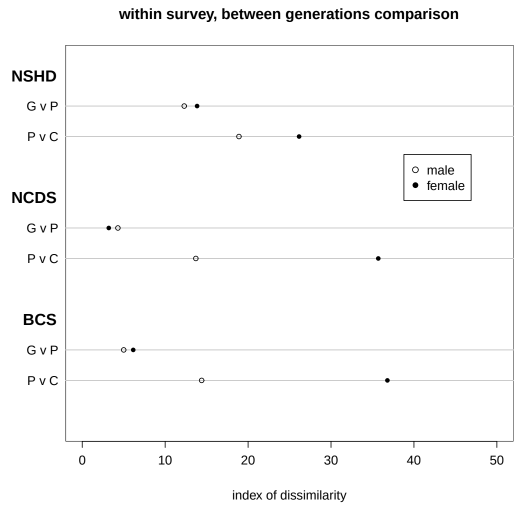

Figure 1: Indices of dissimilarity of maginal distributions, within survey but between generations

respondents with grandparents in skilled manual class (class IIIm).

Figure 2 also shows that total mobility rates in the P–C tables are considerably higher for respondents with less advantaged grandparents. For example, among NSHD men, 53% of those with class I+II grandparents are found off the main diagonal (i.e. not in their parents' class), compared with 64% of those with class IV+V grandparents.

Comparing the middle and lower panels of Figure 2, it is clear that much of the overall mobility is due to upward mobility rather than downward mobility. There is also a clear gradient in upward mobility rates in the P–C tables by grandparents' class: those with less advantaged grandparents are more likely to experience upward mobility. This is partly due to a ceiling effect: those with more advantaged grandparents are more likely to have parents in an advantaged social class, and thus would have less room to move further upwards.

There is an opposite gradient in downward mobility rates by grandparents' class, which could to some degree be attributed to a floor effect. However, the important exception here is that downward mobility rate in the P–C tables is *not* the highest for those with class I+II grandparents, suggesting perhaps that individuals with advantaged grandparents (many of whom have advantaged parents as well) are better protected from downward mobility.

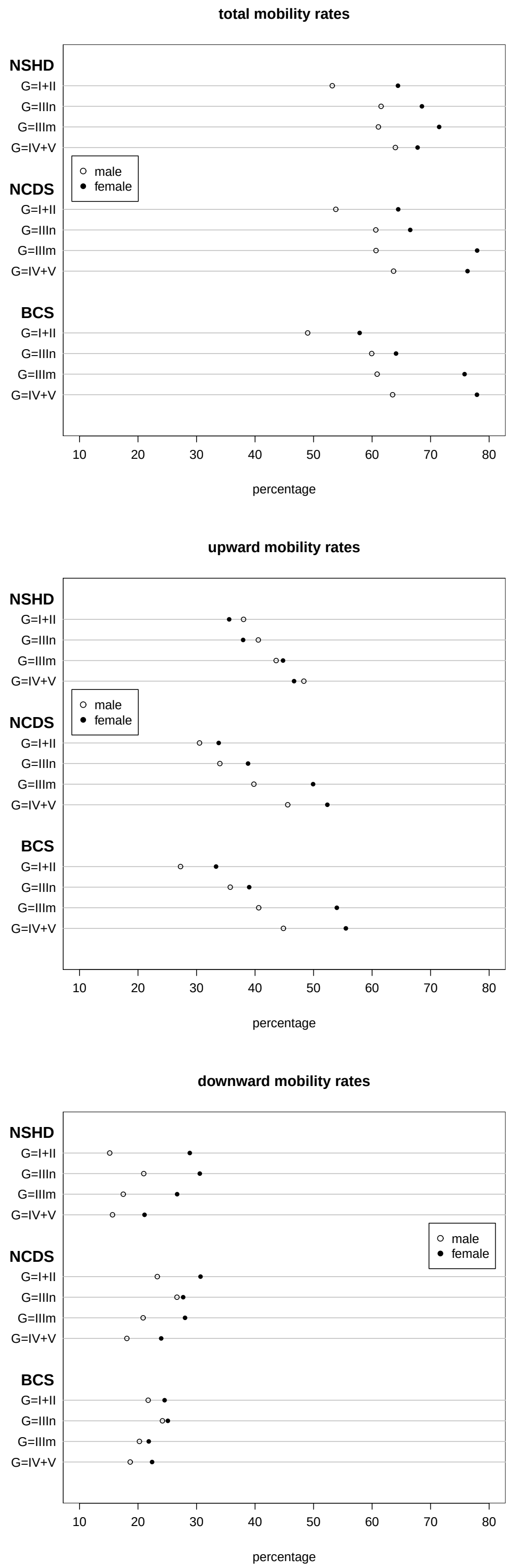

Figure 2: Total, upward and downward mobility rates in P–C tables by gender, survey and grandparents' class

4.1.3 Inflow and outflow rates

As regards inflow and outflow rates, our three-way mobility tables contain many sub-tables of column and row percentages. Instead of reporting all of them here, we show some indicative patterns graphically.[8] Figure 3 reports the distribution of class I+II respondents by parents' and grandparents' class. To elaborate, each of the six mobility tables that we analyse contributes one panel to Figure 3. Within each panel, the four columns refer to grandparents' class position, and the four blocks within each column refer to parents' class.

Thus, for example, of those NSHD men who are themselves found in class I+II, 59% have class I+II parents (P) *if* their grandparents (G) were also in class I+II. The rate of intergenerational self-recruitment in class I+II declines sharply and monotonically by grandparents' class, such that for those with class IV+V grandparents, only 20% have class I+II parents. Conversely, 7% of those in class I+II are from class IV+V origin (P) if their grandparents (G) were in class I+II, compared to 35% of those with class IV+V grandparents. This pattern is observed for both men and women and for all three surveys.

Turning to outflow rates, we report in Figure 4 the class destination of respondents with class I+II parents. Within each panel, the four rows refer to grandparents' social class, and the four blocks within each row refer to class destination (i.e. children's class). For NSHD men with intergenerationally stable class I+II backgrounds (i.e. both parents *and* grandparents in class I+II), 78% end up in class I+II, and only 3% slid down to class IV+V. In contrast, of those with class I+II parents and class IV+V grandparent, only 46% stay in class I+II; one-eighth experience what can be called downward counter-mobility and slid back to class IV+V. Overall, whilst the gradient of outflow rates by grandparents' class in Figure 4 is not always neatly monotonic, especially for NSHD men and NCDS women, outflow rates in the P–C tables clearly depend on grandparents' class.

4.2 Relative mobility rates

Having seen evidence that grandparents' social class matters for absolute mobility rates, we now examine relative mobility pattern using loglinear and cognate models. Let us first consider models 1 and 2 of Table 3, which are equivalent to models IV and IX of Erola and Moisio (2007) respectively.[9] To recap, model 1 is the conditional independence model:

$$\log F_{ijk} = \lambda + \lambda_i^G + \lambda_j^P + \lambda_k^C + \lambda_{ij}^{GP} + \lambda_{jk}^{PC}, \qquad (1)$$

[8] All inflow and outflow tables are available from the authors on request.

[9] All models are fitted with R, using in particular the gnm package (Turner and Firth, 2011).

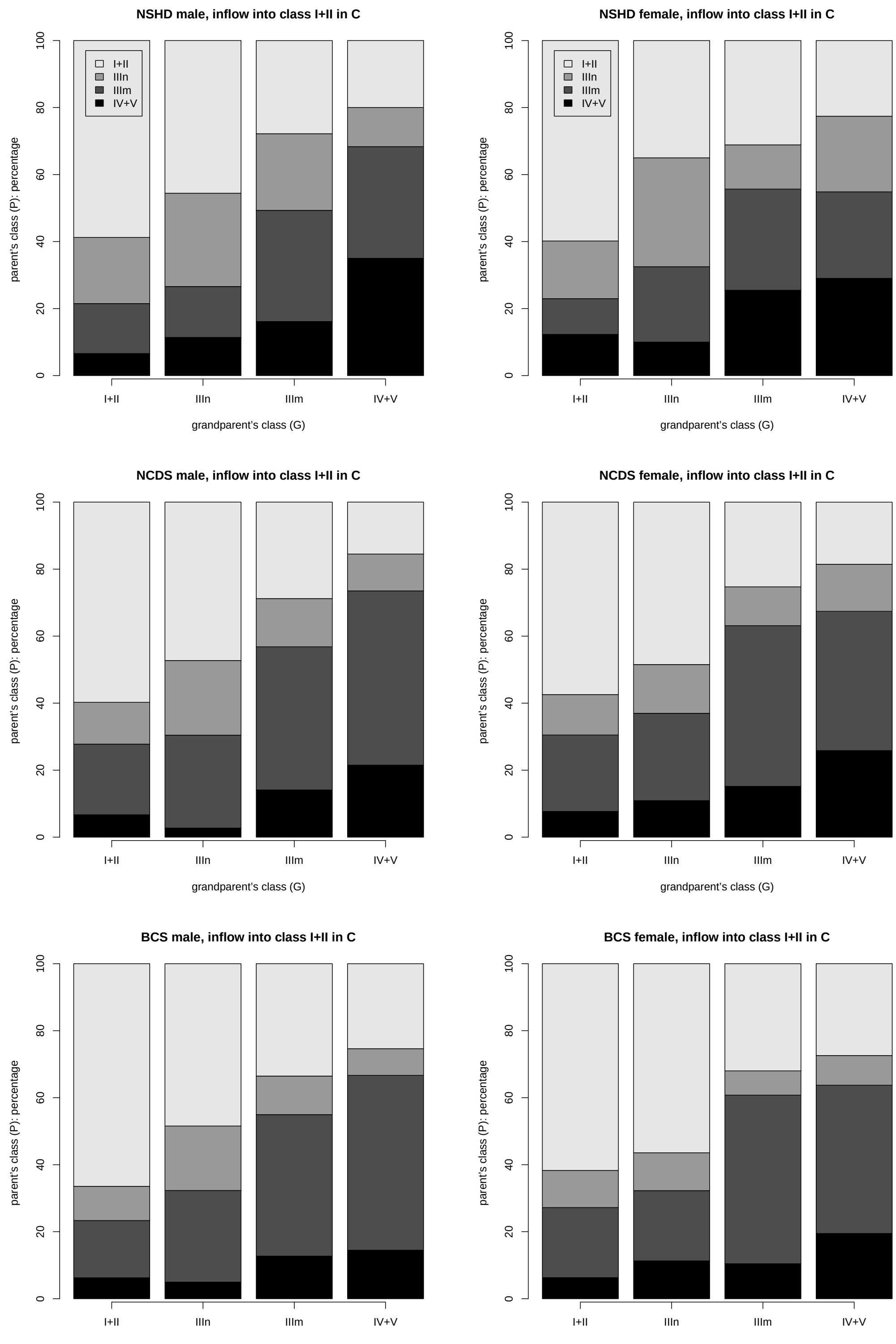

Figure 3: Inflow rates: distribution of male respondents (left column) and female respondents (right column) found in class I+II by parents' social class (P) and grandparents' social class (G) in the three surveys

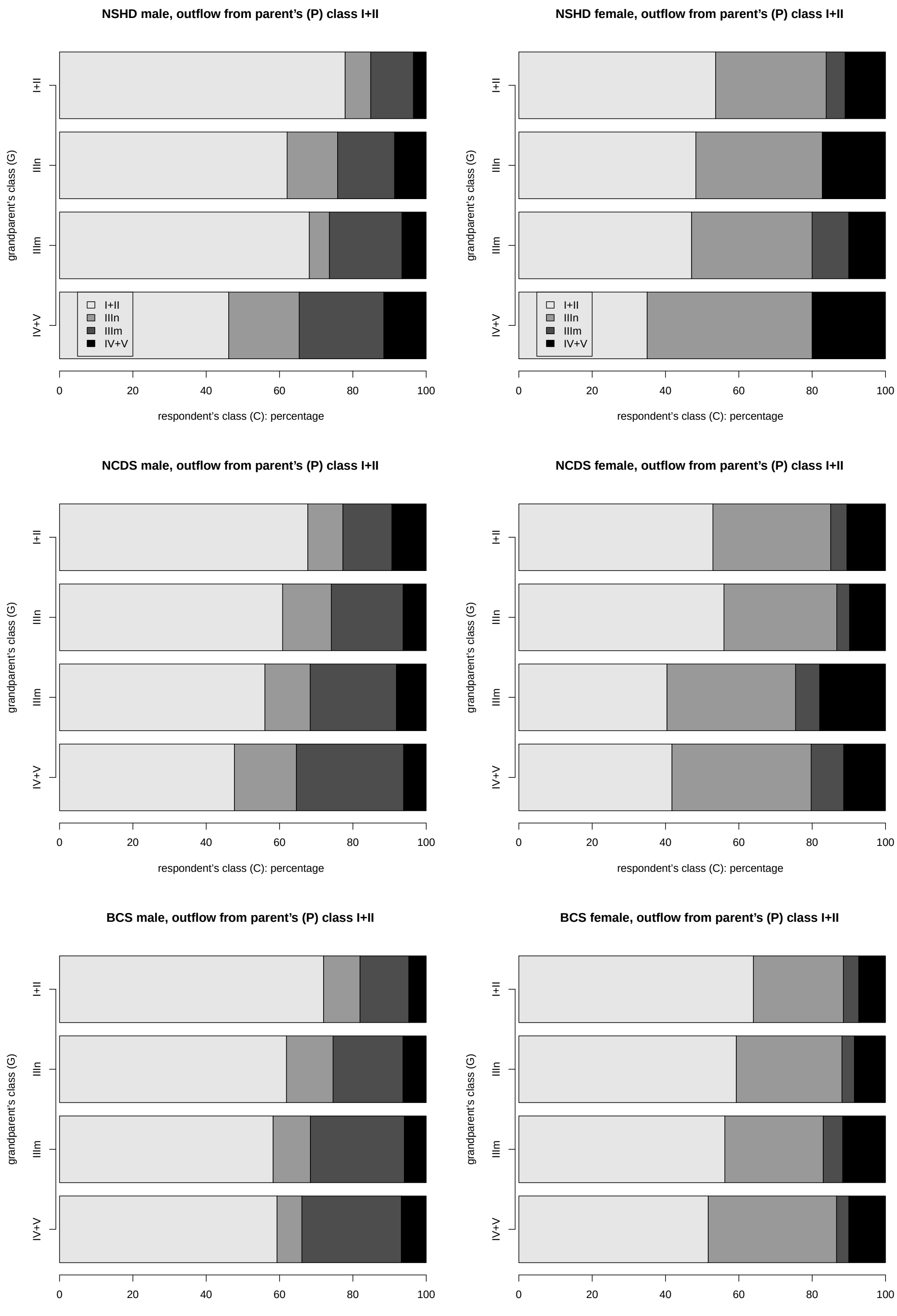

Figure 4: Outflow rates: distribution of male respondents (left column) and female respondents (right column) by their own social class (C) and grandparents' social class (G) for those with parents (P) in class I+II in the three surveys

where F_{ijk} is the expected frequency of cell-ijk; λ is the grand mean; λ_i^G, λ_j^P and λ_k^C are the main effects for grandparents', parents' and children's class respectively; and λ_{ij}^{GP} and λ_{jk}^{PC} refer to two-way associations between grandparents' and parents' class, and between parents' and children's class.[10] Since model 1 does not contain the λ_{ik}^{GC} term, it posits that there is no net GC association once the GP and PC associations are controlled for.

Table 3 shows that, using the usual criterion of 5% type I error, model 1 does not fit the data, except for NSHD women and BCS women. Further, the p-value of these two exceptional cases are very close to the 5% threshold (p = .079 and p = .064 respectively). Model 2, which is model 1 plus the λ_{ik}^{GC} term, can be represented as follows:

$$\log F_{ijk} = \lambda + \lambda_i^G + \lambda_j^P + \lambda_k^C + \lambda_{ij}^{GP} + \lambda_{jk}^{PC} + \lambda_{ik}^{GC}. \quad (2)$$

It can be seen from Table 3 that model 2 fits the data very well in all six cases. Moreover, because models 1 and 2 are nested, we can compare their fit to the data using the likelihood ratio test. In the case of NSHD men, model 2 reduces the G^2 of model 1 by 28.65 for 9 degrees of freedom, which is a large and statistically significant improvement in model fit (p = .001). The same is true for the other five mobility tables that we consider (see the right panel of Table 3).[11] Overall, there is consistent and, in most cases, strong evidence against the null hypothesis of no net GC association. Grandparents' class does have direct effects on grandchildren's mobility outcome, net of parents' class position.

To find out in what ways grandparents' class matters, we explore the net GC association further. Our goal is to find a model which is more parsimonious than model 2, but which would still fit the data. With this in mind, we first try the quasi-independence (QI) model. QI allows for a tendency for grandchildren to stay in their grandparents' class, but it otherwise posits independence between G and C. Formally, this can be represented as follows:

$$\log F_{ijk} = \lambda + \lambda_i^G + \lambda_j^P + \lambda_k^C + \lambda_{ij}^{GP} + \lambda_{jk}^{PC} + \lambda_{ik}^{GC}\ \delta, \quad (3)$$

where $\delta = 1$ if $i = k$, otherwise $\delta = 0$. From Table 3, it can be seen that QI fits all six mobility tables very well. This would suggest that the grandparent effects take place on the main diagonal only.

[10] We use the ANOVA identifying convention, i.e. $\Sigma_i\lambda_i^G = \Sigma_j\lambda_j^P = \Sigma_k\lambda_k^C = 0$; $\Sigma_i\lambda_{ij}^{GP} = \Sigma_j\lambda_{ij}^{GP} = \Sigma_j\lambda_{jk}^{PC} = \Sigma_k\lambda_{jk}^{PC} = 0$.

[11] Although BIC is more negative for model 1 than for model 2 in all six cases, it should not override the likelihood ratio test. This is because BIC is meant to be used as a model selection criterion where the sample size is so large that no model (even those which make no good theoretical sense) would fit the data according to p-values (Raftery, 1986, 1995). In the present case, the Ns of the six mobility tables are moderate, ranging from 1,031 to 4,111. Moreover, model 2 actually fits the data in all six cases.

Table 3: Goodness of fit statistics of models fitted to explore net GC association

survey	model	G^2	*df*	*p*	Δ	BIC	comparison with model 1 rG^2	r*df*	*p*
NSHD	1 con. independence	56.862	36	.015	7.7	-200.84			
male	2 1+full GC association	28.208	27	.400	4.8	-165.07	28.654	9	.001
	3 1+quasi-independence	41.929	32	.112	5.9	-184.14	14.933	4	.005
	4 1+uniform association	32.301	35	.599	5.0	-218.25	24.561	1	.000
NSHD	1 con. independence	48.577	36	.079	7.1	-201.20			
female	2 1+full GC association	30.259	27	.303	5.3	-157.07	18.318	9	.032
	3 1+quasi-independence	37.311	32	.238	6.3	-184.71	11.267	4	.024
	4 1+uniform association	34.610	35	.487	5.6	-208.23	13.967	1	.000
NCDS	1 con. independence	84.269	36	.000	5.4	-214.92			
male	2 1+full GC association	30.925	27	.274	2.5	-193.47	53.344	9	.000
	3 1+quasi-independence	38.284	32	.206	2.8	-227.67	45.986	4	.000
	4 1+uniform association	44.888	35	.122	3.4	-245.99	39.381	1	.000
NCDS	1 con. independence	73.343	36	.000	4.8	-226.23			
female	2 1+full GC association	24.392	27	.608	2.5	-200.29	48.950	9	.000
	3 1+quasi-independence	39.856	32	.160	3.4	-226.43	33.487	4	.000
	4 1+uniform association	29.200	35	.744	2.7	-262.05	44.143	1	.000
BCS	1 con. independence	71.459	36	.000	6.1	-213.40			
male	2 1+full GC association	25.431	27	.550	2.7	-188.21	46.028	9	.000
	3 1+quasi-independence	35.259	32	.317	3.4	-217.95	36.200	4	.000
	4 1+uniform association	38.526	35	.313	4.2	-238.42	32.933	1	.000
BCS	1 con. independence	49.685	36	.064	5.2	-230.77			
female	2 1+full GC association	28.672	27	.377	3.5	-181.67	21.013	9	.013
	3 1+quasi-independence	33.141	32	.411	4.0	-216.15	16.544	4	.002
	4 1+uniform association	36.414	35	.403	3.9	-236.25	13.271	1	.000

We then contrast this view with the uniform association (UA) model (Goodman, 1979a,b; Duncan, 1979). UA is a linear-by-linear model. It assumes that the class categories are ordered (which is a reasonable assumption for RG classes) and posits that the GC association can be summarised as the product of a uniform association parameter and the scale scores of the class categories, i.e.

$$\log F_{ijk} = \lambda + \lambda_i^G + \lambda_j^P + \lambda_k^C + \lambda_{ij}^{GP} + \lambda_{jk}^{PC} + \beta^{GC} ik. \quad (4)$$

In the absence of strong reasons to do anything more complex, we further assume roughly equal distance between adjacent RG classes, and use the simplest integer scoring for i and k (i.e. the scale scores for the four RG classes are entered as 1, 2, 3 and 4 respectively). Thus, compared to the conditional independence model, UA uses just one extra parameter, namely, β^{GC}. It turns out that UA, which is even more parsimonious than QI, also fits the data well. Indeed, for NSHD men, NSHD women and NCDS women, the deviance of UA is smaller than that of QI, despite UA's greater parsimony. As for the other three cases, UA returns greater deviance, but the difference is small.

Although QI and UA both fit the data, the interpretation they give of the GC association is very different. QI suggests that the net GC association is found on the main diagonal only. By comparison, UA gives no special status to the main diagonal and suggests that the same social force, scaled by the distance between class categories, operate throughout the partial GC table. Because UA and QI are not nested models, we cannot compare their fit to the data formally. It seems fair to say that our data does not allow us to choose unambiguously between these two models on empirical grounds.[12] Nevertheless, for the following reasons, we have a slight preference for UA over QI: (i) UA is more parsimonious, (ii) the QI parameters are not consistent across the six cases,[13] and, most importantly, (iii) inspection of the residuals of the UA model does not suggest any particular lack of fit along the diagonal.

It is remarkable that UA (and QI) provides a satisfactory description of net GC association, especially in light of the fact that when comparable analyses are applied to examine the net GP association and the net PC association, UA and QI generally fail to fit the data on their own. In some

[12]For example, while UA returns a larger index of dissimilarity (Δ) than does QI for NCDS men and BCS men, the opposite is true for the other four cases.

[13]For NSHD men, NCDS men and BCS women, only the diagonal parameter for class I+II in the partial GC table is significant; for NSHD women and NCDS women, the diagonal parameters for class I+II and class IV+V are both significant; while for BCS men, the diagonal parameters for classes I+II, IIIn and IV+V are significant.

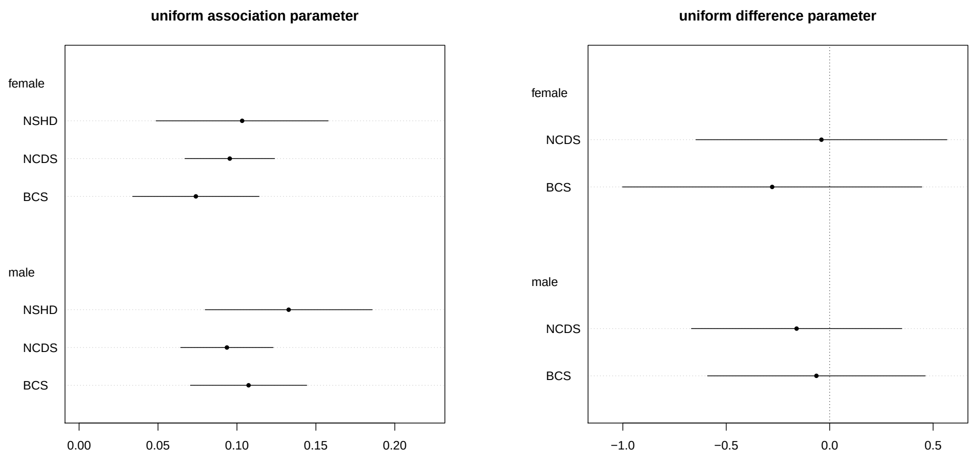

Figure 5: Uniform association parameter (left panel) and uniform difference (right panel) parameters with 95% confidence interval for net GC association

cases, a UA plus QI model would fit the data, while in others even more complex models are called for (see also Hout, 1985; Erikson and Goldthorpe, 1992).[14] In any case, the upshot is that the way grandparents directly affect grandchildren's mobility outcome is quite different from the relative mobility pattern that is discerned in parents–children mobility tables.

4.2.1 Variation between surveys

The left panel of Figure 5 shows the β^{GC} estimate for the six mobility tables, together with 95% confidence interval. Given the substantial overlap of the confidence intervals, it would seem that β^{GC} does not differ between sex or over the three surveys. But since the β^{GC} parameters of Figure 5 are estimated in separate models, they are not fully comparable. So to check the result of no change in the net GC association between surveys, we have also fitted to the four-way tables cross-classifying grandparents' class, parents' class, children's class and surveys what might be called partial uniform difference models (cf. Erikson and Goldthorpe, 1992; Xie, 1992):

$$\begin{aligned}\log F_{ijkl} = &\lambda + \lambda_i^G + \lambda_j^P + \lambda_k^C + \lambda_l^S + \lambda_{ij}^{GP} + \lambda_{jk}^{PC} + \lambda_{ik}^{GC} \\ &+ \lambda_{il}^{GS} + \lambda_{jl}^{PS} + \lambda_{kl}^{CS} + \lambda_{ijl}^{GPS} + \lambda_{jkl}^{PCS} + e^{\phi_l^S}\lambda_{ik}^{GC}.\end{aligned} \tag{5}$$

The partial uniform difference model assumes that the general pattern of the net GC association is the same for all three surveys, but the strength of

[14]Details are available from the authors on request.

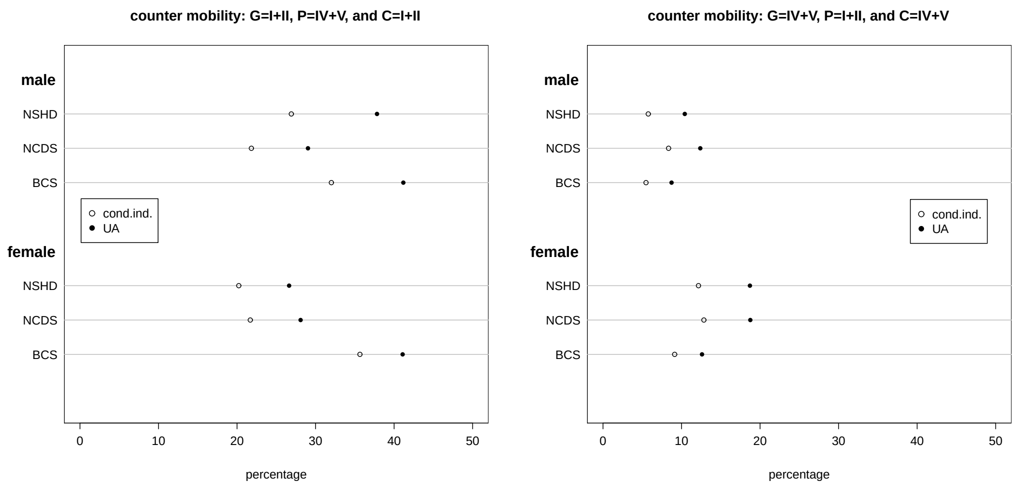

Figure 6: Expected upward and downward counter mobility rates under conditional independence and uniform association models

that association differs between surveys by a scalar ϕ_l^S. We identify ϕ_l^S by setting the level for NSHD to 0. As the right panel of Figure 5 shows that the confidence intervals of ϕ_l^S for NCDS and BCS comfortably straddle zero, it confirms that, for both men and women, there is no evidence of change in the strength of the net GC association between surveys.

4.2.2 Substantive magnitude of the grandparent effect

How strong is the 'grandparent effect' in social mobility? The point estimate of β^{GC} ranges from .074 (BCS women) to .133 (NSHD men). Thus, 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 between 1.08 ($e^{.074}$) and 1.14 ($e^{.133}$); and the odds ratio for the four corner cells is somewhere between 1.95 ($e^{.074(4-1)(4-1)}$) and 3.31 ($e^{.133((4-1)(4-1))}$). That is, controlling for parent's class, the odds of our respondents getting into class I+II rather than class IV+V is about two to three times better if they have class I+II grandparents rather than class IV+V grandparents.

We have also calculated some indicative outflow rates under the conditional independence model and the UA model respectively. A comparison of these mobility rates illustrates further the substantive magnitude of the grandparent effect in social mobility. For example, the left panel of Figure 6 shows the outflow rates of moving from class IV+V (P) to class I+II (C),

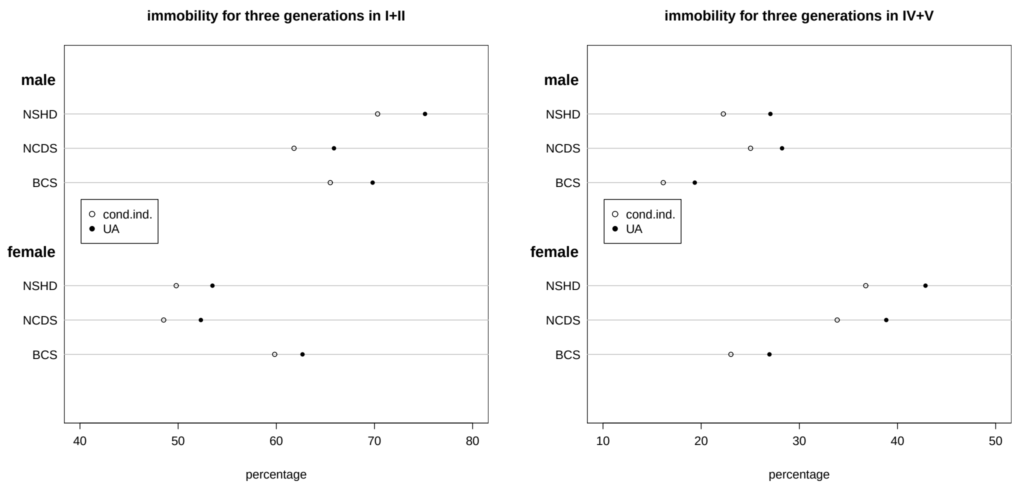

Figure 7: Expected three-generational immobility rates under conditional independence and uniform association models

conditional on having class I+II grandparents.[15] Under the UA model, the rate of this kind of counter-upward-mobility is estimated to be between 27% (NSHD women) and 41% (BCS men and BCS women). But if there were no grandparent effect (i.e. under the conditional independence model), the estimates would be consistently lower, ranging from 20% (NSHD women) to 36% (BCS women). These differences are not trivial. For example, the estimates of these two models for BCS women differ by 6 percentage points, or one eighth of the UA estimate in proportional terms.

The right panel of Figure 6 shows that the conditional independence model also consistently under-predicts the extent of counter-downward-mobility, from grandparents in class IV+V to parents in class I+II, and then for children to return to class IV+V. Under the UA model, in the partial P–C table of class IV+V grandparents, the outflow rate from class I+II (P) to class IV+V (C) is between 9% (BCS men) and 19% (NSHD women and NCDS women). If there were no direct grandparents effect, this kind of outflow rate would be 3% to 6% lower. These are, again, non-trivial differences in proportional terms.

Grandparents also matter for multi-generational class immobility. Again, the conditional independence model consistently under-predicts long term class persistence, though the magnitude of the grandparents effect here is smaller. The left panel of Figure 7 shows that, under the UA model, in the

[15]The outflow rates of Figures 6 and 7 refer to those of partial P–C tables with class I+II grandparents (left panel) or class IV+V grandparents (right panel) respectively.

partial P–C table of class I+II grandparents, between 52% (NCDS women) and 75% (NSHD men) of those from class I+II (P) end up in class I+II (C). But if there were no grandparents effect, these percentages would be 3% to 5% lower.

At the other end of the class hierarchy, in the partial P–C table of class IV+V grandparents, the UA model predicts that between 19% (BCS men) and 43% (NSHD women) of those with class IV+V parents also end up in class IV+V. Under the conditional independence model, three-generation immobility in class IV+V would be 3% to 6% lower (see right panel of Figure 7).

Overall, the grandparent effect seems to operate as follows: where grandparents and parents are in the same social class, it would encourage further class immobility. But in cases where grandparents and parents are in different social class, the grandparent effect would imply a greater level of counter-mobility.

5 Summary and discussion

In this paper, we use data collected in three British birth cohort surveys to investigate the patterns of social mobility over three generations of family members: grandparents, parents and children. We report quite substantial change in the class structure over generations within each survey, and clear evidence of the dependence of absolute mobility rates in the parents–children mobility tables on grandparents' social class. In particular, respondents with more advantaged grandparents have lower rates of total and upward mobility. There are also clear and quite steep gradients in inflow and outflow rates by grandparents' social class.

As regards relative mobility rates, there is consistent and strong evidence that, net of parents' social class, grandparents' class position has a direct effect on grandchildren's mobility outcomes. This net grandparents–children association can be summarised by a single uniform association parameter. This suggests that the grandparent effect in social mobility operates throughout the class hierarchy, and is not restricted to the two ends, as Mare (2011) suggests. At the same time, it should be noted that most members of RG class I+II do not have 'great wealth'. Likewise, most of those in RG class IV+V are not in 'abject poverty'. In other words, our data is not best suited to test Mare's argument, and it is possible that, say, at the top 1% and bottom 1% of the population, even stronger and qualitatively different multigenerational effects are at work.

The results we report in this paper are consistent with those reported for Finland by Erola and Moisio (2007), though as we argued above, we do not agree with the conclusion that they draw. As regards the findings of Warren and Hauser (1997), it is indeed possible that the Wisconsin study sample is the exception rather than the rule when it comes to multigenerational effect (Mare, 2011). But the divergent results might also be due, in part, to methodological differences. Warren and Hauser (1997) have analysed their data with structural equation models, using occupational status, a continuous variable, as their dependent variable. We work within the framework of class analysis, and employ models for categorical data analysis. As is well known, loglinear models effectively control for changing marginals between generations, while regression analyses with continuous dependent variables do not. This might have some bearing on the different results if, say, those occupations which have the weakest grandparent effect happen to be more common in the Wisconsin sample.

More importantly, Warren and Hauser (1997) have employed multiple indicators of grandparents' and parents' characteristics in their analysis, while we have only employed a single class variable for each generation. It is quite possible that with more and better control of parents' characteristics (especially educational attainment and perhaps wealth), some of the net grandparents effect reported in this paper could be explained away. All three birth cohort surveys contain further information about parents and grandparents which could be exploited for this purpose. Our plan is to incorporate these variables into our analysis in future papers. This should address some of the methodological concerns outlined above, and help specify more clearly the mechanisms through which the grandparents effect of social mobility take place.

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