Family Matters: Impacts of Family Background on Educational Attainments

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The analysis uses new data matching parents and their young adult children to study the impact of family background on young people's educational attainments. The data is derived from the first seven years (1991–97) of the British Household Panel Study. Parents' educational attainments are found to be very strongly associated with their children's educational attainments, and for an important part of the population these associations can be given a causal interpretation. In addition, young adults who experience single parenthood as children and those who come from families in the bottom income quartile have significantly lower educational attainments.

INTRODUCTION

The recent literature on 'endogenous growth' has stressed the important role that human capital accumulation plays in economic growth and development (e.g. Becker *et al.* 1990; Lucas 1988). Many human capital investment decisions are made by parents on behalf of their children. Thus, the family should play a central role in studying investment in human capital, as recognized, for example, by Becker (1981), Becker and Tomes (1986), Behrman *et al.* (1995) and many others.

The idea that the family plays an important role in shaping economic outcomes of its members is hardly a new one. As noted by Parsons (1975), Frank Knight (1935) identified the family as the principal social institution in a market economy that fosters income inequality, through behaviour that forges intergenerational links between parents' and children's wealth. As better data have become available, it has been possible to measure the strength of these links. While there have been many American studies of these (e.g. Solon 1992; Zimmerman 1992), the relationship between the earnings or education of British parents and that of their children has been studied only by Atkinson (1981) and Dearden *et al.* (1997).[1] The most recent of these used the National Child Development Study (NCDS), which is a cohort of persons born in a week in March 1958.

The present paper estimates the association between various aspects of family background, including parents' education, income and family structure, and the educational attainments of more recent cohorts of British youth (born during 1974–81). It uses new data from the first seven waves of the British Household Panel Study (BHPS). In addition to being a better reflection of contemporary impacts of family background,[2] these data allow for better measurement of family economic circumstances than the NCDS. On the other hand, the NCDS does have a larger sample and more measures of background factors and the child's behaviour throughout childhood.

The paper is organized as follows. The next section presents a theoretical framework that is used to structure and interpret the empirical analyses. In particular, it suggests the circumstances under which the measured associations between family background and educational attainments may be interpreted as causal 'effects' rather than intergenerational correlation in 'endowments', and it indicates the channels through which such effects may operate. Section II describes the data and statistical methods used in the analyses, and Section III examines the estimated effects of family background on young people's educational attainments, with particular emphasis on the impacts of parents' education, childhood family structure and family income. The last section summarizes our main findings.

I. Theoretical Background

In order to clarify the ways in which aspects of family background, such as parents' education and income, may affect a child's educational attainments, we present a simple model in which there is only one child. The income of the child as an adult is assumed to be a public good to the parents. The child's income is made up of her earnings, denoted as e, and income from gifts and bequests from parents, denoted as rb, where b is the amount of transfers (gifts or bequests) and r is the market interest rate. Earnings are determined by educational attainments and by an 'endowment' with which the child is born. We view educational attainment as the outcome of human capital investments made by parents throughout childhood, not just as a choice when the child is a teenager. Even if the child has an important input into the decision of when to terminate her education, it is constrained by human capital investments made throughout her childhood. We abstract from the dynamics of these investment decisions and model these as if parents were choosing their child's education directly in a static framework, even though it is actually the outcome of many human capital investment decisions by parents.

The child's earnings function is given by $e = f(S, \varepsilon)$, where S is the educational level achieved by the child (resulting from human capital invested in that child) and ε is the 'earnings endowment' of the child. The parents' 'consensus preferences' are represented by the utility function $U(x, e + rb)$, where x denotes their own consumption. The parents choose x, b and S to maximize their utility subject to $y = x + b + p_s S$, where p_s is the unit cost of education and y is parents' income. The level of education chosen by the parents must satisfy

(1) $p_s \leqslant [\partial f(S, \varepsilon)/\partial S]/r.$

The right-hand side of (1) is the marginal return from educational investment and the left-hand side is the marginal cost.

(a) Parents making financial transfers to their child

If parents give monetary transfers to their child (i.e. if $b > 0$), then (1) holds with equality. Note that in this case the child's educational level does not depend on parents' income: it depends only on the market interest rate, the cost

of education and the child's earnings endowment. For illustration, let $e = S^{\gamma}\varepsilon$, with $0 < \gamma < 1$. Then optimal human capital investment produces an education level of

$$(2) \qquad S^* = (\gamma\varepsilon/rp_s)^{1/(1-\gamma)}.$$

The amount of monetary transfers does, however, depend on the income of the parents. For instance, if in addition to this particular earnings function we assume a specific, widely used utility function for the parents, $U = \alpha \ln(x) + (1 - \alpha)\ln(e + rb)$, then

$$(3) \qquad b^* = (1 - \alpha)[y - p_s S^*] - \alpha e^*/r,$$

where $e^* = S^{*\gamma}\varepsilon$ and S^* is given by (2). Thus, parents make efficient human capital investments in their child and then make transfers to their child according to their incomes and preferences.

There is likely to be a correlation between mother's education S_m (father's education S_f) and the child's education, because ε and S_m (S_f) are correlated. This correlation is likely to be positive because of genetics and possibly also because of 'cultural transmission'; more highly educated parents may provide a better environment (e.g. books around the house) for producing human capital in their children, and this is part of the child's endowment ε. In these circumstances, the correlation between parents' and child's education would be a poor indication of the 'effect' of raising parents' education on child's education. It would reflect the correlation between parents' and child's *endowments*, thereby producing an upwardly biased estimate of any 'true effect'. As noted above, parents' incomes would have no causal impact.

If, however, parents' educational attainments did affect the cost of education p_s, then mother's and father's education levels would have a *causal effect* on child's education. How might this come about? Suppose, for example, that a child's human capital is only produced in the home using time inputs of the parents: $S = h_f t_f + h_m t_m$, where t_j is the time input of parent j and h_j is parent j's home productivity in human capital investment (f indicates father and m, mother). If we allow the mother to have a comparative advantage in human capital investment in her child (i.e. if $w_m/h_m < w_f/h_f$, where w_j is parent j's wage), the cost of her child's human capital (p_s) is w_m/h_m. Higher mother's education could raise both her wage w_m and her home productivity in human capital investment h_m. If the mother's wage increases proportionately less than her home productivity with higher levels of her education, then the cost of human capital investment will decrease, leading to a positive effect of mother's education on child's education.[3] If the opposite is the case, p_s increases and the effect is negative. In this example fathers do not contribute to their children's human capital investment, and so the correlation between a father's education and his children's would not represent any causal impact of the father's education, but purely a correlation between ε and S_f.

Qualitatively, these results would also arise in a model in which purchased inputs are imperfect substitutes for parents' time and fathers also contribute time in the production of S. In such a model, there would be effects of father's education as well, although smaller than those of mother's education if his share in production costs is smaller than hers. It is, however, difficult to

disentangle such causal effects of parents' education because of intergenerational correlation in endowments.

(b) Parents too poor to make monetary transfers

If parents are too poor to make transfers, in the sense that the marginal utility of their private consumption exceeds the marginal utility of transfers, then the inequality in (1) holds. This means that parents do *not* invest in their child's human capital up to the point where the marginal return equals the marginal cost of education. They invest less than this amount, and, in contrast to the 'wealthy' parents who make transfers, their optimal investment depends on their income. With the particular earnings and utility functions assumed above,

$$(4) \qquad S^* = \gamma(1 - \alpha)y / \{[\gamma(1 - \alpha) + \alpha]p_s\}.$$

The impact of a mother's education (S_m) on her child's human capital is

$$(5) \qquad \partial S^*/\partial S_m = (\partial y/\partial S_m)(\partial S^*/\partial y) - (S^*/p_s)(\partial p_s/\partial S_m).$$

From equation (5) we can distinguish a family income effect of mother's education, and a substitution effect, which depends on any impact of mother's education on the cost of human capital investment in children. The impact of father's education (S_f) is analogous to (5), but a substitution effect may be absent $(\partial p_s/\partial S_f \cong 0)$ if fathers are much less involved than mothers in the human capital investment in their children.

Equation (4) indicates that the child's earnings endowment has no impact on investment in the child's human capital. This strong result is a product of the particular earnings and utility functions assumed in deriving (4). In general, a higher endowment could either increase or decrease human capital investment when parents are too poor to make transfers (Becker and Tomes 1986). On the one hand, a higher endowment increases the marginal return to human capital investment, but on the other hand it means that the child will be richer, which lowers the parents' marginal utility of additional investment in their child. If the latter effect dominates, a higher endowment would reduce investment.

Thus, if parents do not make gifts or bequests, the correlation between parents' and child's education is likely to represent primarily a causal effect of parents' education. This is because human capital investment is not carried to the point at which the marginal return from education equals its marginal cost. In this case, resources and preferences, in addition to endowments and marginal cost (p_s), determine the level of education chosen. In this sense this static model is similar to Loury's (1981) dynamic model. It is also in the spirit of Maoz and Moav's (1999) dynamic analysis in that, in their model, the correlation between a parent's and child's education arises because more educated parents have more resources, not because of correlation in ability between generations.[4]

The 'separable earnings transfer' (SET) model, introduced by Behrman *et al.* (1982), produces the same predictions for all parents as the above model does for parents too poor to make transfers. In their model, parents' preferences have earnings of children separable from parents' consumption and from financial transfers to children. Again, parents' resources and preferences,

not only child endowments and marginal cost, determine the level of education chosen.

The analysis above has assumed 'consensus preferences'. The main results are the same in a model in which each parent has their own preferences and the parents are cooperative in the sense of producing efficient allocations. In this model, higher mother's income (or education) also gives rise to a 'bargaining effect' on the child's education, which is positive if mothers put more weight on the child's income than fathers ($\alpha_f > \alpha_m$ in the utility function used above) and higher mother's income (or education) increases her bargaining power. The bargaining effect of higher father's income or education would be negative in these circumstances. These effects are absent if parents have the same preferences ($\alpha_m = \alpha_f$).

(c) Parents who divorce

Another aspect of family background is experience of the parents' divorce. Divorced parents could be viewed as behaving noncooperatively. Consider the Nash equilibrium of a model of voluntary contributions to a public good (child's income here) introduced by Warr (1982) and Bergstrom et al. (1986). If at least one parent makes transfers after divorce, then the efficient level of education investment is attained, and it is given by equation (2).[5] In this case, divorce should not affect the child's educational attainments, which are determined by the child's endowments and the cost of human capital investment.

If neither parent makes monetary transfers but both parents make human capital investments, then investment in their child's education depends on the total income of the parents. For example, if we use the particular form of the parents' utility functions and the earnings function used above, it is given by

$$(6) \qquad S^{nc} = [\gamma(1 - \alpha_m)(1 - \alpha_f)y]/D^{nc},$$

where $D^{nc} = p_s[\alpha_f(1 - \alpha_m) + \alpha_m(1 - \alpha_f) + \gamma(1 - \alpha_f)(1 - \alpha_m)]$. If, however, only one parent (j) makes human capital investment, then only that parent's income matters. Continuing the illustration, then

$$(7) \qquad S^{nc} = \gamma(1 - \alpha_j)y_j/\{[\alpha_j + \gamma(1 - \alpha_j)]p_s\},$$

where y_j is parent j's income. In either case, human capital investment will tend to be lower than when parents cooperate.[6] Thus, if neither parent makes financial transfers to the child after the parents' divorce, the child's education tends to be lower than that of children whose parents remain together.

(d) Implications

These theoretical analyses generalize to families with more than one child, although issues of compensation or reinforcement of endowments among offspring in human capital investment arise in these families when parents do not make monetary transfers to all children (e.g. see Behrman, 1997). In the empirical work, we focus on the three factors suggested by the above analysis to be important for a child's educational attainments: (i) parents' education,

(ii) experience of a single parent family and, in a restricted sense, (iii) family income.

We specify a basic model (model I) for young people's educational attainment, which relates it to the following set of explanatory variables: mother's and father's education, family structure during childhood, ethnic group, year of birth, and current age of the child. The last variable controls for the fact that we observe young adults at ages in which they could still be in education, and 'year of birth' is meant to capture any secular trends in educational attainments.

When parents are too poor to make financial transfers, or transfers are separable from the child's earnings in parents' utility functions (the SET model), we can more readily interpret the associations between parents' education and that of their offspring as causal effects. They work through parents' incomes, bargaining and the cost of human capital investment. Furthermore, in this case we expect that a child's experience of single parenthood would reduce educational attainments. For shorthand, we shall refer to this case as the 'poor parents case', but note that it includes the SET model.

If, however, parents make monetary transfers, and the child's *income* as an adult ($e + rb$) enters the parents' utility function, then the associations between parents' education and that of their children is likely to reflect primarily intergenerational correlation in endowments. If financial transfers continue to be made by at least one parent after the parents' divorce, a child's experience of single parenthood will not affect his educational attainments in this case. For short, we shall refer to this as the 'wealthy parents case'.

We estimate a second model (model II), which also includes the number of brothers and sisters, the quartile of parents' real income when the child was aged 16–17, whether or not the parents are owner-occupiers and, if so, the house value when the child was aged 16–17, whether the child was an only child, and whether or not he was the first child. These variables should affect education only in the 'poor parents case'.

II. DATA AND METHODOLOGY

Since autumn 1991, the BHPS has interviewed annually a representative sample of 5,500 households, containing about 10,000 persons. The same individuals are re-interviewed each successive year, and if they leave their original households to form new households all adult members of these new households are also interviewed. Similarly, children in original households are interviewed when they reach the age of 16. Thus, the sample remains broadly representative of the population of Britain as it changes through the 1990s.[7]

(a) Sample selection

Our sample consists of 1,157 individuals who: (i) are aged 16 or more and were born between 1974 and 1981; (ii) do not have serious disabilities;[8] (iii) live with their biological, adoptive or step-parent(s) when aged 16 or 17 during the first seven waves of the panel study; and (iv) have complete information on the mother's variables. Condition (iii) is imposed to match data on family

background from the parents' records to their child. Because 95% of the panel members live with their parents when aged 16–17, this condition should not affect the randomness of the sample. A young adult's educational attainment is measured at the oldest age at which we observe her in the panel. The distribution of individuals in the sample by age at observation of educational attainment is evenly distributed between ages 16 and 23. Thus, more than two-thirds of them are 20 years old or younger, with their average age being 19.7.

(b) Variables

Descriptive statistics of all the variables are presented in Table 1. *Educational attainment* of the child is measured by the highest completed academic qualification, and it is grouped into seven classes in ascending order: no

TABLE 1
DESCRIPTIVE STATISTICS: FULL SAMPLE

Variable	Mean	Standard deviation
Dependent variable		
No qualification	0.089	
Less than GCSE/O-level	0.093	
1 to 4 GCSEs	0.113	
5+ GCSEs	0.254	
A-level	0.283	
Higher vocational qualifications	0.127	
Degree qualifications	0.041	
Independent variables		
Female	0.478	
Year of birth – 1900	77.320	2.263
Age	19.682	2.262
Age 16	0.134	
Age 17	0.168	
Age 18	0.138	
Age 19	0.122	
Age 20	0.120	
Age 21	0.117	
Age 22	0.105	
Age 23	0.097	
White	0.944	
Black	0.017	
Indian	0.019	
Pakistani/Bangladeshi	0.012	
Chinese and others	0.008	
Mother's education		
No qualification	0.303	
Less than O-level	0.111	
O-level	0.215	
A-level	0.073	
Higher vocational qualifications	0.220	
Degree qualifications	0.078	

(*continued*)

TABLE 1

CONTINUED

Variable	Mean	Standard deviation
Father's education[a]		
No qualification	0.239	
Less than O-level	0.068	
O-level	0.164	
A-level	0.123	
Higher vocational qualifications	0.293	
Degree qualifications	0.113	
Missing information on father's education	0.194	
Ever in single-parent family	0.283	
Ever in single-parent family at (child's age):		
0–1	0.028	
2–5	0.111	
6–10	0.086	
11–16	0.060	
Ever in stepfamily	0.182	
Mother's age at birth (years)	26.425	4.533
Mother's age at birth ⩽ 21	0.121	
Mother's age at birth ⩾ 35	0.034	
Father's age at birth (years)[b]	28.867	5.424
Father's age at birth ⩽ 21	0.049	
Father's age at birth ⩾ 35	0.063	
First-born	0.397	
Only child	0.090	
Number of brothers[c]	0.870	0.880
Number of sisters[c]	0.768	0.865
Parents are homeowners (outright)	0.086	
Parents are homeowners (with mortgage)	0.690	
House value (in 1997 prices)[d]	75,378	71,795
Annual family income (in 1997 prices)	20,796	17,062
Annual family income (in 1997 prices) at		
25th percentile	6,889	
50th percentile	14,892	
75th percentile	23,886	
Proportion of individuals by quartile of average annual family income		
1st quartile (bottom)	0.159	
2nd quartile	0.259	
3rd quartile	0.271	
4th quartile (top)	0.311	

[a] Computed on individuals with available father's information. Missing observations are replaced with 'no qualification'. The distribution of father's education for all individuals is (in ascending order): 0.387; 0.055; 0.132; 0.099; 0.236; 0.091.
[b] Computed on individuals with available father's information. Missing observations are replaced with average values.
[c] Computed on all individuals. The mean (standard deviation) number of brothers and sisters computed only on individuals with siblings are 1.402 (0.707) and 1.382 (0.706), respectively.
[d] Computed on all individuals. The figures on individuals whose parents are homeowners are 97,118 (67,298) and house values range between £19,000 and £500,000.

qualification, qualifications lower than GCSEs (General Certificate of Secondary Education, formerly O(rdinary)-levels), one to four GCSEs, five or more GCSEs, A-level, higher vocational qualifications (mainly nursing and teaching) and degree qualifications (first and higher degree).[9] GCSE qualifications are assessed over a two-year period ending when the person is aged 16–17, while A-level exam results are usually obtained when the person is aged 18. University degrees are usually completed when the person is aged 21–22. One-fourth of the sample have five or more GCSEs (O-levels) as their highest qualification, 28% have one or more A-levels, while only 4% have achieved a university degree; 9% have no qualification. Of course, this sample distribution of qualifications reflects the age distribution of the sample; many are not old enough to have received a degree as yet. Nearly half of the young adults are women. Most of the individuals are whites: less than 2% are blacks (African, Caribbean and others), another 2% are Indians, 1% are Bangladeshi and Pakistani, and just less than 1% are Chinese and of other ethnic groups.

Young adults are matched with information about their mother and a 'father-figure' from the interviews during the panel.[10] The father-figure is the natural father in the cases in which the family has remained intact, but will be a stepfather in other cases; for short, we shall refer to the father-figures as 'fathers'. Thus, information about the parents is obtained from them, providing for both parents and child the advantages of self-reported information discussed by Parsons (1975). For the parents, all O-level qualifications are grouped together. Thirty per cent of mothers and nearly one-quarter of fathers have no academic qualification. Mothers' advantage over fathers in educational qualifications is mainly in more having O-levels or lower qualifications (33% of mothers versus 23% of fathers). In 19% of the cases, the education of a father is not known, in large part because there is no father-figure in the household. In order to avoid dropping these observations, the analysis includes an indicator variable for missing information on the father's education.

On average, mothers gave birth at age 26, and fathers were approximately two years older than the mothers. Around 12% (5%) of the young adults in the sample were born when their mother (father) was aged 21 or less, and 3% (6%) of them have mothers (fathers) aged 35 or more at their birth. They have an average of 1.6 siblings, including 9% who had neither brother nor sister. About two-fifths of young adults were first-born (including only children). Over three-fourths of parents were homeowners (either outright or with mortgage) by the end of childhood. The average house value (computed for owners only) is £97,000 (expressed in 1997 prices). The average annual family income when the child was aged 16–17 is almost £21,000 (in 1997 prices).[11] In the analysis below, we divide young adults into four groups according to their position in the distribution of real annual family income computed over all the available panel years in which parents are observed. In our sample, 16% of young adults have parents whose annual family income is in the lowest quartile of this distribution, while 31% of them are in the top quartile.

The second wave (1992) of the BHPS contains retrospective information on complete fertility, marital and cohabitation histories for all adult panel members in that year. This information provides the basis for our family structure measure. Our analysis proceeds as if all children lived with their mothers throughout their years of dependency, which we assume to be until

their sixteenth birthday.[12] The reference group is having lived in an *intact family*; i.e. the child lived with both biological or adoptive parents throughout childhood. A child is said to have lived in a *single-parent family* if, while aged under 16, he lived with a biological or adoptive mother who was not cohabiting or married, either because the mother had dissolved or ended the partnership in which the child was born, or because the child was born outside a live-in partnership and the mother did not cohabit or marry within one year of the birth.[13] Finally, a child is said to have lived in a *stepfamily* if he lived with a biological or adoptive mother who is cohabiting with or married to a person other than the biological father.

Clearly, all children who spent time in a stepfamily had earlier spent time in a single-parent family. The simplest assessment of childhood family structure is whether a child ever spent some time living in a non-intact family. About 28% of young adults in our sample either experienced their mother's partnership dissolution before they reached age 16, or were born outside of a partnership; while 18% had lived in a stepfamily sometime during their childhood.[14] Interestingly, of the children who spent time in a single-parent family before their sixteenth birthday, almost 50% of them started doing so below the age of 6.

(c) Statistical method

The impacts of family background variables on educational attainments are modelled in terms of an ordered logit model, which takes the following form. Let J_{if} be a (continuous) latent variable measuring level of education for the ith individual in family f. Then $J_{if} = \beta \mathbf{Z}_{if} + u_{if}$, where $\mathbf{Z}_{if}$ is a vector of family background variables, β is a vector of coefficients, and u_{if} is a random variable distributed as logistic. There are seven educational qualification categories (discussed above), denoted by $E_{if} = 1, 2, ..., 7$. $E_{if} = j$ if $\mu_{j-1} \leqslant J_{if} \leqslant \mu_j$, where $\mu_0 = -\infty$, $\mu_7 = \infty$ and $\mu_j, j = 1, 2, ..., 6$ are estimated as part of the model. (A constant term is not identified in the model.) Using these 'cutoff' parameters μ_j, the model predicts the probability of an individual with characteristics $\mathbf{Z}_{if}$ of being in education qualification category j as $F(\mu_j - \beta \mathbf{Z}_{if}) - F(\mu_{j-1} - \beta \mathbf{Z}_{if})$, where $F(\cdot)$ is the logistic distribution function.[15]

III. Findings

(a) Educational attainment and parents' education

There is a significant gradient between each parent's education level and their child's educational attainment in both models I and II in Table 2. Relative to a parent with no qualifications, mother's education has a stronger association with her child's educational attainments than the education of the father. In particular, obtaining a qualification below O-level, and moving from A-level to higher-level vocational qualifications or degrees, have much stronger associations with child's education for mothers than for father-figures. This could be a 'bargaining effect', because mothers put more weight on the child's income than fathers do, and higher mother's education increases her bargaining power (see Section I(b)). It also could reflect higher productivity in human capital investment among more highly educated mothers, or it may be because

TABLE 2

TABLE 2
DETERMINANTS OF EDUCATIONAL ATTAINMENT: FULL SAMPLE

Variable	Model I		Model II	
	Coeff.	| t-ratio |	Coeff.	| t-ratio |
Female	0.179	1.552	0.214	1.776
Year of birth -1900	0.085	2.158	0.083	2.213
Age 17	1.141	6.211	1.177	6.550
Age 18	1.657	7.784	1.658	7.912
Age 19	2.248	9.469	2.265	9.420
Age 20	2.577	9.921	2.535	9.668
Age 21	2.996	11.139	3.012	11.643
Age 22	3.828	9.408	3.893	9.557
Age 23	3.824	10.240	3.807	10.179
Black	-0.496	1.137	-0.121	0.293
Indian	0.938	2.784	1.024	3.154
Pakistani/Bangladeshi	0.497	1.363	0.787	1.723
Chinese and others	0.880	2.542	0.852	2.174
Mother's education				
Less than O-level	0.594	3.350	0.405	2.334
O-level	0.641	4.304	0.483	3.146
A-level	0.588	2.772	0.374	1.634
Higher vocational qualifications	0.969	5.949	0.746	3.974
Degree qualifications	1.037	5.109	0.778	3.652
Father's education				
Less than O-level	-0.009	0.033	-0.050	0.190
O-level	0.463	2.263	0.327	1.664
A-level	0.569	2.457	0.378	1.806
Higher vocational qualifications	0.585	2.901	0.414	2.131
Degree qualifications	0.700	3.047	0.611	2.724
Ever in single-parent family	-0.464	3.440	-0.323	2.172
Missing information on father's education	0.300	1.432	0.273	1.314
Mother's age at birth $\leqslant 21$			-0.196	1.021
Mother's age at birth $\geqslant 35$			0.431	1.160
Father's age at birth $\leqslant 21$			-0.102	0.412
Father's age at birth $\geqslant 35$			-0.177	0.487
First-born			-0.045	0.413
Only child			-0.361	1.708
Number of brothers			-0.159	1.413
Number of sisters			-0.261	3.608
Outright homeowners			0.988	4.338
Mortgage homeowners			0.459	2.320
House value $\div 10{,}000$			-0.001	0.145
Quartile of annual family income:				
1st quartile (bottom)			-0.528	2.912
2nd quartile			-0.122	0.786
3rd quartile			-0.101	0.832
μ_1	6.656		6.122	
μ_2	7.652		7.164	
μ_3	8.404		7.951	
μ_4	9.802		9.397	
μ_5	11.576		11.193	
μ_6	13.309		12.941	
Wald χ^2(d.f.)		495 (25)	578 (39)	
Log likelihood		-1837	-1810	
Number of observations		1157	1157	

Note: Estimates obtained from ordered logit models. Absolute *t*-ratios are obtained by dividing each estimated coefficient with the corresponding robust standard error. Standard errors are robust in the sense that they are adjusted to account for repeated observations on siblings or half-siblings in the same family.

stepfathers are included in the 'father-figures' and their association with child's education is weaker.[16] But can we give these associations a causal interpretation?

The strong negative association between experience of a single-parent family and educational attainments in both models suggests that we can, because such an association would be absent if parents made financial transfers to their children before and after divorce. In other words, this negative association supports the 'poor parents case', for which parents' education has a causal impact on child's education. Furthermore, the estimates from model II indicate that young adults with parents in the bottom income quartile have much lower educational attainments, while those whose parents are home-owners (particularly outright owners) have much higher ones. In addition, those with more brothers and sisters, particularly the latter, have lower attainments. These results also support the 'poor parents case', and they point to an important role for parental resources in the amount of human capital investment for a substantial part of the population.[17]

In order to explore this idea further, we conducted the same analysis for four sub-samples of young adults with potentially 'poor parents'. The first of these sub-samples contains children whose parents are in the bottom family income quartile when the children are aged 16–17. In the second, 'poor parents' are defined to be those who are not homeowners. In the third, 'poor families' are those in which both parents have no O-levels. Finally, the fourth sub-sample defines 'poor parents' as those with no savings (as recorded in the 1995 wave of the BHPS). Our expectation is that parents in each of these sub-samples are not likely to make financial transfers to their children. According to the theory outlined in Section I, the correlation between parents and children in endowments should have much less influence on the measured association between the education of 'poor parents' and their children's education than would be the case for 'wealthy parents'. Thus, estimates from these four sub-samples should provide a clearer picture of the influence of parents' resources on children's educational attainments. Table 3 shows that, in each of these sub-samples, mother's education (and sometimes father's education) shows a strong positive association with the child's educational attainment. Furthermore, experience of a single-parent family continues to have a strong negative impact on educational attainment in these samples of 'poor families'.[18]

Table 4 shows the association between family background measures and child's education predicted by model II in Table 2. In the case of mother's education, all characteristics other than mother's education are set at their sample values for each person, and predicted probability values for each person are averaged over the sample to obtain the probabilities shown in Table 4. For instance, the probability of obtaining qualifications of A-level or more averages at 0.45 for children of mothers with an A-level qualification, compared with 0.38 for those whose mothers had no qualifications. As the mother's qualification level increases above A-level, the likelihood of her child achieving A-level or above qualification level increases further, reaching 0.53 for children of mothers with a higher-level degree.

The association between the father's education and child's education predicted by model II is also illustrated in Table 4 using similar methods. Young adults with a father whose highest education is at O-level have an average probability of obtaining A-level or higher qualifications of 0.48, compared with

TABLE 3

FAMILY BACKGROUND AND EDUCATIONAL ATTAINMENT OF YOUNG ADULTS IN
FOUR SUB-SAMPLES OF 'POOR' PARENTS: MODEL I

	Sub-samples of 'poor' parents			
	[1]	[2]	[3]	[4]
Variable	In the bottom quartile of annual family income	Parents are not homeowners	Both mother and father hold less than O-level qualifications	Parents hold no savings
Mother's education				
Less than O-level	0.779	0.569	0.543	0.932
	(1.549)	(1.556)	(1.899)	(2.248)
O-level	0.854	0.823		0.748
	(1.890)	(2.674)		(2.570)
A-level	−0.343	0.489		1.561
	(0.432)	(0.814)		(3.380)
Higher vocational qualifications	1.497	−0.029		0.967
	(3.249)	(0.061)		(2.915)
Degree qualifications	2.432	1.025		1.448
	(4.816)	(1.906)		(4.102)
Father's education				
Less than O-level	−0.522	0.409	−0.323	0.386
	(0.523)	(0.923)	(1.045)	(0.914)
O-level	−0.977	0.618		0.268
	(1.358)	(1.716)		(0.741)
A-level	0.308	0.556		0.425
	(0.688)	(1.443)		(1.341)
Higher vocational qualifications	0.145	0.668		1.275
	(0.316)	(1.205)		(3.620)
Degree qualifications	−0.778	1.523		1.038
	(1.361)	(2.196)		(2.011)
Ever in single-parent family	−0.510	−0.743	−1.204	−0.693
	(2.187)	(2.269)	(2.880)	(2.190)
Number of observations	184	259	186	309

Note: Estimates obtained from ordered logit models. Absolute *t*-ratios, obtained from robust standard errors, are in parentheses (*see* note in Table 2). Other variables included in all regressions are: gender, race (4 dummy variables), year of birth, age (7), a dummy variable for missing information on father's education, and 6 'cutoff' parameters. For other estimates, see Table A1.

0.41 for those with no qualifications. Increases in father's education beyond O-level increase this average probability further. These strong effects of mother's and father's education are found throughout the American literature, as the surveys by Haveman and Wolfe (1995) and Card (1999, Table 2) document.

Educational attainment and family structure

The negative coefficients on the family structure variables shown in Tables 2 and 3 imply large effects on educational attainments. For example, model II in

TABLE 4

PREDICTED PROBABILITIES OF CHILD'S EDUCATIONAL ATTAINMENT BY FAMILY STRUCTURE MEASURES

Family structure measures	Predicted attainment						
	No qualifications	< O-level	1–4 O-levels	5+ O-levels	A-level	Vocational qualifications	Degrees
Baseline probabilities	0.092	0.096	0.106	0.250	0.284	0.130	0.042
Mother's education							
No qualification	0.118	0.116	0.121	0.264	0.257	0.096	0.027
Less than O-level	0.087	0.095	0.107	0.255	0.288	0.128	0.040
O-level	0.082	0.091	0.104	0.252	0.294	0.134	0.043
A-level	0.089	0.097	0.108	0.256	0.286	0.125	0.039
Higher voc. quals.	0.067	0.079	0.094	0.241	0.308	0.157	0.054
Degree quals.	0.065	0.077	0.092	0.240	0.310	0.160	0.055
Father's education							
No qualification	0.104	0.107	0.116	0.262	0.270	0.109	0.032
Less than O-level	0.108	0.110	0.117	0.262	0.266	0.106	0.031
O-level	0.081	0.091	0.104	0.252	0.294	0.135	0.044
A-level	0.078	0.088	0.102	0.250	0.297	0.139	0.046
Higher voc. quals.	0.076	0.086	0.100	0.249	0.299	0.142	0.047
Degree quals.	0.065	0.077	0.092	0.240	0.309	0.160	0.056
Ever in single parents family	0.106	0.107	0.115	0.259	0.269	0.110	0.033
Never in single parent family	0.083	0.091	0.103	0.250	0.292	0.136	0.044
Position in family income distribution							
1st quartile (bottom)	0.118	0.115	0.120	0.262	0.257	0.099	0.029
2nd quartile	0.087	0.094	0.106	0.253	0.288	0.130	0.042
3rd quartile	0.086	0.093	0.105	0.252	0.289	0.131	0.042

Note: Probabilities are computed at sample values using estimated parameters from model II in Table 2.

Table 2 predicts a mean probability of obtaining an A-level or higher qualification of 0.47 for a child from an intact family, but the mean probability for a child from a non-intact family is only 0.41.

Gregg and Machin (1998) find a strong negative impact of having ever been in a single-parent family on the probability of staying on in full-time education at age 16, but it is no longer statistically significant once they control for whether the family experienced financial difficulties in early or late childhood (their table III), which has a strong negative impact on staying on at school.[19] Regarding educational attainment by age 23, attainment is found to be lower for those from single-parent families, even among those who did not experience financial difficulties (their table VI). Gregg and Machin's analysis includes many controls for family background and behaviour during childhood, including measures of ability. Blundell *et al.* (1997) find that absence of a 'father-figure' at age 16 has little impact on the probability of achieving an A-level or higher qualification, but this result may reflect the control for family financial difficulties when the child was aged either 11 or 16, which has a strong negative effect on A-level attainment.

In general, there is considerable consensus from American studies that experience in a lone-parent family during childhood has a negative impact on educational attainment (McLanahan and Sandefur 1994; Haveman and Wolfe 1995). In Britain, Elliott and Richards (1991) also found negative impacts of experiencing the divorce of one's parents on educational attainments by age 23 among a sample of members of the 1958 birth cohort who remained in an intact family until the age of 7. With the exception of father's occupation (manual/nonmanual) when the child was aged 7, they do not include any other family background controls in estimating the family structure effect. Ní Broclcháin *et al.* (1994) include many controls in a similar sample, and find that experiencing a parental divorce significantly increases the probability of leaving school at 16, particularly for young men who are living in stepfamilies at age 16 and for young women living with a single parent at age 16. The negative effect of living in a non-intact family on educational attainments is also broadly in line with Kiernan's (1996) results for Britons born in 1958, although she finds a negative effect only for non-intact families in which the mother did not work when the child was aged 16. All of these studies use NCDS data.

Other family background effects

Our finding that young adults whose parents are in the bottom quartile of the family income distribution have lower educational attainments is consistent with the negative impact of being from a family that experienced financial difficulties in the person's early or late childhood, found by Gregg and Machin (1998) and by Blundell *et al.* (1997). These results are consistent with the impacts of poverty found by Duncan *et al.* (1998) and the positive income effects found in many American studies (Haveman and Wolfe 1995). Having more brothers or sisters, particularly more sisters, reduces educational attainment. Thus, as in Micklewright (1989) and Blundell *et al.* (1997), there is some evidence that scarcity of resources (both money and time) in larger families may lower educational attainments.[20] Finally, despite our relatively small samples of ethnic minorities, young adults with Indian or Chinese parents have significantly higher educational attainments.

IV. CONCLUSIONS

Our analysis has used a new set of data derived from the first seven waves of the British Household Panel Study and its retrospective family history information to study the impact of family background on young people's educational attainments. Parents' educational attainments are very powerful predictors of their children's educational attainments. The degree to which these associations reflect parental resources, differential efficiency in the production of children's human capital and bargaining within the household, rather than inheritance of genetic and cultural endowments from the parents, depends on what is the relevant model for parent's human capital investment decisions. We find evidence that, for an important part of the population, these associations can be given a causal interpretation, either because a substantial proportion of parents are 'too poor' to make financial transfers to their children, or because their preferences have earnings separable from financial transfers (as suggested by Behrman *et al.* 1982). In particular, we find that young adults who experience single parenthood as children and those who come from families in the bottom income quartile have significantly lower educational attainments, while those whose parents are homeowners, particularly outright owners, have much higher attainments.

These differences in educational attainments ultimately translate into differences in earnings. Thus, the distribution of earnings within one generation is strongly conditioned by the distributions of earnings and income among the parents of that generation. This produces generational dynamics in the earnings distribution such as those suggested in the analyses of Loury (1981) and of Maoz and Moav (1999).

APPENDIX

Table A1 presents family background and gender differences in educational attainment for the full sample. Table A2 gives estimates of variables used in the regressions reported in Table 3.

TABLE A1
FAMILY BACKGROUND AND GENDER DIFFERENCES IN EDUCATIONAL ATTAINMENT:
FULL SAMPLE

	Model I			Model II		
	χ^2-stat.	d.f.	*p*-value	χ^2-stat.	d.f.	*p*-value
Gender interactions with:						
Mother's education	2.84	5	0.725	2.94	5	0.710
Father's education	2.00	5	0.850	1.54	5	0.909
Mother's and father's education	4.61	10	0.916	2.71	10	0.988
Ever in a single-parent family	0.22	1	0.640	0.67	1	0.414
Position in annual family income distribution				2.66	3	0.448
All of the above	4.92	11	0.935	5.73	14	0.973

Note: d.f. = degrees of freedom. Figures are obtained from regressions that contain all the variables reported in Table 2 in addition to the gender interactions.

TABLE A2

ESTIMATES OF OTHER VARIABLES USED IN THE REGRESSIONS REPORTED IN TABLE 3

Variable	Sub-samples of 'poor' parents			
	[1] In the bottom quartile of annual family income	[2] Parents are not homeowners	[3] Both mother and father hold less than O-level qualifications	[4] Parents hold no savings
Female	−0.355	0.409	0.007	0.322
	(1.130)	(1.332)	(0.023)	(1.734)
Year of birth − 1900	0.110	0.110	0.027	0.051
	(0.908)	(1.209)	(0.272)	(0.554)
Age 17	1.571	1.103	0.602	0.388
	(2.538)	(2.635)	(1.036)	(1.106)
Age 18	2.452	1.644	1.119	0.832
	(3.491)	(3.661)	(1.615)	(2.123)
Age 19	2.419	1.468	0.793	1.076
	(3.422)	(2.799)	(1.256)	(2.145)
Age 20	2.583	1.832	1.468	1.449
	(2.859)	(2.558)	(1.989)	(3.215)
Age 21	2.387	2.727	2.274	1.323
	(3.395)	(4.018)	(3.238)	(2.280)
Age 22	3.394	3.230	2.100	2.696
	(4.391)	(4.288)	(2.355)	(4.353)
Age 23	3.899	1.978	1.730	2.531
	(4.470)	(2.651)	(2.047)	(3.708)
Black	−0.561	−0.144	2.207	−0.217
	(1.176)	(0.335)	(8.453)	(0.357)
Indian	1.171	0.939	1.628	0.980
	(2.436)	(3.541)	(3.864)	(1.782)
Pakistani/Bangladeshi	0.722	n.a.	0.451	−0.322
	(0.957)		(0.728)	(0.335)
Chinese and others	0.372	0.408	−0.266	1.784
	(0.585)	(0.390)	(0.227)	(2.023)
Missing information on father's education	0.129	0.453		0.505
	(0.327)	(1.031)		(1.176)
μ_1	8.870	9.126	1.208	1.266
μ_2	9.807	9.932	2.409	2.213
μ_3	10.501	10.664	3.196	3.274
μ_4	11.938	11.742	4.022	4.088
μ_5	12.763	12.866	5.408	5.096
μ_6	16.574	16.092		7.485
Wald χ^2(d.f.)	153 (25)	126 (25)	212 (15)	182 (25)
Log likelihood	−293	−425	−307	−510
Number of observations	184	259	186	309

Note: Absolute *t*-ratios are in parentheses (see Table 3).
n.a. = estimate not available due to collinearity.

NOTES

1. In addition, O'Neill and Sweetman (1998) have studied the relationship between the unemployment of fathers and sons using the National Child Development Study. An early study of the relationship between children's education and parental background (including schooling and social class) is the work by Halsey *et al.* (1980).

2. This may be particularly important for the impact of family structure, because the incidences of single parenthood and stepfamilies are now much higher than among the 1958 cohort, but it also may be important for the intergenerational associations in education as educational attainments have increased generally.

3. For instance, Behrman *et al.* (1999) find, in the context of rural India, that a component of the positive association between maternal literacy and children's schooling attainments reflects the higher home productivity of literate mothers in 'home learning'.

4. In the Maoz–Moav model, the child of an educated parent is more likely to become an educated worker than is the child of an uneducated parent, solely because the educated parent has higher earnings.

5. In this case, monetary transfers depend on total family income and not on its distribution if both parents make transfers, but they will depend only on the income of the parent giving if only one does so. The level of transfers will in either case be inefficient.

6. Because of the operation of bargaining, it is not possible in general to say whether the non-cooperative equilibrium under-provides or over-provides human capital investment relative to the cooperative one, but if parents' preferences are identical ($\alpha_m = \alpha_f = \alpha$) and both contribute to human capital investment, then $S^{nc}/S^c = [\gamma(1-\alpha) + \alpha]/[\gamma(1-\alpha) + 2\alpha] < 1$, where S^c is the level of education chosen when no financial transfers are made in the cooperative equilibrium. If only parent j contributes to human capital investment, then $S^{nc}/S^c = y_j/(y_m + y_f)$.

7. Of those interviewed in wave 1 (1991), 88% were re-interviewed in wave 2. The wave-on-wave response rates from the third wave onwards have been consistently above 95%. The BHPS data are therefore unlikely to suffer from serious attrition bias.

8. Serious disabilities are defined as being registered as a disabled person (either with Social Security or with a green card) and having any of the following health problems: sight problems, hearing problems, asthma, diabetes, epilepsy, or emotional disturbances (see Blau and Grossberg 1992, for a similar sample selection). As a result of such a selection, we lose 10 individuals in our sample. We have performed the entire analysis also including those 10 disabled individuals and found remarkably similar results to those reported here.

9. Those who completed their compulsory education in 1988 (born 1971–72) were the first to study for the GCSE qualification. In our sample, the oldest cohort was born in 1974.

10. For children who are adopted, we use information on the year in which they were adopted to match in the mother's information appropriately. In 96% of the cases, the children are natural children.

11. We measure family income and house value at age 16 unless we observe the young adult living with his/her parents at 17. Table 1 shows high standard deviations in both house value and family income. As a further indication of this heterogeneity across families, house value ranges between £19,000 and £500,000, while family income varies from £1,000 to £170,000.

12. The first seven waves of the BHPS indicate that 93% of one-parent families are headed by the mother and that 86% of dependent children living with a step-parent lived with their natural mother.

13. If the birth occurred outside of a partnership and the mother partnered within one year, we assumed that the mother had married the biological father (as assumed in Bumpass *et al.* 1995; Ermisch and Francesconi 1996).

14. Most of the results obtained with the inclusion of 'ever in stepfamily' are similar to those obtained with 'ever in single-parent family'. Hence they are not reported. Some economic and sociological research on children's achievements and prospects find differential effects of family structure depending on the age at which children experience different structures (Haveman and Wolfe 1994; Hill *et al.* 1998). We have performed all our analyses using the measures above broken down by the timing of the start of single motherhood and stepfamilies, and distinguishing between four different child developmental stages; ages 0–1, 2–5, 6–10 and 11–16. Our main findings remain unaltered. The results from such estimations are, therefore, not reported.

15. Similar results are obtained with the ordered probit model, which substitutes the normal for the logistic distribution function.

16. The coefficient of about 0.3 for the indicator variable for missing information on father-figure's education suggests that the missing fathers have educational attainments of about O-level.

17. As Table A1 demonstrates for both models I and II, we cannot reject the hypothesis that the measured effects of parents' education, experience of a single-parent family and position in the family income distribution do not differ by gender.

18. The coefficients of the other variables in these models are reported in Table A2.
19. Micklewright (1989) also found no significant effects of single parenthood on staying on in education at 16.
20. Hill and O'Neill (1994) find a similar effect on cognitive achievements among American children drawn from the National Longitudinal Surveys of Youth.

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