Family Structure and Educational Outcomes in England

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Abstract

Recent figures show that educational outcomes of English adolescents from nonintact families tend to be lower than those of their counterparts from intact ones in general and in key stage four exam results by 23% on average in particular[1]. Economic theory explains this gap by investigating the resources available to the family, which could be either those in the form of human capital and/or the availability of financial and time resources to children. Using Becker's household production model (1965) this paper explains such outcome gap to an extent by the type of family structure adolescents live with. The key hypothesis is that living in a nonintact family has "pure" adverse impact on educational outcomes even after controlling for the effects of possible observed compensating or reinforcing family characteristics or allocation decisions.

Keywords: Educational outcomes, Educational Production Functions, family structure, single mother.

JEL Classification: D12, D13, I21.

1. Introduction and Conceptual Discussion of Family Structure

There has been a long-standing interest in how family background factors determine children's educational trajectories (Argys, 1998; Astone and McLanahan, 1991; Baker and Stevenson, 1986; Becker, 1965 among others). This paper takes special interest in family structure, which is identified by both the marital status of the parent(s) and the type of parent(s); namely being biological, foster or adoptive parent(s). Earlier research has shown that family structure plays an important role in the educational development of adolescents and examining such relationship is essential for designing policies targeting children from nonintact families (Becker, 1981; Becker and Tomes, 1986; Beller, 1992 among others).

Economic theory perceives family resources either in the form of human capital and/or the availability of financial and time resources to children. It proposes that socioeconomic success is partly a function of human capital (Becker, 1965; 1975; 1981; Becker and Tomes, 1986; Leibowitz, 1974). This implies that the total amount invested in human capital differs among individuals due to differences in either demand or supply conditions. In this context, family background affects schooling through altering both the opportunities (supply conditions) and the capacities (demand conditions).

[1] Figure is based on the Longitudinal Study of Young People in England (LSYPE) data.

Relying on the household production theoretical framework (Becker, 1965) one can explain children's educational attainment as a good produced with inputs of market goods and services and parental time that enters the household's utility function (Beller and Chung, 1992; Gennetian, 2005). A household production function for the child's educational attainment can be represented as:

$$Z_1 = f(T_i, X_i; E_i) \quad (1)$$

where Z_1 is the educational attainment of the child; T_i are the inputs of parents' home time devoted to the children for the purpose of investing in their human capital (Beller and Chung, 1992); X_i are the inputs of goods and services purchased with family income to accommodate such investment; and E_i is a vector of other demographic factors that could affect children's attainment. Within this framework one can analyze the effect of different family structures on children's outcome as a key demographic factor.

A review of the economic literature by Biblarz and Raftery (1999) reports that an efficient system for maximizing utility and, by extension, the human capital of children is that of a two-parent family. In that logic, economic theory might show that children from single parent families would do worse than those in two parents families since one parent cannot provide all required resource to the success of the child (DaVanzo and Rahman, 1993).

After reviewing the literature, the paper has identified a gap particularly in the Economics of Education literature regarding how family structure could affect English adolescents' both educational cognitive and affective outcomes. Specifically, with the exception of Kiernan (1997), Hampden-Thompson and Galindo (2015) and Mensaha and Kiernan (2010; 2011), most of the previous research on the effect of family structure on children's educational attainment has generally been conducted in North America with less volume of research in England. Accordingly, this paper hypothesizes that living in a nonintact English family has "pure" adverse impact on educational outcomes even after controlling for the effects of possible observed compensating or reinforcing family characteristics or allocation decisions.

To prove the stated hypothesis, based on Becker's household production function framework the paper uses a unique dataset comprising data from the Longitudinal study of Young People in England (LSYPE) and the National Pupil Database (NPD) to answers the following research questions: Does family structure account for the disparities among English adolescents in their cognitive and affective educational outcomes? And is the effect of family structure on such outcomes mediated by factors, such as parents' socioeconomic status and their involvement in their education?

The paper proceeds with a review of empirical literature in section 2 followed by data, model specification and statistical method in section 3. Main findings are discussed in section 4 and the paper ends with conclusion and discussion in section 5.

2. Review of Empirical Literature

In general, most studies (see discussion by Hill, Yeung and Duncan, 2001) show that family structure fixed effect is significant for explaining children's educational outcomes. Previous

research has shown that generally children from nonintact families such as single parent families compared to those from intact families are likely to fare worse in educational achievement (Astone and McLanahan, 1991) and have worse attitude towards school (Wallerstein and Lewis, 2005). are also more likely to drop out of school (Bowlby and McMullen, 2002). Similar studies have shown that children's cognitive achievement tends to be better in two-biological parent married families than in cohabiting families (Dunifon and Kowaleski-Jones, 2002). Other studies showed that children of biological parents or a single mother are likely to have higher educational attainment and occupational status than children living with a stepparent or with a single father (Biblarz and Raftery, 1999; Biblarz, Raftery, and Bucur, 1997; Boggess, 1998; McLanahan, 1985; Wojtkiewicz, 1993).

The theoretical mechanisms that are central to explaining the relationship between family structure and educational outcomes could be basically classified into two main mechanisms defining the type of family resources; economic resources and parental resources (Amato, 1993; Becker and Tomes, 1986; Beller and Chung, 1992; Carlson and Corcoran, 2001; Gennetian, 2005; Hanson et al., 1997; Thornton, 2001 among others).

2.1. Parental Socioeconomic Status

Economic resources indicated by parental socioeconomic status vary among family structures and there has been generally a debate about whether it is a cause or a consequence of such status (Garfinkel and McLanahan, 1986). At the same time, such status is highly associated with children's educational outcomes and is often recognized in the literature as a mechanism through which family structure affects such outcomes (Carlson and Corcoran, 2001; Teachman, 2008; Thomson, Hanson and McLanahan, 1994). Socioeconomic status affects children's aspirations through its impact at both their rational and psychological levels (Teachman and Paasch, 1998). A second channel is represented by the availability of home learning resources such as computers, books and access to internet or even extracurricular activities (Teachman and Paasch, 1998). A third channel is the neighbourhood effect, where adverse neighbourhood conditions could negatively affect children's attitudes about returns to education (Bowen, et al., 2008; Teachman and Paasch, 1998).

A number of studies have found that nonintact families tend to suffer from lack of economic resources compared to married parents' families (Argys et al., 1998; Ver Ploeg, 2002). Specifically, lone mother families are more likely than other families to be poor (Garfinkel and McLanahan, 1986) and to suffer more from poverty (Astone and McLanahan, 1991). Similarly, cohabiting parents with low levels of education suffer from less earning compared to married parents (Brown, 2004; McLanhan, 1997). Single parent families and cohabiting families were found to have lower socioeconomic status, which negatively affects children's outcomes (Astone and McLanahan, 1991; Brown, 2004). Similar findings were found for British single mothers, where the availability of financial resources was found to be more important than the two parents staying together (Kiernan, 1997).

2.2. Parental Involvement in Children's Education

Despite the importance of economic resources, it was revealed that they do not fully explain the family structure effect and that children's outcome is associated with the level of parental resources represented by their involvement in their children's life in general and education in particular or sometimes referred to as social capital, which explains later reformation of socioeconomic status across generations (Astone and McLanahan, 1991; Brown, 2004; Coleman, 1988; Thomson, Hanson and McLanahan, 1994). Even after controlling for parent's socioeconomic status, such status was found to have negligible impact on children's outcomes in the absence of strong parental involvement (Coleman, 1988). In that context, it was shown that some single parent families adjust and compensate for their lack of economic resources by becoming more involved with their children's education (McLanahan and Booth, 1989).

In general, indicators of parental involvement were reported to have a positive influence on children's academic performance (Gutman, McLoyd, and Tokoyawa, 2005). Forms of parental involvement, such as parents' support (Steinberg, Elmen, and Mounts, 1989; Stone, 2006), parent adolescent emotional closeness (Crosnoe, 2004), and parents' involvement in their children's schools and discussing school issues with them (Muller, 1995; 1998) improve their children's academic performance (Marchant et al., 2001). The quantity and quality of such involvement have been found to be key mediators of the family structure effect (Dunifon and Kowaleski-Jones, 2002).

Parental involvement in children's education was found to be less in nonintact families, where children receive less consistent parenting practices and less social control compared to intact families (Steinberg, 1987). The tendency of less involvement is attributed sometimes to the lack of parental time supervising and nurturing their children, such as in the case of single parent families (Astone and McLanahan, 1991; Amato, 1987; Brown, 2000; Thomson, McLanahan and Curtin, 1992).

Less parental involvement is likely to exist in cohabiting parents families and stepparent families due to the unclear norms of parental roles in the former and lack of commitment from the stepparent side in the latter (Brown, 2004) due to lack of biological kinship (Hofferth and Anderson, 2003) or the incomplete institutionalization of stepfamilies, such as lack of consensus about when it is appropriate for a stepfather to discipline a stepchild (Cherlin, 1978).

3. Data, Econometric Method and Model Specification

The data used for the analysis in this paper is an integrated dataset comprising data from the Longitudinal study of Young People in England (LSYPE) and the National Pupil Database (NPD). The LSYPE is a panel study of young people that is designed to provide information about the factors affecting the educational attainment and progress of the cohort group at the end of compulsory education. The longitudinal study started in 2004, when respondents were at the age of 13 and continued annually till 2010 forming the seven main waves of the study (DfE, 2011a). The national pupil database built from 2002 is a database for pupils' educational attainments in England through the five key stages of schooling along (for further information see Administrative Data Liaison Service [ADLS], 2010).

The analysis uses two educational outcome variables; the adolescent's cognitive outcome measured by his/her key stage 4 total GCSE/GNVQ point score for the year 2005/2006 using a sample of 7128 adolescents and the adolescent's affective outcome measured by his/her average score of attitude towards school given by the answers to twelve questions, where for each question the adolescent can answer one of 5 categories: 'strongly disagree', 'disagree', 'I don't know', 'agree' and 'strongly agree', using a sample of 7009 adolescents. Both variables were reported approximately around the same time of wave three of the LSYPE.

Family Structure

The current analysis empirical definition of family structure is based on whether the adolescent belongs to an intact family identified by living with both his/her married biological parents. Otherwise, he/she belongs to a nonintact family structure. In that regard, the analysis uses two family structures variables: one with a reduced structure and another with a full structure to see any potential differences in their effects. Specifically, the *reduced* family structure variable is a nominal categorical variable with six structures defined as (1) Married couple both biological parents, (2) Other Married couple, which is defined as any married couple with one or both of the two parents is not a biological parent, (3) Cohabiting couple, (4) Lone Father, (5) Lone mother, and (6) No parents in the household. The *full* family structure variable includes eight structures defined as (1) Married couple both biological parents, (2) Married couple, step-parent(s), which also includes cases with 2 step parents, and so on for other rare combinations, (3) Other Married couple, which is defined as any of the following: 'married couple with one or both of the parents is not a biological parent', 'married couple with one or both adoptive parent' and 'married couple with one or both foster parent', (4) Cohabiting couple both biological parents, (5) Other Cohabiting couple, one or less biological parent(s), which is defined as any cohabiting couple with one or both of the parents is not a biological parent, (6) Lone Father, (7) Lone mother, and (8) No parents in the household.

Parents' Socioeconomic Status

Three variables are used to account for the family socioeconomic status. First, the family's socioeconomic class (NS-SEC), which was measured as an ordinal variable at wave two of the LSYPE. Eight main classes were reported including (1) higher managerial and professional occupations, (2) lower managerial and professional occupations, (3) intermediate occupations, (4) small employers and own account workers, (5) lower supervisory and technical occupations, (6) semi-routine occupations, (7) routine occupations and (8) never worked/long term unemployed.

The second variable used is family income measured by the mean family income from work, benefits, and anything else over waves one and two adjusted for the family size at wave two. A third channel for the transmission of socioeconomic status effect is through the neighbourhood effect using the Income Deprivation Affecting Children Index (IDACI) reported in 2005/2006, which measures in a local area the proportion of children under 16 who live in low income households (DfE, 2011b).

Parents' Involvement in Adolescents' Education

Three variables are used to account for Parents' Involvement in Adolescents' Education. The first reflects parents' participation in school activities measured by 'how involved is the main parent in the young person's school life?'. The variable takes values of (1) Very involved, (2) Fairly involved, (3) Not very involved and (4) Not at all involved. Second, a variable reflecting parental aspirations for their adolescents measured by 'what would the main parent like the young person to do when reaching school leaving age?'. The variable takes values of (1) continue in full time education, (2) start learning a trade / get a place on a training course, (3) start an apprenticeship, (4) get a full-time paid job (either as an employee or self-employment), (5) something else. Third, a variable reflecting parents' willingness to provide resources and learning experiences measured by a dummy of 'whether parent(s) will support or give money if the young person stayed on in education'.

Following the model specification indicated in equation (1), the analysis controlled for several student's inputs, family background factors and school inputs[2].

3.1. Econometric Method and Model specifications

The first cognitive outcome variable is a count variable following a negative binomial distribution, hence examined using a negative binomial regression model defined as

$$\ln(\mu(co)_{it}) = \alpha + \gamma F_{i,t-1} + \sum_{k=1}^{3} \lambda_k (SEC_{i,t-1} + I_{i,t-1,t-2} + D_{it}) + \sum_{m=1}^{3} \eta_m PI_{mi,t-1} + \sum_{n=1}^{10} \beta_n (X_{i,t-1} + X_{i,t-2}) + \sum_{l=1}^{2} \zeta_l (S_{i,t-2} + S_{i,t-1,t-2}) + \varepsilon_i \quad (2)$$

The second affective outcome variable is an ordinal variable examined using an ordinal logit model defined as

$$\ln(\mu(af)_{it} / 1 - \mu(af)_{it}) = \alpha + \gamma F_{i,t-1} + \sum_{k=1}^{3} \lambda_k (SEC_{i,t-1} + I_{i,t-1,t-2} + D_{it}) + \sum_{m=1}^{3} \eta_m PI_{mi,t-1} + \sum_{n=1}^{10} \beta_n (X_{i,t-1} + X_{i,t-2}) + \sum_{l=1}^{2} \zeta_l (S_{i,t-2} + S_{i,t-1,t-2}) + \varepsilon_i \quad (3)$$

where $\mu(co)_{it}$ represents the expected value of the <u>co</u>gnitive outcome variable of young person *i* measured at time *t* corresponding to year 2005/2006 and $\mu(af)_{it}$ represents the expected value of the <u>af</u>fective outcome variable measured at time *t* corresponding to year 2005/2006 around wave three of the LSYPE and $F_{i,t-1}$ is family structure. The socioeconomic status mechanism is introduced in the model using three variables; namely $SEC_{i,t-1}$ is family NS-SEC class, $I_{i,t-1,t-2}$ is the mean family income over wave one (*t-2*) and wave two (*t-1*)), and D_{it} is the income deprivation index reported in 2005/2006. The parental involvement mechanism is

[2] See Note 1 in the supplementary appendix for further details on the specifications of other covariates.

tested using three variables measured at wave two (*t-1*). X_{Ni} are student's input variables measured at either wave one (*t-2*) or wave two (*t*-1), and finally S_{Li} are two school variables; one representing a dummy for whether the school attended at wave one (*t*-2) was an independent or maintained school, and the other represents the teacher influence index (constructed by a mix of variables measured at both wave one (*t-2*) and wave two (*t-1*) with α = 0.71)[3].

Endogeneity

The models specified in the previous equations indicate that all independent variables except one were reported at a time period prior to that when the dependent variables were reported, thus one can argue to an extent that it is less likely to suffer from an endogeneity problem. However, a counter argument could be that the use of one or two lagged term independent variables may not necessarily overcome the endogeneity problem. In response to that a differentiation is made between the main independent variable of interest (family structure) and the other additional covariates in the model.

Starting with the main independent variable of interest that is family structure one can assume that it is more likely to be exogenous based on a number of reasons. First, the previously reviewed literature in section 3.2 has indicated that family structure is more likely to be the one affecting children's outcomes through the parents' socioeconomic status or parental involvement among other mechanisms rather than the other way around (Beller and Chung, 1992; Biblarz and Raftery, 1999; Boggess, 1997; Gennetian, 2005; Haveman and Wolfe, 1995). Second, even if there is a possibility for a reverse relationship implying that children's outcomes could affect the family structure, one would expect that such reverse relationship to happen if the family structure variable was observed after the outcome of the child, which is the opposite case in the analysis where the family structure was observed before the child's outcome was observed. Third, even if the possibility of a reverse relationship could hold, one might argue that it might take a longer time to reveal. That is, family structure would not necessarily change just after a year or few years of a certain child's outcome. In that logic and given the nature of the data used in the analysis where both the outcome and the family structure status are slightly contemporaneous, one can assume that such reverse relationship is less likely to hold.

As for the rest of the additional covariates used in the model, one can argue that some of these variables could suffer from an endogeneity problem despite the lagged term. However, a number of justifications could yet be provided. First, the use of these variables as controls or even mediators has been supported by the literature. To mention a few; family socioeconomic status by (Ven Ploeg, 2013); parents' occupation and income by (Krein and Beller 1988; Martin, 2012; McLanahan 1983, 1985); neighbourhood effect by (Bowen, et al., 2008; Teachman and Paasch, 1998). Other variables that could be argued to be endogenous include parental involvement in school life that has been used by (Muller, 1995; 1998); labour force problem and number of siblings by (Martin, 2012); the number of younger siblings by

[3] See Note 2 in the supplementary appendix for further details about the construction of the teacher influence index.

(Gennetian, 2005). Second, these variables are known as extraneous or confounding variables that need to be controlled for to avoid any biased results (Kish, 1959; Vandenbroucke, 2004). Third, even if one does not control for these confounding variables, it is likely to lead to an omission bias that could be another source of endogeneity.

Considering the previous arguments, one can state that since these confounding variables are not the main variable of interest in the model, the study does not attempt or claim to solve their potential endogeneity. Having said that, the analysis acknowledges the limitations caused by such endogeneity. As such and since the exogeneity assumption is often violated, yet to widely varying degrees, in the analysis of educational production functions, as in most other areas of empirical economic research, what one learns about important relationships is not devoid of meaning; however, attributing causality to the estimates should be done with extreme caution. Accordingly, the following findings of the models do not claim such causality, rather they explain the association between the family structure and children's outcome controlling for other confounding covariates. Lastly, it is worth noting that as with the related literatures on educational production function studies, such functions are not completely known and must be estimated using imperfect data, which makes any estimates subject to considerable uncertainty (Hanushek, 1986) and unassailable estimates of causal relationships explaining the underlying process are not yet attainable (Haveman and Wolfe, 1995).

4. Findings

4.1. Adolescent's Cognitive Outcome

A quick look at the weight of each family structure tell us that although more than half of the adolescents live in intact families, 23% live with lone mothers and 18% live in other nonintact families[4]. The analysis starts by investigating the relationship between the reduced family structure and cognitive outcome via model (1) of table (1). Indeed, in line with the literature, adolescents from nonintact families tend to perform worse in KS4 than those from intact families. Specifically, those living with a cohabiting couple, other married couple, lone father and lone mother families have expected value of KS4 score lower than those living in intact families by 3.7% for the first two, 10.3% for those living with a lone father and almost 9% for those living with a lone mother.

To explain the previous finding, the socioeconomic status of the family is introduced into model (2). However, the findings show that such status hardly mediates the effect of family structure with almost no change in the significance or the magnitude of three of the four previously differentiated family structures, where there is a loss of any significant effect of cohabitation. The findings may also imply that adolescents from lone mother families may do slightly better compared to those from lone father families even after controlling for socioeconomic differences. Moreover, such status tends to have a significant effect on

[4] For more details see table (A.1). Table (A.2) provides descriptive statistics for the variables examined in the estimation sample of the cognitive outcome analysis covering 7128 adolescents.

cognitive outcome via the three specified variables. For example, one standard deviation increase in the deprivation index is associated with almost 2% decrease in cognitive outcome.

Table 1

Family Structure Influence on Cognitive Outcome

	Reduced Family Structure			Full Family Structure		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	IRR	IRR	IRR	IRR	IRR	IRR
Family Structure (reference level: married natural couple)						
Other Married couple (OM)	0.963**	0.965**	0.965**	n.a	n.a	n.a
	(0.0167)	(0.0168)	(0.0169)			
Other Married couple (OM)	n.a	n.a	n.a	0.898***	0.902***	0.905***
				(0.0334)	(0.0339)	(0.0346)
Married with one or both step-parent (MS)	n.a	n.a	n.a	0.988	0.989	0.988
	n.a	n.a	n.a	(0.0194)	(0.0193)	(0.0193)
Cohabiting couple (CC)	0.964*	0.968	0.970	n.a	n.a	n.a
	(0.0195)	(0.0198)	(0.0203)	n.a	n.a	n.a
Cohabiting two biological parents (CB)	n.a	n.a	n.a	0.973	0.982	0.987
	n.a	n.a	n.a	(0.0374)	(0.0381)	(0.0382)
Other Cohabiting couple (OC)	n.a	n.a	n.a	0.960*	0.962	0.962
	n.a	n.a	n.a	(0.0236)	(0.0240)	(0.0247)
Lone father (LF)	0.897**	0.898**	0.901**	0.896**	0.897**	0.901**
	(0.0411)	(0.0408)	(0.0411)	(0.0411)	(0.0408)	(0.0411)
Lone mother (LM)	0.912***	0.915***	0.914***	0.912***	0.915***	0.914***
	(0.0135)	(0.0140)	(0.0143)	(0.0135)	(0.0140)	(0.0142)
No parents in the household (NP)	0.913	0.929	0.937	0.912	0.928	0.936
	(0.0806)	(0.0845)	(0.0851)	(0.0805)	(0.0843)	(0.0849)
MP's NS-SEC class (reference level: Higher Managerial and professional occupations)						
Lower managerial and professional occupations		1.033**	1.035***		1.033***	1.035***
		(0.0130)	(0.0130)		(0.0130)	(0.0130)
Intermediate occupations		1.034	1.037*		1.034	1.037*
		(0.0223)	(0.0227)		(0.0223)	(0.0226)
Small employers and own account workers		1.038*	1.040**		1.037*	1.039**
		(0.0201)	(0.0201)		(0.0200)	(0.0200)
Lower supervisory and technical occupations		1.042**	1.044**		1.040**	1.042**
		(0.0209)	(0.0204)		(0.0207)	(0.0202)
Semi-routine occupations		1.040	1.045*		1.040	1.045*
		(0.0257)	(0.0256)		(0.0258)	(0.0257)
Routine occupations		0.974	0.979		0.974	0.979

		(0.0214)	(0.0214)		(0.0214)	(0.0215)
Never worked/long term unemployed		0.948	0.952		0.949	0.953
		(0.0457)	(0.0458)		(0.0458)	(0.0459)
Mean income (Z)		0.987***	0.986***		0.987***	0.986***
		(0.00455)	(0.00451)		(0.00456)	(0.00452)
IDACI score (Z)		0.980**	0.982**		0.980**	0.981**
		(0.00790)	(0.00784)		(0.00789)	(0.00784)
MP: How involved is the MP in the young person's school life? (reference level: very involved)						
Fairly involved			1.028**			1.027**
			(0.0133)			(0.0133)
Not very involved			1.031**			1.030*
			(0.0157)			(0.0157)
Not at all involved			1.050			1.050
			(0.0365)			(0.0363)
MP's educational aspiration for young person (reference level: continue in full time education)						
Start learning a trade / get a place on a training course			0.970			0.970
			(0.0242)			(0.0241)
Start an apprenticeship			0.992			0.992
			(0.0298)			(0.0299)
Get a full-time paid job			0.889**			0.888**
			(0.0445)			(0.0444)
Something else			0.914			0.914
			(0.0744)			(0.0743)
MP: How the young person's expenses would be paid if stayed on in education- Parent(s) will support or give money			1.048**			1.046*
			(0.0243)			(0.0243)
Constant	50,564***	53,502***	56,863***	53,498***	56,484***	59,744***
	(123,330)	(130,334)	(140,886)	(131,006)	(138,160)	(148,635)

All models control for highest education level in the family, gender, ethnicity, disability, age, KS3 attainment, likelihood to apply to university, whether the main parent is currently receiving job seeker allowance, number of siblings, number of younger siblings, independent/maintained school and overall teacher index. Estimates provided in the supplementary appendix table (SA.1).

Standard error (Eform) in parentheses. n.a means category not available since it is not defined as a structure. *** p<0.01, ** p<0.05, * p<0.1

The effect of the family's SEC class shows that when the occupational class of the family is 'lower managerial and professional occupation', or 'small employers and own account worker', or 'lower supervisory and technical occupation', adolescents are likely to have higher cognitive outcome by 3% for the first and 4% for the other two classes compared to those living in families with 'higher managerial and professional occupations'. Some might interpret such positive association as unexpected, since there is a low significant negative correlation (ρ=-0.32) between cognitive outcome and the family's SEC variable. This could imply that the effect of the family's SEC class is conditional on other covariates in the model. The same applies for the effect of family income, which is found to be negatively associated with

cognitive outcome, while it has a low significant positive correlation with such outcome (ρ=0.21).

With the absence of potential mediating role of the socioeconomic status, the analysis introduces parental involvement as an additional mechanism. In essence, model (3) shows that parental involvement has hardly any mediating role as well, where adolescents from other married families, lone father and lone mother families performing worse than those from intact families with almost no change in their magnitudes. Additionally, the effect of the three socioeconomic status variables almost does not change with the addition of the three added parental involvement variables, which are also found to have a significant impact on cognitive outcome.

Adolescents whose parents aspire for them to get a full-time job (either as an employee or self-employed) at the school leaving age are likely to have a lower cognitive outcome by 11% compared to those whose parents aspire for them to continue full time education instead. Also, those whose parents are willing to financially support them to continue their education have 5% higher outcome than those whose parents are not willing to support them. At the same time, adolescents whose parents are fairly involved or not very involved in their school life are likely to have higher cognitive outcome by almost 3% compared to those whose parents are very involved in their school life. The unexpected positive association detected can be explained by the fact that the effect of involvement in school life variables is conditional on the effect of other covariates in the model as shown by the very small significant negative correlation between it and cognitive outcome (ρ=-0.03).

The analysis goes a step further by examining the *full* family structure variable to determine whether further discrepancies could be detected with narrowly defined family structures. To elaborate, model (4) shows similar findings reflecting that adolescents from nonintact families tend to have lower cognitive outcome than those from intact families. Specifically, those living with other married couple, lone father, other cohabiting couple, and lone mother families have lower outcomes by almost 10% for the first two, 4% for those living with other cohabiting couple and almost 9% for those living with a lone mother. Hence, one can suggest that the ‘’other married’’ category in the reduced structure is actually formed by two very different groups. First, the ‘’married, step-parent(s)" that performs very well, almost the same as the married biological parents, where the former are likely to have only 1% lower outcome compared to the latter. Second, the married with adoptive or foster parents (represented by the other married category in the full structure) that performs very poorly, as poor as lone father or lone mother. Thus, separating this category into two under the full structure does reveal a valuable pattern. Testing for whether the family socioeconomic status and parental involvement could mediate the *full* family structure effect, model (5) and (6) respectively show similar findings to those reported for model (2) and (3) respectively.

4.2. Adolescent's Affective Outcome

Following the same analytical framework[5], the analysis first investigates the relationship between the *reduced* family structure and affective outcome in model (1) of table (2) showing that in line with the literature as well, adolescents from nonintact families tend to have worse attitude towards school than those from intact families. Specifically, the odds of those living with other married couple and lone mother to have better attitude are lower than those living with intact families by 20% and 23% respectively.

Table 2
Family Structure Influence on Affective Outcome

	Reduced Family Structure			Full Family Structure		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	OR	OR	OR	OR	OR	OR
Family Structure (reference level: married natural couple)						
Other Married couple (OM)	0.800**	0.806**	0.804**	n.a	n.a	n.a
	(0.0739)	(0.0751)	(0.0751)			
Other Married couple (OM)	n.a	n.a	n.a	0.673**	0.686**	0.674**
				(0.122)	(0.125)	(0.121)
Married with one or both step-parent (MS)	n.a	n.a	n.a	0.853	0.856	0.858
	n.a	n.a	n.a	(0.0920)	(0.0926)	(0.0932)
Cohabiting couple (CC)	0.840	0.843	0.849	n.a	n.a	n.a
	(0.0943)	(0.0967)	(0.0981)	n.a	n.a	n.a
Cohabiting two biological parents (CB)	n.a	n.a	n.a	0.793	0.796	0.797
	n.a	n.a	n.a	(0.161)	(0.163)	(0.162)
Other Cohabiting couple (OC)	n.a	n.a	n.a	0.861	0.864	0.874
	n.a	n.a	n.a	(0.113)	(0.116)	(0.118)
Lone father (LF)	0.748	0.751	0.784	0.746	0.750	0.782
	(0.151)	(0.150)	(0.152)	(0.150)	(0.150)	(0.151)
Lone mother (LM)	0.771***	0.765***	0.769***	0.770***	0.764***	0.767***
	(0.0583)	(0.0600)	(0.0610)	(0.0582)	(0.0599)	(0.0609)
No parents in the household (NP)	1.352	1.374	1.327	1.348	1.370	1.322
	(0.476)	(0.488)	(0.473)	(0.475)	(0.486)	(0.471)
MP's NS-SEC class (reference level: Higher Managerial and professional occupations)						
Lower managerial and professional occupations		0.951	0.954		0.951	0.953
		(0.0841)	(0.0846)		(0.0842)	(0.0847)
Intermediate occupations		0.988	0.994		0.987	0.993
		(0.130)	(0.131)		(0.130)	(0.131)
Small employers and own account workers		0.951	0.955		0.950	0.953

[5] Table A.3 provides descriptive statistics of the variables examined in the affective outcome estimation sample.

	(0.134)	(0.135)	(0.134)	(0.135)
Lower supervisory and technical occupations	0.962	0.993	0.957	0.988
	(0.108)	(0.111)	(0.108)	(0.111)
Semi-routine occupations	1.006	1.029	1.007	1.030
	(0.127)	(0.131)	(0.127)	(0.131)
Routine occupations	0.895	0.919	0.894	0.918
	(0.110)	(0.113)	(0.110)	(0.113)
Never worked/long term unemployed	0.810	0.822	0.811	0.822
	(0.155)	(0.156)	(0.155)	(0.156)
Mean income (Z)	0.932*	0.938*	0.934*	0.940
	(0.0360)	(0.0362)	(0.0362)	(0.0363)
IDACI score (Z)	0.972	0.963	0.972	0.963
	(0.0392)	(0.0385)	(0.0392)	(0.0385)
MP: How involved is the MP in the young person's school life? (reference level: very involved)				
Fairly involved		0.863**		0.860**
		(0.0648)		(0.0647)
Not very involved		0.867*		0.863*
		(0.0731)		(0.0729)
Not at all involved		0.561***		0.559***
		(0.0863)		(0.0862)
MP's educational aspiration for young person (reference level: continue in full time education)				
Start learning a trade / get a place on a training course		0.691***		0.690***
		(0.0824)		(0.0822)
Start an apprenticeship		0.656***		0.656***
		(0.0808)		(0.0809)
Get a full-time paid job		0.442***		0.440***
		(0.0944)		(0.0936)
Something else		0.855		0.852
		(0.240)		(0.237)
MP: How the young person's expenses would be paid if stayed on in education- Parent(s) will support or give money		1.029		1.023
		(0.0934)		(0.0930)

All models control for highest education level in the family, gender, ethnicity, disability, age, KS3 attainment, likelihood to apply to university, whether the main parent is currently receiving job seeker allowance, number of siblings, number of younger siblings, independent/maintained school and overall teacher index. Estimates provided in the supplementary appendix table (SA.2).

Standard error (Eform) in parentheses. n.a means category not available since it is not defined as a structure. *** p<0.01, ** p<0.05, * p<0.1

To explain these findings, the socioeconomic status of the family is introduced into model (2) showing that it does not have a mediating, but it does have a significant effect on affective outcome via only the family income, where one standard deviation increase in income is associated with almost 7% decrease in the odds of having better attitude towards school. Such

unexpected negative association can be explained by family income being conditional on other covariates in the model (ρ=0.03).

Introducing parental involvement as an additional mechanism in model (3) shows that it has hardly any mediating role, but do have mostly a significant impact on affective outcome. Adolescents whose parents are not at all involved in their school life are likely to have a worse attitude towards school by almost 44% compared to those whose parents are very involved in their school life. At the same time, adolescents whose parents aspire for them to 'start learning a trade or get a place on a training course' or 'start an apprenticeship' or 'get a full-time job (either as an employee or self-employed)' are likely to have worse attitude by 31%, 34% and 56% respectively compared to those whose parents aspire for them to continue full time education instead. Accordingly, it could be implied that adolescents who perceive their parents to have high values in education and its importance tend to adopt such values and thus have better academic behaviours.

The analysis goes a step further by examining the *full* family structure variable in model (4) showing those living with other married couple and lone mother families have worse attitude towards school by 33% and 23% respectively. Testing for whether the family socioeconomic status and parental involvement could mediate the family structure effect, model (5) and (6) respectively show similar findings to that reported for model (2) and (3) respectively.

4.3. Testing for Interactions

Given the absence of an adequate mediating role of both the socioeconomic status and parental involvement, the analysis goes a step further by introducing the interaction effect of both mechanisms sequentially with the family structure variable.

Starting with the *reduced* family structure, the interaction effect of the socioeconomic status with family structure shows that even with the inclusion of such interaction there is still no mediating role[6]. Essentially, the average marginal effects show that adolescent living with other married couple, cohabiting couples and a lone mother are having 4% lower cognitive outcome for the first two and 8% of the latter compared those living in intact families. Such magnitude hardly changes after controlling for the interaction effects of parental involvement, which implies that parental involvement does not have a mediating role for family structure as well. Examining the *full* family structure variable shows similar findings reflecting that after controlling for socioeconomic status interaction effects, adolescents living with other married couple, other cohabiting couple and lone mother families have lower cognitive outcome than those living in intact families by 10%, 4%, and 8% respectively. These adverse effects slightly increase after controlling for parental involvement interaction effects for the first two groups.

Examining the affective outcome show that for the *reduced* family structure variable, there is no mediating role of the socioeconomic status. Essentially, the probability of having the highest average score of attitude (score=4) for adolescent living with other married couple, a lone father or a lone mother compared those living in intact families decreases by 23%, 41% and 26% respectively. However, the inclusion of the parental involvement interaction effects plays a

[6] For further details see table A.3 in the supplementary appendix.

partially mediating role, where those living with a lone father have no significantly different though smaller outcome compared those living in intact families.

Examining the *full* family structure shows similar findings reflecting that after controlling for socioeconomic status interaction effects the probability of having the highest average score of attitude (score=4) for adolescent living with married step couple, other married couple, a lone father and a lone mother decreases by 19%, 37%, 41% and 27% respectively. However, the inclusion of the parental involvement interaction effects plays a partially mediating role, where those living with a lone father have no significantly different though smaller outcome compared those living in intact families.

The previous interactions models reveal four main findings: first, similar to the models with no such interactions the comparison between the reduced and the full family structure variables hardly reveal any significant difference in their effect on the adolescent cognitive and affective outcome aside from the addition of a significant effect of living in a step-parent family on affective outcome. Second, family structure always has an independent significant effect on both outcomes. Third, the socioeconomic status does not have a mediating effect, while parental involvement has a partially mediating effect. Thus, it could be said that other unobserved family heterogeneities may explain the significant effect of family structure on both outcomes. Fourth, the comparison between the set of models with and without the interaction terms usually if not always reveals similar findings across models.

5. Conclusion and Discussion

This paper has investigated the relationship between family structure and two educational outcomes showing some broad patterns in the data. The findings generally support the literature that living in a nonintact family structure has a negative effect on adolescents' educational outcomes (Astone and McLanahan, 1991; Wallerstein and Lewis, 2005 among others). The primary exception being that the two mechanisms of the family socioeconomic status and parental involvement examined to explain such effect do not play their expected mediating role except for the partial mediating role of the interaction effects of parental involvement on affective outcome. Accordingly, one can suggest that the effect of including those two mechanisms and other controls highlights the main finding of the analysis that part of the observed educational outcomes is "pure" family structure effect even after controlling for the effects of possible observed compensating or reinforcing family characteristics or allocation decisions on the contrary to other findings suggested in the literature that such outcomes are not pure family structure effects (Gennetian, 2005).

Based on the previous findings, it could be said that in the English context family structure always plays an independent effect on the adolescent's educational outcome and that other unobserved family heterogeneities could explain such adverse effect. As such, policy makers should pay more attention to compensating such adverse effect through policies targeting the adolescent him/herself rather than focusing only on the parent(s). Such policies like providing benefits, for example, in the form of unemployment benefits to single parents or to those parents with financial problems are shown here not have a significant effect on the adolescent's outcome.

As stated earlier, the findings indicate that indeed living in a nonintact family does have an adverse effect on adolescents' educational outcomes, both cognitive and affective. Specifically, two main structures dominated such adverse effect; other married couple and lone mother families. Furthermore, the extended version of the family structure shows that living with a married step couple has also an adverse impact on affective outcome.

Deeper investigation of the discrepancies between the previously identified structures shows that in most cases one cannot determine a general trend for whether living with other married couple could have worse impact than living with a single parent or whether living with married couple is better than a cohabiting couple. For example, living with a lone mother has worse effect on cognitive outcome than with other cohabiting couple; and in certain cases, (full structure analysis) slightly better than living with other married couple. This entails that in some cases having a non-biological parent(s) in the family as in the examined sample where the married couple could be adoptive, foster or any non-biological couple, is worse than living with just a single parent (Hofferth and Anderson, 2003).

Living with a lone mother does have a negative significant impact on adolescents' cognitive and affective outcome (Amato and Booth, 1997) and that is usually better than the effect of living with a lone father (Amato and Booth, 1991; Amato and Keith, 1991a; Hoffmann and Johnson, 1998). Some researchers tend to justify the difference in the two impacts with the adequacy of the socioeconomic status. However, the analysis showed that living with a lone mother has an adverse effect on cognitive outcome regardless of the type of occupation the mother has, while no such conclusive statement could be made for the effect on affective outcome, where in certain occupation such as being a small employer and own account worker, living with a lone mother could have a positive impact on the adolescent's attitude towards school. Accordingly, relying on the lone mother type of occupation may not be adequate enough to justify the adverse effect on her adolescents' educational outcome. In fact, the adverse effect of living with a lone mother is mostly related to her involvement in the adolescent's school life and her aspiration for his/her future. Nevertheless, living with a lone mother has an independent adverse effect on both outcomes that could be explained by other unobserved family heterogeneities.

A key limitation of the analysis is the lack of data on the historical family structure status and whether there has been any change in it during the lifetime of the adolescent, which may adequately reflect any possible change in the living arrangements during childhood (Ginther and Pollak, 2004). The use of one year variable might serve as a weak proxy for childhood circumstances and events, and can result in unreliable estimates (Wolfe, et al., 1996). Accordingly, future research should account for changes in family structure over the childhood of adolescents. Nevertheless, the findings show that while omitted variable bias is possible, one might argue say that the regressions at least do not suffer from reverse causation (bad performance in school should not cause family structure). Thus, one could say that these cross-section results might suggest a causal relationship.

Traditional classifications of family structure sometimes ignore the complexity of blended families and the existence of step siblings. Although, the adolescent may be living with two parents, the family structure effect may have different implications for an adolescent's well-

being than growing up in a family in which not all the siblings are with both biological parents (White, 1994). Although the analysis has shown that having more siblings is likely to adversely affect both outcomes with no conclusive direction for the effect of the age difference between siblings, the analysis suffers from the limitation that it did not account for the possibility of having a step sibling in the family due to lack of data. A similar limitation exists related to the absence of information about the causes of family disruptions, whether separation or death, for example, and how that accounts for the differences in outcome (Beller and Chung, 1992; Biblarz and Gottainer, 2000). Future research examining the possible effects of having a step sibling and the cause of family disruption would be a promising direction for further inquiry.

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Appendix A

Table A.1
Distribution of Adolescents across Family Structures

	Cognitive Outcome		Affective Outcome	
	Reduced Structure	Full Structure	Reduced Structure	Full Structure
Married two biological parents (MB)	4,191	4,191	4,132	4,132
	(58.80)	(58.80)	(58.95)	(58.95)
Other Married couple (OM)	626	184	615	178
	(8.78)	(2.58)	(8.77)	(2.54)
Married with one or both step-parent (MS)	-	442	-	437
	(-)	(6.20)	(-)	(6.23)
Cohabiting couple (CC)	484	-	474	-
	(6.79)	(-)	(6.76)	(-)
Cohabiting two biological parents (CB)	-	156	-	151
	(-)	(2.19)	(-)	(2.15)
Other Cohabiting couple (OC)	-	328	-	323
	(-)	(4.60)	(-)	(4.61)
Lone father (LF)	133	133	132	132
	(1.87)	(1.87)	(1.88)	(1.88)
Lone mother (LM)	1,642	1,642	1,605	1,605
	(23.04)	(23.04)	(22.9)	(22.9)
No parents in the household (NP)	52	52	51	51
	(0.73)	(0.73)	(0.73)	(0.73)
Total	7,128	7,128	7,009	7,009
	(100)	(100)	(100)	(100)

Percentage in parentheses. [-] means not defined.

Table A.2
Descriptive Statistics of the Cognitive Outcome Model Variables

VARIABLES	Mean	Std. Dev.	Min	Max
KS4 point score	381.212	149.973	0	886
Family structure-reduced	2.237	1.692	1	6
Family structure-full	2.890	2.578	1	8
Family's NS-SEC class	3.977	2.247	1	8
Mean income (Z)	-0.020	0.848	-0.893	11.986
IDACI score (Z)	-0.136	0.970	-1.291	3.875
MP: How involved is the MP in the young person's school life?	2.034	0.781	1	4
MP educational aspiration for the young person	1.297	0.754	1	5
MP: How the young person's expenses would be paid if stayed on in education- Parent(s) will support or give money	0.881	0.324	0	1
KS3 score (Z)	0.158	0.962	-2.739	2.267
Likelihood of the young person applying to university	2.899	1.024	1	4
Highest qualification of family	3.436	1.860	1	7
Whether the main parent is currently receiving job seeker allowance	0.008	0.088	0	1
Number of siblings	1.915	1.424	0	15
Number of younger of siblings	0.955	1.062	0	12
Young person's ethnicity	1.888	1.785	1	8
Gender	1.499	0.500	1	2
Whether young person has disability	1.866	0.341	1	2
Young person's age when started KS4	15	0.044	14	16
Independent/maintained school	0.001	0.029	0	1
Overall teacher index ($\alpha = 0.71$)	-0.097	11.204	-50.612	38.472

Table A.3
Descriptive Statistics of the Affective Outcome Model Variables

VARIABLES	Mean	Std. Dev.	Min	Max
Attitude towards school score	2.314	0.721	0	4
Family structure-reduced	2.322	1.690	1	6
Family structure-full	2.881	2.574	1	8
Family's NS-SEC class	3.965	2.241	1	8
Mean income (Z)	-0.021	0.840	-0.893	11.986
IDACI score (Z)	-0.141	0.968	-1.291	3.875
MP: How involved is the MP in the young person's school life?	2.032	0.780	1	4
MP educational aspiration for the young person	1.293	0.749	1	5
MP: How the young person's expenses would be paid if stayed on in education- Parent(s) will support or give money	0.882	0.323	0	1
KS3 score (Z)	0.170	0.952	-2.739	2.267
Likelihood of the young person applying to university	2.909	1.019	1	4
Highest qualification of family	3.426	1.855	1	7
Whether the main parent is currently receiving job seeker allowance	0.008	0.087	0	1
Number of siblings	1.906	1.410	0	15
Number of younger of siblings	0.951	1.053	0	12
Young person's ethnicity	1.884	1.786	1	8
Gender	1.500	0.500	1	2
Whether young person has disability	1.866	0.341	1	2
Young person's age when started KS4	15	0.045	14	16
Independent/maintained school	0.001	0.029	0	1
Overall teacher index ($\alpha = 0.71$)	-0.076	11.196	-50.612	38.472

Supplementary Appendix

Note 1

Specification of Other Covariates

The estimation included control variables that are known to affect either investment in adolescents or adolescents' educational outcomes. Two main sets of control variables are included; child's controls and school controls.

Adolescent's controls include child's ethnicity that captures any cultural differences that may affect his outcome or parents' marriage patterns (Krein and Beller, 1988; McLanahan, 1985; Shaw, 1982). The child's gender is controlled for since prior studies on stepfamilies finds that girls perform differently than boys (Hill and Duncan, 1987; Hill, Yeung and Duncan, 2001; Krein and Beller, 1988; McLanahan, 1985). An indicator of general health reported at wave one of the LSYPE (whether or not the adolescent has a long-standing physical or mental impairment, illness or disability) is included to control for the potential effects of disability or poor health on his/her outcome and parental behaviour (Gennetian, 2005). The child's age at the beginning of KS4 controls for differences in outcomes due to age.

The analysis controls for child's academic self-schema, where theorization of the concept defines it as child's cognitive generalization of their past achievements, including learning experiences which affect his/her cognitive, affective and behavioural responses to learning (Markus, 1977). In light of that, students with positive academic self-schema are more likely to have confidence in their ability to achieve, they value education more and they see the process of educational attainment as more positive and rewarding (Plucker, 1998; Trusty, 1998). In this context, the estimation measured child's academic self-schema by both his/her prior cognitive outcome in key stage 3 average point score (using fine grading) for contextual value added and his/her likelihood of applying to university reported at W2.

Given that income and labour force participation change dramatically after divorce, particularly for mothers (Duncan and Hoffman, 1985; Hoffman and Duncan, 1988; Rainwater, 1979) and since the single parent status does not provide information for the reason behind being single, for example due to divorce or nonmarital childbearing or death of spouse, one would want to control for a relatively exogenous measure of socioeconomic status, meaning one less affected by divorce itself for instance. For this reason, the current analysis controlled for the family's education status (Gennetian, 2005; Sewell, Haller and Portes, 1969) measured at wave two of the LSYPE. The variable is an ordinal one indicating the highest educational qualification of the family as reported by the main parent. Seven main qualifications were reported including (1) degree or equivalent, (2) Higher education below degree level, (3) GCE A level or equivalent, (4) GCSE grades A-C or equivalent, (5) qualifications at level 1 and below, (6) Other qualifications and (7) No qualification.

Unobserved characteristics of parents could explain both their socioeconomic status and their adolescents' educational outcomes. For example, a married couple family could have low socioeconomic status because of a typically unobserved problem that interferes with their

education or employment and, in turn, their adolescents' education (Martin, 2012). In order to account for such unobserved heterogeneity, the analysis controlled for two variables reflecting parents' labour force problems using a measure for 'Whether the main parent is currently receiving job seeker allowance at W2'[7].

Previous studies showed that the greater the number of siblings, the lower children's attainments (Blake, 1989; Powell and Steelman, 1993; Steelman and Powell, 1989). If children from single mother families have fewer siblings than children from two parent families, this would represent an advantage associated with the single mother family structure. Therefore, studies that take away this advantage by controlling for the number of siblings show a stronger negative effect of single motherhood (Biblarz and Raftery, 1999). Therefore, the analysis controlled for the number of siblings (Martin, 2012) using the number of siblings to young person including non resident siblings (W2).

Along with the effect of sibling size, the analysis controlled for variables to capture differential educational outcomes due to the age composition of household members. For example, having an infant in the household may have an adverse effect on time allocated to a school aged adolescent independent from the effect of having more siblings (Gennetian, 2005). Accordingly, the analysis accounts for the number of younger siblings that young person had at wave one (no updated information was available for wave two). Finally, the analysis controlled for school effect using two variables: whether it is a maintained or independent school and a teacher effect variable reflecting adolescents' perception of their teachers.

Note 2

Teacher Influence

Credible identification of teacher influence requires matching student to teacher data (Link and Ratledge, 1979; Rockoff, 2004). The ability to associate individual teachers and students enables more precise estimation of the effects of teacher inputs on achievement than would studies relying on average teacher characteristics (Link and Ratledge, 1979; Kyriakides, 2005). However, such matching is not usually feasible for researchers largely because school administrative data may not necessarily have information about students' perception of teachers or their schools in general (Rockoff, 2004). Accordingly, one of the contributions of the current analysis is the use of data from the LSYPE wave one and two about student's perception of his/her teacher to measure teacher influence.

In light of the preceding, there are three main dimensions of the behaviour of an effective teacher identified in the teacher effectiveness research (TER). These are classroom management, the form and quality of teacher's organized lessons, and classroom climate (Kyriakides, 2005). Hence, the current analysis followed similar framework to construct the variables measuring teacher influence. Specifically, three variables of teacher influence were

[7] Another variable was tested to measure the effect of whether either MP/SP or both is currently receiving job seeker allowance at W2. However, a high correlation of 0.84 was detected between the variable and the family structure variable for both the cognitive and affective outcome analysis.

constructed based on data from the LSYPE about student's perception of his/her teacher. These are student-teacher relationship, teacher quality and overall teacher index.

The student-teacher relationship variable (S_Trelation_A), as reflected by the name, measures the student's perception of such relationship. The variable was constructed using information from 21 questions asked to the student about his/her teacher at wave one (W1) and wave two (W2). These were: W1 agreement with statements: I chose these subjects because I like the teachers who teach these subjects in year 10, W1-2 how many times a week YP works with teacher to prepare for exams outside lessons, W1-2 how often talk about plans for future study with teachers as part of lesson, W1-2 how often talk about plans for future study with teachers outside lessons, W1-2 how many teachers this applies to: my teachers praise me when I do my school work well, W1-2 how many teachers this applies to: I like my teachers, W2 why YP chose optional subjects: teachers advised them to study subject, W2 why YP chose optional subjects: like the teachers for this subject, W2 why YP chose vocational subjects: teachers advised me to study a course (or courses),W2 why YP did not think about doing vocational courses: teachers advised me not to do vocational courses, W2 why YP decided not to do vocational courses: teachers advised me not to do vocational courses, W2 how many teachers this applies to: my teachers don't really listen to what I say in class, W2 how many teachers this applies to: I get treated unfairly by my teachers, W2 how much interest teachers take in YP's work compared with others, W2 how likely teachers are to blame YP if there is trouble in class compared with others, and W2 main reason for playing truant: don't like particular teacher or teachers.

The construction of the student-teacher relationship variable was first done by recoding some of the 21 variables to have similar ordering of values compared to the rest, where the lowest value indicated the best teacher outcome. Later all variables were standardized (mean=0 and standard deviation=1) then summed. Because of the ordering nature of the variables and due to their standardization, the final variable was then multiplied by -1 to avoid confusion so that as the values go up, teacher influence would reflect better student-teacher relationship. Finally, the internal consistency of the variable was estimated by Cronbach's alpha (eq. A1) (Kyriakides, 2005; Muller and Ellison, 2001).

$$\alpha = \frac{K}{K-1}\left(1-\frac{\sum_{i=1}^{K}\sigma_{Y_i}^2}{\sigma_X^2}\right) \qquad \text{(A1)}$$

where X is the sum of K items used in constructing the variable: $X = Y_1 + Y_2 + Y_3 + \cdots + Y_K$, and $\sigma_{Y_i}^2$ is the variance of item i. Cronbach's alpha estimates and is a lower bound to the proportion of test variance attributable to common factors among the items. Thus, it is an index of common-factor concentration, which serves purposes claimed for indices of homogeneity (Cronbach, 1951). The theoretical value of alpha varies from zero to 1 with higher values of alpha indicating better homogeneity or internal consistency. However, depending on the estimation procedure used, estimates of alpha can take on any value less than or equal to 1, including negative values, although only positive values make sense. Most researchers, as a

rule of thumb, require a reliability of 0.70 or higher (Nunnally, 1978). For the student-teacher relationship variable Cronbach's alpha was ($\alpha = 0.21$) indicating that it is not homogenous enough or that its internal consistency is not satisfactory enough.

The teacher quality variable (teacherquality_A) measures the student's perception of his/her teacher quality. The variable was constructed using information from 16 questions asked to the student about his/her teacher at wave one (W1) and wave two (W2). These were: W1-2 how many of YP's teachers who set homework make sure YP does it, W1 usefulness of information from teachers outside lessons, W1-2 how many teachers this applies to: my teachers make sure we do any homework that is set, W1-2 how many teachers this applies to: the teachers at my school make it clear how we should behave, W1-2 how many teachers this applies to: the teachers in my school take action when they see anyone breaking school rules, W1-2 how many teachers this applies to: my teachers can keep order in class, W1-2 how hard teachers make YP work, W1-2 how often most teachers mark YP's work, and W2 how many teachers this applies to: my teachers treat everyone the same regardless of skin colour or cultural background.

Following the same approach, the construction of the teacher quality variable was first done by recoding some of the 16 variables to have similar ordering of values, where the lowest value indicated the best teacher outcome. Later all variables were standardized then summed. Also, the final variable was then multiplied by -1 to avoid confusion so that as the values go up, teacher influence would reflect higher teacher quality. Finally, the internal consistency of the variable was ($\alpha = 0.82$) indicating that it is homogenous enough or that its internal consistency is satisfactory enough.

The last teacher related variable measures the overall teacher index by basically summing the two previously constructed variables to provide the overall student's perception of his/her teacher in terms of relationship and teacher quality (teachereffect_A). The internal consistency of the variable was ($\alpha = 0.71$) indicating that it is homogenous enough or that its internal consistency is satisfactory enough.

It is also important to mention that given the timeframe of the variables used to create the three teacher indices, that is being observed in waves one and two of the LSYPE which are previous times points to the time point where the cognitive outcome variable (KS4 score) was observed at (2005/06), there need not be much worry about possible problem of endogeneity. The same reasoning applies for the affective outcome variable (attitude towards school), which was measured at wave four of the LSYPE.

Additional Tables

Table A.1
Family Structure Influence on Cognitive Outcome

	Reduced Family Structure			Full Family Structure		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	IRR	IRR	IRR	IRR	IRR	IRR
Family Structure (reference level: married natural couple)						

Other Married couple (OM)	0.963**	0.965**	0.965**	n.a	n.a	n.a
	(0.0167)	(0.0168)	(0.0169)			
Other Married couple (OM)	n.a	n.a	n.a	0.898***	0.902***	0.905***
				(0.0334)	(0.0339)	(0.0346)
Married with one or both step-parent (MS)	n.a	n.a	n.a	0.988	0.989	0.988
	n.a	n.a	n.a	(0.0194)	(0.0193)	(0.0193)
Cohabiting couple (CC)	0.964*	0.968	0.970	n.a	n.a	n.a
	(0.0195)	(0.0198)	(0.0203)	n.a	n.a	n.a
Cohabiting two biological parents (CB)	n.a	n.a	n.a	0.973	0.982	0.987
	n.a	n.a	n.a	(0.0374)	(0.0381)	(0.0382)
Other Cohabiting couple (OC)	n.a	n.a	n.a	0.960*	0.962	0.962
	n.a	n.a	n.a	(0.0236)	(0.0240)	(0.0247)
Lone father (LF)	0.897**	0.898**	0.901**	0.896**	0.897**	0.901**
	(0.0411)	(0.0408)	(0.0411)	(0.0411)	(0.0408)	(0.0411)
Lone mother (LM)	0.912***	0.915***	0.914***	0.912***	0.915***	0.914***
	(0.0135)	(0.0140)	(0.0143)	(0.0135)	(0.0140)	(0.0142)
No parents in the household (NP)	0.913	0.929	0.937	0.912	0.928	0.936
	(0.0806)	(0.0845)	(0.0851)	(0.0805)	(0.0843)	(0.0849)
MP's NS-SEC class (reference level: Higher Managerial and professional occupations)						
Lower managerial and professional occupations		1.033**	1.035***		1.033***	1.035***
		(0.0130)	(0.0130)		(0.0130)	(0.0130)
Intermediate occupations		1.034	1.037*		1.034	1.037*
		(0.0223)	(0.0227)		(0.0223)	(0.0226)
Small employers and own account workers		1.038*	1.040**		1.037*	1.039**
		(0.0201)	(0.0201)		(0.0200)	(0.0200)
Lower supervisory and technical occupations		1.042**	1.044**		1.040**	1.042**

	(0.0209)	(0.0204)	(0.0207)	(0.0202)
Semi-routine occupations	1.040	1.045*	1.040	1.045*
	(0.0257)	(0.0256)	(0.0258)	(0.0257)
Routine occupations	0.974	0.979	0.974	0.979
	(0.0214)	(0.0214)	(0.0214)	(0.0215)
Never worked/long term unemployed	0.948	0.952	0.949	0.953
	(0.0457)	(0.0458)	(0.0458)	(0.0459)
Mean income (Z)	0.987***	0.986***	0.987***	0.986***
	(0.00455)	(0.00451)	(0.00456)	(0.00452)
IDACI score (Z)	0.980**	0.982**	0.980**	0.981**
	(0.00790)	(0.00784)	(0.00789)	(0.00784)
MP: How involved is the MP in the young person's school life? (reference level: very involved)				
Fairly involved		1.028**		1.027**
		(0.0133)		(0.0133)
Not very involved		1.031**		1.030*
		(0.0157)		(0.0157)
Not at all involved		1.050		1.050
		(0.0365)		(0.0363)
MP's educational aspiration for young person (reference level: continue in full time education)				
Start learning a trade / get a place on a training course		0.970		0.970
		(0.0242)		(0.0241)
Start an apprenticeship		0.992		0.992
		(0.0298)		(0.0299)
Get a full-time paid job		0.889**		0.888**
		(0.0445)		(0.0444)
Something else		0.914		0.914
		(0.0744)		(0.0743)
MP: How the young person's expenses would be paid if stayed on in education-Parent(s) will		1.048**		1.046*

support or give money						
			(0.0243)			(0.0243)
Independent school	1.141***	1.127***	1.131***	1.141***	1.127***	1.131***
	(0.0217)	(0.0225)	(0.0261)	(0.0217)	(0.0225)	(0.0260)
Overall teacher index	1.003***	1.003***	1.003***	1.003***	1.003***	1.003***
	(0.000728)	(0.000730)	(0.000727)	(0.000724)	(0.000727)	(0.000724)
KS3 score (Z)	1.499***	1.496***	1.491***	1.500***	1.496***	1.491***
	(0.0254)	(0.0256)	(0.0265)	(0.0254)	(0.0256)	(0.0265)
Likelihood of the young person applying to university (reference level: very likely)						
Not at all likely	0.852***	0.850***	0.860***	0.853***	0.851***	0.861***
	(0.0196)	(0.0197)	(0.0217)	(0.0195)	(0.0197)	(0.0217)
Not very likely	0.985	0.982	0.987	0.986	0.982	0.987
	(0.0156)	(0.0152)	(0.0149)	(0.0157)	(0.0152)	(0.0149)
Fairly likely	1.039***	1.037***	1.036***	1.039***	1.037***	1.036***
	(0.0116)	(0.0114)	(0.0112)	(0.0116)	(0.0114)	(0.0113)
Young person's ethnicity (reference level: White)						
Mixed	1.045*	1.050*	1.050*	1.048*	1.053*	1.053*
	(0.0279)	(0.0283)	(0.0283)	(0.0281)	(0.0285)	(0.0286)
Indian	1.128***	1.130***	1.129***	1.128***	1.130***	1.129***
	(0.0299)	(0.0303)	(0.0310)	(0.0299)	(0.0303)	(0.0310)
Pakistani	1.184***	1.207***	1.204***	1.186***	1.209***	1.205***
	(0.0439)	(0.0464)	(0.0471)	(0.0442)	(0.0467)	(0.0474)
Bangladeshi	1.217***	1.259***	1.271***	1.221***	1.263***	1.275***
	(0.0550)	(0.0628)	(0.0650)	(0.0555)	(0.0632)	(0.0653)
Black Caribbean	1.123***	1.142***	1.148***	1.123***	1.142***	1.149***
	(0.0380)	(0.0392)	(0.0397)	(0.0380)	(0.0393)	(0.0398)
Black African	1.213***	1.238***	1.249***	1.216***	1.240***	1.251***
	(0.0435)	(0.0455)	(0.0475)	(0.0438)	(0.0458)	(0.0477)
Other	1.170***	1.185***	1.191***	1.173***	1.188***	1.194***
	(0.0522)	(0.0540)	(0.0550)	(0.0520)	(0.0539)	(0.0549)
Female	1.094***	1.095***	1.092***	1.094***	1.095***	1.092***
	(0.0111)	(0.0112)	(0.0115)	(0.0111)	(0.0112)	(0.0115)
Whether young person has disability	0.912***	0.913***	0.914***	0.912***	0.913***	0.914***
	(0.0226)	(0.0226)	(0.0223)	(0.0226)	(0.0226)	(0.0224)
Young person's age when started KS4	0.714**	0.710**	0.704**	0.711**	0.707**	0.702**
	(0.116)	(0.115)	(0.116)	(0.116)	(0.115)	(0.116)
Highest qualification of family (reference						

level: Degree or equivalent)						
Higher education below degree level	1.029**	1.021*	1.022*	1.029**	1.022*	1.023*
	(0.0128)	(0.0126)	(0.0126)	(0.0127)	(0.0126)	(0.0125)
GCE A Level or equiv	1.065***	1.059***	1.059***	1.065***	1.059***	1.060***
	(0.0169)	(0.0159)	(0.0155)	(0.0168)	(0.0159)	(0.0154)
GCSE grades A-C or equiv	1.053***	1.049***	1.050***	1.053***	1.050***	1.051***
	(0.0181)	(0.0174)	(0.0171)	(0.0180)	(0.0174)	(0.0170)
Qualifications at level 1 and below	1.027	1.029	1.033	1.029	1.032	1.035
	(0.0313)	(0.0309)	(0.0310)	(0.0316)	(0.0312)	(0.0314)
Other qualifications	0.969	0.978	0.981	0.970	0.979	0.982
	(0.0368)	(0.0373)	(0.0369)	(0.0367)	(0.0372)	(0.0368)
No qualification	0.927***	0.948**	0.956	0.929***	0.950*	0.958
	(0.0241)	(0.0254)	(0.0261)	(0.0241)	(0.0255)	(0.0262)
Whether the main parent is currently receiving job seeker allowance	1.081	1.122	1.120	1.081	1.121	1.119
	(0.119)	(0.129)	(0.128)	(0.119)	(0.128)	(0.126)
Number of siblings	0.986**	0.987**	0.987**	0.986***	0.987**	0.987**
	(0.00532)	(0.00535)	(0.00538)	(0.00529)	(0.00532)	(0.00535)
Number of younger siblings	1.002	1.003	1.004	1.002	1.003	1.004
	(0.00686)	(0.00689)	(0.00682)	(0.00686)	(0.00690)	(0.00682)
Constant	50,564***	53,502***	56,863***	53,498***	56,484***	59,744***
	(123,330)	(130,334)	(140,886)	(131,006)	(138,160)	(148,635)

Standard error (Eform) in parentheses. n.a means category not available since it is not defined as a structure.
*** p<0.01, ** p<0.05, * p<0.1

Table A.2
Family Structure Influence on Affective Outcome

	Reduced Family Structure			Full Family Structure		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	OR	OR	OR	OR	OR	OR
Family Structure (reference level: married natural couple)						
Other Married couple (OM)	0.800**	0.806**	0.804**	n.a	n.a	n.a
	(0.0739)	(0.0751)	(0.0751)			

Other Married couple (OM)	n.a	n.a	n.a	0.673**	0.686**	0.674**
				(0.122)	(0.125)	(0.121)
Married with one or both step-parent (MS)	n.a	n.a	n.a	0.853	0.856	0.858
	n.a	n.a	n.a	(0.0920)	(0.0926)	(0.0932)
Cohabiting couple (CC)	0.840	0.843	0.849	n.a	n.a	n.a
	(0.0943)	(0.0967)	(0.0981)	n.a	n.a	n.a
Cohabiting two biological parents (CB)	n.a	n.a	n.a	0.793	0.796	0.797
	n.a	n.a	n.a	(0.161)	(0.163)	(0.162)
Other Cohabiting couple (OC)	n.a	n.a	n.a	0.861	0.864	0.874
	n.a	n.a	n.a	(0.113)	(0.116)	(0.118)
Lone father (LF)	0.748	0.751	0.784	0.746	0.750	0.782
	(0.151)	(0.150)	(0.152)	(0.150)	(0.150)	(0.151)
Lone mother (LM)	0.771***	0.765***	0.769***	0.770***	0.764***	0.767***
	(0.0583)	(0.0600)	(0.0610)	(0.0582)	(0.0599)	(0.0609)
No parents in the household (NP)	1.352	1.374	1.327	1.348	1.370	1.322
	(0.476)	(0.488)	(0.473)	(0.475)	(0.486)	(0.471)
MP's NS-SEC class (reference level: Higher Managerial and professional occupations)						
Lower managerial and professional occupations		0.951	0.954		0.951	0.953
		(0.0841)	(0.0846)		(0.0842)	(0.0847)
Intermediate occupations		0.988	0.994		0.987	0.993
		(0.130)	(0.131)		(0.130)	(0.131)
Small employers and own account workers		0.951	0.955		0.950	0.953
		(0.134)	(0.135)		(0.134)	(0.135)
Lower supervisory and technical occupations		0.962	0.993		0.957	0.988
		(0.108)	(0.111)		(0.108)	(0.111)

Semi-routine occupations	1.006	1.029	1.007	1.030
	(0.127)	(0.131)	(0.127)	(0.131)
Routine occupations	0.895	0.919	0.894	0.918
	(0.110)	(0.113)	(0.110)	(0.113)
Never worked/long term unemployed	0.810	0.822	0.811	0.822
	(0.155)	(0.156)	(0.155)	(0.156)
Mean income (Z)	0.932*	0.938*	0.934*	0.940
	(0.0360)	(0.0362)	(0.0362)	(0.0363)
IDACI score (Z)	0.972	0.963	0.972	0.963
	(0.0392)	(0.0385)	(0.0392)	(0.0385)
MP: How involved is the MP in the young person's school life? (reference level: very involved)				
Fairly involved		0.863**		0.860**
		(0.0648)		(0.0647)
Not very involved		0.867*		0.863*
		(0.0731)		(0.0729)
Not at all involved		0.561***		0.559***
		(0.0863)		(0.0862)
MP's educational aspiration for young person (reference level: continue in full time education)				
Start learning a trade / get a place on a training course		0.691***		0.690***
		(0.0824)		(0.0822)
Start an apprenticeship		0.656***		0.656***
		(0.0808)		(0.0809)
Get a full-time paid job		0.442***		0.440***
		(0.0944)		(0.0936)
Something else		0.855		0.852
		(0.240)		(0.237)
MP: How the young person's expenses would be paid if stayed on in education-Parent(s) will support or give money		1.029		1.023

			(0.0934)			(0.0930)
Independent school	0.522***	0.523***	0.492***	0.522***	0.523***	0.491***
	(0.0418)	(0.0438)	(0.0423)	(0.0419)	(0.0437)	(0.0423)
Overall teacher index	1.072***	1.072***	1.071***	1.072***	1.072***	1.071***
	(0.00300)	(0.00301)	(0.00304)	(0.00299)	(0.00300)	(0.00303)
KS3 score (Z)	1.441***	1.440***	1.402***	1.441***	1.440***	1.402***
	(0.0543)	(0.0553)	(0.0534)	(0.0542)	(0.0552)	(0.0533)
Likelihood of the young person applying to university (reference level: very likely)						
Not at all likely	0.316***	0.314***	0.361***	0.316***	0.314***	0.361***
	(0.0349)	(0.0351)	(0.0411)	(0.0349)	(0.0351)	(0.0410)
Not very likely	0.421***	0.417***	0.457***	0.421***	0.417***	0.457***
	(0.0383)	(0.0381)	(0.0425)	(0.0381)	(0.0380)	(0.0423)
Fairly likely	0.702***	0.700***	0.712***	0.702***	0.699***	0.712***
	(0.0490)	(0.0491)	(0.0502)	(0.0490)	(0.0492)	(0.0503)
Young person's ethnicity (reference level: White)						
Mixed	0.985	0.986	0.946	0.990	0.992	0.951
	(0.142)	(0.143)	(0.138)	(0.142)	(0.144)	(0.138)
Indian	2.175***	2.154***	2.041***	2.170***	2.150***	2.036***
	(0.306)	(0.305)	(0.292)	(0.305)	(0.304)	(0.291)
Pakistani	1.238	1.267	1.170	1.238	1.266	1.169
	(0.199)	(0.209)	(0.191)	(0.199)	(0.209)	(0.191)
Bangladeshi	1.739***	1.830***	1.675**	1.744***	1.835***	1.677**
	(0.364)	(0.398)	(0.363)	(0.365)	(0.399)	(0.364)
Black Caribbean	0.976	0.994	0.928	0.977	0.995	0.929
	(0.168)	(0.174)	(0.158)	(0.169)	(0.174)	(0.158)
Black African	1.827***	1.870***	1.669***	1.838***	1.880***	1.676***
	(0.344)	(0.363)	(0.328)	(0.346)	(0.365)	(0.330)
Other	1.240	1.256	1.188	1.243	1.259	1.190
	(0.280)	(0.283)	(0.274)	(0.280)	(0.283)	(0.274)
Female	1.172***	1.172***	1.118**	1.171***	1.171***	1.117**
	(0.0639)	(0.0641)	(0.0628)	(0.0639)	(0.0641)	(0.0628)
Whether young person has disability	1.028	1.029	1.023	1.026	1.027	1.021
	(0.0864)	(0.0866)	(0.0843)	(0.0866)	(0.0868)	(0.0845)
Young person's age when started KS4	1.352	1.319	1.217	1.344	1.313	1.211
	(0.628)	(0.622)	(0.598)	(0.621)	(0.616)	(0.593)
Highest qualification of family (reference						

level: Degree or equivalent)						
Higher education below degree level	1.173*	1.162*	1.189*	1.173*	1.163*	1.190*
	(0.105)	(0.106)	(0.109)	(0.105)	(0.106)	(0.110)
GCE A Level or equiv	1.194**	1.178*	1.198*	1.193**	1.178*	1.198*
	(0.106)	(0.112)	(0.114)	(0.107)	(0.112)	(0.115)
GCSE grades A-C or equiv	1.048	1.034	1.065	1.048	1.036	1.066
	(0.0895)	(0.0982)	(0.102)	(0.0895)	(0.0985)	(0.103)
Qualifications at level 1 and below	1.099	1.090	1.144	1.104	1.096	1.151
	(0.160)	(0.168)	(0.177)	(0.161)	(0.168)	(0.178)
Other qualifications	1.032	1.037	1.086	1.039	1.045	1.095
	(0.200)	(0.206)	(0.216)	(0.200)	(0.206)	(0.216)
No qualification	0.994	1.020	1.077	1.000	1.028	1.085
	(0.119)	(0.135)	(0.144)	(0.121)	(0.137)	(0.145)
Whether the main parent is currently receiving job seeker allowance	0.873	0.916	0.979	0.875	0.918	0.981
	(0.373)	(0.401)	(0.397)	(0.376)	(0.405)	(0.401)
Number of siblings	0.939**	0.938**	0.935**	0.938**	0.937**	0.935**
	(0.0279)	(0.0281)	(0.0276)	(0.0279)	(0.0281)	(0.0277)
Number of younger siblings	1.100***	1.099***	1.104***	1.100***	1.098***	1.103***
	(0.0367)	(0.0368)	(0.0364)	(0.0366)	(0.0368)	(0.0364)

Standard error (Eform) in parentheses. n.a means category not available since it is not defined as a structure.
*** p<0.01, ** p<0.05, * p<0.1

Table A.3
Average Marginal Effects (%)

	Cognitive Outcome			
	Reduced Family Structure		Full Family Structure	
VARIABLES	(1)	(2)	(3)	(4)
Family Structure (reference level: married natural couple)				
Other Married couple (OM)	-4**	-4**	n.a	n.a

	(0.018134)	(0.018618)		
Other Married couple (OM)	n.a	n.a	-10***	-11***
			(0.039156)	(0.040757)
Married with one or both step-parent (MS)	n.a	n.a	-1	-1
			(0.020514)	(0.02053)
Cohabiting couple (CC)	-4**	-5***	n.a	n.a
	(0.019589)	(0.019632)		
Cohabiting two biological parents (CB)	n.a	n.a	-2	-
			(0.035145)	-
Other Cohabiting couple (OC)	n.a	n.a	-4*	-6***
			(0.023827)	(0.02481)
Lone father (LF)	-5	-3	-5	-3
	(0.046548)	(0..05907)	(0.046542)	(0.05918)
Lone mother (LM)	-8***	-8***	-8***	-8***
	(0.015258)	(0.016280)	(0.01526)	(0.01628)
No parents in the household (NP)	-19	-	-19	-
	(0.163777)	-	(0.163339)	-
	Affective Outcome (=4)			
VARIABLES	(1)	(2)	(3)	(4)
Family Structure (reference level: married natural couple)				
Other Married couple (OM)	-23***	-21**	n.a	n.a
	(0.094794)	(0.092637)		
Other Married couple (OM)	n.a	n.a	-37*	-35*
			(0.219273)	(0.112534)
Married with one or both step-parent (MS)	n.a	n.a	-19*	-21*
			(0.113787)	(0.21372)
Cohabiting couple (CC)	-15	-16	n.a	n.a
	(0.116624)	(0.118812)		
Cohabiting two biological parents (CB)	n.a	n.a	-24	-
			(0.202044)	-
Other Cohabiting couple (OC)	n.a	n.a	-11	-11
			(0.137686)	(0.139688)
Lone father (LF)	-41*	-19	-41*	-20
	(0.237251)	(0.219026)	(0.238163)	(0.220746)
Lone mother (LM)	-26***	-25***	-27***	-26***

	(0.086687)	(0.089138)	(0.086876)	(0.089678)
No parents in the household (NP)	26	-	26	-
	(0.440119)	-	(0.440448)	-

Note: the average marginal effect is estimated using the form dln(y)/dx. (-) means not estimable. n.a means category not available since it is not defined as a structure.
For the reduced family structure, model (1) introduces the interaction mechanism between socioeconomic status and family structure and model (2) adds the interaction mechanism between parental involvement and family structure. For the full family structure, models (3) and (4) do the same respectively.
Standard error in parentheses. *** p<0.01, ** p<0.05, * p<0.1