Parenting after medically assisted reproduction
Evidence from the UK Millennium Cohort Study

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Abstract: Parenting style and practices represent an important channel through which parental background affects children's outcomes. There are different reasons why the use of medically assisted reproduction (MAR) may be associated with parenting, including the experience of the treatment itself and the selective characteristics of individuals who access the treatments. Using longitudinal data from the UK Millennium Cohort Study (MCS), this study examines whether parents who conceived through MAR differ from the other parents on two dimensions of parenting up to when the children are 5 years old. Results show that MAR mothers tend to be more involved with the child and are more likely to read every day to the child. However, such differences are related to their background characteristics rather than to the experience of fertility treatment.

3.1 Introduction

The diffusion in the use of medically assisted reproduction (MAR) that occurred in the last decades has generated concerns about possible detrimental effects on child health and development, parents' wellbeing, and parent-children relationships. Yet, research has usually found higher risks of adverse health outcomes at birth (van Balen, 1998; Wagenaar et al., 2008; Pinborg et al., 2012) but, overall, a good development of children and families born with the aid of MAR treatments (Golombock et al, 1995; Hart and Norman, 2013), and even a better cognitive development of children (Carson et al., 2011, Barbuscia and Mills, 2017). These studies have suggested that the positive development of MAR children is at least partly due to the selective socio-economic characteristics of couples who can afford the expensive treatments (Chambers et al, 2014) and that might counterbalance the potential effects of poorer outcomes at birth and lead to positive outcomes for the children.

As children's cognitive and non-cognitive skills are developed in the first years of life and depend heavily on the environment including parental background and stimuli (Carneiro and Heckman, 2003; Cunha et al., 2006; Heckman and Masterov, 2004), a crucial question is whether specific ways of parenting following MAR might play a role in the observed good development of MAR children. Scholars have suggested that the experience of the treatment might affect the way parents develop the relationship with their offspring (Bernstein 1990, Gibson et al., 2000; Hammarberg et al., 2008). In addition, the characteristics of parents who use fertility treatments may be linked to the emotional involvement and time investment (i.e. the amount and kind of activities carried on with the children), a main determinant of children's cognitive and non-cognitive development and important component in the intergenerational transmission of socio-economic status (Ermisch and Francesconi, 2000; Carneiro and Heckman, 2003; Cunha et al., 2006). A longstanding tradition of sociological

work links parents' involvement with their children to higher level of education and income (Blau and Duncan, 1967; Muller, 1993), and identifies older parental age as a resource that facilitates investments in children (MacLanahan, 2004).

In this study, I ask whether there is indeed an association between the use of MAR treatments and parental involvement and time investment, after controlling for parental background. Most existing studies that looked at the effects of fertility treatments on parent-children relationships relied on very small samples and considered one single point in time, usually in the perinatal years (Colpin, 2002; Golombok, 2015). Moreover, the role of the specific demographic and socio-economic characteristics of parents, despite the important role that parental background has on the observed outcomes, was often not adequately considered (Colpin, 2002; Golombok et al., 1995; 2001). Furthermore, the majority of studies focused on emotional dimensions of the parent-children relationship and to the best of my knowledge, no study has investigated parent's investment and active involvement in their children's development. These might be dimensions especially relevant to study for children born after MAR treatments because of the amount of emotional, financial and time resources that parents have invested in the birth.

I study whether MAR parents differ from natural parents (NC) in their involvement with the child using two measures of parenting style: an index of what I call "parenting beliefs", measured when the child is 9 months old, and how often the mother reads to the child at the age of 3 and 5 years. Although these are of course not comprehensive of the many dimensions involved in parenting, I consider them as measures of parental involvement and time investment. A key question is whether potential differences in parenting might depend on the specific background of couples accessing the treatments rather than the experience of the treatment. While giving an important contribution to the existing knowledge about the outcomes of MAR treatments, this work tries to improve the understanding that we have about

the general processes underlying the process of parental investment. This is an important field of study as it can help determine how family structure benefits or hinders children's life chances.

3.2 Infertility, fertility treatments and parenting

The experience of infertility is very stressful and going through the process of fertility treatment can be very long. Therefore, scholars have been investigating the possible consequences of fertility treatment on the wellbeing of individuals and couples (Baldur-Felskov et al., 2013; Kjaer et al., 2014) and on the way parents develop the relationship with their children (Gibson et al., 2000; Hammarberg et al., 2008). Bernstein (1990) proposes several potential ways in which infertility could affect the transition to parenthood and parenting. These include the potential of a carryover of negative feelings (increased anxiety levels during pregnancy and just after-birth, sense of loss, a decreased self-esteem and sense of competence), delayed bonding with the child, a lack of role models. The experience might also negatively affect the couple' relationship (Bernstein, 1990; Kjaer et al., 2014) and therefore the development of parent-child relationships. Others have underlined the high expectations couples might have of themselves in the parent role (Hammarberg et al., 2008), or the possibility of self-exclusion from social networks, which negatively impact the development of parent-children relationship (Belsky, 1984).

Empirical studies, however, in general show no significant difference in the way parents who conceived with the aid of MAR adjust to parenthood and develop their relationship with the children compared to the rest of parents. In a review of the literature, Gibson (2000) reports evidence that IVF mothers tend to report less self-esteem and parenting competence; no difference on the level of protectiveness was observed, but IVF mothers perceived their children as more vulnerable and "special". No differences were found on many other

dimensions, including attachment to the child and attitudes to child-rearing. Colpin and Soenen (2002) also observed that parenting and children's psychosocial development do not differ significantly between IVF and natural families.

A few studies compared the parent-child relationship and the child's development in families created thorough MAT and natural families after the perinatal years, with mixed findings (Golombok et al., 1995; Owen et al., 2009; Golombok et al., 2015;). Some revealed positive effects of IVF parenting like higher emotional involvement with children and less parenting stress, while others have found that IVF parents are overprotective. One explanation that has been provided for the positive findings is that the stress that accompanies infertility might be compensated for by the birth of a child (Gibson et al., 2000). Children born after IVF are an extreme example of planned and desired children, and this might be linked to higher levels of satisfaction coming from parenthood and thus to better relationship with the child (Colpin, 2002). In another study Golombok and colleagues (2001) looked at parent-children relationships during adolescence without finding significant differences.

Considering the theoretical and empirical studies reviewed, I hypothesize that parents who used a fertility treatment will show higher levels of involvement (H1).

I expect such difference to be directly connected to the experience of the treatment and therefore to the birth of a very desired child, and not to parental demographic and socioeconomic characteristics (H1.a).

3.3 Parenting style and socio-economic background

The association between parenting and demographic and socio-economic background has been extensively studied in sociological, economic and psychological research. A complete review of such literature goes beyond the scope of this article. However, since parents who conceived

with the aid of fertility treatments are likely to represent a selective population in terms of demographic and socio-economic characteristics, it is important to highlight how such characteristics might be associated with specific ways of parenting or parenting activities.

Parents were shown to differ consistently in their approach to parenting depending on age, educational level and socio-economic status (among others, Brooks-Gunn and Markman, 2005; Lareau, 2002) and this has an important effect on their children's health and cognitive and non-cognitive development (Ermisch and Francesconi, 2000; Ermisch, 2008; Heckman et al., 2010). A consistent literature has shown that cognitive and non-cognitive abilities are developed in the first years of life of the child and depend heavily on parental background (Carneiro and Heckman, 2003; Cunha et al., 2006; Heckman and Masterov, 2004). The different parenting styles and practices linked to parental background are an important mechanism in how parental education and socio-economic status affect the children development (Lareau, 2002; Gauthier et al., 2004; Brooks-Gunn and Markman, 2005; Ermisch, 2008; Cheadle and Amato, 2011).

Starting from the 90s, the idea of 'good parenting' emerged and greater attention has been given to the way parents actively engage in their children development (Gauthier, 2004; Brooks-Gunn and Markman, 2005; Altintas, 2016). The idea that parents should not only provide for the material needs of the children but actively engage in their cognitive and non-cognitive development has led to a social pressure on what is "good parenting" (Gauthier, 2004; Altintas, 2016). It has also increased the focus on the time parents spend with their children and the activities they engage as relevant in the study of how educational and economic status is transmitted from a generation to the next one (Ermisch, 2008). In 2002, Lareau introduced the idea of 'concerted cultivation' referring to an approach that considers it crucial for the children to be involved in several organised activities expected to arm them with important life skills, a stress on the use of language and development of reasoning and talking

as a preferred form of discipline. This approach would be specific to middle- and upper class, in contrast to working- and lower-class parents who are more inclined towards 'natural growth' (Lareau, 2002). Following Lareau's seminal work, several studies have proposed a quantitative assessment of concerted cultivation. Bodowsky and Farkas (2008) observed that concerted cultivation has an important role in explaining the better educational performances of children from higher socio-economic background. Interestingly, they also concluded that this is a direct expression of the socio-economic status of the parents rather than a rational strategy to promote the development of the child. Cheadle and Amato (2011) observed that parental education has the strongest net association with concerted cultivation. Older mothers are also more likely to engage in concerted cultivation, while the biggest the family size, the lower probability of experiencing concerted cultivation.

Other scholars have focused on the importance of parental time as main source of parental investment in children and having a strong impact on their development (Gauthier et al., 2004; Kalil et al., 2012; Fiorini and Keane, 2014; Altintas, 2015). Fiorini and Keane's (2014) results show that time spent in educational activities, especially with parents, is the most productive input for cognitive skills. Older parental age and higher education are linked to more time spent with children (Gauthier et al., 2004). Altintas (2015) used time use data to show that the educational gap in how high- and low-educated parents spend time in developmental child-care activities with their children has been widening. Ermisch (2008) found that differences by parents' income group in cognitive and behavioural development emerge by the child's third birthday and that an important part of these differences can be accounted for by what parents do in terms of educational activities and parenting style. His results show that reading more often to the child or taking the child to the library improve cognitive and behavioral development up to the age of 3.

In light of the literature on parental background and parenting style and practices, I hypothesize that parents who used fertility treatments will show higher levels of time investment in the child's development (H2.a). However, I expect such difference to be linked to the demographic (age) and socio-economic background of the couples accessing fertility treatments rather than to the experience of the treatment itself (H2.b).

3.4 Data and measurements

Sample

The Millennium Cohort Study (MCS) is a nationally representative prospective cohort study of 18,552 families across the UK. A random two-stage sample of all infants born in 2000-2001 and resident in the UK at 9 months was drawn from the Department of Social Security Child Benefit Registers. Ethnically diverse and disadvantaged areas were oversampled to ensure adequate representation. Baseline interviews captured socio-demographic and health information, including questions about pregnancy and fertility treatment. Follow-up surveys were conducted in 2003, 2005, 2007 and 2012. The surveys covered different topics such as health, development, behaviour, wellbeing, parenting, and collected information about their siblings and parents. This represents an advantage when compared to registered data, which do not include such kind of information about the environment where the child lives. My sample included children born from either married or cohabiting parents.[1] I only considered the ones who had available information for at least one of the waves after the first one, which left us with a final sample of 15,218 observations. Of these, 487 children were conceived through MAR treatments. These included In Vitro Fertilization (IVF) and Intracytoplasmatic Sperm

[1] Because of the selective sample considered in this study, i.e. children born to cohabiting or married parents and who have available information at later sweeps, I did not include the survey weights in the analyses.

Injection (ICSI), the most common kinds of ART, intra-uterine insemination (IUI), and the use of ovarian stimulating drugs not followed by any ART treatment.

Measurements

Parenting style

My main dependent variables were two measures of parenting style and activities at different ages of the child. They were both derived from the main respondent surveys and refer to mothers. The choice to focus on mothers exclusively is due to the greater richness of information available and the high number of missing values in answers about parenting style provided by fathers. Although it is undoubtedly a limitation to include measures referring to mothers only (Gibson-Davis, 2008), there seems to be overall agreement in the literature that mother's parenting behavior have a stronger impact on the children's development, because mothers tend to spend more time interacting and engaging with children in the early years being usually the primary caregivers (Martin et al 2010; Sayer et al., 2004).

The first measure was derived from a series of question asked to the respondents at the first interview, when the child was 9 months old. Mothers were asked about the importance of cuddling, talking, stimulation and regular bedtimes for the child's development, and whether a child should be picked up immediately whenever crying. Answers were on a 1-4 scale, from "strongly agree" to "strongly disagree"[2]. I used factor analysis to identify an index of *parenting beliefs* and consider it a measure of maternal involvement at very young age of the child (higher values of the factor meaning higher levels of involvement). The 5 questions were originally developed by the European Longitudinal Study of Pregnancy and Childhood to measure what parents think about child rearing practices, whether the baby should grow up in a structured or

[2] The distribution of the answers to each item and factor loadings are shown in the Appendix

in a more laissez-faire environment. They help to understand the likelihood that parents will provide sensitive care to their babies[3].

The second measure was derived from a series of questions about the time spent by mothers in different activities with the child, that were asked in the MCS starting from the second wave (when the child is around 3 years old). The general structure of the question was "How often do you … with the child?" with possible answers going from "every day" to "not at all". I considered how often the mother reads to the child as a dummy variable taking the value 1 when the mother answered "every day" and 0 otherwise. Such operationalization followed the one suggested by Ermisch (2008) and was due to the very skewed distribution of the answers on the first two options. Reading to the child was also shown to be a reliable measure of the extent the parents engage with their children in educational activities, and important for the children's cognitive development (Sylva et al., 2004; Ermisch, 2008). An additional appealing feature of the measure was that the question on how often parents read to their child was available in several sweeps of the MCS and therefore at different ages of the child. I considered it as a measure of maternal time investment in the child at the age of 3 and 5.[4] Reading to the child after the age of 5 was not considered because of the possible association with lower cognitive skills of the child/ more need for help in reading at an age when many children are able to read on their own.[5]

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[3] Other measures of parenting were considered in additional analyses. A measure of maternal attachment was built from a series of question asked at the first wave, however this is rather similar to other measures already used in literature and refer to the emotional dimension of parent-child relationship. Further, it showed very small variation across individuals. A measure of parenting was also built from a series of questions asked at the 2nd wave (age 5) concerning the presence of strict rules in the family. The results were very similar to the ones obtained considering parenting beliefs, but less statistically significant. I decided to opt for parenting beliefs instead of parenting style as it is measured at a younger age of the child. Results of the analyses of the determinants of these alternate measures are available in the Appendix.

[4] I tried different measures of maternal time investments that included other parenting activities at age 3 and 5 years, using factor analysis. The results were very similar to the ones for reading to the child, but with less statistical power. Factor loadings and results of the main analyses considering such other measure are available upon request.

[5] Analyses were also performed considering reading every day at the age of 7, but the measure was not included in the final analyses for the possible association with lower cognitive skills of the child

Information about parenting beliefs was available for 14,247 observations; for reading to the child at age 3, for 12,393 observations; for reading to the child at age 5, for 12,189 observations.

MAR treatments

Main independent variable was whether the child was conceived with the aid of a MAR, as declared by the mother in the first wave. All the different kinds of fertility treatments mentioned in the MCS were included in the treatment category. These included the two main kinds of Assisted Reproduction Technology, i.e. In Vitro Fertilization (IVF, 137 women) and Intracytoplasmatic Sperm Injection (ICSI, 72 women), Intrauterine Insemination (IUI, 25 women) and Ovarian Stimulating drugs (OI, 247 women). All kinds of fertility treatments were considered together in the analyses, as looking at them separately would lead to small sample sizes.[6]

Control variables

I controlled for a number of confounders that are likely related both to parenting style and the use of fertility treatments. These were child and maternal demographic characteristics, family structure and parental socio-economic factors. Child's and mother's characteristics included child's ethnicity (*white*, *black* or *other*), gender, multiple birth and low birth weight *(LBW*), mother's age. Measures of family structure were marital status of the parents, whether the child was first born and the number of siblings. To measure parental socioeconomic background, both the educational level of the mother (whether she had a degree or higher educational level, AA levels, or lower) and the household income (*UK income quintiles*) were considered[7]. I also included a control for whether the child was born from an intended

[6] Sensitivity analyses considered separately the different kinds of fertility treatment used. The results (available upon request) were very similar but with less statistical power because of the smaller sample size.

[7] Other specifications of the models included socio-economic status of the head of the household (based on the NS SEC classification), but were not included in the final analysis because of the high correlation with the measures of income.

pregnancy (*planned*). All individual controls were time-invariant characteristics and the information was provided by respondents at the first sweep of the MCS.

3.5 Statistical methods

Two-tailed t-tests compared the demographic and socioeconomic characteristics of couples who conceived with and without the aid of fertility treatments, the birth outcomes and the average values of the measures of parenting style considered.

To test hypotheses H1 and H2, I run respectively linear regression and logistic models to study the determinants of parenting beliefs and of the probability that a mother reads every day to the child. In both sets of regression, the confounders were added to the model in a stepwise way. The first models included only basic demographic characteristics and whether the mother undertook any fertility treatment, to see whether there was an overall association with parenting style. I then added controls for family structure, age and socio-economic characteristics of the parents to understand whether possible differences in parenting style were linked to the treatment itself (H1a.) or to confounding parental background (H2a). Because of the high prevalence of twins and triplets as consequence of fertility treatments, all models included robust clustered standard errors.

3.6 Results

Descriptive characteristics of the sample confirmed the prediction that couples who conceived with the aid of MAR differed consistently from the rest of the sample (Table 3.1). MAR parents were significantly older (around 3 years both for mothers and fathers), more likely to be married, to be in the first quintile of the UK income distribution and to have higher socio-economic status (managerial or higher professional occupation of the head of household). MAR mothers were also more likely to have at least a tertiary educational level, to be employed

and to have breast-fed the child. These findings were in line with the literature, and consistent with the high costs of fertility treatments in the UK, which makes them accessible only to a selective population. The proportion of children born from multiple births and the prevalence of low-birth-weight were significantly different between the two sub-samples, and confirmed previous findings about the high incidence of multiple births following fertility treatments, which often result in pre-term births and low-birth-weight. The uncontrolled measures of parenting style were also significantly different. The index of parenting beliefs when the child was 9 months showed higher values in the treatment subgroup, suggesting higher maternal involvement in the first months of life of the child. MAR mothers were also more likely to read every day to their children at the age of 3, 5 and 7, although the difference at the last observation was smaller and only slightly significant.

Table 3.2 shows the results of the linear regression models to study the determinants of parenting beliefs. The use of fertility treatment was associated with higher values of the factor both in the first uncontrolled model (Model 1) and after adjustment for parity and number of siblings (Model 2), indicating higher maternal involvement when the child was 9 months old. However, the association became insignificant after controlling for parental background. Mother's age, educational level and household income were all significantly associated with higher values of parenting beliefs, suggesting higher levels of involvement among older and higher SES parents. While the general hypothesis of higher involvement among MAR parents was confirmed (H1), no support was provided to the hypothesis of a "fertility treatment effect" net of parental background (H1.a), which seemed to be the main driver of the observed difference.

The models on the determinant of the probability of reading every day to the child showed similar results (Table 3.3). MAR mothers had a higher probability of reading every day to the child in the uncontrolled model (Models 1). The association was reduced, but remained

significant on adjustment for family structure and birth outcomes at the age of 3, and became statistically insignificant at age of 5. There was no remaining significant association at both ages after controlling for parental background. These results seem to support hypothesis H2.a of a higher time investment of MAR mothers and that this is linked to their demographic and socio-economic characteristics (H2.b). The effects of the confounders were similar to the ones for parenting beliefs, with older and higher SES mothers more likely to read every day to their child. Household income in particular showed the strongest association. Being first born and the number of siblings also were significantly (respectively positive and negative) associated with the probability that the mother reads every day, suggesting that this might be affected by time-related constraints like having other children to take care of. Results were similar at the age of 3 and 5 years, but at later age the relationship with parental background was weaker[8].

3.7 Conclusion and Discussion

The importance of parenting style and activities for children's development is well established and in the last decades, research has shown that an active involvement of parents since very early ages is linked to higher cognitive and non-cognitive abilities during childhood (Lareau, 2002; Ermisch 2008; Fiorini and Keane, 2014). There are several reasons why undertaking a fertility treatment may affect the way individuals interact with and invest in their offspring, which makes it not only relevant but also particularly interesting to investigate. The literature on parenting after fertility treatments, however, is scarce and provided mixed findings.

I examined two measures of parenting style (parenting beliefs and whether the mother reads every to the child) at different ages of the child and studied their association with the use of MAR treatments and parental background. I found that MAR mothers showed higher levels of

[8] The analysis of the determinants of reading every day to the child at the age of 7 provided very similar results.

maternal involvement when the child was 9 months old and were more likely to read every day to the child at the age of 3 and 5 years compared to NC mothers. However, my results indicate that these differences were linked to the specific demographic and socio-economic background of couples who accessed fertility treatments rather than to the use of the treatments. These findings corroborate the ones from previous studies suggesting that parenting style and practices are a direct expression of socio-economic background (Bodowsky and Farkas; 2008). MAR parents were on average older, with higher education and income, all characteristics that were associated with a high involvement and investment in the child's development. Family structure also emerged as an important factor for parenting practices linked to the time spent with children. MAR children were more likely to be first born and have a smaller number of siblings, which was linked to higher maternal time investment.

This study confirms that children and families born with the aid of fertility treatment are a selective population in terms of the demographic and socio-economic characteristics of parents and children's outcomes at birth. Despite the concerns about possible negative health consequences of the treatments, the children seem overall to benefit from the parental resources and parenting practices related to such advantageous socio-economic conditions, and show a cognitive development that is higher than average.

The study suffers some important limitations. The chosen measures of parenting style are of course not comprehensive of the many dimensions of parenting that may be crucial for children's development. As discussed earlier, they only refer to mothers and might therefore be only partially informative about the stimuli received overall by the children. Furthermore, an important question that remains partly unanswered is what these measures do actually measure. My results show that they are strongly associated with the observable socio-economic characteristics of parents, but part of the association with children cognitive skills remains after adjustment for parental background. However, is it real inputs or do they mainly reflect

unobserved traits of the parents? The question has been asked previously in the literature (Ermisch, 2008), and remains relevant for interpreting the results of this study, as the measures of parenting style considered here might well being another expression of parental background, rather than indicate actual differences in how the children are raised.

The relatively small number of MAR children compared to NC children represents another limitation of the study, and makes it impossible to perform the analyses dividing by the kind of treatment. Nevertheless, these findings provide an important contribution to the literature exploring the consequence of the use of fertility treatment, an increasingly relevant phenomenon especially in Western societies. Further, they add to our understanding of the mechanisms underlying intergenerational transmission of socio-economic status and highlight once more the different environment and opportunities faced by children from different background in the UK.

Table 3.1: Descriptive statistics of the sample, divided by whether the respondent used fertility treatments

	N C		MAR	
Birth outcomes	Mean	SE	Mean	SE
Twin (%)	1.11	0.000	12.50***	0.001
Triplet (%)	0.003	0.001	1.17 ***	0.005
First born (%)	39.07	0.004	67.45***	0.022
Number of siblings	0.98	0.008	0.39 ***	0.030
Low birth weight (%) *	5.21	0.001	10.40***	0.014
Parental background				
Mother's age	29.10	0.045	32.32***	0.22
Father's age	30.87	0.070	34.62***	0.33
Married parents (%)	70.34	0.037	87.73***	0.015
Mother's education: degree (%)	27.91	0.004	36.08***	0.024
Mother's education: AA levels (%)	43.45	0.004	46.61	0.022
HH Income: UK 1st quintile (%)	18.61	0.003	34.90***	0.023
UK 2nd quintile (%)	20.65	0.003	24.76*	0.020
UK 3rd quintile (%)	21.86	0.003	21.46	0.019
UK 4th quintile (%)	23.20	0.003	14.62***	0.017
UK 5th quintile (%)	15.32	0.002	4.10 ***	0.009
High SES (managerial or professional occupation of head of HH, %)	29.92	0.003	43.63***	0.024
Employed mother (%)	47.51	0.004	56.13***	0.024
Parenting style and activities				
Parenting beliefs	0.025	0.007	0.183***	0.032
Read every day to the child (age 3, %)	59.40	0.004	71.75***	0.023
Read every day to the child (age 5, %)	51.11	0.004	60.23 **	0.026
Read every day to the child (age 7, %)	41.64	0.004	47.63*	0.028
N	14,559		424	

Notes: the sample is family-specific, i.e. only one twin or triplet for each multiple birth was considered to avoid the repetition of family characteristics (*except for LBW and children's cognitive skills)
Stars indicate that the difference is significant according to T-test: *p<0.05 **p<0.01 ***p<00.1

Table 3.2: Determinants of parenting beliefs at age 9 months, estimates from linear regression models, clustered SE

	Model 1	Model 2	Model 3
MAR	0.142***	0.125***	0.055
	(0.036)	(0.037)	(0.037)
Female	-0.009	-0.011	-0.013
	(0.014)	(0.014)	(0.014)
Ethnic background (ref. white)			
Black	-0.088*	-0.052	-0.055
	(0.047)	(0.047)	(0.048)
Pakistani	-0.375***	-0.341***	-0.200***
	(0.034)	(0.035)	(0.036)
Other	-0.118***	-0.114***	-0.104***
	(0.031)	(0.031)	(0.031)
First born		0.0192	0.025
		(0.022)	(0.022)
Num siblings		-0.031***	-0.028**
		(0.011)	(0.011)
LBW		-0.055*	-0.034
		(0.036)	(0.035)
Multiple pregnancy		-0.004	-0.016
		(0.056)	(0.055)
Planned pregnancy			0.011
			(0.016)
Mother's age at birth			0.013***
			(0.001)
Mother's education			
Degree or higher			0.302***
			(0.023)
AA levels			0.191***
			(0.020)
HH income (ref. 5th UK quintile)			
1st quintile			0.161***
			(0.032)
2nd quintile			0.134***
			(0.031)
3rd quintile			0.110***
			(0.029)
4th quintile			0.099***
			(0.028)
Mother employed			-0.004
			(0.015)
Observations	14,247	14,247	14,247
R-squared	0.013	0.018	0.044

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Low Birth Weight refers to children<2.5 Kg

Table 3.3: Determinants of reading every day to the child at age 3 and 5, estimates from logistic regressions, clustered SE

	Age 3			Age 5		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
MAR	0.400***	0.208*	-0.0325	0.262**	0.074	-0.0934
	(0.125)	(0.126)	(0.129)	(0.117)	(0.119)	(0.121)
Female	0.142***	0.156***	0.158***	0.0692*	0.0738**	0.0674*
	(0.0375)	(0.0383)	(0.0393)	(0.0365)	(0.0371)	(0.0375)
Ethnic background (ref. White)						
Black	-1.282***	-1.154***	-1.312***	-0.414***	-0.345**	-0.427***
	(0.144)	(0.147)	(0.160)	(0.133)	(0.137)	(0.139)
Pakistani	-1.318***	-1.156***	-0.768***	-0.744***	-0.629***	-0.452***
	(0.0762)	(0.0807)	(0.0859)	(0.0760)	(0.0797)	(0.0846)
Other	-0.630***	-0.639***	-0.659***	-0.235***	-0.244***	-0.281***
	(0.0769)	(0.0791)	(0.0831)	(0.0774)	(0.0792)	(0.0808)
Multiple birth	0.0294	0.132	0.136	-0.0393	0.0236	-0.0170
	(0.163)	(0.171)	(0.173)	(0.156)	(0.162)	(0.168)
Firstborn		0.258***	0.347***		0.445***	0.499***
		(0.0611)	(0.0628)		(0.0581)	(0.0593)
Num siblings		-0.231***	-0.213***		-0.120***	-0.153***
		(0.0300)	(0.0321)		(0.0280)	(0.0301)
LBW		-0.172*	-0.112		-0.0675	-0.0427
		(0.0892)	(0.0918)		(0.0867)	(0.0883)
Planned pregnancy			0.0888**			0.029
			(0.0432)			(0.0417)
Mother's age at birth			0.0317***			0.0313***
			(0.00440)			(0.00428)
Mother's education						
Degree or higher			0.976***			0.438***
			(0.0500)			(0.0463)
AA levels			0.462***			0.186***
			(0.050)			(0.050)
HH Income (ref. 5th UK quintile)						
1st quintile			0.600***			0.266***
			(0.0852)			(0.0832)
2nd quintile			0.430***			0.102
			(0.0785)			(0.0772)
3rd quintile			0.314***			0.0294
			(0.0729)			(0.0728)
4th quintile			0.068			0.0290
			(0.0677)			(0.0677)
Mother employed			-0.202***			-0.126***
			(0.0447)			(0.0431)
N	12,189	12,189	12,189	12,189	12,189	12,189

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Low Birth Weight refers to children<2.5 Kg

Appendix

Table 3.5: Individual predictors of undertaking MAR treatments, estimates from logistic regression, odds ratios

VARIABLES	Fertility treatment
Mother's age	1.116***
	(0.0132)
Father's age	1.031***
	(0.00901)
Married parents	2.725***
	(0.403)
HH Income	
UK 1st quintile	2.119***
	(0.554)
UK 2nd quintile	1.898**
	(0.492)
UK 3rd quintile	2.135***
	(0.541)
UK 4th quintile	1.890**
	(0.479)
Mother's education	
Degree or higher	0.773*
	(0.120)
AA levels	1.078
	(0.151)
Employed	0.826*
	(0.0843)
English only language spoken	1.385**
	(0.229)
Childless	4.900***
	(0.527)
Observations	15,183

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 3.1: Distribution of answers on parenting beliefs items

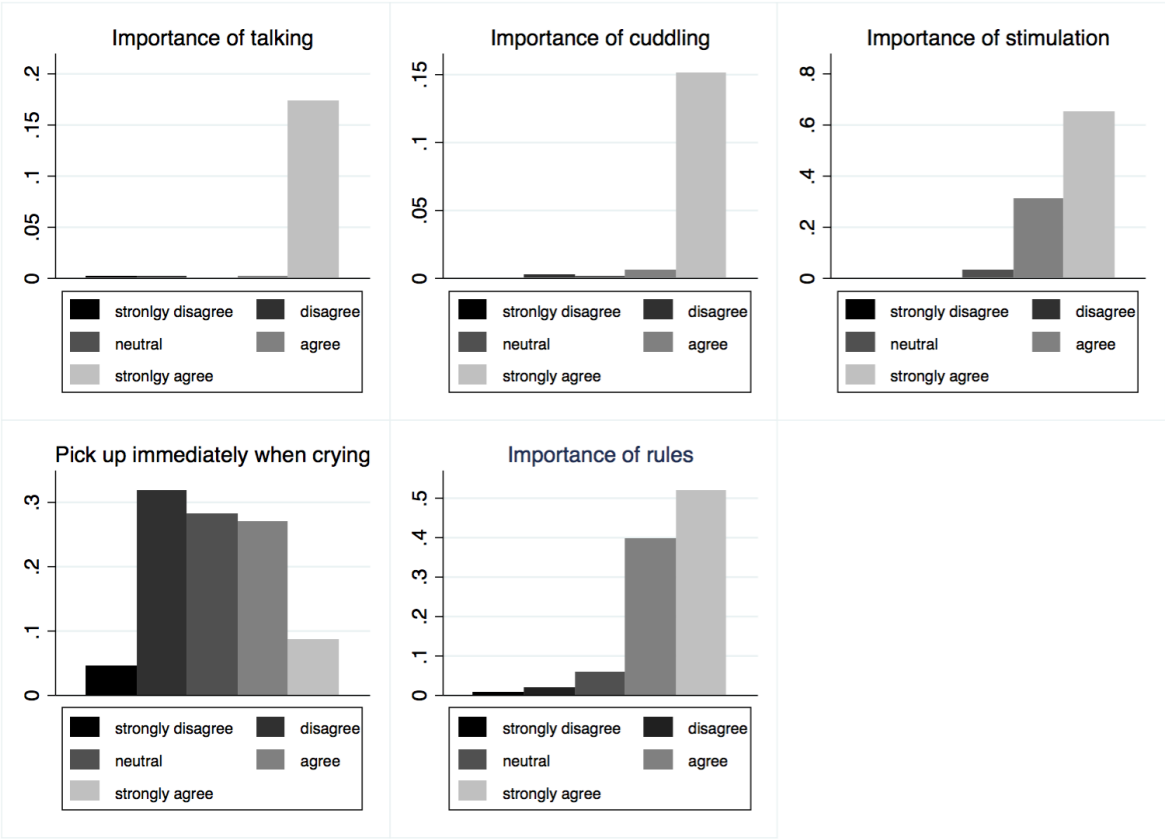

Table 3.6: Parental beliefs- factor loadings

VARIABLES	***Parenting Beliefs***
Importance of talking	0.403
Importance of cuddling	0.284
Importance of stimulation	0.275
Pick up immediately when crying	0.033
Importance of rules	0.118

Table 3.7: Determinants of maternal attachment, estimates from linear regression models

	Model(1)	Model(2)	Model(3)
MAR	-0.0552	-0.0152	0.00464
	(0.0377)	(0.0380)	(0.0381)
Female	0.0638***	0.0634***	0.0647***
	(0.0127)	(0.0126)	(0.0125)
Ethnic background (ref: white)			
Black	0.219***	0.213***	0.208***
	(0.0445)	(0.0453)	(0.0465)
Pakistani	-0.0973**	-0.122***	-0.195***
	(0.0402)	(0.0405)	(0.0410)
Other	-0.0134	-0.0134	-0.0213
	(0.0317)	(0.0316)	(0.0315)
First born		0.135***	0.138***
		(0.0199)	(0.0199)
Num siblings		0.0746***	0.0740***
		(0.0101)	(0.0107)
LBW		0.0354	0.0303
		(0.0323)	(0.0319)
Multiple birth		-0.202***	-0.203***
		(0.0558)	(0.0550)
Planned			0.0521***
			(0.0143)
Mother age at birth			-0.00391***
			(0.00147)
Mother's education (ref: high school)			
Degree			-0.150***
			(0.0204)
AA levels			-0.0213
			(0.0174)
Household income (ref: UK 5th quintile)			
UK 1st quintile			-0.0339
			(0.0288)
UK 2nd quintile			0.0291
			(0.0271)
UK 3rd quintile			0.0489*
			(0.0259)
UK 4th quintile			0.0613**
			(0.0253)
Employed			-0.00376
			(0.0140)
Observations	12,775	12,746	12,734

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 3.8: Determinants of parenting style, estimates from linear regression models

	Model (1)	Model (2)	Model (3)
MAR	0.0579*	-0.0151	-0.00615
	(0.0355)	(0.0369)	(0.0363)
Female	0.0145	0.0139	0.0131
	(0.0118)	(0.0117)	(0.0116)
Ethnic background (ref: White)			
Black	-0.333***	-0.302***	-0.282***
	(0.0467)	(0.0469)	(0.0481)
Pakistani	-0.220***	-0.178***	-0.0886***
	(0.0256)	(0.0264)	(0.0282)
Other	-0.169***	-0.155***	-0.132***
	(0.0261)	(0.0259)	(0.0258)
First born		-0.112***	-0.119***
		(0.0186)	(0.0184)
Number of siblings		-0.0751***	-0.0386***
		(0.00973)	(0.0101)
LBW		-0.0243	0.00263
		(0.0300)	(0.0296)
Multiple birth		0.145***	0.161***
		(0.0523)	(0.0516)
Planned pregnancy			0.0761***
			(0.0131)
Mum age birth			-0.00760***
			(0.00133)
Mother's education (ref: high school)			
Degree			0.225***
			(0.0190)
AA levels			0.130***
			(0.0167)
Household income (ref: 5th quintile)			
UK 1st quintile			0.196***
			(0.0266)
UK 2nd quintile			0.147***
			(0.0253)
UK 3rd quintile			0.0964***
			(0.0240)
UK 4th quintile			0.0102
			(0.0229)
Employed			-0.0480***
			(0.0127)
Observations	12,281	12,243	12,225

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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