

Family Structure and Educational Outcomes in England

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Abstract

Economic theory perceives the resources available to the family as those in the form of human capital and the availability of financial and time resources to children. Using Becker's household production model (1965) this paper investigates the relationships between family structure and educational outcomes in England. The arguments are that the outcome gap among adolescents could be explained to an extent by the type of family they live with and that living in a nonintact family has adverse impact on these outcomes. The analysis seeks to fill some of the gap in the literature about why nonintact structures of English families could lead to worse educational outcomes. For this, two identified intervening mechanisms in the literature of the family socioeconomic status and parental involvement are tested for whether they could mediate such effect. The main finding of the analysis is 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.

Keywords: Educational outcomes, 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. Family structure plays an important role in this process and examining its relationship with children's educational attainments is essential for designing policies targeting children from nonintact families. It is important to mention here that what is meant by family structure in this framework is the marital status of the parent(s) in particular and/or the type of parent(s) in general, such as being foster or adoptive parent(s). In this respect, most of the earliest research on family structure was empirical analysis by sociologists; whereas the contributions of economists have come later. Compared to earlier work, economic studies are distinguished by attention to more formal models of children's attainment process (Haveman and Wolfe, 1995).

To explain how family structure influences children's educational outcomes, earlier research has traditionally proposed three main theoretical frameworks; the sociological, psychological and economic (Biblarz and Raftery, 1999; Haveman and Wolfe, 1995; Hill, Yeung and Duncan, 2001). Additionally, there has been some research on another two frameworks through which family structure could be associated with children's attainment. These are parental competency and marital conflict theory (Biblarz and Raftery, 1999). Although the main focus in the literature was on the first three frameworks, one can generally differentiate between them based on the mechanism through which family structure influences children's outcome (Haveman and Wolfe, 1995).

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It has only been in the past few decades that modern economic analysis has been involved in investigating the family. The revolutionary work in this area was done by Nobel laureate Gary Becker in the 1960s and 1970s, which has since been consolidated into his monograph, *A Treatise on the Family* (1981, 1991). Since then there has been a growing interest in the economic literature to examine a wide range of family issues. One of these issues is family structure and how it affects children's development (Carlin, 1999).

Economic theory perceives resources in the form of human capital and the availability of financial and time resources to children. It proposes that socioeconomic success is partly a function of human capital. Basically, families are singular units (agents) maximizing utility coming from children (goods) that are produced by investments in both market activity and household services (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).

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, which could be reflected in variables such as mother's employment or number of siblings (Beller and Chung, 1992); X_i are the inputs of goods and services purchased with family income; 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. Specifically, it is considered among the best-functioning forms in modern capitalist society because it allows for the provision of household services by one partner and economic resources (or market goods) by the other. In that logic, economic theory might suggest 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; Meyer and Garasky, 1993).

This paper adopts the economic theoretical perspective of investing in children (Beller and Chung, 1992; Boggess, 1997; Haveman and Wolfe, 1995) based on Becker's household production function framework (1965) that has been adopted by a number of researchers such as Beller and Chung (1992) and Gennetian (2005) as shown in equation (1). In this perspective, children's well-being in general and educational outcome in particular (the focus of the

analysis) is a function of family structure and parents' choices about the level of resources to invest in their children.

Previous literature has drawn the attention to a number of reasons to believe that estimated effects of family structure are instead capturing unobserved characteristics that are correlated with family structure (Gennetian, 2005). Examples include sexual customs that could play a role in nonmarital childbearing (Akerlof, Yellen and Katz, 1996). Therefore, the current analysis proposes a more comprehensive framework controlling for the main identified mechanisms in the literature through which family structure influences children's educational outcome in addition to key family background, adolescent and school attributes (Levaččić and Vignoles, 2002).

Over the past few decades there has been an increasing change in family structures and forms. Partially, this has been due to the rising divorce rates and the proliferation of complex stepfamilies. Another reason for such change is the increasing rates of nonmarital fertility and cohabitation (Bianchi and Casper, 2000). Consequently, the proportion of children residing with two biological married parents has been steadily declining in contrast to nonintact family structures such as single parent and cohabiting parents. England is no exception; the recent census data shows that although there has been a decrease in the divorce rate in the last twenty years by 27% to reach 10% in 2012, there has been a much further decrease in the marriage rate by 35% during the same period. This has been coupled with an increase in the number of civil partnerships by 1196% just between 2007 and 2013 and an increase in the marriage rate by only 3.5% in the same period (Office for National Statistics, 2015). This has been accompanied by the rise in single parenting, which has been found to have an effect on children's educational outcomes (Brown, 2004; Ginther and Pollak, 2004; Martin, 2012; Sandefur, Meier and Campbell, 2006).

The following literature review of this paper has identified a gap in the Education Economics literature regarding how family structure could affect English adolescents' both educational cognitive and affective outcomes. To explain, 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. In this framework, the paper answers the following research questions: Does family structure account for the disparities among 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 proposed framework is based on both Becker's household production function (1965; 1975; 1991) and socialization framework accounting for parents' characteristics (Biblarz and Raftery, 1999) and school characteristics (Levaččić and Vignoles, 2002), hence including new school information in the analysis that has been lacked in the literature with exception of few studies, such as Zheng, Schimmele and Hou (2015). Additionally, the analysis uses a unique dataset comprising data from the Longitudinal study of Young People in England (LSYPE) and the National Pupil Database (NPD).

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

Previous research has shown that generally children from single parent families are likely to fare worse in educational achievement than those from intact families (Astone and McLanahan, 1991; Rodriguez and Arnold, 1998), have worse attitude towards school (Wallerstein and Lewis, 2005) and are also more likely to drop out of school (Bowlby and McMullen, 2002; Hetherington et al., 1998). Children residing with a single parent or a stepparent are less likely to complete high school or attend college compared to those residing with both parents (Amato, 1988; Coleman, 1988; Corak, 1999; Krein and Beller, 1988; McLanahan, 1985; McLanahan, Astone and Marks, 1988; Mueller and Cooper 1986; Shaw 1982).

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; Nelson et al., 2001). Likewise, rising family conflict and lack of family "cohesiveness" or joint activities led to worse educational achievement in children from divorced or remarried families (West, Sweeting and Richards, 2000). Also, boys growing in non-traditional family structure were found to do worse in schooling compared to those who belong to traditional two-biological parent family structure (Cid and Stokes, 2013).

Other studies suggested 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). Their findings were consistent with evolutionary psychology², which argues that mothers care more about the well-being of their children than do fathers. Similar findings implied that living with a stepfather had a negative significant correlation with children's educational attainment (Wojtkiewicz, 1993; Boggess, 1998). Other studies have shown that nonintact family types such as single-mother, single-father, and stepfamilies have similar negative consequences for children (Dawson, 1991) and that children of a single mother do as well as children from two biological parents when other factors are taken into account (Biblarz, Raftery, and Bucur, 1997; McLanahan, 1985).

It is important to mention however that unlike most studies (see discussion by Hill, Yeung and Duncan, 2001) few have argued that family structure fixed effect was not significant for explaining children's educational outcomes (Björklund and Sundström (2002) when controlling for income (Smith, Brooks-Gunn and Klebanov, 1997. Also, another study suggested an unexpectedly positive effect of a single parent structure on children's achievement scores (Cooksey, 1997). The argument was that having a divorce may positively affect children in the case of high parental conflict, especially for young parents.

² Evolutionary psychology theories explore the relationship between family structure and children's development in general without specifying the pathways through which parental motivations affect outcomes for children. In that sense, it is considered a complement to theories that propose resource based mechanisms. Their main argument is that biological parents are more willing to provide resources than stepparents and that mothers are more willing to provide resources than fathers (Ginther and Pollak, 2004). For more details on evolutionary psychology and extensive references to the literature, see Daly and Wilson 1999).

Mechanisms of Family Structure Impact

As has been explained earlier, 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; McLanahan and Sandefur, 1994; Thornton, 2001 among others).

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 (Eggebeen and Lichter, 1991; Garfinkel and McLanahan, 1986; McLanahan and Sandefur, 1994). 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; Magnuson and Berger, 2009; McLanahan and Sandefur, 1994; Teachman, 2008; Thomson, Hanson and McLanahan, 1994). Socioeconomic status represented by material resources affects children's aspirations through its impact at both rational and psychological levels (Kao and Tienda, 1998). The availability of resources to children's affects their rational decisions about the availability and possibility of succeeding in and continuing education and thus their decision about their willingness to progress to higher education (Hochschild, 1988; Teachman and Paasch, 1998).

A second channel through which socioeconomic status affect children's academic characteristics and socialization is the availability of home learning resources such as computers, books and access to internet or even extracurricular activities such as field trips. The availability of such resources transmits positive messages about the value of education and thus enhances the academic socialization of the children and their aspiration towards education (Magnuson and Berger, 2009; Teachman and Paasch, 1998). A third channel for the transmission of socioeconomic status effect is through the neighbourhood effect. 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, despite having the same working hour patterns and they tend not share resources to the same extent that married parents do, because they tend to suffer from more material hardship such as food, income and housing insecurity, which in turn might undermine effective parenting (Brown, 2004; Duncan and Hoffman, 1985; Manning and Brown, 2003; McLanahan, 1997).

Studies found that generally the deficiency of socioeconomic resources is more likely to negatively affect children's educational outcome (McLanahan, 1985; McLanahan, Astone and Marks, 1988; McLanahan and Bumpass, 1988; Sandefur, McLanahan and Wojtkiewicz, 1989;

Shaw 1982). Likewise, 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; Garg, Melanson and Levin, 2007; Manning and Brown, 2006). 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. *Parental Involvement in Children's Education*

Despite the importance of economic resources usually represented by the socioeconomic status of the family, it was revealed that they do not fully explain such relationship 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; Magnuson and Berger, 2009; Thomson, Hanson and McLanahan, 1994). In line with that, it was found that parental expectations rather than their income or education were shown to be a stronger determinant of children's aspiration (Marchant et al., 2001). 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), parent adolescent emotional closeness (Crosnoe, 2004), parents' involvement in their children's schools and discussing school issues with them (Muller, 1995; 1998), and parents' educational support (Bridgeland et al., 2006; Stone, 2006) improve their children's academic performance. Children who perceive their parents to have high values in education tend to adopt such values as their personal goals and thus have better academic behaviours (Gonzalez-DeHass, Willems and Holbein, 2005; Marchant et al., 2001).

Parental behaviour in general or parental involvement in children's education in particular is another dimension of children's academic socialization. The quantity and quality of such involvement in the form of helping with homework, after school activities and general supervision has been found to be key mediators of the family structure effect (Dunifon and Kowaleski-Jones, 2002) and to positively affect both children's educational cognitive and affective outcomes (Fan and Williams, 2010; McLanahan and Sandefur, 1994). Such involvement allows parents to transmit their expectations and values to their children (Astone and McLanahan, 1991; Sewell, Haller and Portes, 1969).

Parental involvement in children's education tends to be less in nonintact families, where children receive less consistent parenting practices and less social control compared to intact families (Dornbusch et al., 1985; Steinberg, 1987; Wallerstein and Kelly, 1979). 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 (Amato, 1987; Thomson, McLanahan and Curtin, 1992) due to the absence of a second parent and other times to the

work-family conflict faced by the existing parent, which can lead to emotional, task, and responsibility overload and provide less encouragement and support for their children's schooling (Astone and McLanahan, 1991; Cavanagh, Schiller, and Riegle-Crumb, 2006; Cherlin, 1992; Magnuson and Berger, 2009).

Less parental involvement are 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; Downey, 1995) 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). It could also be due to the tendency of experiencing high depression levels among cohabiting mothers or single mothers because of the higher likelihood of unemployment and insufficient income or relationship instability, which leads to poor mental health (Belle, 1990; Brown, 2000; Demo and Acock, 1996). Such adverse parental well-being tends to increase children's risk of having poor educational outcomes and behavioural problems (Amato and Booth, 1997).

Weak parental involvement was found to adversely affect children's educational outcomes and aspiration. This was attributed to low parental expectations for their children and their low ability to transmit their expectations (Astone and McLanahan, 1991; Coleman, 1988; Garg et al., 2007) and also to low parental levels of psychological well-being, which might weaken parenting or amplify sensitivity to children's behavioural problems (Carlson and Corcoran, 2001). Consequently, ineffective or inadequate parental involvement may lead children to feel overwhelmed and subsequently withdraw from school (Astone and McLanahan, 1991; Baker and Stevenson, 1986). Likewise, children with low educational aspiration tend to disengage from school at early age, where such aspiration was found to be a main predictor of their educational outcomes (Sewell and Shah, 1968).

In addition to the two aforementioned mechanisms, studies have indicated that even after controlling for those two factors there are still other parental variables that could contribute to the explanation of the relationship between family structure and children's outcomes (Astone and McLanahan, 1991; Teachman, 2008). Accordingly, researchers should pay more attention to the selection process and to the right choice of variables accounting for unobserved heterogeneity.

3. Data, Econometric Method and Model Specification

The data used for the analysis in this paper is an integrated dataset comprising a wide range of information about the child's educational and behavioural development indicators, family background factors and school factors. The analysis captures the adolescent's cognitive outcome by his/her key stage 4 total GCSE/GNVQ new style point score for the year 2005/2006 using a sample of 7128 adolescents and measures the student's affective outcome by his/her average score of attitude towards school given by the answers to twelve questions, where for each question the student can answer one of 5 categories: 'strongly disagree', 'disagree', 'I don't know', 'agree' and 'strongly agree' using a sample of 7009 adolescents.

Independent Variables

The analysis examines two key mechanisms to explain the effect of family structure; parental socioeconomic status and parental involvement.

Family Structure

The current analysis empirical definition of family structure is based on whether the adolescent belongs to an intact family defined by living with both his/her married biological parents. Otherwise, he/she belongs to a nonintact family structure. The family structure variable is generated using information from three variables in the LSYPE; the family type regardless of the biological nature of the parents, the relationship of the main and second parent to young person respectively. In that regard the analysis uses two family structures variables: one with a reduced structure and another with a full structure in order 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 and it also includes the cases that lack information about either the MP or SP but was defined as married couple, (3) Cohabiting couple, (4) Lone Father, (5) Lone mother, and (6) No parents in the household. Note that in category 3, cohabiting couple, both adults, one of them, or none of them, may be biological parents. 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 MP/SP 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 MP/SP is not a biological parent, (6) Lone Father, (7) Lone mother, and (8) No parents in the household. The two structure variables include the cases that provide information about the family type even if they lack information about either the MP or SP relationship to the young person.

Accounting for Parents’ Socioeconomic Status

Prior research reveals that results are consistent when parents’ occupation and income are included in the measure of family socioeconomic status (Martin, 2012). Consequently, the analysis accounted for the family’s NS-SEC class. It was measured at wave two of the LSYPE as an ordinal variable indicating the SEC class of the family. 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.

Another measure of family socioeconomic status is family income, which represents potential access to potential long term resources or more permanent income, which in turn affects adolescents’ outcomes (Duncan and Brooks-Gunn, 1997; Hill and Duncan 1987; Krein and Belier 1988; McLanahan 1983, 1985; Shaw, 1982). For that, the analysis measures family income by the mean family income from work, benefits, and anything else over waves one and two adjusted for the family size at wave two. In addition, a third channel for the

transmission of socioeconomic status effect is through the neighbourhood effect. Adverse neighbourhood conditions could negatively affect adolescents' attitudes about returns to education (Bowen, et al., 2008; Teachman and Paasch, 1998). Accordingly, the analysis used the Income Deprivation Affecting Children Index (IDACI) reported in 2005/2006 as a third measure of socioeconomic status effect.

Accounting for Parents' Involvement in Adolescents' Education

Earlier studies have found that adolescents have better schooling outcomes when their parents discuss their schooling with them and when parents are involved in their school (Muller, 1995; 1998). Accordingly, the analysis used a variable to reflect parent participation in school activities, such as '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. Also, a variable reflecting parental aspirations for their adolescents, such as '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. Finally, a variable reflecting parents' willingness to provide resources and learning experiences measured by '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 a number of school inputs, student's inputs and family background factors.

Econometric Method and Model specifications

Given the discrete nature of the two dependent variables on one hand and the categorical nature of most of the independent variables on the other hand, this paper uses discrete choice modeling methodology to examine the proposed models. The first cognitive outcome variable is a count variable that follows a negative binomial distribution, hence the analysis uses a negative binomial regression model defined as

$$\eta_i = \ln(\mu_i) = \sum_j \beta_j x_{ij} \quad i = 1, \dots, N \text{ and } Y \sim \text{Negative Binomial} \quad (2)$$

The second affective outcome variable is an ordinal variable; accordingly, the analysis uses an ordinal logit model given by

$$\eta_i = \ln(\mu_i / 1 - \mu_i) = \sum_j \beta_j x_{ij} \quad i = 1, \dots, N \quad (3)$$

Specifically, the analysis examines cognitive outcome via the model defined in eq. (4) and affective outcome via the model defined in eq. (5)

$$\begin{aligned} \ln(\mu(\text{co})_{it}) = & \alpha + \gamma F_{i,t-1} + \sum_K \lambda_K (SEC_{i,t-1} + I_{i,t-1,t-2} + D_{it}) + \sum_M \eta_M^{PI} m_{i,t-1} + \\ & \sum_N \beta_N (X_{i,t-1} + X_{i,t-2}) + \sum_L \zeta_L (S_{i,t-2} + S_{i,t-1,t-2}) + \varepsilon_i \end{aligned} \quad (4)$$

$$\ln(\mu(af)_{it} / 1 - \mu(af)_{it}) = \alpha + \gamma F_{i,t-1} + \sum_K \lambda_K (SEC_{i,t-1} + I_{i,t-1,t-2} + D_{it}) + \sum_M \eta_M PI_{mi,t-1} + \sum_N \beta_N (X_{i,t-1} + X_{i,t-2}) + \sum_L \zeta_L (S_{i,t-2} + S_{i,t-1,t-2}) + \varepsilon_i \quad (5)$$

where $\mu(co)_{it}$ represents the expected value of the cognitive 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 affective 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 tested using three variables measured at wave two ($t-1$). X_{Ni} ($N=10$) are ten student's input variables measured at either wave one ($t-2$) or wave two ($t-1$), and finally S_{Li} ($L=2$) 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 $\alpha = 0.71$).

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 (Duncan and Brooks-Gunn, 1997; Hill and Duncan 1987; Krein and Belier 1988; Martin, 2012; McLanahan 1983, 1985; Shaw, 1982); 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 (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, one can see that although more than half of the adolescents live in intact families, 23% live with lone mothers and 18% live in other nonintact families, which does have an impact on their educational outcome³. The analysis starts by investigating the relationship between the reduced family structure and cognitive outcome via model (1) of table (1). Indeed, as expected, adolescents in nonintact families tend to perform worse in KS4 than those in intact families (Astone and McLanahan, 1991; Dunifon and Kowaleski-Jones, 2002; Nelson et al., 2001; Rodriguez and Arnold, 1998). Specifically, those living with other married couple, cohabiting couple (Brown, 2004; Duncan and Hoffman, 1985; Dunifon and Kowaleski-Jones, 2002; Manning and Brown, 2003; McLanahan, 1997; Nelson et al., 2001), lone father (Dawson, 1991) and lone mother families (Dawson, 1991)

³ 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.

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.

In order to explain how belonging to a nonintact family structure tends to worsen adolescents' cognitive outcomes, the socioeconomic status of the family is introduced into the 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 the four previously differentiated family structures aside from the 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 (Amato and Booth, 1991; Amato and Keith, 1991a; Hoffmann and Johnson, 1998). Moreover, such status tends to have an independent effect on cognitive outcome via the three specified variables. For example, one standard deviation increase in the deprivation index is associated with almost 2% decrease in the expected value of KS4 score (Bowen, et al., 2008; Teachman and Paasch, 1998).

The effect of the family's SEC class shows that when the occupational class of the family is 'lower managerial and professional occupations', or 'small employers and own account workers', or 'lower supervisory and technical occupations', 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, in which case it can be explained by the low significant negative correlation ($\rho=-0.32$) between cognitive outcome and the family's SEC variable, indicating that originally a negative relationship should exist between the deterioration in the SEC class and the outcome. This could imply that the effect of the family's SEC 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 ($\rho=0.21$) reflecting that its effect is also conditional on other covariates in the model.

VARIABLES	Reduced Family Structure			Full Family Structure		
	(1)	(2)	(3)	(4)	(5)	(6)
	IRR	IRR	IRR	IRR	IRR	IRR
Family Structure (reference level: married natural couple)						
Other Married couple (OM)	0.963** (0.0167)	0.965** (0.0168)	0.965** (0.0169)	n.a	n.a	n.a
Other Married couple (OM)	n.a	n.a	n.a	0.898*** (0.0334)	0.902*** (0.0339)	0.905*** (0.0346)
Married with one or both step- parent (MS)	n.a	n.a	n.a	0.988 (0.0194)	0.989 (0.0193)	0.988 (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 table (A.3).

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

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 new parental involvement variables (Coleman, 1988), which are also found to have an independent 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 on 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 (Bridgeland et al., 2006; Steinberg, Elmen, and Mounts, 1989; Stone, 2006;). 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 ($\rho=-0.03$)⁴.

The analysis goes a step further by examining the *full* family structure variable to determine whether further discrepancies could be detected with more detailed family structures. To elaborate, model (4) examines the full family structure effect showing similar findings reflecting that adolescents in nonintact families tend to perform worse in KS4 than those in intact families. Specifically, those living with other married couple, lone father, other cohabiting couple, and lone mother families have lower KS4 score than those living in intact families 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 in the full structure does reveal a valuable pattern.

Testing for whether the family socioeconomic status could mediate the family structure effect, model (5) shows similar findings to that reported for model (2) where such status hardly mediates the effect of family structure with almost no change in the significance or the magnitude of three of the previously differentiated family structures. Moreover, such status tends to have the same independent effects on cognitive outcome via the three specified variables as those of model (2). Testing further for whether parental involvement can explain the association between family structure and cognitive outcome, model (6) shows that parental involvement also has hardly any mediating role with almost no change in the significance or the magnitude of the three previously differentiated family structures. Additionally, the effect of the three socioeconomic status variables almost does not change with the addition of the three new parental involvement variables, which are also found to have the same independent significant impact on cognitive outcome identified in model (3).

4.2. Adolescent’s Affective Outcome

Following the same analytical framework⁵, the analysis first investigates the relationship between family structure and affective outcome in model (1) of table (2) showing that indeed,

⁴ The unexpected positive impact of the significant categories could also be explained by the bivariate regression between the school involvement variable and the cognitive outcome which shows positive effects of those categories in contrast to the ‘not at all involved’ category having an expected negative effect. This could imply that the difference between those two categories and the reference category ‘very involved’ is not substantial enough to indicate the exact relationship between those levels of involvement. This is shown by the low economic significant magnitude of just 3% in model (3) and the expected negative significant effect on outcome of the ‘not at all involved’ category compared to the reference category of ‘very involved’ in the bivariate regression.

⁵ Table A.4 provides basic descriptive statistics of the variables examined in the affective outcome estimation sample.

as expected, adolescents in nonintact families tend to have worse attitude towards school than those in intact families (Wallerstein and Lewis, 2005). Specifically, the odds of those living with other married couple and lone mother to have higher attitude score are lower than those living with intact families by 20% and 23% respectively.

In order to explain how belonging to a nonintact family structure tends to worsen adolescents' affective outcome, the socioeconomic status of the family is introduced into the model (2) showing that it does not mediate the effect of family structure with almost no change in the magnitude or the significance of the two previously differentiated family structures. Moreover, such status has an independent 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 higher attitude score. Similar to the effect found on the cognitive outcome, such negative unexpected association can be explained by the low significant positive correlation ($\rho=0.03$) between affective outcome and the family income, indicating that originally a positive relationship should exist between the increase in income and attitude towards school. This again implies that the effect of the family income is conditional on other covariates in the model.

With the absence of potential mediating role of the socioeconomic status, the analysis introduces parental involvement as an additional mechanism. Nevertheless, model (3) shows that parental involvement has hardly any mediating role with no change in either the significance or the magnitude of living with other married couple or a lone mother. Additionally, the effect of the three socioeconomic status variables almost does not change with the addition of the three new parental involvement variables, which on the contrary are found to have mostly an independent 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 / 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 on 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 (Gonzalez-DeHass, Willems and Holbein, 2005; Marchant et al., 2001).

Following the same analytical framework, 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 than those living in intact families by 33% and 23% respectively. Testing for whether the family socioeconomic status could mediate the family structure effect, model (5) shows similar findings to that reported for model (2) where such status hardly mediates the effect of family structure with almost no change in the significance or the magnitude of the two previously differentiated family structures. Moreover, such status tends to have the same independent effect on affective outcome via only the family income as that of model (2). Testing further for whether parental involvement can explain the

association between family structure and affective outcome, model (6) shows that parental involvement also has hardly any mediating role with almost no change in the significance or the magnitude of the two previously differentiated family. Additionally, the effect of the three socioeconomic status variables almost does not change with the addition of the three new parental involvement variables, which are found to have the same independent significant impact on affective outcome identified in model (3).

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

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 table (A.5).

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

4.3. Testing for Interactions

Given the absence of an adequate mediating role of the main effects 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, as indicated by equations (6) and (7).

$$\begin{aligned} \ln(\mu(o)_{it}) = & \alpha + \gamma F_{i,t-1} + \sum_K \lambda_K (SEC_{i,t-1} + I_{i,t-1,t-2} + D_{it}) + \sum_M \eta_M^{PI} PI_{mi,t-1} + \\ & \sum_W \delta_W^F (SEC_{i,t-1} + I_{i,t-1,t-2} + D_{it}) + \sum_V \vartheta_V^F PI_{vi,t-1} + \\ & \sum_N \beta_N (X_{i,t-1} + X_{i,t-2}) + \sum_L \zeta_L (S_{i,t-2} + S_{i,t-1,t-2}) + \varepsilon_i \end{aligned} \quad (6)$$

$$\begin{aligned} \ln(\mu(af)_{it} / 1 - \mu(af)_{it}) = & \alpha + \gamma F_{i,t-1} + \sum_K \lambda_K (SEC_{i,t-1} + I_{i,t-1,t-2} + D_{it}) + \sum_M \eta_M^{PI} PI_{mi,t-1} + \\ & \sum_W \delta_W^F (SEC_{i,t-1} + I_{i,t-1,t-2} + D_{it}) + \sum_V \vartheta_V^F PI_{vi,t-1} + \\ & \sum_N \beta_N (X_{i,t-1} + X_{i,t-2}) + \sum_L \zeta_L (S_{i,t-2} + S_{i,t-1,t-2}) + \varepsilon_i \end{aligned} \quad (7)$$

Starting with the *reduced* family structure variable, model (1) introduces the interaction effect of the socioeconomic status mechanism with family structure, showing that even with the inclusion of such interaction there is no mediating role of such status for the effect of family structure on cognitive outcome. Essentially, the average marginal effects in upper part of table (3) shows that adolescent living with other married couple, cohabiting couples and a lone mother are having 4% lower 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 with family structure in model (2), which implies that parental involvement does not have a mediating role for family structure as well.

Examining the *full* family structure variable in model (3) 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 in model (4) for the first two groups.

The same analytical framework examined the effect possible interactions on adolescents' affective outcome. The findings in the lower part of table (3) report the average marginal effects for the highest outcome where the average attitude score is 4 showing that starting with the *reduced* family structure variable, model (1) reveals that 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 and 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 in model (2) plays a partially mediating role in explaining the effect of family structure, where there is no change in the significance or magnitude of those living with other married couple and a lone mother while those living with a lone father have no significantly different though smaller outcome compared those living in intact families.

Table 3: Average Marginal Effects (%)				
Cognitive Outcome				
VARIABLES	Reduced Family Structure		Full Family Structure	
	(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 $d\ln(y)/dx$. (-) means not estimable. n.a means category not available since it is not defined as a structure.

Standard error in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Examining the *full* family structure variable in model (3) 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 compared those living in intact families decreases by 19%, 37%, 41% and 27% respectively. However, the inclusion of the parental involvement interaction effects in model (4) plays a partially mediating role in explaining the effect of family structure, where there is no change in the significance or magnitude of those living with married step couple, other married couple and a lone mother while those living with a lone father have no significantly different though smaller outcome compared those living in intact families. Accordingly, one can again conclude that family structure still has an independent effect on cognitive outcome even after controlling for any possible interaction effects for both the socioeconomic status mechanism and the parental involvement mechanism, confirming the earlier finding that other unobserved family heterogeneities could explain the effect of family structure on adolescents' affective outcome as well.

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, the family structure always has an independent significant effect on such outcome. Third, the socioeconomic status does not mediate the effect of family structure though parental involvement partially mediates such effect. Thus, it could be said that

other unobserved family heterogeneities may explain the significant effect of family structure on affective outcome as well. 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 relationships between family structure and educational outcomes. In light of that, some broad patterns emerge 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; Rodriguez and Arnold, 1998; Wallerstein and Lewis, 2005 among others). The primary exception being that the two mechanisms 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).

The effect of living with a single mother has widely been investigated in the literature. Essentially, the analysis agrees to a great extent with the general effect observed in such

literature. 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 current analysis has distinguished between such effect on both cognitive and affective outcome. To explain, living with a lone mother has an adverse effect on cognitive outcome regardless of the type of occupation the mother has, however, no such conclusive statement could be made for the effect on affective outcome, where in certain occupation such as being a small employers 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 not 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 could 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 (Hetherington and Jodl, 1994; 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 suffer 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; Skevik, 2003). 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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