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Heather Joshi
Elizabeth Cooksey
Georgia Verropoulou

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Heather Joshi
Institute of Education, University of London

Elizabeth Cooksey
The Ohio State University

&

Georgia Verropoulou
University of Piraeus

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Author for Correspondence: **h.joshi @ioe.ac.uk**

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Please contact the Centre for Longitudinal Studies.
tel: +44 (0)20 7612 6875
email: info@cls.ioe.ac.uk

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1. Introduction

In this study we address the important yet controversial questions of whether and how a mother's employment might impact the prospects for her children's development. Does a woman's role as producer conflict with her role as reproducer of 'child quality'? Alternatively, might her economic productivity enhance her child's development? And if there are discernible effects of mothers working on child outcomes, what is it about either maternal employment per se or other aspects of the child's life that might be impacted by their mother working, which serves to improve, or diminish, children's development? These questions are placed against a contextual backdrop of widespread lay concern, at least in English speaking countries, that the combination of maternal employment, and hence non-parental responsibility for increasingly young children, must be at the expense of child welfare and development.

The specific feature of this paper is that we relate not only the existence but also the *quality* of maternal employment at the end of a child's first year of life with children's cognitive and behavioural development as they move through middle childhood and into adolescence. In addition to measures of work hours, we use broadly comparable data from both the United Kingdom and the United States to construct an indicator of the likely complexity and autonomy of the full-time and part-time jobs held by mothers. Our analyses control simultaneously for a mother's own ability and educational record as these factors tend to confound the association between maternal employment and child outcomes. We take this approach because the empirical literature provides little evidence of systematic or substantially negative outcomes for children when their mothers work (see for example, Parcel and Menahan, 1994 and references therein; Cooksey, Menaghan and Jekielek, 1997; Joshi and Verropoulou, 2000; Waldfogel et al, 2002; Brooks-Gunn et al., 2002; Ruhm, 2008; Belsky et al., 2007). Instead, findings tend to be mixed: When statistically significant associations between maternal employment and child outcomes have been obtained, these have been positive as well as negative depending on the outcome measured and the data used, although full-time employment in the child's first year of life seems the most likely candidate to be associated with negative outcomes, particularly when confounders are controlled (Han et al., 2001; Brooks-Gunn et al., 2002; Baum, 2003; James-Burdumy, 2005,Gregg ,Washbrook, Propper and Burgess 2005).

Additionally, Ermisch and Francesconi, (2002) point to full-time rather than part-time maternal employment "within the preschool period" as having negative long-term consequences for young adults' educational attainment. A similar negative association was found at around age 18 for children born in the 1970 British Birth Cohort (Verropoulou and Joshi, 2000). Ruhm (2008) and Morrill (2009) also find negative outcomes of maternal employment on child health in the US -- in the latter case looking at contemporaneous employment and allowing for its endogeneity.

Despite no general confirmation of a strong or consistent negative impact of maternal employment on children, however, the prevailing common wisdom is that maternal

employment when children are young is deleterious for their development. Ermisch and Francesconi (2005) suggest that this lack of statistical confirmation is due to inadequate data and insufficiently sophisticated econometrics to disentangle positive from negative effects and those of confounders. Other possible interpretations could be that children are more resilient than they are given credit for, or that on balance, they may actually benefit from the economic and psychological gains mothers draw from employment. It is also necessary to consider (1) the adequacy of alternative care arrangements as the link between high quality child care in the pre-school years and good child outcomes at later ages is a consistent one (Layard and Dunn, 2009), and (2) adaptations made by mothers to render their employment and their maternal responsibilities compatible. Both of these latter factors depend on the family-friendliness of the labour market and social policy, as well as the mother's capacity to take advantage of these institutions to facilitate her 'combination strategy' (Bernhardt 2000): employment *combined* with motherhood rather than conflicting with it.

In this paper we examine whether various indicators of child cognition and behavioural development in later childhood and early adolescence, might be associated with: (1) hours of paid maternal work, and (indirectly) mother's access to maternity leave; (2) the kinds of working conditions that mothers are likely to experience in the jobs they hold when they have small children; and (3) a broad indicator of the types of non-maternal care the children encounter during their early years. Because we use comparative longitudinal panel study data from both Great Britain and the United States, we also address whether our findings hold across two countries with similar levels of economic development but different historical and contemporary patterns of and provisions for maternal employment.

Both the UK and the US have witnessed a substantial increase in the labour force participation of mothers with young children in recent decades but the institutional context does differ. In the United Kingdom a growing proportion of mothers have been covered by maternity leave and matenity pay across the 1980s and 1990s An increasing proportion of mothers return to the labour market during the first year of a child's life, likely to be after 4-6 months of leave. In contrast, even after the introduction of more formalized family leave legislation in the United States in1993, American mothers employed during the child's first year are often likely to have started back to work within 1-2 months of giving birth. Additionally, although by international standards both countries have high rates of unpartnered teenage motherhood, the benefit regimes they encounter reinforce early labour market entry for single mothers in the United States, while in the United Kingdom the income support system has hitherto reflected a normative expectation that mothers should stay at home with their babies.

In our recent study (Cooksey, Joshi and Verropoulou, 2009) we focused on whether or not mothers were employed (full- or part-time) during the first year of their child's life.. Our results lent only very limited support to a negative effect of mother's employment during infancy *per se* on later child well-being in either the United Kingdom or the United States as we found only one significant negative estimate (for reading comprehension) in the US and no negative associations in the British data collected in 2004. Earlier studies had found small significant negative effects in

British data on mid-childhood collected in the 1990s (Verropoulou and Joshi, 2009, Gregg et al 2005) following births mainly in the 1980s and early 1990s respectively.

2. Research Questions

This paper builds on our earlier comparative study using the BCS70 and the NLSY79 by bringing in information on occupational complexity and childcare arrangements. Our measure of occupational complexity is based on the type of occupation that mothers held during the latter part of their child's first year of life: Are their jobs boring and routinized or do they provide a degree of stimulation and autonomy? The complexity score is highly correlated with the social and economic status of the occupational codes on which it is based. The theoretical rationale for looking at the (likely) complexity of a job, stems from the personality and social structure frameworks developed by Melvin Kohn and his colleagues (Kohn, 1977; Kohn and Schooler, 1982; Miller et al., 1979), and incorporated into earlier work linking parental employment and child development by Menaghan and Parcel (for example, Menaghan, 1991; Parcel and Menaghan, 1994a, 1994b). The argument made is that parental working conditions influence child-rearing values. If parents are rewarded for certain styles of behaviour in their work, then they may encourage those same styles of behaviour in their children. Parents in occupations with high complexity where they have opportunities for self-direction and autonomy are less likely to emphasize direct parental control (Schooler, 1987), are less restrictive and show a greater warmth in their interactions with their children (Luster, Rhoads and Haas, 1989). This type of parenting has been shown to be positively associated with child cognition and negatively associated with behavioural problems. In contrast, parents whose work is highly routinized, requires few skills, is heavily supervised and where the incumbent takes orders rather than initiative, lack opportunities for self-direction and autonomy that are viewed as critical influences for positive child development.

Parcel and Menaghan hypothesised that the nature of employment might impact parenting skills and behaviors more fully than employment per se. Holding many other factors constant (for example, parental wages and education, plus pre-parental measures of maternal ability and locus of control) they found that children of working mothers did better in terms of both cognitive and behavioural scores if their mothers held jobs of high occupational complexity, and that the 'less benign implications of maternal employment were confined to those in more routine, monotonous labor at low wages'. The interpretation of positive benefit might account for the finding by Verropoulou and Joshi (2009) using British data collected in 1991 that the negative impact of maternal employment in the child's first year on child cognition was confined to the least educated mothers, as their analyses did not contain any information relating to occupational type.

These results suggest a line of investigation worth following. We add information on the complexity of occupations held in the child's first year of life to a model which includes employment at that time along with controls for the mother's prior earning power in terms of her educational attainment and her own cognitive ability. We

cannot include wages at the time of the employment as Parcel and Menaghan did because the necessary details are not recorded in the BCS70, although they do exist in the NLSY79. This means that, in the interests of international comparability, our indicator of occupational complexity is likely to pick up financial as well as psychological rewards of paid work, and in any case we are interested in any overall impact of mothers' employment, without netting out its effect via the income it brings in..

We also investigate whether any negative or positive associations between maternal employment and child outcomes are mediated (or emerge) when account is taken of the child-care arrangements likely to have been in place during the child's early years. Again we face some data limitations as the BCS70 only reveals which types of non-maternal childcare were used in the child's pre-school years as a whole rather than more precisely at the time of the employment spell under consideration. Child care information in the NLSY79 is a little more specific but still only pertains to various care arrangements that were used during the child's first (or second or third) year of life). However, it is possible to detect use of multiple types of formal and informal arrangements that were ever used in the first 5 years of the child's life There has been no attempt to model these crude childcare variables as the outcome of unobserved factors affecting child outcomes.

3. Methods

This is an exercise in international comparison of similar, but not identical, second-generation supplements to two large-scale, long-term, multi-purpose cohort studies that we describe in more detail below. Among their common features is that both the BCS70 and the NLSY79 contain data on more than one child for some mothers, giving each dataset a hierarchical structure. In our analyses we include variables that reflect characteristics of both the child and the mother and our data are therefore structured in a two-level hierarchy where children represent the first level and mothers represent the second. Our methods need to take into account the nested structure of the data otherwise standard errors will be underestimated, and the significance of independent variables overestimated. We therefore use a multi-level modeling procedure (Goldstein, 1995), which enables one to take into account the correlations between the various outcome variables within a family hence allowing for more accurate inferences. Put another way, this method acknowledges that the cognitive and behavioural development of different children within a family may be subject to the same influences. If the correlations between the error terms are significant, one can conclude that the multi-level model provides a better fit than if the estimation procedure assumed independence between siblings. There is more scope to exploit this feature in the US data where the child outcome variables are not age-specific. At this stage we allow separate independent models for each outcome. However, the data are structured in such a way that they could also be subject to multivariate multi-level modeling, allowing for cross-child correlations in the different outcome variables.

The model we apply here is a random intercept model i.e. where families differ in terms of their intercept only and we run separate analyses for each country. Although the datasets have a common structure and many common features, there are sufficient differences in the available variables to deter outright pooling.

If y_{ij} represents the score of the i^{th} child in the j^{th} family, recorded when the child is of school age, then the following equation describes the association of each score with potential explanatory variables:

$$y_{ij} = \beta_0 + \sum E_{ijt}\beta_t + \sum x_{ij} + \sum Z_j\delta + u_{0j} + e_{0ij}$$

β_0 is the average intercept for all families

E_{ijt} is a vector of variables recording the child's exposure to maternal employment at time *t* in the preschool ages, here in the first year of the child's life, and β_t is a parameter reflecting the impact of maternal employment at age *t* on outcome y_{ij}.

x_{ij} are other predictors of the Y outcomes pertaining to the i^{th} child in the j^{th} family, directly and independently influencing the outcome, or confounders indirectly influencing both employment as well as the outcome.

Z_j are other contextual predictors of the y_{ij} outcome pertaining to family *j,* directly and independently influencing the outcome, or confounders indirectly influencing both employment as well as the outcome.

For each outcome y_{ij} the model contains two random effects: u_{0j} and e_{0ij}*;* each of these indicates a different source of unexplained variation. The random intercept u_{0j} indicates unexplained differences between families in the average y_{ij} values (controlling for the effects of x_{ij} and Z_j*)*. The random residual e_{0ij}, indicates unexplained variation among the individual children within families.

Linear multilevel models are mixed, containing both fixed and random effects. The current models were fitted via maximum restricted likelihood (REML) using STATA 10.0. Fixed effects are analogous to standard regression coefficients and are estimated directly. Random effects are not directly estimated but are summarized according to their estimated variances and covariances. The error distribution of the linear mixed model is assumed to be Gaussian.

4. Data

Our data are taken from the second generation of two cohort studies: the British Birth Cohort Study of 1970 (BCS70) and the American 1979 National Longitudinal Study of Youth (NLSY79). The BCS70 provides data back to birth for the mothers, and to their early teen years for the NLSY79, supplying us with an array of controls for confounding variables (such as mother's education, ability, and family history) likely to affect whether or not she enters the labour market during the early years of her child(ren)'s life. Both data sources also include reasonably comparable information

on maternal, child and family characteristics which may mediate or compensate for maternal employment, such as indicators of family income, child care, family structure, number of siblings, maternal health and child health.

The BCS70 is a longitudinal study whose subjects are all persons living in Great Britain who were born in a week of April, 1970, originally 17,198 babies. The data we use in our analyses are taken from wave 6 of the survey which was carried out over 2004-2005 when the respondents were ages 34-35. For a one in two sample of BCS70 cohort members, information was also gathered about all natural and adopted children currently living with them. A total of 2,846 parents participated in this Parent and Child Interview and gave information on 5,207 children (Simmonds et al., 2007). To complement the US dataset, we use information from mothers only. Our analysis sample consists of 1,227 mothers of 2,064 children ages 4-16 after excluding cases with missing data

The NLSY79 is also a longitudinal study. Over 12,000 respondents were first interviewed in 1979 when they were aged 14-22. These American respondents are therefore 5 to 13 years older than their BCS70 counterparts who would have turned 9 years old in 1979. Our analyses are therefore confined to women who were under 18 in 1979. NLSY79 respondents have been re-interviewed annually through 1994 and biennially since. By 2006 more than 80 percent of those eligible for interview were still being followed. Beginning in 1986, in-depth information was collected on and from all children born to NLSY79 women including various age-appropriate batteries of cognitive and developmental testing, and detailed questions concerning behavioural problems that can be matched to similar information gleaned from the children of the BCS70. The children of the NLSY79 have also been followed biennially with exceedingly high retention rates and so we are able to use data on child outcomes from various survey points. The US sample consists of 1,413 children born to 840 mothers.

The second generation sample design does not generate a random sample of children. They all have mothers born in a specific week (UK) or within a small span of years (US), and they have to be old enough to provide evidence of their developmental scores. This means that the older children of younger mothers are over-represented, particularly in the BCS70 sample where the mothers are all 34 years old at interview, and their children must have been born before they were 30 to qualify for the sample, (or age 34 in the NLSY79). Any child assessed as a teenager in the BCS70 sample must therefore have been born to a mother who was 21 or younger. As mother's age is systematically associated with many other social, economic, psychological and biological factors, we need to remember that our conclusions may not be generalizable to children of other ages or children born to older mothers, or indeed to other cohorts. Nevertheless we do attempt to control for socio-demographic differences within our samples, and the second generation sample design does have advantages over cross-sectional samples by permitting inter-generational comparisons over a longer time span.

5. Measures

5.1 Cognitive and Behavioural Outcomes

We assess child outcomes in various cognitive and behavioural dimensions. Both the BCS70 and the NLSY79 include measures of reading and Maths. In the BCS70, children aged 4-5 and 6-16 are assessed using age appropriate versions of the British Ability Scales (Elliott, 1996, Hill, 2005) for naming vocabulary (ages 4 and 5) reading recognition (age 6+) and Maths proficiency. The children of the NLSY79 are assessed at ages 5-14 using three subtests of the Peabody Individual Achievement Test (PIAT): mathematics, reading recognition and reading comprehension (CHRR, 2006).

In each country, mothers were asked to report on their children's behavioural adjustment, using Goodman's Strengths and Difficulties Questionnaire (SDQ) (Goodman, 2001) in the United Kingdom, and the Behaviour Problems Index or BPI (Peterson and Zill, 1986) in the United States. Although the two behavioural indices differ, evidence suggests that they are comparable. Many items in the BPI are derived from the Achenbach Behaviour Problems Checklist (Achenbach and Edelbrock, 1981) and research undertaken by Goodman and Scott (1999) showed that scores from the SDQ and the Achenbach's Behaviour Checklist were highly correlated. Both data sets include similar, though not identical, scales that measure externalised and internalised behaviour. The former includes aggression, disobedience, restlessness and impulsivity. Children with internalized problems are described as often tearful, fearful, anxious or unhappy. For the NLSY79 we used an existing pair of variables summarizing externalised and internalised behaviour (CHRR 2006). For the BCS70 we took the conduct problems and hyperactivity/ inattention subscales of the SDQ to reflect externalised behaviour, and the emotional problems and peer relations subscales to reflect internalized behaviour. Each behavioural score is inverted so that all of our child development indicators move in a favourable direction as they increase.

We internally standardise each score for age by including age and age squared in our regressions. We follow the recommendation of Wiggins and Wale (1996) in this practice rather than use national age norms, since our samples have atypically young mothers. In order to facilitate comparison across instruments and countries we convert each child's developmental assessments into a percentage fraction of the highest score it would be possible to achieve on that particular test.

Table 1 presents descriptive statistics on our outcome measures. The mean for most of the U.S. cognitive scores is around 50 percent although American children scored less well on average on reading comprehension – a measure for which there is no exact parallel in the BCS70. The mean cognitive scores for the British children are higher than those of the American children, especially the mean "early number concepts" Math test for the relatively small group of British four and five year olds. Similar differences in reading and mathematics test scores for children ages 5-9 in the UK and the US were also noted by Robert Michael (2003) when he compared

children of the NLSY79 in 1992 with children of the 1958 NCDS in 1991. No differences were found by 10-14 years. Michael suggests that this pattern of a difference at younger ages only is likely due to an earlier age of entry into formal schooling into Britain (5 rather than 6). The different ages of school entry in the two countries would help to explain our findings too. In contrast to most of the cognitive scores being in the middle of the range, behaviour scores are on average closer to 100% than 50%, as most mothers report few, if any, behaviour problems for their children. Fewer internalizing behaviours are reported than externalizing behaviours, and British mothers appear more likely to report behaviour problems on average than are their American counterparts.

5.2 Maternal Employment

In this paper we focus on maternal employment during the last quarter of a child's first year of life. Although the model could cover employment at other stages of the pre-school years, previous work by ourselves and others suggests that the first year is key. The last 3 months of the child's first year is also the most suitable window to compare American and British mothers in view of differences in maternity leave in the two countries, and inconsistencies in reports of leave and employment in the early months post-birth in the BCS70. For those entitled to maternity leave from an existing job, this timing of their employment is likely to reflect the provisions of maternity leave which vary from woman to woman, employer to employer and, of course, from country to country., Widespread maternity leave is a much more recent and limited phenomenon in the United States. NLSY79 mothers would have had less opportunity for a job-protected break of any extended length after childbirth. Sixty-four percent of children in our NLSY79 sample had mothers who reported employment at any time during the first year of their lives 55 percent during their first six months. By the last quarter, (ages 9-11 months), 57 percent had mothers who were employed, as had 65 percent of the BCS70 children. For reasons given below we are not sure about the early months of the British children's lives.

Ideally, we would like to distinguish the precise age of each infant at their mother's return, or entry, to paid work. This is possible to compute from the NLSY79 data, but the BCS70 employment histories rely on retrospective reports which do not reliably distinguish spells of maternity leave from spells of employment (Cooksey et al 2009).We assume that spells of 'employment' which appear to be continuous during the first year of a child's life were almost certainly punctuated by maternity leave whose exact dates may not be known We further assume that any BCS mother who appeared to be employed in the last quarter of her child's first year (months 9-11) was almost certainly actually working in that period , since the statutory entitlement to maternity leave lasted to the 7^{th} month. Any BCS70 mother not apparently employed in the last quarter is unlikely to have been in employment at any point in the year. The more detailed American work histories show that 83 percent of mothers who reported working full-time in the last quarter of a child's first year had been working since the first or second quarter, as were 68 percent of those who worked only part-time.

Along with maternity leave, part-time rather than full-time work is another way in which motherhood and paid work may be rendered more compatible. We distinguish two categories of employment status in months 9-11 post birth according to whether any work reported during that period is more than 30 hours per week or only part-time. Forty-three percent of children in our American sample had mothers who reported full-time work, 14 percent were employed only part-time, and 44% reported no employment in those months. Among the British sample, 29% had mothers with full-time jobs in the relevant 3 months, 36% had held jobs which were part-time, and 35% reported no employment. Thus although more mothers reported working 9-11 months post-birth in the UK than in the US, approximately three quarters of employed American mothers were working full-time compared with less than half of employed British mothers. Descriptive statistics on maternal employment and all other explanatory variables are presented in Table 2.

Information on the type of jobs held is also available in both data sets: In the NLSY79 these are the 1970 3-digit US Census occupational codes and the BCS70 gives 3-digit occupation codes under the British Soc 90 scheme. We know of no other work that has attempted to match the occupations in one data set to those in the other and so we used our own expertise regarding the nature of the work done in various occupations in the two countries to match the BCS70 titles in our British sample to the 1970 US Census codes. Most, for example, architect, librarian or midwife, were straightforward. Others required input from colleagues with additional expertise. We then assigned an occupational complexity code to each occupation given in the two data sets using the same scores as Parcel and Menaghan (1994). Occupational complexity is a 19-item based scale with an alpha of 0.94 that is derived from data in the U.S. *Dictionary of Occupational Titles* (DOT) (see Parcel, 1989; Parcel and Menaghan, 1994). Items include complexity of working for people and with data; measures of education and training levels required to perform the work; and direction, control and planning of activities. In our NLSY79 sample, raw occupational complexity scores range from -20.98 up through 28.12 and the corresponding range in the BCS70 is -21.79 to 25.78. The lowest occupational complexity scores are assigned to occupations such as maid or cleaner and the highest to architects, lawyers and physicians. Examples of occupations around zero are dental lab technician, vehicle dispatcher and teacher aides.

In our BCS70 sample the mean complexity scores for mothers who worked fulltime and part-time were 2.4 and -2.0 respectively. The corresponding scores for our NLSY79 sample were -0.39 and -0.12. It is not surprising that the occupations of youngish women have relatively low complexity scores in both countries. The lower score for British part-timers is consistent with the general picture of mothers' part-time jobs being concentrated in the feminized and routinized end of the labour market). The lower mean score for US full time workers when compared with UK full time workers no doubt reflects the fact that so many more employed mothers are working full time, and among relatively young and uneducated mothers who have little choice but to work, their employment is often low paying and low skilled.

In our analyses, we shifted our scales by +26 so that all occupational scores were above zero. Women with no employment were then coded as zero.

5.3 Child Care

We created a set of variables to capture the varied child care arrangements that both British and American children might have experienced in the first 5 years of their lives. Because children may have been in different kinds of child care settings at different ages (or times of the day) prior to entering kindergarten, each child care dummy is coded 1 if the child had any experience of that type of care in their first 5 years and zero otherwise. We operationalize 6 different types of child care ranging from: care-giving by the child's other parent/stepparent (only in the US data); grandparents; day care centre/day nursery; childminders including nannies and au pairs; early education facilities such as nursery school, preschool or Headstart program; and other informal arrangements such as being looked after by other relatives or neighbours.

Over the whole pre-school period from birth through age 4, very few children had no encounter with a carer other than their parents (mother in the US): 7 percent had no non-parental care in the British sample, 13 percent had no non-maternal care in the US sample. A very substantial majority (79% in UK, 72% US) had some experience with pre-school education, usually after the age of three, not necessarily associated with mother's employment, and not necessarily offered for very long hours. The various types of other formal care, which may have started at earlier ages are somewhat more frequent in the US sample. A high proportion of children, around a third in the UK but only a fifth in the US had been cared for by their grandparents at some stage of their pre-school lives.

Proportions with no childcare arrangements are much higher among non-employed (23% in NLSY and 13% in BCS70) compared to working mothers (6% and 4%, respectively). By contrast, in both countries, proportions that have attended pre-school education are very similar across employment statuses. In Britain, high proportions of parents among non-employed (20%) but also among working mothers (40%) use grandparent's help as part of their arrangements. In the US the corresponding proportions are lower (11% and 29%, respectively, perhaps because grandparents are more likely to live further away or to be working themselves, and American mothers opt for day care centers and childminders in equally high proportions.

5.4 Additional control variables

We also show in Table 2 a range of variables to control for moderating, or confounding, factors which might affect the interpretation of the outcome variables, or whose omission may bias the measurement of a link between maternal employment and child outcomes. In order to detect the full extent of any 'impact'', we deliberately do not include (or 'net out)' variables which might mediate such a relationship, for example, the level of family income to which the mother's employment would contribute, or, initially, the nature of child care arrangements during the time employment separated the mother from the young child.

The mean age of the children is very similar in both samples (9.5 years in the NLSY79 and 9.2 years in the BCS70) and girls represent slightly less than half of the sample in each country. We also include an indicator of whether the child suffered from any longstanding illness (17% in BCS70 against 13% in NLSY). The relevant questions may not be entirely comparable but, nonetheless, are entered in the models as such conditions may have affected the child's scores. In addition, the variables correlate only weakly with the mother's employment.

Family demographic variables include birth order and an indicator of the presence of a younger sibling. More siblings may mean competition for parents' attention while the presence of younger siblings in the household may result in the mother staying at home. Thirty-three percent of American children were first born compared to 58 percent of British children. Regarding family living arrangements at the time of the child assessments, about two thirds of children were living with both biological parents (intact families) in both countries while 27% in the US lived in a lone mother household compared to 19% in the UK. Finally, 7% of US children lived with a stepfather while the respective figure for the UK is double that. For children in intact families we can assume that their father was present during the first year of their lives; for other living arrangements, however, it is not possible to make this assumption.

Given national patterns of participation rates within welfare systems, it is less likely that single mothers with infants in the United Kingdom would have been employed than mothers in two parent families, whereas in the United States the pattern would be the reverse. Another control introduced in the models for the US is race; such a control was not necessary for the British models as proportions of mothers in minority ethnic groups are very small.

The paradox confronting the hypothesis that maternal employment harms children is that the simple correlation of child outcomes and maternal employment in many data sets (including these) displays a positive association between child development and mother's work. This paradox arises because other factors, such as a mother's ability or competence are positively associated with both the child outcomes and with maternal employment. It is only when the model is adjusted for these types of spurious relationships that the ' *true'* relationship between child outcome and maternal employment emerges as the effect on the child of a mother of given ability taking paid work. One approach is to take pairs of siblings (Ermisch and Francesconi, 2002). However, our data sets contain relatively few sibling pairs (especially in the same age band), but do contain direct and prospectively measured indicators of mothers' ability as well as their educational attainments.

Mother's overall cognitive ability is measured in the NLSY79 in 1980 with the Armed Forces Qualifying Test (AFQT) and in the BCS70 using cognitive tests assessed during her childhood. In order to match the data as closely as possible across the two countries, we constructed a general ability score from a set of tests administered at age 10 in the BCS70 using factor analysis. These include a test in Maths (Friendly Maths Test - FMT) one in reading (Shortened Edinburgh Reading Test – ERT) and

four British Abilities Scales (BAS) tests, two verbal and two non-verbal, which are akin to IQ tests (Elliot et al, 1978). Scores from both countries were then standardized by dividing through by their own standard deviations. The AFQT score ranges from 0 to 3.5, has a mean value of 1.5, and is somewhat lower among non-employed than employed mothers (1.3 vs.1.7) The general ability score for British mothers ranges from -2.59 to 2.38 and has a mean of -0.03. Again non-employed mothers score lower than employed mothers (-0.23 vs. 0.08).

Mother's educational attainment at the time of their children assessment is also included in the analysis. We classify American mothers into four groups where nearly half have attended at least some college and one fifth has graduated. Although both samples contain a high proportion of mothers who had their first child when under 21 (a measure that we include to allow for antecedent and consequent disadvantages that may attach to very early motherhood), the BCS70 sample appears less well educated. Only one third of these British mothers have qualifications to A level or more, and very few have any tertiary qualifications. The lowest educational category of below O level (29% in BCS70) is nearly twice as big as the 'below High School' group in NLSY79 (17%), and it might be argued that the UK 'O level' group was also not as well qualified as the US 'High School'. So the BCS70 sample comprise distinctly low attainers, although reassuringly a little better qualified than the equivalent group of 33 year old mothers in corresponding analyses of the NCDS (Verropoulou and Joshi 2009). We also note, however, that the American educational system is more flexible than the British system in allowing people of all ages to return to school and gain an educational qualification equivalent to a High School Diploma, and to then take college classes at a variety of schools and slowly build college credits towards a degree. It is therefore likely that more of our American mothers have achieved formal educational qualifications in recent years than their British counterparts.

6. Results

Tables 3, 4 and 5 present results from both countries of our baseline models for Math, literacy and child behaviour, respectively. Each includes estimates of the impact of full and part-time maternal employment when each child was 9-11 months old, and controls for child and mother-specific factors, but no information on occupational complexity or child care arrangements. We present separate models for children 4-5 and 6-16 years old for the cognitive measures in the BCS70, and two literacy assessments (reading comprehension and reading recognition) for children ages 5-14 in NLSY79. Behavioural outcomes are for children ages 4-16 in the UK and ages 4-14 in the US. These results replicate those of Cooksey et al. (2009) with slightly amended sample sizes due to missing data on occupational complexity and child care that we include in later models.

6.1 Maternal employment

The main findings, as far as a relationship of child outcomes with mother's employment are concerned, remain. In the British sample of children assessed in 2004, no significant estimate emerged from either full or part-time employment on

any of the six outcomes investigated. Of the ten estimates on five outcomes analysed in NLSY79, there is one with a significant (at the 5% level) negative association. Reading Comprehension at ages 4-14 is 1.6 percentage points of the maximum possible score lower for children whose mothers had full-time employment during the last months of the child's first year than for children whose mothers were not employed. There is also one similarly significant *positive* estimate in the NLSY79 results: Freedom from internalized behaviour problems is 1.6 points more likely among children whose mothers worked full-time than among children whose mothers did not work in the last quarter of infancy. For Math in the US sample there was also a borderline (10% significance) negative coefficient for full-time work, but there was also a similarly borderline significant positive estimate in the UK for Math among children ages 4-5. Otherwise, estimates were small, of mixed sign and poorly determined and lend very little support to the idea that maternal employment is deleterious to children. We suggest that the lack of any negative estimates in the UK sample was consistent with improvement of conditions and options for employment after maternity leave compared with earlier periods in Britain, as well as with the USA.

6.2 Other variables

Of the other child level variables, age has significant associations with most outcomes in both studies, except where the there is only a two year age span covered. In most cases the slope of curve diminishes with age, maxima and minimum are beyond or close to the range of ages covered. Note that these patterns reflect a cross section over different children of different ages, not longitudinal trajectories. Female gender is strongly related to lack of aggressive behavior, particularly in the British sample, but less to cognitive scores, or to internalized behavior problems. Having a longstanding illness or health problem has a very substantial negative association with most scores. For the NLSY79, being African American is negatively associated with most cognitive outcomes, but is non-significant regarding behavioural scores. Regarding family arrangements, increasing birth order has negative associations with cognitive outcomes in the NLSY79 and with reading and externalized behaviour in BCS70, but having a younger sibling does not seem important. Children living with a step father at the time of the assessment appear to perform significantly worse in most tests compared to children in intact families, both in the US and in the UK, while those living in a lone mother household score significantly worse in aggression and anxiety. On the whole, these coefficients of child-level variables are remarkably similar across countries, although they vary more by outcome.

Turning to controls which are specific to the mother rather than the child, maternal education and especially her general ability are strongly associated with cognitive outcomes. Educational attainment and mother's ability are also positively associated with child behaviour, although not quite as strongly or consistently, especially in the US. These results do suggest, however, that mothers' competence is being captured by these indicators. On the other hand, our indicator of early entry to motherhood -- having had a first child at 20 or under -- does not seem to add significant information

which is not already embodied in the child age terms. It comes nearest to reaching significance with a poorly determined 0.024 in the Externalized Behaviour model for the BCS70.

Overall, apart from a significant association of full-time employment with the child lacking anxiety in the NLSY79, maternal employment seems least associated with behavioural scores. Family structure and long-term health illness, on the other hand, have a more significant association with children's aggressive behaviour and anxiety while mother's educational qualifications and general ability seem least important in that context showing particularly weak associations with internalised behaviour.

6.3 Nature of Employment: Occupational Complexity

We now turn to the question of whether the apparent lack of negative impact on children as expected by the role overload literature might be due to our measurement of employment hiding the heterogeneous nature of jobs, some of which facilitate mothers' adapting to their dual responsibilities and some of which do not. We use the occupational complexity score to proxy this feature. Past research in the US has found that the higher complexity jobs are also more flexible and offer the employee (or the self-employed person) more autonomy and self-esteem which feeds back into positive experiences for their children.

The coefficients we present in Table 6 show maternal employment terms only, although each model also contained all the other background and control variables included in our baseline model. In the top two panels (6a) we present coefficients for full and part-time work, plus occupational complexity for Math and reading in the two countries, and in the bottom panel (6b) coefficients are for externalized and internalized behaviours. Does the complexity of the occupation held by the mother in the last few months of her child's first year of life matter in terms of later child cognitive and behavioural development?

In fact few of the estimates on employment terms in these models reached conventional levels of significance. The only ones with a positive association significant at the five percent level are for complexity and the two Math outcomes in Britain. There is a borderline significant positive estimate for internalized behaviour in the NLSY79, but the remaining complexity coefficients are small and non-significant. The inclusion of occupational complexity reduces the previously well determined negative association of full-time employment with Reading Comprehension in the NLSY79 (Table 4). The now less precise estimate suggests that the original result was associated with more complex (rather than routine) jobs. Apart from this, most of the other estimates suggest the hypothesized beneficial impact of more job autonomy. If the occupation offers greater flexibility, the mothers' employment does tend to be associated with better child outcomes. In some cases it reverses a negative impact of low quality jobs. For example, the net estimate for full-time employment on Math in the British sample aged 5-16 is positive over all occupations except those with a complexity score below -17 (corresponding to textile factory operatives, for example). In the case of BCS Math for children aged 4-5 the net

impact of fulltime employment is positive for all levels of complexity scores, but smaller for the more routine jobs. The very small estimate for part-time jobs is also positive within almost all the range of occupations. The best determined complexity effect in the US estimates, for Internalized behavior, is also positive for full-timers over almost all of the range (above -24) and for part-timers with scores above -4.

In additional analyses in which we interacted complexity scores with the full- or part-time status of the job (not shown), there was one further 'significant' estimate. In the British sample externalized behaviour appears to be worse in children whose mothers worked part-time in jobs with low complexity scores, but the estimated effect reversed for those with a score greater than -1.2 (corresponding to craft occupations, or bank tellers). It is difficult to claim too much for this finding (one in twenty-two possible relationships) which might have arisen by chance. Almost all of the other employment related relationships were extremely poorly determined. In the case of the three (near) significant relationships in the NLSY79, the introduction of complexity scores reduced all estimates to indeterminacy.

To expand our understanding of maternal occupational complexity, we also looked at maternal employment *in the year prior* to when mothers gave birth. Although only approximately four percent of mothers in both countries reported working in the last quarter of their child's first year but not at all in the year prior to the birth, approximately 22 percent did work in the year prior to the birth but then left the labour force for at least a year after their child was born. Twenty six percent of British mothers and 23 percent of American mothers reported no employment in either the year prior to birth or at the end of the child's first year, and just under 50 percent of mothers in both countries reported working at both time points. This latter figures masks considerable cross-country differences in other aspects of employment, however, as it does not mean that occupational complexity is unchanged. For example, although three quarters of the British mothers who held a job at both times remained in the same occupation, in the United States only a little over 50 percent of mothers reported the same occupation in both periods.

For those mothers who did change occupations, we looked to see if their occupational complexity remained at a similar level, or increased/decreased to any appreciable extent as changing jobs could represent a conscious strategy to try and accommodate the dual responsibilities of earning and childrearing. Such a move could also signal difficulties inherent in employment that make the marriage of the two sets of responsibilities a difficult one. In the United States, 18.4 percent of mothers reported a decrease of 10 points or more, whereas 25.8 percent reported an increase of 10 points or more. In the UK the comparable figures were very different: 40.1 percent vs. 9.4 percent. Among British mothers who changed occupations and whose post-birth employment was only part-time, the contrast was even more striking: only 9.1 percent showed a 10 point upgrade vs. 45.6 percent with a 10 point downgrade. These UK findings fit with Dex's work (Dex, 1992) showing an association between taking part-time jobs after childbearing and occupational downgrading. Downgrading was not associated with part-time employment in the US, however. Further work needs to be undertaken to explore these preliminary findings.

6.4 Effects of childcare?

We then ask whether the general lack of association of mother's employment with child outcomes might be due to net positive benefits of childcare. Including the set of childcare variables in models which also included mainly insignificant employment terms did not yield any clear results. Instead, we present estimates of broad brush indicators of childcare used by children up to age 5 from models that include all variables in the baseline model *except* maternal employment (Table 7). Even this device to give non-maternal care the 'best chance' to reveal associations with child outcomes produces few well determined estimates, however. Day care is significantly positively associated with Math scores for the younger British children, who 'gain' scores 3 percentage points of the maximum higher than those who attended no other care. The Math score of those aged 6-16 in BCS70 is associated with having attended early education with a gain of 1.5 points. The Vocabulary at 4-5 of the British Children is positively associated with having being cared for by a grandparent, childminder or other non-group arrangement, resembling the finding of Hansen and Hawkes (2009) who used data from the British Millennium Cohort. No childcare coefficients relating to child cognition reach statistical significance at the 5% level for American children. There are significant negative estimates for group daycare (nursery) in both countries on externalized/aggressive behaviour, however. British children showed 2.8 percentage points more externalized behaviour problems if they had ever attended group childcare, and American children 2.9 points. The closeness of these estimates may be a coincidence but the direction of the finding also corresponds with US findings from the National Institute of Child Health and Human Development Study of Early Child Care and Youth Development (Belsky et al, 2007) and reported on by Belsky (2001) in other US data.

Note that these childcare outcomes are not associated with maternal employment, and not all children who attend the day care settings had mothers who were employed in the first year. Of the children in day care settings in the NLSY79 78% had employed mothers in the months we study. The relevant proportion for BCS70 is 82%. Hence the adverse association is with that type of childcare arrangement not with employment. We have no evidence to say in which direction the causation lies. Children may learn aggressive behaviour in non-educational group settings. On the other hand, children who are more aggressive when assessed may already have had such characteristics in their early years which might have affected the type of setting they attended. Another similarity with the analysis of the Millennium Cohort Study is the apparent lack of impact of early education for most outcomes which may well be due to a lack of variance in the measure: it is difficult to detect effects when the vast majority of children attend early education facilities prior to kindergarten, regardless of maternal employment patterns. Another general remark about the childcare indicators used here is that they lack information on the quality of the setting, or the exact times they were attended.

6.5 The unexplained part of the model

We now turn to a summary of how much of the random variation in the original data remains unexplained by the models we have fitted. In Table 8 we compare random effects between the "null" model (which controls only for child age and age squared) and the "full" model which includes both employment dummies and the complexity score. Had complexity been excluded, the estimates of the random part of the "full" model would have been only minutely different.

Variance at mother level for the NLSY79 indicates that variability between families is significant for all child scores; this also holds for BCS70 with the exception of math scores at age 4-5. In contrast, variability between children is insignificant for the NLSY79 while it is important only for Reading 6-16 scores and Externalised behaviour in BCS70. The reduction of variance between the null and the full models is more noticeable at the mother rather that the child level; hence, the additional variables included in the "full" model contribute towards explaining variability more between mothers than between children. This accounting for variability in the NLSY79 is more marked for cognitive scores. For BCS70 again it is more substantial for the cognitive scores of younger children (ages 4-5) and for externalized behaviour.

The coefficients showing the intra-level 2 unit correlation, i.e. whether scores are correlated between children within families, indicate that there is a high degree of association for reading recognition (0.355) and internalized behaviour (0.412) in NLSY and for reading scores of younger (0.364) and older children (0.328) in BCS70.

7. Conclusions

In this paper we ask if early maternal employment impinges on the cognitive and behavioural development of school aged children. We also investigate three ways in which maternal employment and childrearing may be combined which might impact associations between employment and child outcomes: the limitation of work to part-time hours; the nature of the mother's work which is hypothesized to affect maternal stress and hence parenting style, and lastly the arrangements for non-maternal care of the child.

In answer to the first question, we continue to find very little evidence from either Britain or the United States of a negative effect of maternal employment on child development. The findings for British children, assessed in 2004 and born mainly during the 1990s, should be read with an understanding of two features of British employment context which facilitated an adaptation to 'working motherhood' in Britain: a widening and deepening of maternity leave so that mothers and infants were not usually separated during the first 4-6 months of infancy; and the availability of part-time jobs for mothers resuming employment after childbirth. Our research using British data collected a decade earlier (Verropoulou and Joshi 2009) suggested more of an adverse effect on the child's language if mothers had been working in the child's first year, than we found in the present study. This could reflect harsher employment choices facing women who had their children in the 1970s and 1980s.

Our findings here for the American sample of children, assessed in 2000 and born up to the mid 1990s look more like our findings for our British sample in 1991 than those assessed in 2004 in BCS70. In both the NLSY79 reported here and the NCDS results for 1991, there is only one significant negative estimate among a number (5) of outcomes. As with our earlier NCDS findings, the NLSY79 result is related to literacy (reading comprehension) and as we show here, it is related to full-time maternal employment. This suggests that the shorter and less generous arrangements for maternity leave that exist in the US may be contributing some difficulties to child-rearing. However our estimates fail to suggest that any 'effect' is very great. Instead, they illustrate that the association of maternal employment with different aspects of children's progress are diverse and mixed, as found elsewhere in the literature.

One comment on our 'failure' to find well-determined estimates of maternal employment 'effects' could be that the sample sizes are not big enough and hence do not have enough power to detect relationships that really exist. However a similar analysis of vocabulary, school readiness and behaviour problems in another UK dataset (3 year olds in the Millennium Cohort, assessed in 2004) also found little by way of a systematic negative relationship with maternal employment in the first year using a sample of around 5000 cases (Hansen, Hawkes and Joshi 2009) – a finding which serves to reinforce our conclusion of 'little harm detected'.

Rather than rest our contribution here, we investigated the hypothesis that some jobs may be easier to combine with motherhood than others – if the mother has more autonomy at her workplace, the child may draw the benefit of a less stressed parenting style. We do not, however, find any compelling evidence for this idea in either of the datasets. There is some very weak suggestion that the more complex/autonomous jobs tend to be associated with improved outcomes for children, but this does not apply to children's reading comprehension scores in the United States.

Our evidence on childcare is even less conclusive because we are unable to match childcare arrangements to the spell of employment of interest, but again we find very few significant estimates. The one exception is a curious negative term linking attending a day care centre with aggressive behaviour, although centre attendance is not necessarily linked to maternal employment per se. It could reflect particularly disruptive children being sent to this type of care even when their mothers are not working.

This speculation illustrates one of the limitations of the methodology of our secondary analysis of observational studies. Even though we are able to rule out reverse causation by comparing outcomes at school ages with mother's behaviour earlier in the child's life, and we have evidence from even earlier in the mother's life on what are often unobservable attributes in other studies, we are hesitant to claim that significant coefficients reflect causal effects - or that the absence of significant associations proves that there is no effect on child outcomes. We have no evidence on the role of child agency in reaching these scores. Indeed the very language of 'outcome' implies a model where children are passive recipients of inputs from their

parents, which is at best a simplification. Mothers also adapt their employment behavior to accommodate their parental roles, and the result of these family processes does not seem to provide clear evidence of the one-way relationship about which there is so much concern.

Another qualification to make is that our present cross-national study does not have much evidence on the development of older children or their transition to adulthood. The richer data of the NLSY79 would permit such follow-up, as well as tracking the progress of individual children through childhood.

The strategy of comparing two longitudinal datasets has had the benefit of augmenting the evidence available on each country and providing a truly exogenous contrast in maternal employment regimes, but it has come at a cost. The datasets were not designed at the outset to be compared, and it has been necessary to discard information which could not be made at least roughly comparable. The rough comparability is not always perfect, for example, the measurement of education. Nevertheless, in putting this evidence together we have learned a lot about the two countries, and trust that our explorations also throw light on the combination of childrearing and employment in other contexts and on the potential and pitfalls of multi-purpose cohort studies.

Table 1: Descriptive statistics of dependent variables used in the analysis, BCS70 and NLSY79

	BCS70		NLSY79	
Outcome	**Mean (std dev)**	**N**	**Mean (std dev)**	**N**
Math Ability Score				
Child aged 4 to 5	0.759 (0.098)	368		
Child aged 6 to 16	0.526 (0.155)	1,521		
Math Score			0.482 (0.196)	1,220
Reading Ability Score				
Child aged 4 to 5	0.647 (0.081)	368		
Child aged 6 to 16	0.609 (0.174)	1,523		
Reading Recognition Score			0.518 (0.218)	1,223
Reading Comprehension Score			0.464 (0.183)	1,218
External behavioural adjustment	0.763 (0.184)	1,889	0.834 (0.155)	1,299
Internal behavioural adjustment	0.845 (0.151)	1,903	0.898 (0.128)	1,327

All dependent variables are expressed as a fraction of the maximum score obtainable in each assessment. Behavioural problems scores are inverted, such that 1= no problems. NLSY79 children range from 4-14.

Table 2: Descriptive Statistics of Explanatory Variables, BCS70 and NLSY79

	BCS70		NLSY79	
Child Level Predictors	Mean	std dev	Mean	std dev
Mother's employment when child 9-11 months				
At least some full-time	0.290		0.431	
Only part-time	0.362		0.134	
No employment	0.348		0.435	
Occupational Complexity Score*	-0.281	11.52	-0.041	11.17
Full-timers (9-11)	2.332	11.43	-0.390	11.01
Part-timers (9-11)	-1.987	11.18	-0.119	11.63
Other child –level Predictors				
Child's age in months	111.13	39.143	114.18	35.420
Child's age in months (div by 100)	138.82	95.440	142.90	80.284
Child's sex: female	0.494		0.486	
Child's Birth Order	1.568	0.783	2.139	1.130
Any younger sibling	0.414		0.542	
Any longstanding illness	0.172		0.132	
Child's race Hispanic	-		0.170	
Table 2 (Contd)	**BCS70**		**NLSY79**	
Black	-		0.270	
Other	-		0.560	
Family status at interview				
Child with both natural parents	0.670		0.623	
Child lives with step-father	0.143		0.106	
Mother currently alone	0.187		0.255	
Other arrangements, mother present	-		0.016	
Child care experience up to age 5 – (not mutually exclusive)				
Early education	0.789		0.720	
Nursery/Day care	0.158		0.209	
Child minder/Nanny	0.107		0.250	
Grandparents	0.326		0.213	
Other informal arrangements	0.084		0.116	
Other parent	-		0.077	
Not any childcare	0.073		0.134	
N (children)	**2,064**		**1,413**	
Family Level Predictors				
Mother's educational attainment				
UK: Low - Less than 'O' Level	0.293			
Mid - 'O' Level	0.378			
High - 'A' Levels or more	0.329			
USA: Below High School			0.166	
High School			0.360	
Some College			0.267	
College Graduate			0.207	
First child born at 20 or earlier	0.214		0.312	
Mother's general ability score at age 10	0.014	0.891		
Score missing	0.258			
Mother's AFQT 'intelligence' score			1.538	1.000
N (mothers)	**1,227**		**840**	

* Complexity score of occupation reported here only for those employed at 9-11 months. It enters regressions as zero for the non employed and as the value reported here plus 26 for those with jobs.

Table 3: Baseline Model for Math Scores BCS70 & NLSY79 (Fixed effects)

	BCS70 4-5 years		BCS70 6-16 years		NLSY 5-14 years	
	b	**z**	**b**	**z**	**b**	**z**
Constant	0.024	0.05	-0.385	-10.01	-0.753	-16.60
Mother's Employment (child 9-11 months)						
(ref: No employment)						
Full-time	0.028	1.88	0.006	0.73	-0.012	-1.70
Part-time	0.015	1.09	0.005	0.75	-0.001	-0.05
Other Child Level Variables						
Age	0.014	0.87	0.012	19.89	0.016	22.70
Age squared	-0.005	-0.36	-0.003	-14.04	-0.005	-16.00
Girl	0.015	1.75	-0.001	-0.24	-0.009	-1.47
Birth order	-0.003	-0.37	-0.004	-1.01	-0.010	-2.54
Any younger siblings	-0.006	-0.22	-0.003	-0.54	-0.004	-0.68
Any illness/limiting condition	-0.024	-2.13	-0.033	-4.71	-0.034	-3.67
Race/ethnicity (ref: white)						
Black					-0.014	-1.36
Hispanic					-0.025	-2.52
Family status at iiiiinterinterview						
(ref: Intact family)						
lone mother	0.003	0.20	0.002	0.31	-0.024	-2.16
step father	-0.006	-0.29	-0.019	-2.43	-0.008	-0.91
other arrangements					0.081	3.11
Family Level Variables						
Mother's educational qualifications (US)						
(ref: less than high school)						
HS Diploma					0.038	3.46
Some college					0.038	3.18
College graduate					0.056	3.77
Mother's educational attainment (GB)						
(ref: Low-less than 'O' level)						
Mid -'O' Levels	0.001	0.11	0.016	2.31		
	-0.019	-1.47	0.011	1.32		
Mother's ability tested at age 10 (GB) or AFQT on entry to study US						
	0.033	5.77	0.015	4.07	0.031	6.08
Ability score missing	0.012	1.26	-0.013	-2.01		
1st birth at 20 or before	0.005	0.26	-0.006	-0.64	-0.007	-0.78
N	368		1519		1219	
Log-restricted likelihood	345.78		1261.89		937.27	

Table 4: Literacy Scores, Baseline Model BCS70 & NLSY79 (Fixed effects)

	BCS70 4-5 years Naming Vocabulary		BCS70 6-16 years Reading Recognition		NLSY 5-14 years Reading Recognition		NLSY 5-14 years Reading Comprehension	
	b	**z**	**b**	**z**	**b**	**z**	**b**	**z**
constant	-0.356	-0.82	-0.359	-8.36	-0.640	-11.68	-0.571	-11.99
Mother's Employment (child 9-11 months)								
(ref: No employment)								
Full-time	0.011	0.88	-0.001	-0.15	0.001	0.07	-0.016	-2.16
Part-time	0.016	1.35	-0.004	-0.52	-0.005	-0.42	0.000	0.01
Other Child Level Variables								
Age	0.028	1.98	0.013	19.16	-0.003	-9.55	0.013	17.26
Age squared	-0.019	-1.64	-0.003	-13.50	0.008	1.05	-0.004	-11.58
Girl	0.008	1.06	0.009	1.61	-0.008	-1.62	0.009	1.38
Birth order	-0.021	-3.43	-0.017	-3.31	0.002	0.31	-0.011	-2.60
Any younger siblings	-0.032	-1.32	-0.001	-0.18	-0.046	-4.07	-0.001	-0.17
Any illness/limiting	-0.008	-0.85	-0.048	-6.03	-0.003	-9.55	-0.018	-1.86
Race/ethnicity (ref white)								
Black					0.018	1.38	-0.001	-0.07
Hispanic					-0.014	-1.11	-0.028	-2.71
					-0.012	-1.07		
Family status at interview (ref: Intact family)								
lone mother	0.000	0.01	-0.008	-0.91	-0.012	-1.07	-0.008	-0.84
step father	-0.015	-0.79	-0.021	-2.30	-0.039	-2.82	-0.039	-3.36
other arrangements					0.055	1.73	0.000	0.00
Mother Level Variables								
Mother's educational qualifications (US) (ref: less than high school)								
HS Diploma					0.026	1.89	0.025	2.24
Some college					0.044	2.96	0.034	2.79
College graduate					0.042	2.27	0.027	1.75
Mother's educational attainment (GB) (ref: Low-less than 'O' level)								
Mid-'O' Levels	0.009	0.86	0.020	2.41				
High≥ A' Levels	0.004	0.40	0.030	3.18				
Mother's ability tested at age 10 (GB)/12-18 USA								
	0.021	4.23	0.024	5.56	0.035	5.38	0.032	5.97
Ability missing	0.008	0.94	-0.012	-1.59				
1st birth ≤ age 20	-0.004	-0.26	-0.006	-0.53	-0.007	-0.55	-0.015	-1.49
N	368		1523		1222		1217	
Log-restricted likelihood	401.05		1080.92		704.67		881.05	

Table 5: BCS70 & NLSY79 Baseline Model for Behavioural Scores (Fixed effects)

	BCS70 4-16 years Externalised		BCS70 4-16 years Internalised		NLSY 4-14 years Externalised		NLSY 4-14 years Internalised	
	b	**z**	**b**	**z**	**b**	**z**	**b**	**z**
constant	0.623	14.73	0.902	26.01	-0.010	-1.24	0.926	26.87
Mother's Employment (child 9-11 months)								
(ref: No employment)								
Full-time	-0.002	-0.16	0.005	0.54	-0.001	-0.11	0.016	2.22
Part-time	0.001	0.14	0.009	1.05	0.005	0.41	0.001	0.12
Other Child Level Variables								
Age	0.001	1.66	0.000	-0.72	0.003	4.16	-0.001	-1.96
Age squared	0.000	-1.2	0.000	0.07	-0.001	-4.30	0.001	3.25
Girl	0.068	8.54	-0.003	-0.49	0.016	2.03	-0.009	-1.52
Birth order	-0.013	-1.96	-0.001	-0.23	-0.001	-0.22	-0.001	-0.24
Any younger	0.002	0.19	-0.007	-0.92	-0.012	-1.38	-0.009	-1.45
Any illness/limiting	-0.054	-5.1	-0.066	-7.50	-0.055	-4.68	-0.046	-5.29
Race/ethnicity (ref white)								
Black					0.001	0.09	0.001	0.06
Hispanic					0.009	0.71	0.001	0.09
Family status at interview								
(ref: Intact family)								
lone mother	-0.062	-5.28	-0.043	-4.42	-0.041	-3.51	-0.038	-4.29
step father	-0.055	-4.27	-0.025	-2.29	-0.029	-1.98	-0.018	-1.60
other					-0.125	-3.51	-0.018	-1.60
Family Level Variables								
Mother's educational qualifications (US) (ref: less than high school)								
HS Diploma					0.025	1.72	0.005	0.45
Some college					0.028	1.77	0.004	0.34
College graduate					0.047	2.45	0.015	1.01
Mother's educational attainment (GB) (ref: Low-less than 'O' level)								
Mid -'O' Levels	0.024	2.23	0.014	1.56				
High – 'A'	0.036	2.96	0.020	1.95				
Mother's ability tested at age 10 (GB) AFQT (US)								
	0.024	4.35	0.015	3.24	0.001	0.15	0.010	1.93
Ability missing	-0.011	-1.10	-0.010	-1.24				
1st birth at 20 or	-0.024	-1.63	0.009	0.72	-0.005	-0.40	0.003	0.28
N	1888		1909		1298		1326	
Log-restricted	575.30		938.41		618.75		1027.1	

Table 6 : Estimated coefficients for employment in child's first year and its occupational Complexity.

a) Cognitive scores (Fixed effects)

	BCS70 4-5 years		BCS70 6-16 years		NLSY79 5-14 years			
	b	**z**	**b**	**z**	**b**	**z**	**b**	**z**
Maths								
Mother's Employment (child 9-								
(ref: No employment)								
Full-time	0.012	0.77	-0.006	-0.75	-0.005	-0.41		
Part-time	0.000	-0.03	-0.005	-0.65	0.006	0.43		
Complexity of occupation, if working	0.001	2.91	0.001	2.95	0.000	-0.67		
Log likelihood	345.7		1253.3		894.6			
Literacy/ Language	**Vocabulary**		**Reading**		**Reading Recognition**		**Reading Comprehension**	
Mother's Employment (child 9-11 months)								
(ref: No employment)								
Full-time	0.012	0.83	-0.005	-0.41	0.004	0.30	-0.007	-0.53
Part-time	0.016	1.27	0.006	0.43	-0.001	-0.05	0.010	0.65
Complexity of occupation, if working	0.000	-0.09	0.000	-0.67	0.000	-0.30	0.000	-0.96
Log likelihood	392.2		1072.3		695.7		871.3	
Other variables and sample size as in Baseline model								

b) Behavioural scores (Fixed effects)

	BCS70 4-16 Externalized		BCS70 4-16 Internalized		NLSY 4-14 Externalized		NLSY 4-14 Internalized	
	b	**z**	**b**	**z**	**b**	**z**	**b**	**z**
Mother's Employment								
(ref: No employment)								
Full-time	-0.011	-0.8	0.001	0.06	-0.016	-1.06	-0.002	-0.14
Part-time	-0.006	-0.52	0.005	0.46	-0.009	-0.50	-0.016	-1.23
Complexity of occupation, if working	0.001	1.42	0.000	1.07	0.001	1.25	0.001	1.91
Log likelihood	568.1		929.3		610.5	1027.2	1027.2	

Table 7 : Estimated coefficients for experience of various childcare modes during child's first five years

a) Cognitive scores (Fixed effects)

Any use of child care mode in child's first five years.	BCS70 4-5 years		BCS70 6-16 years		NLSY 5-14 years			
	b	z	b	z	b	z	b	z
Maths								
Informal	-0.004	-0.30	0.007	0.47	-0.009	-0.89		
Other parent					0.006	0.55		
Grandparent	-0.004	-0.38	-0.002	-0.39				
Childminder etc	0.009	0.71	-0.007	1.17	0.003	0.43		
Daycare/nursery	0.030	2.33	0.013	1.52	0.010	1.27		
Early education	-0.007	-0.49	0.015	2.09	-0.008	-1.13		
Log likelihood	340.8		1250.4		926.3			
Literacy/ Language	**Vocabulary**		**Reading**		**Reading Recognition**		**Reading Comprehension**	
Informal	0.007	0.54	0.007	0.60	-0.011	-0.92	-0.006	-0.64
Other parent					-0.003	-0.25	-0.005	-0.4
Grandparent	0.017	2.11	0.004	0.56				
Childminder etc	0.024	2.17	-0.017	-1.62	0.002	0.23	-0.007	-0.89
Daycare/nursery	0.007	0.60	0.001	0.14	0.003	0.26	-0.005	-0.62
Early education	0.013	1.10	0.003	0.35	-0.016	-1.81	-0.010	-1.36
Log likelihood	393.5		1069.90		610.46		1027.1	

b) Behavioural scores (Fixed effects)

	BCS70 4-16 Externalized		BCS70 4-16 Internalized		NLSY 4-14 Externalized		NLSY 4-14 Internalized	
	b	**z**	**B**	**z**	**b**	**z**	**b**	**z**
Informal	-0.021	-1.32	-0.006	-0.46	0.007	0.59	-0.006	-0.65
Other parent					-0.010	-0.67	0.002	0.14
Grandparent	-0.021	-1.32	0.005	0.59				
Childminder etc	0.010	0.71	0.004	0.39	-0.005	-0.50	-0.007	-1.02
Daycare/nursery	-0.028	-2.16	-0.008	-0.72	-0.029	-2.79	-0.011	-1.47
Early education	-0.005	-0.46	0.016	1.74	-0.009	-0.92	-0.002	-0.26
Log likelihood	570.8		933.2		613.01		1014.7	
Models include all other control variable in the baseline except maternal employment terms.								

Table 8 : Random Effects: Variance (std. errors in parentheses) at Mother and Child Level for the Null and the Full Models

BCS70	Maths 4-5	Maths 6-16	Naming Vocab 4-5	Reading 6-16	External'd Behaviour	Internalised Behaviour
Mother Level Null Model	0.0016 (0.021)	0.0024 (0.004)	0.0035 (0.011)	0.0050 (0.004)	0.0075 (0.006)	0.0058 (0.005)
Full Model	0.0007 (0.034)	0.0021 (0.004)	0.0017 (0.023)	0.0041 (0.004)	0.0057 (0.006)	0.0047 (0.005)
Child Level Null Model	0.0056 (0.463)	0.0077 (0.404)	0.0020 (0.589)	0.0087 (0.003)	0.0238 (0.004)	0.0146 (0.228)
Full Model	0.0060 (0.274)	0.0077 (0.371)	0.0030 (0.288)	0.0084 (0.358)	0.0224 (2.284)	0.0146 (0.587)
Correlation coef.*	0.055	0.213	0.364	0.328	0.203	0.244

NLSY79	Maths	Reading Recognition.	Reading Comprehension.	Externalised Behaviour	Internalised Behaviour
Mother Level Null Model	0.0057 (0.004)	0.0087 (0.005)	0.0055 (0.005)	0.0061 (0.007)	0.0051 (0.004)
Full Model	0.0031 (0.004)	0.0057 (0.005)	0.0028 (0.005)	0.0051 (0.007)	0.0045 (0.004)
Child Level Null Model	0.0077 (0.877)	0.0103 (0.582)	0.0087 (0.919)	0.0142 (0.676)	0.0066 (0.528)
Full Model	0.0076 (1.114)	0.0103 (0.718)	0.0087 (0.368)	0.0142 (1.323)	0.0065 (4.172)
Correlation coef.*	0.292	0.355	0.246	0.265	0.412

* intra-level 2 unit correlation, (i.e. children within families, full model)
Full model includes complexity of post-birth occupation.

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Centre for Longitudinal Studies
Institute of Education
20 Bedford Way
London WC1H 0AL
Tel: 020 7612 6860
Fax: 020 7612 6880
Email cls@ioe.ac.uk
Web http://www.cls.ioe.ac.uk