Divorce, parental conflicts and child skills: A story of selection

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Abstract

This paper uses the UK Millennium Cohort Study to quantify and characterize parental selection into divorce and the relationship with child cognitive and socio-emotional skills during childhood. Combining a decomposition method with a counterfactual analysis based on a model of endogenous selection into divorce, this paper shows that the skill disadvantages among children of divorce stem almost entirely from the effects of selection. Here, skill gaps materialise due to disadvantages in household characteristics that also increase divorce risk. Inter-parental conflicts, parental education, and family financial resources emerge as key pre-divorce characteristics that explain divorce gaps in children's cognitive and socio-emotional skills from age 3, through age 11. Inter-parental conflicts are often unobserved and overlooked in the literature, but our results demonstrate that they indeed play a major role, particularly for gaps in socio-emotional skills. Moreover, such gaps are found to be more pronounced for more vulnerable children, i.e. those with lower levels of socio-emotional skills. Overall, our results suggest that targeting pre-divorce characteristics like inter-parental conflicts may be an effective approach for mitigating skill deficits among children of disrupted families as these would be less likely to select into divorce.

Keywords: Divorce, Inter-parental conflicts, Cognitive and Socio-emotional skills, Decomposition, Counterfactual analysis.
JEL Classification: J12, J13, J24, C21, D1

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1 Introduction

Rising rates of marital instability in recent decades have fueled political and public debate regarding the relationship between parental divorce and child development. It is well established that shocks to family structure, such as divorce, may create consequences for children's human capital formation and accumulation.[1] However, parental divorce is endogenous as the decision to divorce is correlated with parental and household characteristics that also influence children's outcomes (Manski et al., 1992). Numerous empirical studies have found a negative correlation between parental separation and children's achievements, with more mixed results when establishing causality (Ermisch and Francesconi 2001; Björklund and Sundström 2006; Sanz-de Galdeano and Vuri 2007; Björklund et al. 2007; Francesconi et al. 2010; Frimmel et al. 2016; Pronzato and Aassve 2017; Le Forner 2020, among others). In contrast, less attention has been devoted to analysing and modeling — rather than controlling for — parental selection into divorce. Understanding selection is however a crucial component of the broader narrative since family instability is more prevalent among more disadvantaged families.

In this paper, we conduct a comprehensive analysis of parental selection into divorce and its relationship with children's skill formation. Leveraging longitudinal data from the UK Millennium Cohort Study (MCS) we analyse skill outcomes at ages 3, 5, 7, and 11, focusing on divorces that occurred before age 3.[2] First, we adopt a decomposition approach, accounting for a rich set of pre-divorce characteristics, to quantify the extent to which *divorce skill gaps* — the differential in skill levels between children from intact families and those whose parents have divorced — are attributed to selection.[3] Second, we develop and estimate a dynamic model of child skill formation that incorporates an endogenous parental divorce decision. Using the model, we conduct a counterfactual analysis and evaluate how children of disrupted families would have performed if: (i) they had identical observable characteristics as the children in intact families, or (ii) their parents opted not to divorce. Our approach therefore acknowledges the endogeneity of the divorce decision, and complements the existing

[1] McLanahan et al. (2013) provide a comprehensive survey of this literature. More generally, the family plays a crucial role in shaping child ability, through genetics, parental investments, and through the choice of child environment (Cunha and Heckman, 2007; Borghans et al., 2008; Cunha and Heckman, 2009; Almlund et al., 2011).

[2] Supplementary analysis, reported in the Appendix, also considers divorces that occurred between ages 3 and 5 and between ages 5 and 7.

[3] Our analysis includes both married and cohabiting parents, therefore we use the terms divorce (among married parents) and separation (among cohabiting parents) interchangeably. We consider divorce skills gaps both at the mean, and across different quantiles of the skill distribution.

literature by highlighting the role of selection in the overall story of divorce skill gaps among children.

Our first contribution is to include in our analysis a measure of *inter-parental conflicts* — a variable that is often unobserved in the literature — alongside an extensive set of parental and family background variables.[4] Moreover, we further utilize the measure of parental conflicts where it serves a dual purpose in our counterfactual analysis: both as a predictor of the endogenous divorce decision, and as a variable that is dependant on pre-divorce characteristics. High-conflicts couples are more likely to divorce and children that are exposed to inter-parental conflict are more likely to have behavioural problems such as: conduct disorders, aggressive behaviour, anxiety, depression and withdrawal, as well as lower academic achievement (Buehler et al., 1998; Amato et al., 1995; Grych and Fincham, 2001). Consequently, failing to account for parental conflicts risks to omit a crucial factor in the analysis of selection into divorce, and the skill gaps that result.

Our second contribution is substantive as we provide novel evidence on the heterogeneity of divorce skill gaps across the distribution of both cognitive and socio-emotional skills. It's natural to anticipate disparities between these two types of skills, either in the magnitude of the divorce skill gaps, or in the relative contributions of specific family characteristics in explaining the gaps.[5] Indeed, in light of the *diathesis stress framework* proposed in the psychological literature (Beck, 1967; Monroe and Simons, 1991; Hilsman and Garber, 1995), we expect children with lower levels of socio-emotional skills to have larger divorce skill gaps than high-skilled children. This is because a stressful event - e.g. parental divorce - can trigger the manifestation of socio-emotional disorders if the child has a predisposition to such a disorder, while the same is not necessarily valid for cognitive skills (Moroni et al., 2019). Moreover, by evaluating divorce skill gaps separately for boys and girls, this paper also contributes to a growing literature documenting gender differences in children's skill development.[6]

In our final contribution, we provide practical policy advice through a counterfactual analysis. Specifically, we utilise a Cunha et al. (2010) style model of skill formation, extended to

[4]There are however a few recent papers that include measures of conflicts. Tartari (2015) includes a measure of parental conflicts in her analysis, but focuses exclusively on children's cognitive outcomes. Amato et al. (1995), Ribar et al. (2017) and Clark et al. (2015) look at how the impact of divorce on children varies by the level of conflict.

[5]According to the recent economic literature on child human capital, it is fundamental to capture the multidimensional aspect of human capital —i.e. the distinction between cognitive and socio-emotional skills — because of their different determinants and evolution patterns (Heckman, 2000; Cunha et al., 2006; Almlund et al., 2011; Del Bono et al., 2016)

[6]See Bertrand and Pan (2013) and Baker and Milligan (2016).

include an endogenous divorce decision, and evaluate the effectiveness of interventions aimed at narrowing divorce skill gaps by mitigating the effects of selection. First, we document heterogeneity in intervention efficacy across the skill distribution and compare intervention outcomes to a benchmark where we exogenously change the divorce decision, keeping all other characteristics unchanged. Second, we enhance the story of selection by acknowledging that interventions (e.g. reducing interparental conflicts among divorce couples) can also influence the endogenous divorce decision, and therefore use our counterfactual analysis to disentangle the direct and indirect mechanisms through which each intervention operates.

Our empirical analysis includes two steps. In the first step, we conduct an Oaxaca-Blinder (O-B) decomposition analysis of the divorce skill gaps (Oaxaca, 1973; Blinder, 1973; Firpo et al., 2007, 2009)[7] whereby we decompose the skill gaps —both at the mean and across the skills distribution— into two parts: the first part is explained by differences in observed characteristics (*explained/compositional effect*) and the second part is given by the differences in the return to these characteristics (*unexplained/ residual effect*). Then, we further decompose the compositional effect to establish the relative contributions of each set of observed characteristics in explaining the observed divorce gaps.[8] This first part of the empirical strategy allows us to thoroughly characterize the parental selection into divorce by quantifying the contribution to the gap of each of the extremely rich set of pre-divorce characteristics that we can observe in our dataset.[9]

In the second step, we utilise the results of our decomposition analysis to build and estimate a Cunha et al. (2010) style model of skill development, extended to include an endogenous divorce decision. The model captures skill development, via a series of skill production technologies, between four points in time, corresponding to ages 3, 5, 7, and 11, respectively, observed in the MCS data. The model includes reduced-form specifica-

[7]The standard O-B decomposition approach has been extensively used in labour economics to analyze the wage gap between different sub-sample of the population, e.g. between men and women, between ethnic groups and between disable and non-disable workers. It has also been used to study child development gaps attributed to child health conditions, health gaps by socio-economic status, racial differences in health insurance. See among others, Blinder (1973); Oaxaca (1973); Blau and Kahn (1992); Doiron and Riddell (1994); Cobb-Clark and Hildebrand (2006); Grove et al. (2011); Longhi et al. (2012, 2013); Pylypchuk and Selden (2008); Salm and Schunk (2012); Johar et al. (2013); Carrieri and Jones (2017). The more flexible approach of the generalized O-B (Firpo et al., 2007, 2009) allows to overcome some of the drawback of the standard O-B approach whereby children at the lower tails of the distribution may present different gaps compared with children at the upper tails, a feature that is highly plausible in the context of divorce.

[8]Given the substantial importance of the differences in observed characteristics, our analysis focuses on the detailed decomposition of the compositional effect. However, we provide also evidence of the detailed decomposition of the residual component when it significantly explains the divorce skills gap of children.

[9]We address the limitations of the O-B decomposition by carrying out a set of sensitivity analyses (i) using the re-weighted decomposition method (DiNardo et al., 1996), (ii) changing the reference group in the decomposition and (iii) imposing a common support between the two groups of children.

tions for inter-parental conflicts and the parental divorce decision that both depend on the child/family's observable characteristics. This allows the model to capture selection into divorce while also providing multiple channels through which observable characteristics influence skill development. We estimate the parameters of the model via maximum likelihood estimation and use the recovered parameters to conduct our counterfactual analysis. In each scenario we simulate counterfactual skill outcomes that consider how children of disrupted families would have performed if they had similar observable characteristics as children in intact families.

Overall, our results indicate that divorce skill gaps are driven by parental selection into divorce. According to the decomposition analysis skills gaps are, in most cases, completely explained by compositional effects, i.e. by the differences in pre-divorce characteristics between children of intact and disrupted families. Such results are fully confirmed in the counterfactual analysis. First, they show that exogenously changing the divorce decision, while keeping all the other characteristics unchanged lead to a negligible reduction in the gaps. This implies that discouraging divorce would be an ineffective strategy for offsetting skill gaps. Second, they demonstrate that the divorce skill gaps can be effectively narrowed by equalising pre-divorce characteristics, as these have a direct effect on the skill production technologies, and an indirect effect via reductions in the divorce probability. This implies that interventions targeting pre-divorce characteristics that have a negligible impact on the divorce probability will be less effective overall.

In addition, we find that the divorce gaps in cognitive and socio-emotional abilities can be ascribed to different factors. Cognitive gaps are attributed to differences in parents' education and family financial resources, whilst socio-emotional gaps are mostly attributed to inter-parental conflicts and financial resources. Since parental education largely explains cognitive skill disparities and inter-parental conflicts largely explain socio-emotional skill disparities —whereby these characteristics are also highly correlated with parental abilities— our results suggest that inter-generational transmission of ability is an important driver of divorce skill gaps. Finally, consistent with the *diathesis stress framework*, we find that more vulnerable children, i.e. children with lower levels of socio-emotional abilities, present larger divorce gaps, especially among boys.

On the basis of this evidence, interventions aimed at increasing parental education, reducing inter-parental conflict and providing financial support to at-risk families, may be more effective at narrowing inequalities between children of intact and disrupted families—as they would decrease the probability to divorce — in contrast to policies aimed solely at

discouraging divorce.

The outline for the remainder of the paper is as follows. Section 2 describes the data and Section 3 the empirical strategy. In Section 4 we report our findings of the decomposition of mean skill gaps, the description of the characteristics that account for the gaps, and the decomposition of the gaps across the skill distributions as well as the counterfactual analysis derived from the endogenous model of parental divorce. Section 5 shows that our results are robust to several sensitivity analyses, conducted to address the main drawbacks of the O-B methodology such as the linearity assumption, the choice of the reference group and the common support assumption. Section 6 concludes with a discussion of the results.

2 Description of data

2.1 Millennium Cohort Study

This paper uses data from the UK Millennium Cohort Study (MCS), a multidisciplinary longitudinal cohort survey which comprises a representative sample of children born in the UK between September 2000 and January 2002. The cohort members are followed over time with interviews conducted in 2000, 2004, 2006, 2008 and 2012, when children are 9 months and ages 3, 5, 7 and 11.[10] Information on both the child and parents is available. The data includes a rich set of measures regarding the child's cognitive and socio-emotional skills. More precisely, child cognitive skills are assessed by trained interviewers using appropriate tests, whereas child socio-emotional skills are assessed by asking questions to the child's parent, usually the mother. In addition, the survey also includes a wide variety of information on the social, demographic and economic characteristics of the child, their parents, and their family overall.

Our sample is selected to include all singleton children interviewed at 9 months with married or cohabiting natural parents. This criteria reduces our original sample size by 31.8 percent, consisting of 13,131 children. We also consider a balanced panel of cohort members with non-missing information on a set of variables on family and child characteristics, excluding children whose parents separate after the age 3. Our final sample consist of 5003 observations.

In this study, the key variable is the relationship between the natural parents, i.e. whether

[10] For details on the survey design, recruitment process and fieldwork consider Dex and Joshi (2005).

they are in relationship or separated. Since our analysis comprises both married and cohabiting couples, it follows that, the notion of divorce will include not only legally divorced or legally separated couples, but also cases where one of the two natural parents has left the house. This choice is motivated by the fact that the shock faced by the child in case of parental split-up arises as soon as the two parents separate, that is when they stop living together, regardless of their legal marital status. Among our initial sample of 13,131 children at 9 months, 72.29% of them have married parents whilst the rest have cohabiting parents. For the remainder of the paper, the notions of divorce and separation will be used interchangeably.[11]

2.2 Children outcomes: cognitive and socio-emotional skills

The dataset offers several measures of cognitive abilities, mainly from the British Ability Scales (BAS) (Elliott et al., 1996, 1997), the Bracken School Readiness test and the National Foundation for Educational Research Progress in Maths Test (NFER), which are designed to measure verbal ability, recognition of patterns and the richness of vocabulary, among others.[12] These are widely used age-varying tests and for each age multiple tests are available. Table A.1 in the Appendix shows the list of cognitive tests available in our dataset by age of the child.[13]

At ages 3, 5 and 7 we have more than one cognitive ability measure available. For this reason, rather than using the measures separately, we use latent factor models to reduce measurement error and to construct a single and more exhaustive measure of cognitive abilities for these ages. Table A.2 in the Appendix shows the corresponding factor loadings (Column 1) and signal (Column 2), i.e. the proportion of the variance for each of the measure explained by the latent factor. Figure A.1, Panel A shows the distribution of the latent skills that are comparable across ages and have mean 0 and standard deviation of 1.

Socio-emotional skills are derived from the Strengths and Difficulties Questionnaire (SDQ) which is designed to examine children's behaviors and emotions in a number of settings. In each interview, starting at age 3, the parent is asked to complete the SDQ questionnaire con-

[11] At national level, the number of divorce in England and Wales in 2013 was 114,720, involving 94,864 children under 16. Among these children, 21% were under 5 and 64% were under 11 years old. Detailed information on the institutional background in the UK is provided in the Appendix A.1.

[12] Among the three types of score available for each of the BAS tests, the raw score, the ability score and the T-score, we use the ability score that is a transformation of the raw score which takes into account the difficulty of the specific questions asked to the child.

[13] For a detailed description and interpretation of all the tests consider Connelly (2013) and Hansen (2014).

sisting of 25 items on their psychological attributes (Goodman, 1997, 2001).[14] The 25 items are grouped in five sub-scales measuring: (i) Emotional Problems; (ii) Conduct Problems; (iii) Hyperactivity; (iv) Peer Relationship Problems and (v) Pro-social Behavior. These broader sub-scales are extensively used in the child development literature and have been shown to be valid in the UK setting (e.g., Goodman et al. 2010; Borra et al. 2012; Del Bono et al. 2016). For the sake of comparison with the cognitive measures, the socio-emotional scores are reverse coded, so that higher values mean higher level of socio-emotional skills and lower values mean lower level of socio-emotional skills.[15]

As with cognitive abilities, rather than using many different measures of socio-emotional abilities for each age, we use factor models to reduce the measurement error and combine this information and estimate a unique and more comprehensive measure of socio-emotional skills. The estimated factors represent a comprehensive measure of psychological traits such as anxiety, depression and withdrawal, but also aggression, irritation, conduct problems and pro-social behavior at each age. We take these factors as our measures of socio-emotional abilities for each age (factor loadings and signals shown in Table A.3 in the Appendix). Figure A.1, Panel B shows the distribution of the latent skills that are comparable across ages and have mean 0 and standard deviation of 1.

Table 1 features the descriptive statistics of children's cognitive and socio-emotional skills as described by the factors and their differences by parental separation. The table clearly shows the existence of a *divorce skill gap*, for both cognitive and socio-emotional skills, with children of intact families having higher cognitive and socio-emotional skills at every age. The final column of Table 1 also shows that the magnitude of the gap is around 11 (13) percentiles for cognitive (socio-emotional) skills at age 3, and suggests that the observed percentile gaps persist throughout childhood and are increasing with child age.[16]

2.3 Quality of inter-parental relationship

The quality of inter-parental relationship, often referred as relationship quality (RQ) or marital conflict, is a crucial aspect in family and child developmental research, especially

[14] The parent is asked whether the item is 'true', 'somewhat true' or 'not true' in respect of their child and, final scores are such that the higher the score the higher the level of behavioral problems.

[15] The pro-social behavior subs-cale, differently from all the other measures, does not need to be reversed to provide a consistent interpretation of higher test score higher socio-emotional abilities.

[16] Although the construction of the skill factors, with different loading measures across child age, makes across-time comparisons difficult, Figure A.1 shows that resulting skill distributions are indeed similar across ages, reassuring us that the percentile gaps are comparable.

in the psychology literature. It has been linked to psychological and physical health of the partners (depressive symptoms, eating disorders, male alcoholism), but also with some key aspects of the family environment such as domestic violence, lower parenting skills, children's disadvantages, parent-child conflicts, and conflict between siblings (Buehler et al., 1998; Grych and Fincham, 2001; Fincham, 2003). Partners satisfied with their relationship are healthier, communicate more effectively with each other, have higher parenting skills and tend to raise their children authoritatively, using less harsh discipline, spend more time with their children, and have less risk of a marital breakup (Jones, 2010).

The MCS provides detailed information about the quality of the relationship between parents. It includes a shortened version of the Golombok-Rust Inventory of Marital State (GRIMS, Rust et al. 1986, 1990), a questionnaire to measure the overall quality of a couple's relationship.[17] Specifically, the MCS asks each parent separately to rate several items: (i) Partner sensitive and aware of needs; (ii) Partner doesn't listen; (iii) Sometime lonely when with partner; (iv) Relationship full of joy and excitement; (v) Wishes was more warmth and affection; (vi) Suspect on brink of separation; (vii) Can make up quickly after argument; (viii) Frequency go out as a couple; (ix) Happy/Unhappy with relationship.[18]

Similarly to skills, we use factor models to combine the different measures of conflicts into a single indicator. This allows us to reduce the dimensionality of the measures explaining the inter-parental conflicts without arbitrarily imposing that all the measures are related to the latent factor with equal weights.[19] Table A.4 reports the factor loadings (Column 1) and the signal, i.e. share of the variance explained by the latent factor for each question (Column 2). We interpret this factor as a measure of inter-parental conflicts perceived by the mother. The use of latent factor models is motivated by the fact that the amount of

[17] This shortened version retains the content validity of the original version which included 28 items measuring two aspects of the relationship, (1) shared interests, communication, sex, warmth, roles, decision making and coping, and (2) beliefs about and attitudes toward their relationship, behavior in the relationship and agreement with the partner (Chiorri et al., 2014).

[18] In the case of statements (i)-(vii), respondents indicate whether they strongly agree, agree, neither agree nor disagree, disagree or strongly disagree with the statement (5-Point Likert-type agreement scales). In the case of statement (viii) respondents are asked to indicate how frequently they go out as couple on a 4 points scale, ranging from 'once a week' to 'hardly never'. Question (ix) about happiness in the relationship is measured on a 7 point scale. These last two items of the quality of inter-parental relationship are not included in GRIMS but represent additional information on the quality of relationship. Items (ii) (iii) (v) and (ix) are reverse coded in such a way to have the same interpretation in terms of quality of relationship. The higher the score, the lower the quality of their relationship, the higher the level of conflicts.

[19] We use the information reported by the mother to construct our measure of inter-parental conflict. Related literature on GRIMS questionnaire implemented in the MCS survey showed that women in the MCS perceive a higher relationship quality than men(Chiorri et al., 2014; South et al., 2009; Shapiro et al., 2000). This would suggest that, if inter-parental conflicts are measured with errors, they are possibly under-reported and therefore we might expect the accounting power of relationship quality to be at most under-estimated.

information contained in each measures varies across the measures and is much lower than 1, suggesting that measurement error needs to be accounted for.

2.4 Other control variables

Our analysis also includes a set of child, parental and family variables observed before separation. The set of variables incorporated in our analysis draws from the human capital formation literature, where parental inputs are the major determinants of child outcomes, as well as from the literature aimed at establishing the impact of divorce on children outcomes. Indeed, we include also explanatory variables that may be a good predictor of divorce but that may also indirectly affect children's abilities. This set of variables consists of: (i) *child characteristics* such as child sex and birth weight; (ii) *demographic characteristics* such as number of siblings, whether parents were cohabiting or married at birth, duration of relationship between the parents at birth, whether the pregnancy was planned, mother's religiosity, parents' age and parents' ethnicity; (iii) *parental education*; (iv) *health characteristics* like parents' general health; and (v) *family financial resources* such as family income, housing tenure, parents' social class based on NS-SEC (National Statistics Socio-Economic Classification).

Table 2 reports the descriptive statistics of all the explanatory variables by parental separation. According to difference in mean tests, the characteristics of children from divorced families are very different from the characteristics of children from intact ones. Children of divorce have, on average, younger, less educated parents with shorter relationships. Non-separated parents also have better health. Parental occupation is dissimilar as well, between the two groups of children, with a higher percentage of parents from divorced families working in routine and manual occupations. Finally, family income also varies between the two groups, with an average equivalised OECD income per week significantly higher for intact families than for disrupted families. Overall, the control variables indicate that children of divorce grow up in more disadvantaged environment than children of intact families. If children who are brought up in more advantaged families are also less likely to experience parental breakup and also perform better at cognitive and socio-emotional tests, either because of higher innate ability or because their environmental background improves these outcomes, then the association between separation and cognitive and socio-emotional skills shown in Table 1 might well be spurious and largely explained by these observable differences between the two groups.

3 Empirical strategy

The empirical strategy unfolds as follows: (i) First we fully characterize the selection into divorce using a decomposition method, whereby we quantify the divorce skill gap between children of intact and disrupted families and the contribution to the gap of each of the observable characteristics; (ii) second, we consider a model where divorce is endogenous and use such model to show the counterfactuals of how children of disrupted families would have performed had they had the same characteristics of children of intact families.

3.1 Decomposition

3.1.1 Oaxaca-Blinder decomposition: Mean gap

The existence of a gap in mean outcomes between two groups has often been investigated using decomposition analysis to estimate how much of the gap can be attributed to differences in observable characteristics between the two groups. We use the 'Oaxaca-Blinder' (O-B) method (Oaxaca, 1973; Blinder, 1973) to decompose the mean of divorce skill gaps of children into the component explained by differences in observed characteristics (*compositional effect*) and the unexplained component (*residual effect*).

Separate regressions are estimated for each group:

$$y_{ij} = \mathbf{X}_{ij}\boldsymbol{\beta_j} + \epsilon_{ij} \tag{1}$$

where y_{ji} is cognitive or socio-emotional skills for child i at ages 3, 5, 7 and 11 in group j, with j= 0 for non-separated (the reference group) or j= 1 for separated parents (the comparison group), observed when the child is between 9 months and age 3 ; $\mathbf{X}_{ij}$ is a vector of K explanatory variables and a constant, β_j is a vector of parameters for group j including the intercept, and ϵ_{ij} is an error term with mean zero and homoskedastic. Then, using the O-B approach, we can decompose the difference in mean outcomes (overbars denote means) between children of intact and disrupted families as follows:

$$\overline{y}_0 - \overline{y}_1 = \overline{\mathbf{X}}_0\boldsymbol{\beta_0} - \overline{\mathbf{X}}_1\boldsymbol{\beta_1} \tag{2}$$

where $\overline{\mathbf{X_j}}$ is the vector of average characteristics for group j (j=0,1) and $\overline{y}_0 - \overline{y}_1$ is the *divorce skill gap*, expressed as a difference between mean outcomes of children of intact families minus mean outcomes of children from disrupted families. This implies that a positive divorce

skills gap indicates skill disadvantages for children of divorce compared to children of intact families. To be able to identify the two components of the decomposition, a counterfactual conditional mean, for instance $\overline{\mathbf{X}}_1\boldsymbol{\beta_0}$, is added and subtracted. This counterfactual reflects a situation in which children of intact families have the same mean covariates of children of disrupted families. This implies that:

$$\overline{y}_0 - \overline{y}_1 = (\overline{\mathbf{X}}_0 - \overline{\mathbf{X}}_1)\boldsymbol{\beta_0} + \overline{\mathbf{X}}_1(\boldsymbol{\beta_0} - \boldsymbol{\beta_1}) \tag{3}$$

where $(\overline{\mathbf{X}}_0 - \overline{\mathbf{X}}_1)\boldsymbol{\beta_0}$ describes the *composition effect* and is the mean differences in covariates $\mathbf{X}$ between the reference and the comparison group, whereas the second component $\overline{\mathbf{X}}_1(\boldsymbol{\beta_0} - \boldsymbol{\beta_1})$ describes the *residual effect*. Moreover, given the additive linearity assumption, we can compute the detailed decomposition to identify the contribution of each covariate K to the explained component:

$$(\overline{\mathbf{X}}_0 - \overline{\mathbf{X}}_1)\boldsymbol{\beta_0} = \sum_k (\overline{X}_{0k} - \overline{X}_{1k})\beta_{0k} \tag{4}$$

where β_{0k} is the parameter for variable X_k for group 0, ($\overline{X}_{0k}$ is its corresponding sample mean) and therefore $(\overline{X}_{0k} - \overline{X}_{1k})\beta_{0k}$ is the contribution of the k_{th} covariate to the composition effect. Such a detailed decomposition is one of the most appealing property of the O-B methodology.

Similarly to the detailed decomposition provided for the compositional effect, we can compute the detailed decomposition of the residual component. This residual component accounts for the divorce skills gap attributable to the differences in the return of the covariates between the two groups of children and it also accounts for all potential effects of differences in unobservables captured by the difference in the intercepts.[20]

3.1.2 Generalized Oaxaca-Blinder decomposition: gap across the distribution

In our setting it may be that the divorce skill gaps is larger at the lower tail of the children skills distribution because lower skilled children may be more vulnerable. To allow for this possibility, we apply the Recentered Influence Function (RIF) method of Firpo et al.

[20] A few examples of such effects are: (i) the detrimental effect of divorce on child development due to the lower time and money investment of the non-residential parent on the child (e.g. Page and Stevens 2004; Le Forner 2023); (ii) failure of cooperative behavior between parents due to union dissolution (Del Boca, 2003; González and Özcan, 2013), (iii) differences in the return to parents' characteristics between children of separated and non-separated parents such as parents' education and inter-parental conflicts (Kalil et al., 2011; Barumandzadeh et al., 2016). (iv) differences in unobservables potentially correlated with children's outcomes and parental divorce.

(2009) to estimate the decomposition at various quantiles of the children's skills distributions. Specifically, we use the RIF method to estimate the relationship between separation and children skills and then we use the RIF regression results as a basis to compute the O-B decomposition of the divorce skill gaps.[21]

More specifically, the RIF for the τth quantile q_τ, of a variable y is given by :

$$RIF(y, q_\tau) = q_\tau + \frac{(\tau - d_\tau)}{f_y(q_\tau)} \tag{5}$$

where $f_y(q_\tau)$ is the density function of y at quantile q_τ, and d_τ is a dummy that takes value one if $y \leq q_\tau$. We therefore compute the RIF for each observation y (after replacing $f_y(q_\tau)$ with its kernel density estimate) and we estimate the conditional expectation of the RIF for each group j using OLS regression (assuming linearity between the RIF and X) considering the RIF as the dependent variable:[22]

$$RIF(y_{ij}, q_\tau) = \mathbf{X}_{ij}\boldsymbol{\beta_j}(q_\tau) + \nu_{ij} \tag{6}$$

where, as before, j is the group indicator (j=0,1), $\mathbf{X}_j$ is a vector of K explanatory variables including the intercepts, $\boldsymbol{\beta}(q_\tau)$ is the vector of coefficients for the quantile τth and ν_j is the error term. Specifically, the conditional expectation of the RIF is what Firpo et al. (2009) call the unconditional quantile regression and therefore we can interpret the coefficient estimated in equation (6) $\boldsymbol{\beta_j}(q_\tau)$ as the marginal effect of X on the unconditional quantile of children outcome. Moreover, the gap in quantiles can be decomposed as follows:

$$q_{0\tau} - q_{1\tau} = (\overline{\mathbf{X}}_0 - \overline{\mathbf{X}}_1)\boldsymbol{\beta_0}(q_\tau) + \overline{\mathbf{X}}_1(\boldsymbol{\beta_0}(q_\tau) - \boldsymbol{\beta_1}(q_\tau)) \tag{7}$$

where — similar to the mean O-B decomposition — we can separate two additive components: the composition effects (first term) and the residual effects (second term). We call this decomposition the *generalized Oaxaca-Blinder method*; this differs from the O-B method

[21] While the mean can be decomposed with O-B using OLS, the quantiles cannot be decomposed using the quantile regressions. Similarly to the mean regression model, a quantile regression model for the τth conditional quantile expressed as $q_\tau(X) = X\beta_\tau$, β_τ is the effect of X on the τth conditional quantile of y given X. However, in the case of quantiles, differently from the mean, we cannot apply the law of iterated expectation so $q_\tau \neq E_X[q_\tau(X)] = E(X)\beta_\tau$ (where q_τ is the unconditional quantile) and therefore β_τ does not represent the effect of increasing the mean value of X on the unconditional quantile (Johar et al., 2013). Therefore, the RIF offer a linear approximation of the unconditional quantiles of the outcome variable which permits the application of the law of iterated expectations to the approximated quantile used to estimate the marginal effect of a covariate by regressing the RIF on the covariates X (Carrieri and Jones, 2017).

[22] This is possible because the RIF satisfies two important properties: (i)$E_y[RIF(y, q_\tau)]$=q_τ that is its mean corresponds to the actual τ_{th} quantile of interest; and (ii) $E_X E_y[RIF(y, q_\tau)|X] = q_\tau$.

only because the dependent variable in the regression model is the RIF rather than y. Just as in the basic O-B method, the *generalized Oaxaca-Blinder method* can be used to derive a detailed decomposition and identify the contribution of each variable $\mathbf{X}$ to the quantile gap.

We use the standard and generalized O-B as our main decomposition analysis but in Section 5 we address some potential shortcomings of the methodology: (i) the linearity assumption between dependent and explanatory variables (ii) the choice of the reference group, which may affect the decomposition results and (iii) the common support assumption to avoid out of sample predictions.

3.2 Counterfactual analysis with endogenous selection into divorce

As a second exercise, we build upon our decomposition analysis to consider how children of disrupted families would have performed, if they had the same observable characteristics as children in intact families. To explore this, we first estimate a simple dynamic model of child skill formation and accumulation in the spirit of Cunha and Heckman (2007); Cunha et al. (2010), extending their framework to incorporate an endogenous divorce decision.

The model captures skill development between four points in time, denoted t, with $t \in \{1, 2, 3, 4\}$, corresponding to child ages 3, 5, 7, and 11, respectively, that we observe in the MCS sample. At each point in time t, child i is characterised by a vector $\boldsymbol{\theta}_{it} = (\theta^c_{it}, \theta^e_{it})$ of cognitive and socio-emotional *skills*, denoted by c and e, and a vector of time-invariant *inputs*, $\boldsymbol{\xi}_i = (D_i, P_i)$, where D_i is a binary indicator equal to one if the child's parents are divorced, and P_i is the reported level of inter-parental conflicts.[23] Finally, $\boldsymbol{X}_i$ is child i's vector of demographic and household characteristics, highlighted in Table 2.

3.2.1 Initial conditions

The model begins with the determination of child i's initial inputs $\boldsymbol{\xi}_i$, conditional on demographic and household characteristics $\boldsymbol{X}_i$. The empirical specification for inter-parental conflicts, P_i is given by:

$$\ln P_i = \delta^p_0 + \boldsymbol{X}_i \boldsymbol{\delta}^p_X + \eta^p \tag{8}$$

[23] We assume that inputs are time-invariant within the model so as to be consistent with our main MCS data sample where, the parent's divorce decision, the level of parental conflicts, and the demographic and household characteristics, are all determined and observed before the child is age 3. This analysis can be extended to consider divorce and parental conflicts occurred later on during childhood.

where η^p is a, normally distributed, unobserved shock to inter-parental conflicts, and $\boldsymbol{\delta}_X^p$ is a parameter vector with length equal to the number of characteristics in $\boldsymbol{X}_i$. Then, we use a logit specification for the parental divorce decision, D_i, so the probability that child i's parents choose to divorce is given by:

$$\mathcal{P}(D_i = 1 | \ln C_i, X_i) = \frac{1}{1 + \exp(-(\delta_0^d + \delta_1^d \ln P_i + \boldsymbol{X}_i \boldsymbol{\delta}_X^d))} \tag{9}$$

where, similarly, $\boldsymbol{\delta}_X^d$ is a parameter vector with length equal to the number of characteristics in $\boldsymbol{X}_i$. In Table 2 we illustrated the substantial differences in characteristics between children from divorced and intact families, with notably higher levels of inter-parental conflicts in divorced couples. The specifications for inter-parental conflicts (equation 8) and the parental divorce decision (equation 9) therefore allows the model to capture these selection patterns. However, specifying reduced-form equations for both inputs also allows us to address the potential endogeneity of these key inputs within the child's skill development process.[24]

3.2.2 Child skill formation and accumulation

Next, we assume that child cognitive and socio-emotional skills, $\theta_{i,t}^k$ $k \in \{c, e\}$, are formed and develop according to a series of trans-log production technologies, that depend on child i's previous period skills and inputs:

$$\ln \theta_{i,t}^k = \begin{cases} A_t^k(D_i, \boldsymbol{X}_i) + \pi_i^1 + \eta_{it}^k \,, & \text{if } t = 1; \\ A_t^k(D_i, \boldsymbol{X}_i) + \pi_i^k + \ln\left[\boldsymbol{\theta}_{i,t-1}, P_i\right] \boldsymbol{\gamma}_t^k + \ln\left[\theta_{i,t-1}, P_i\right] \boldsymbol{\Gamma}_t^k \ln\left[\boldsymbol{\theta}_{i,t-1}, P_i\right]^T + \eta_{it}^k \,, & \text{if } t > 1, \end{cases}$$
$$\text{for } k = c, e. \tag{10}$$

where $A_t^k(\cdot)$ is a linear total factor productivity (TFP) equation that takes the form

$$A_t^k(D_i, \boldsymbol{X}_i) = \alpha_{0t}^k + \alpha_{D,t}^k D_i + \boldsymbol{X}_i \boldsymbol{\alpha}_{X,t}^k \tag{11}$$

and the parameter α_{0t}^k is the location parameter for the production technologies, while $\boldsymbol{\alpha}_{X,t}^k$ is a parameter vector with length equal to the number of baseline child and mother characteristics. Following Cunha et al. (2010), and Aucejo and James (2021), the parameters

[24] In practice, we employ a control function approach where we include the residuals from the inter-parental conflict equation (equation 8) as an additional regressor within the skill production technologies (Heckman, 1979).

$\pi \in \{\pi^1, \pi^c, \pi^e\}$ are random intercepts that capture persistent unobserved heterogeneity in the skill production process.[25] Within the production technologies, $\boldsymbol{\gamma}_t^k$ is a 3×1 parameter vector, and $\boldsymbol{\Gamma}_t^k$ as a 3×3 triangular parameter matrix of the form:

$$\boldsymbol{\gamma}_t^{k\,T} = \begin{bmatrix} \gamma_{c,t}^k & \gamma_{e,t}^k & \gamma_{p,t}^k \end{bmatrix}, \quad \boldsymbol{\Gamma}_t^k = \begin{bmatrix} \gamma_{cc,t}^k & \gamma_{ce,t}^k & \gamma_{cp,t}^k \\ 0 & \gamma_{ee,t}^k & \gamma_{ep,t}^k \\ 0 & 0 & \gamma_{pp,t}^k \end{bmatrix}$$

The parameters $\boldsymbol{\gamma}_t^k$ and $\boldsymbol{\Gamma}_t^k$ are the elasticities of current skills θ_t^k, $k \in \{c, e\}$ with respect to previous period skills θ_{t-1}^k, $k \in \{c, e\}$, and conflicts, P_t. Finally, $\eta_{i,t}^k$ is a normally distributed, unobserved, production technology shock that is independent across skills $k \in \{c, e\}$ and time t. Note, that the specification for the skill production technologies (equation 10) models TFP in a reduced-form way (equation 11) that varies by child i, by period t, and skill k. In addition, we let the parent's divorce decision enter the TFP equation directly. This allows the model to capture a potential direct effect of parental divorce on the child skill development. However, due to equations for inter-parental conflicts and divorce (equations 8 and 9), we are also able to disentangle the indirect effect of divorce, via selection on observable characteristics, from the direct effect of divorce itself when conducting our counterfactual analysis.

3.2.3 Estimation

Letting $\Psi \in \{\delta, \alpha, \gamma, \Gamma, \eta\}$ denote the vector of parameters for the conflict equation (equation 8), the divorce equation (equation 9), and the skill production technologies (equation 10). Moreover, $f_P(\cdot)$ and $f_\theta(\cdot)$ denote the density functions for inter-parental conflicts and child skills, respectively, while $f_D(\cdot)$ denotes the probability mass function for the divorce equation. Conditional on child i's skills $\boldsymbol{\theta}_i$ and inputs $\boldsymbol{\xi}_i$, the likelihood of the observed skill paths for child i is given by:

$$\begin{aligned} L_i(\Psi) = {} & f_P(\ln P_i \mid \boldsymbol{X}_i) \cdot f_D(D_i \mid \ln P_i, \boldsymbol{X}_i) \cdot \ldots \\ & \int_\pi \prod_t \prod_{\rho \in \{\ln \theta^c, \ln \theta^e\}} f(\rho_{it} \mid \ln \boldsymbol{\theta}_{i,t-1}, \ln P_i, D_i, \boldsymbol{X}_i)\, \mathcal{P}(\pi_u)\, d\pi \end{aligned} \tag{12}$$

[25] Specifically, π is drawn from a latent class distribution, where $\pi_u = \{\pi_u^1, \pi_u^c, \pi_u^e\}$ with probability $\mathcal{P}(\pi_u)$, $u = 1, \ldots, 5$, and π_1 is normalised to equal zero.

then, given data on n children, we estimate the parameter vector Ψ by maximimising the integrated log-likelihood function $LL(\Psi)$:

$$LL(\Psi) = \sum_{i=1}^{n} \ln L_i(\Psi) \tag{13}$$

To obtain standard errors and confidence intervals for all parameter estimates we compute 100 bootstrap replications. Then, with the parameter estimates in hand, we conclude our analysis by simulating child outcomes under various counterfactual scenarios where we remove differences in observable characteristics between the children in divorced and intact families.

4 Empirical results

This section describes all of our results from the decomposition and counterfactual analysis. We start by describing the results of the standard O-B decomposition, then proceed to show the detailed O-B decomposition that disentangles the relative contributions of each factor in explaining the divorce gaps. We then report results of the divorce skill gap decomposition across the distribution of child skills providing details on the differences between boys and girls. Finally, we report results from the counterfactual analysis where the selection into divorce is modeled endogenously.

4.1 Decomposing the mean divorce skill gaps

Table 3 summarises the results of the O-B decomposition at the mean of the explained (compositional) and unexplained (residual) components for cognitive (Panel A) and socio-emotional skills (Panel B) respectively, both standardized with mean 0 and standard deviation 1. The first rows in both panels show what we define as the *divorce skill gap*, the second rows reports the amount of the divorce skill gap that is explained by the O-B decomposition method and the third rows show the unexplained component.

Cognitive skill gaps (Table 3, Panel A) are entirely captured by compositional differences in covariates between the two groups of children, where the residual components are never statistically significant in the short or long-term.[26] A 3 year old child whose parents divorced during early childhood (between 9 months and age 3) has, on average, 25% of a

[26]Notice that we consider a balanced panel over time, so that the results across ages are comparable.

standard deviation lower cognitive skills compared to a child of an intact family. Of this, 22.9 percentage points are explained by differences in the characteristics between the two groups of children, where the unexplained component remains insignificant. Similar results are found at ages 5, 7, and 11, respectively. These magnitude of the divorce cognitive skill gaps are substantial and comparable to earlier studies that utilise the MCS to analyse child development (Del Bono et al., 2016).[27]

Panel B in Table 3 features the mean socio-emotional skill gaps by child age, which appear to be quantitatively larger than the corresponding gaps for cognitive skills.[28] Socio-emotional skill gaps appear to increase over time, widening from 0.337 at age 3 to 0.537 at age 11. Overall, similar to our findings for cognitive skills, the divorce socio-emotional skill gap appears to be largely explained by compositional differences. However, a portion of the gap remains unexplained at ages 7 and 11, at 18.7 percentage points (pp) and 17.7 pp respectively. The unexplained component represents the part of the decomposition that is attributable to differences in returns to characteristics between the two groups. The unexplained component also includes differences in the intercepts between the two groups which - if significant - suggests the presence of unobserved characteristics that are explaining the gap that could be attributable to divorce itself. In Table A.5 in the Appendix we show that the difference in the intercepts is never significant.

4.2 What accounts for the mean divorce skill gaps?

Given the major role played by the *compositional effects* in explaining divorce skill gaps, we report the detailed decomposition of the explained divorced skill gaps, by age, in Table 4.

Starting with cognitive skills (Table 4, Panel A), the most notable fact is that, regardless of the age at which the gap is observed, the groups of variables that appear to contribute the most to the explained component of cognitive skill gaps are parents' education and the financial resources of the family. The contribution of parental education to the explained gap is similar across ages and it is around 35%.[29] Looking at family financial resources, the

[27] Del Bono et al. (2016) find that a 1 standard deviation increase in maternal time investment increases cognitive outcomes, significantly, by 13% of a standard deviation at age 3. Similarly, their results also show that having a mother with at least a university degree is associated with an increase in cognitive abilities by 33% of a standard deviation compared to having a mother without qualifications.

[28] Both cognitive and socio-emotional skills have been standardised to have mean 0 and standard deviation of 1, hence these results are directly comparable.

[29] For example, considering cognitive skills at age 3 (column 1), differences in parents' education between children of intact and disrupted families account for 8.4 out of 22.9 percentage points of the explained divorce gap. This would mean that if the average differences in parental education between children of intact and

differences between divorced and intact families contribute to the explained gap by about 60%.[30] None of the remaining groups of variables seem to play a sizable role in accounting for the explained divorce cognitive gaps.

In Panel B of Table 4, we present detailed decompositions of the explained divorce socio-emotional skill gaps over time. As highlighted earlier, the gap in socio-emotional skills is larger, and unlike cognitive skills, almost all groups of variables contribute significantly to explaining the gap.[31] Furthermore, for socio-emotional skills the key factors to explain the gaps appear to be inter-parental conflicts and the financial resources of the family. Specifically, differences in inter-parental conflicts account for 35% of the explained gap an this is similar across ages.[32] Therefore, it appears that inter-parental relationship quality is able to largely explain the differences in behavioral problems between children of disrupted and intact families.[33] Moreover, differences in financial resources account for around 35% of the explained component of the socio-emotional skills gap.[34] In contrast to the results for cognitive skill development, parents' education does not seem to play a major role in explaining the socio-emotional skill gaps.

Our results therefore indicate that failing to control for inter-parental conflicts when trying to establish the impact of separation on child, adolescent, or later outcomes may result in an upward bias. This is because, although conflicts appear to impact only child socio-emotional outcomes, there is consistent evidence in the literature showing that both cognitive and socio-emotional skills are determinants of later life outcomes such as education and labour market participation (Almond and Currie, 2011). This finding may also offer an explanation for the mixed results found in the literature on the impacts of divorce on children's long-run outcomes.

Taken together, our results indicate that different dimensions of skills have different com-

disrupted families were removed, the divorce skill gap would be reduced by 33.6% (0.084/0.250= 0.336, all else equal).

[30]For example, financial resources explain 0.143 out of 0.250 of the explained gap in cognitive skills at age 3.

[31]This is consistent with the notion of higher malleability of socio-emotional skills when compared to cognitive skills (Heckman, 2000).

[32]For example at age 3, interparental conflicts explains 0.130 out of 0.358 of the explained gap, with similar magnitudes across age.

[33]It may be noted that inter-parental conflicts might be correlated with mother's psychological distress as well as children's outcomes. In Appendix Table A.6 we additionally include mother's mental distress as an additional control. Our results show that, despite mother's mental distress contributing positively to the explained component of the socio-emotional skill gap, the proportion of the compositional effect explained by inter-parental conflicts remains large and significant for socio-emotional skills.

[34]For example financial resources account for 0.114 out of 0.358 of the divorce skill gap at age 3, with similar magnitude across age.

positions of factors contributing to their respective divorce gaps, with interesting patterns emerging. The role of financial resources is significant across cognitive and socio-emotional skills, although the impact is larger for the former. Interestingly, beyond financial resources, cognitive and socio-emotional divorce skill gaps seem to be driven by different factors. A large part of the gap in cognitive skills is explained by parental education, whilst a large part of the gap in socio-emotional development is explained by the inter-parental relationship quality. Since, on the one hand, parental education is highly correlated with parental cognitive abilities and, on the other, inter-parental conflicts are correlated with parents' socio-emotional skills, there is also scope to interpret our results in terms of inter-generational transmission, via the transfer of ability from parents to children.[35]

As highlighted in Section 4.1, there is also a statistically significant unexplained component for socio-emotional skills at age 7 and 11, implying that, at these ages, the return to characteristics is different between the two groups. Table A.5 in the Appendix shows the detailed decomposition of the unexplained components when significant. It appears that higher levels of conflict prior to separation decrease the unexplained component, meaning that conflicts are more harmful for children in intact families than for children of divorce, possibly because children of divorce are no longer exposed to conflicts after the parents separate. [36]

4.3 Divorce skill gaps across the children's skills distributions

Figure 1 features the results of the O-B decomposition at the 25th, 50th, 75th, 90th percentiles in the distribution of cognitive and socio-emotional skills, and plots the total mean differences (blue circle), and the corresponding explained component (red diamond). The first row in Figure 1 shows the results of the decomposition for cognitive skills for each age of the child, while the second row shows corresponding results for socio-emotional skills.

For cognitive skills, the figure shows that, consistent with our previous analysis, children of intact families score higher on cognitive tests at all quantiles of cognitive skill distribution, demonstrated by positive and significant quantile gaps materialising at all ages.[37] The

[35]Similar analysis is provided for divorce occurring at later stages (between age 3 and 5, between age 5 and 7). Results are very similar irrespective of the timing of divorce and therefore are not part of the main analysis but are shown in Table A.9 and A.10.

[36]The difference in intercepts between children of intact and disrupted families, the constant in Table A.5, is not statistically significant, thereby suggesting that differences in unobservables between the two groups do not significantly explain divorce skill gaps. This implies that, once accounting for observables, there are no unobserved characteristics that significantly contribute to the gap.

[37]The full table containing all corresponding results for this detailed decomposition for cognitive skills,

figure also suggests that there does not seem to have any clear pattern of pronounced inequality across the cognitive skill distribution with respect to the explained component of the decomposition. These results therefore provide a complementary robustness analysis to the mean decomposition, suggesting that the average decomposition of the divorce cognitive skill gap captures the main features that characterise the divorce gap overall. In addition, consistent with our decomposition at the mean, the results suggest that raw gap is mainly explained by compositional differences in covariates, where the residual component is rarely different from zero at standard significance levels.[38] To highlight this further, in Figure 2, we also provide a detailed decomposition of the divorce skill gap across the distribution of skills. The figure plots, for each set of explanatory factors, their relative contribution to the explained skill gap at each age, for the 25th, 50th, 75th, 90th percentiles of the skill distribution, respectively. The factors that we consider in the figure are parental education (blue bar), financial resources (red bar), and inter-parental conflicts (green bar). The first row of the figure confirms that the major set of factors contributing to the explained component of cognitive skill gaps are family financial resources and parents' education, and that their contributions are stable as the child ages.

A different pattern arises however when looking at socio-emotional skills. As noted in the previous analysis, the divorce socio-emotional skill gaps are larger than the corresponding cognitive skill gaps, and the decomposition across the distribution shows that this remains true for all levels of socio-emotional skills. In addition, differently to cognitive skills, in Figure 1 we find a pronounced pattern of decreasing differentials across the distribution of socio-emotional abilities, whereby the divorce socio-emotional skill gap decreases from the 25th quantile to the 90th quantile for all ages. Consistent with the results at the mean, the socio-emotional divorce gap increases in the long-run between ages 3 and 11. This sharp increase however, is not entirely reflected in the explained component, as in the lower tail of the distribution there is a significant residual component that remains unexplained at ages 7 and 11.[39] These results can be interpreted in light of the diathesis stress framework (see Beck 1967; Monroe and Simons 1991; Hilsman and Garber 1995) whereby a child's predisposition to behavioral problems manifests in the presence of stressful events, e.g. parental separation. Finally, the second row of Figure 2 confirms that the factors contributing most to socio-emotional skill gaps are family financial resources and inter-parental conflicts, and that their

including standard errors, is shown in Table A.11 within the Appendix.

[38] The only exception is the decomposition of cognitive skills at age 7 at the 50th and 90th quantiles shows that some of the unexplained effect is statistically different from zero. However, the difference between the intercepts is insignificant.

[39] In these cases, the difference between the intercepts is insignificant.

contributions remain stable across the distribution of socio-emotional skills.

4.3.1 Gender differences in the divorce skill gaps across the skills distributions

Next, Figure 3 depicts the same decomposition across the distribution of child skills, but by gender. The figure plots the total mean differences (shown in green), and the corresponding explained component (shown in yellow), with circles highlighting estimates for boys and diamonds showing corresponding estimates for girls. The results by gender are similar to the corresponding results for cognitive skills overall, whereby gaps appear to be homogeneous across the distribution. However, there is a clear gender difference in the divorce gaps for socio-emotional skills, with boys showing a more pronounced pattern of decreasing gaps as the level of socio-emotional skills increases, with the largest divorce gaps among children with higher levels of behavioral problems. The raw gap among boys at the 25th percentile is around 80% of a standard deviation whereas for girls the corresponding gap is around 60%. However, the gender differences diminish with the level of socio-emotional skills, with divorce gaps of around 20% of a standard deviation for both genders at the 90th percentile.[40] These results are in line with a contribution by Bertrand and Pan (2013), which finds that boys have more behavioral problems than girls, especially in broken families.

Overall, looking beyond the mean, the decomposition reveals that whilst there are no evident inequalities in the divorce gap across the children's cognitive skills distributions neither for boys nor for girls, the divorce socio-emotional skill gaps are more pronounced at the lower tail of the distribution rather than at the upper tail, especially for boys.

4.4 Offsetting differences in observable characteristics

We now report results from our counterfactual analysis where we consider how children of disrupted families (group $j = 1$) would have performed, if they had similar observable characteristics as children in intact families (group $j = 0$). To achieve this, we take our original sample of MCS families, together with the estimated vector of model parameters Ψ, and simulate skill formation and accumulation for all children, across multiple counterfactual

[40] Tables A.13 and A.14 in the Appendix report the results of the decomposition of the mean divorce skill gaps by gender. At the mean, gender differences are less evident. However, boys seem to have larger mean socio-emotional skill gap than girls at younger ages. This is confirmed by the decomposition results across the distribution of child skills.

scenarios.[41]

We begin with scenarios where each focuses on changes to a different subset of observable characteristics. For characteristics that have continuous measures, we increase the value of each measure, for all children in group $j = 1$, by the corresponding average between group difference.[42] Moreover, for characteristics with discrete measures, we set the value of the measure, for all children in group $j = 1$, to equal the modal value of the measure observed in group $j = 0$. Finally, we compare our results to a benchmark scenario where we exogenously change the divorce decision for families in group $j = 1$ to match that of group $j = 0$, leaving all other observable characteristics unchanged. The results for both cognitive and socio-emotional skills are shown in Figure 4.

In Figure 4, each coloured bar highlights the skill gap that remains between children in group $j = 0$ and group $j = 1$, at different quantiles of the skill distribution, for the counterfactual scenario where we remove differences in: parental education $\boldsymbol{X}^e$ (blue), financial resources $\boldsymbol{X}^f$ (red), inter-parental conflicts P (green), and the decision to divorce (yellow). In addition, the horizontal dashed lines (purple) show the corresponding skill gaps observed in the raw data. The top panel of figures shows the skill gaps for cognitive skills at each age, while the bottom panel shows corresponding skill gaps for socio-emotional skills.

For cognitive skills, the results indicate that removing differences in parental education and family financial resources are most efficacious in narrowing skill gaps, particularly for children at the lower tail of the distribution. Increases to parental education diminish the gap for group $j = 1$ children across all skill quantiles and ages, completely removing the gap for children below the 50th quantile. While offsetting differences in family financial resources show similar overall effectiveness, their impact appears to attenuate with child age for children in the upper quantiles of the distribution.

For socio-emotional skills, analogous to cognitive skills, removing differences in parental education reduces the gap for group $j = 1$ children across all skill quantiles and ages. However, the effect of offsetting financial resource disparities is limited to children in the lower quantiles

[41] Estimates for all model parameters Ψ can be found in appendix Table A.19 for inter-parental conflicts (equation 8) and divorce (equation 9), and Table(s) A.15, A.16, and A.17 for the skill production technologies (equations 10 and 11). In addition, appendix Figure A.2 shows the model fit for the distributions of cognitive and socio-emotional skills, respectively, for all time periods $t > 1$, highlighting that the model predicts the data well.

[42] The vector of average between group differences for all measures of observable characteristics is shown in column (3) of Table 2. For example, the average between group difference in OECD equivalised income is £124.33. Therefore, when we simulate outcomes under changes to family financial resources, in addition to changes in the other measures of financial resources, we increase the OECD equivalised income for all children in group $j = 1$ by £124.33.

of the distribution. Reductions in inter-parental conflicts appear most effective for narrowing socio-emotional skill gaps, decreasing the gap for group $j = 1$ children across all skill quantiles and ages. Notably, improvements in inter-parental conflicts completely offset the gap for children at the 90th percentile of the distribution.

Moreover, exogenously changing the divorce decision, keeping all other observable characteristics unchanged, is noteworthy as it isolates the direct impact of divorce on skill outcomes within the model. For cognitive skills, this leads to negligible reductions in skill gaps at all ages and at all quantiles of the distribution. For socio-emotional skills, changing the divorce decision does reduce skill gaps for children at the lower skill quantiles, however, the reductions are never statistically different from corresponding reductions when we instead change their observable characteristics. Overall, this implies that discouraging divorce would be an ineffective strategy for offsetting skill gaps and that resources would be better allocated towards targeting characteristics of at-risk families, further emphasising the role of selection.

However, recall that parental divorce decisions are determined endogenously, and that changes to observable characteristics also influence the parental propensity to divorce. Therefore, in each counterfactual, group $j = 1$ is actually comprised of families belonging to two distinct subgroups: $j = 1'$, the group $j = 1$ families that remain divorced in that counterfactual, and $j = 1''$, the group $j = 1$ families who no longer divorce in that counterfactual. Figure 5 shows the skill gaps between children in group $j = 0$ and children in group $j = 1''$. Comparing outcomes between these groups adds a new layer to the selection story, and emphasises the need for a model of skill development with an endogenous divorce decision. Specifically, the comparison answers the question: if we are able to equalise observable characteristics to the extent that this also changes the divorce decision, how would this impact on divorce skill gaps? This is a key question that, for example, the O-B decomposition could not answer. Figure 5 shows that for all scenarios where observable characteristics are equalised, the skill gaps between these groups are either completely removed or negligible for both skills, at all quantiles of the distribution, and at all ages. This is noteworthy for two reasons. First, it reinforces that divorce skill gaps can be fully explained by the effects of selection on observable characteristics, leaving negligible room for selection on unobservables. Second, it highlights that the divorce decision is important, but also through the lens of selection, whereby changes in observable characteristics endogenously reduce the probability of divorce, which, in turn, spills over into child skill outcomes. Indeed, Figure 5 confirms that if we were to instead cancel the divorce decision exogenously for the group $j = 1''$ families (yellow), with no other change in their observable characteristics, large and significant skill gaps would remain, for

both skills, at all ages, and all quantiles of the distribution.

To further emphasise the role of selection and the endogenous divorce decision, Figure 6 shows the corresponding skill gaps between children in group $j = 0$ and children in group $j = 1'$. This comparison is also noteworthy because it isolates the effect of equalising observable characteristics when doing so does not impact on the divorce decision. This is equivalent to a model without an endogenous divorce decision, for example the O-B decomposition, and identifies the direct effect of selection on observables. The overall patterns are similar to those in Figure 4, suggesting that the direct effect of equalising observable characteristics indeed leads to a reduction in divorce skill gaps. However, the gaps that remain are larger on average, implying that the benefits of equalising characteristics are not fully realized among the families that remain divorced.

Overall, while Figure 4 suggests that offsetting the effects of selection, by targeting pre-divorce characteristics, appears to be effective at reducing divorce skill gaps, the results in Figures 5 and 6 enhance the story of selection by disentangling the mechanisms through which the interventions operate. Taken together, the results imply that the narrowing of divorce skill gaps is attributed to a combination of the direct effects of equalising pre-divorce characteristics, via the skill production technologies, and the indirect effects of equalising pre-divorce characteristics, via reductions in the divorce probability. The consequence is that interventions targeting pre-divorce characteristics that have a negligible impact on the divorce probability will be less effective overall.

5 Sensitivity analyses

We are concerned about some of the limits of the O-B decomposition and we address them by carrying out a set of sensitivity analyses similar to Longhi et al. (2012, 2013) and Nandi and Nicoletti (2014) by (i) estimating the re-weighted O-B decomposition, (ii) changing the counterfactual and (iii) imposing a common support.

5.1 Re-weighted O-B decomposition

The detailed decomposition of the explained component provided by the O-B method is reliable only if the composition effects estimated with a re-weighted O-B method are similar to the composition effects estimated with the unweighted O-B method (See discussion in the Appendix A.2). We decompose the divorce skill gaps at the mean using the more robust re-

weighted decomposition methodology (DiNardo et al., 1996; Fortin et al., 2011) to separate composition effects from residual effects.[43] Specifically, we construct a counterfactual sample of children of intact families re-weighted to have the same characteristics of children of divorce. Then differences between skills from this counterfactual sample and those of children of intact families represents the true divorce skill gaps, with no misspecification error due to the non-linearity of the underlying conditional expectation. We use a logit model to compute the appropriate weights with the same explanatory variables used in the rest of our analysis.

Table 5 reports the results for the mean divorce skill gaps using the re-weighted method for cognitive and socio-emotional skills in Panel A and B respectively. Overall, the re-weighted method confirms the findings that composition effects largely explain the differences between the two groups of children, for both cognitive and socio-emotional skills.[44] In fact, the re-weighted decomposition results indicate that the composition effect over-explains the divorce gap for both cognitive and socio-emotional skills, which suggests that, given the difference in the covariates, children from intact families should have even higher skills compared to children of divorce. If this is the case, the insights provided in our analysis would largely remain unchanged; indeed it would suggest that the accounting power of some of the factors may be even stronger.

5.2 Choice of the reference group in the decomposition

Another limitation of the O-B decompositions is that the decomposition results may depend on the chosen reference group. Our choice of the counterfactual - children of intact families with the same mean covariates of children of divorce (see Equation 3)- implies that the reference group is the sample of children of intact families. We argue that the children of intact families' skills represent the appropriate counterfactual for the children of divorce's skills in absence of causal impact of divorce on children outcomes.

To test for the robustness of our results that may depend on the choice of the reference group, we consider two alternative reference groups: (i) children of divorce with the same characteristics of children of intact families, whereby the reference group is the subsample of children of divorce; (ii) decomposition using coefficients from pooled regression, whereby the reference group is the full sample (pooled sample) of children of intact and divorced families.

[43] See Longhi et al. (2012, 2013); Nandi and Nicoletti (2014); Fortin et al. (2015) for a recent application of the methodology.

[44] The compositional effects estimated with the re-weighted method are not statistically different from the compositional effects estimated with a generalized O-B decomposition.

Results are shown in Table 6 and 7 respectively and are consistent with those from our primary decomposition provided in Table 3. These results suggest that our decomposition findings are robust to different choices of the counterfactual.

5.3 Common support

To address the common support concern we repeat our analysis following Dehejia and Wahba (2002) and Słoczyński (2015) and we adopt two different rules in order to improve the overlap. First, we remove from our sample all children of divorce whose estimated propensity score is lower than the minimum or higher than the maximum estimated propensity score for children of intact families. By following this rule, we want to avoid including those children of divorce who have no counterparts among children of intact families in the decomposition. Second, we further restrict our sample by excluding all children of intact families whose estimated propensity score is lower than the minimum or higher than the maximum estimated propensity score for the children of divorce. This is to guarantee that none of the dissimilar children of intact families is used to compute the counterfactual outcome of the children of divorce.

Table 8 shows the results of the decomposition when imposing the common support restriction, for cognitive (Panel A) and socio-emotional skills (Panel B) respectively. We find no differences between these results and the main results reported in Table 3. This is unsurprising as we only drop very few observations when imposing the common support assumption, which suggests that the distribution of propensities to divorce between the two groups of children largely overlap.

6 Conclusion

This paper utilises the UK Millennium Cohort Study (MCS) to model and analyse parental selection into divorce and its relationship with child cognitive and socio-emotional skill development from ages 3 to 11. We leverage the richness of the MCS data to calculate divorce skill gaps and perform a decomposition exercise, quantifying the relative contributions of various pre-divorce characteristics in explaining the gaps, both at the mean and across the skill distribution. To complement our decomposition analysis, we then construct a model of child skill formation and accumulation that includes an endogenous parental divorce decision. Importantly, the divorce decision depends on all pre-divorce characteristics considered

in the decomposition exercise, including inter-parental conflicts, that are often unobserved in the literature. The model provides the foundation for our final analysis, where we assess the impact of counterfactual interventions aimed at reducing divorce skill gaps. Specifically, we consider alternative counterfactual scenarios where children of disrupted families (i) have identical observable characteristics as the children in intact families, or (ii) their parents chose not to divorce.

The combined results of our decomposition and counterfactual analysis reveal a clear story of selection. We find that differences in cognitive and socio-emotional skill outcomes between children of divorced and non-divorced parents are entirely explained by parental selection into divorce. Notably, we show that exogenously changing the parental divorce decision, while keeping all the other characteristics unchanged, leads to only a negligible reduction in the divorce skill gaps. This implies that interventions solely aimed at discouraging divorce would be ineffective at offsetting divorce skill gaps. Instead, we demonstrate that skill gaps can be effectively narrowed by equalising pre-divorce characteristics. This approach works through two mechanisms: directly, via the impact of changes in characteristics within the skill production technologies, and indirectly, through the impact of changes in characteristics on the divorce probability. Therefore, our findings suggest that the most effective interventions for reducing divorce skill gaps are those that target factors that influence child skill development and simultaneously reduce the likelihood of divorce.

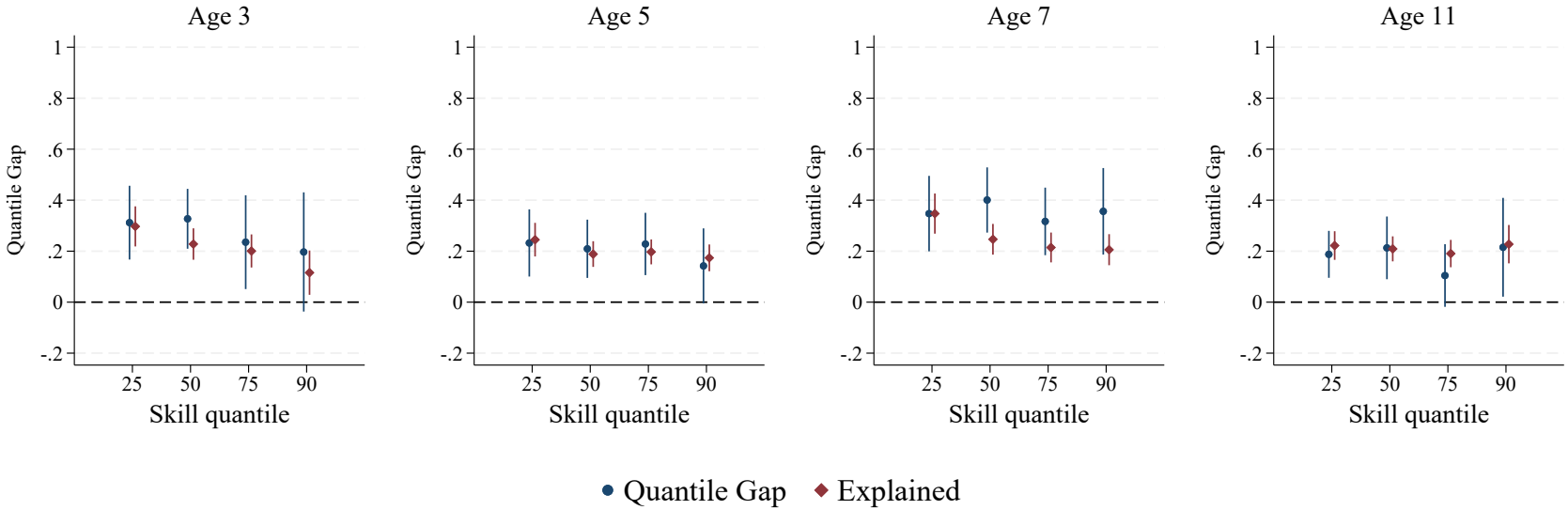
In addition, our analysis reveals that the factors driving divorce skill gaps vary across different skill dimensions. Cognitive skill gaps are primarily explained by differences in parental education and family financial resources, with little sensitivity to other family characteristics. Therefore, including inter-parental conflicts in our analysis adds little to the explanation of divorce gaps in cognitive skills, beyond what is accounted for by the characteristics commonly considered in the literature. In contrast, the measure of inter-parental conflicts plays a significant role in the determination of gaps in socio-emotional skills, alongside the contribution of differences in family financial resources. These insights help to reconcile the previously ambiguous evidence in literature examining the effects of parental separation on children, adolescents, and adults. Our study also extends beyond mean skill gaps, analyzing divorce skill gaps across the complete distribution of child skills. We provide novel evidence showing that skill gaps are more pronounced for children with lower levels of skills, an effect that is particularly salient among boys with lower socio-emotional skills.

Overall, in light of the ongoing political, economic, and public debate regarding the impacts of divorce on children's outcomes, this paper offers a comprehensive analysis of the

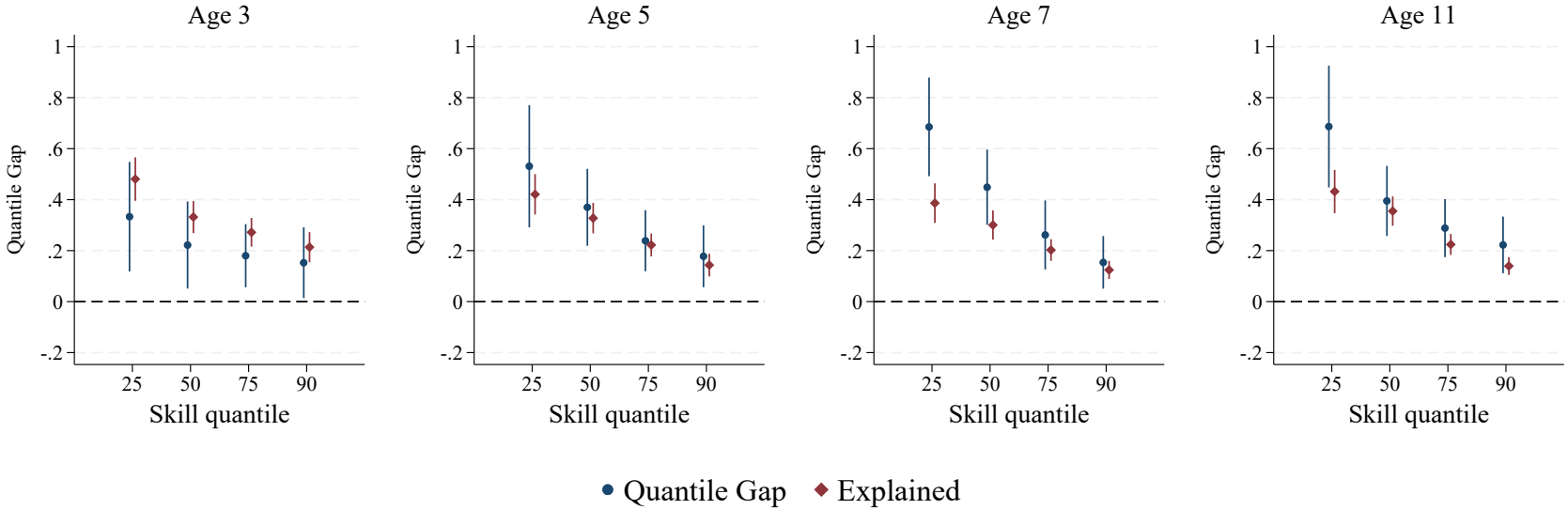
disparities arising between children of separated parents and those whose parents stay together. Our results emphasize the importance of family characteristics that influence both the likelihood of divorce and children's skill outcomes. The key factors accounting for divorce skill gaps are differences in parents' education, inter-parental conflicts, and family financial resources. Based on this evidence, our findings suggest that reducing skill disadvantages among children of divorce requires a nuanced approach. Rather than focusing solely on policies aimed at discouraging divorce, more effective interventions should target the underlying characteristics that drive both parental separation and child skill formation. This strategy addresses the source of family instability and its impact on children, potentially leading to better outcomes for all families, regardless of their marital status.

Figure 1: Decomposition across the skills distribution

(a) Cognitive skills



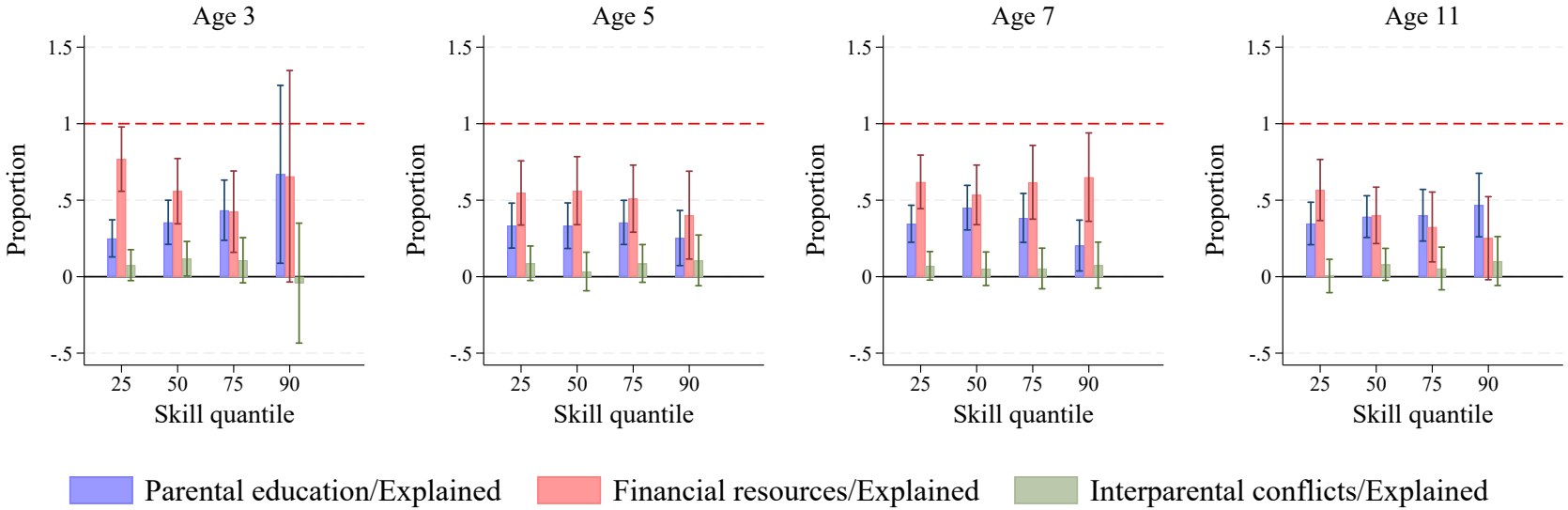
(b) Socio-emotional skills



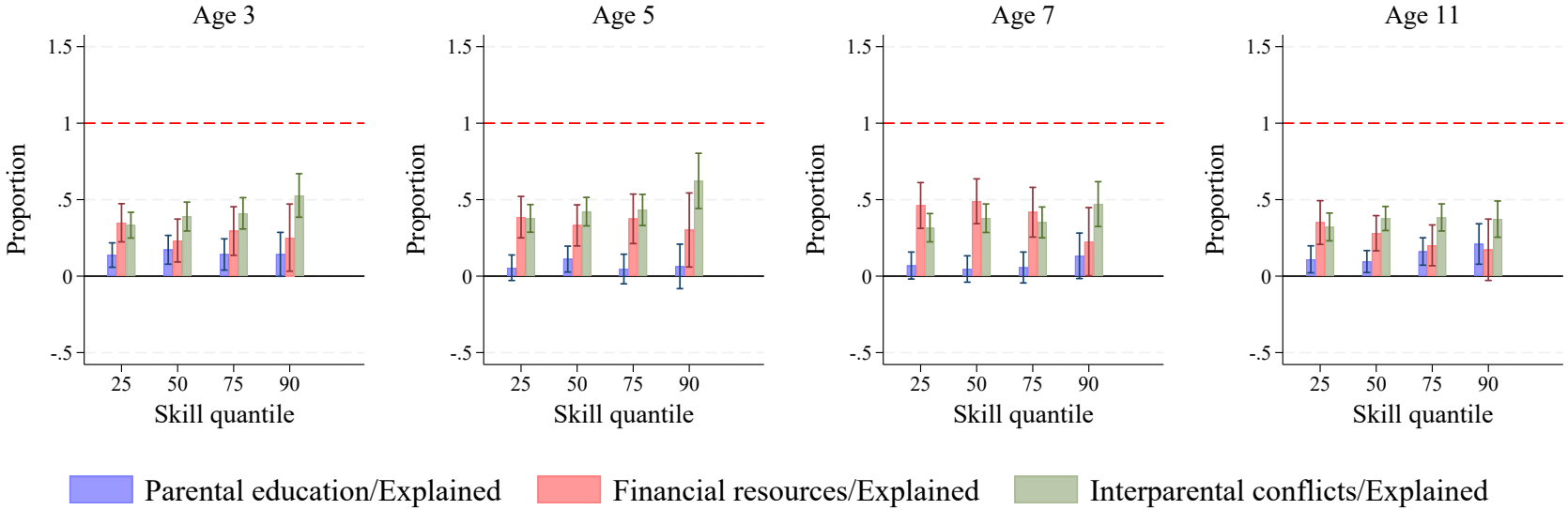
Notes: Children cognitive (Panel A) and socio-emotional skills (Panel B) are in standard deviations. The variables used to explain the gap are the same as Table 3. The quantile gap is the difference in skills between children of non divorced parents and children of divorced parents in the corresponding quantile (25-50-75-90). The explained part indicates the part of the corresponding quantile gap that is explained by observable characteristics (compositional effect). Bar indicates 95% confidence interval. The full set of results for the detailed decomposition across the distribution can be found in Table A.11 and A.12.

Figure 2: Detailed decomposition across the skills distribution

(a) Cognitive skills



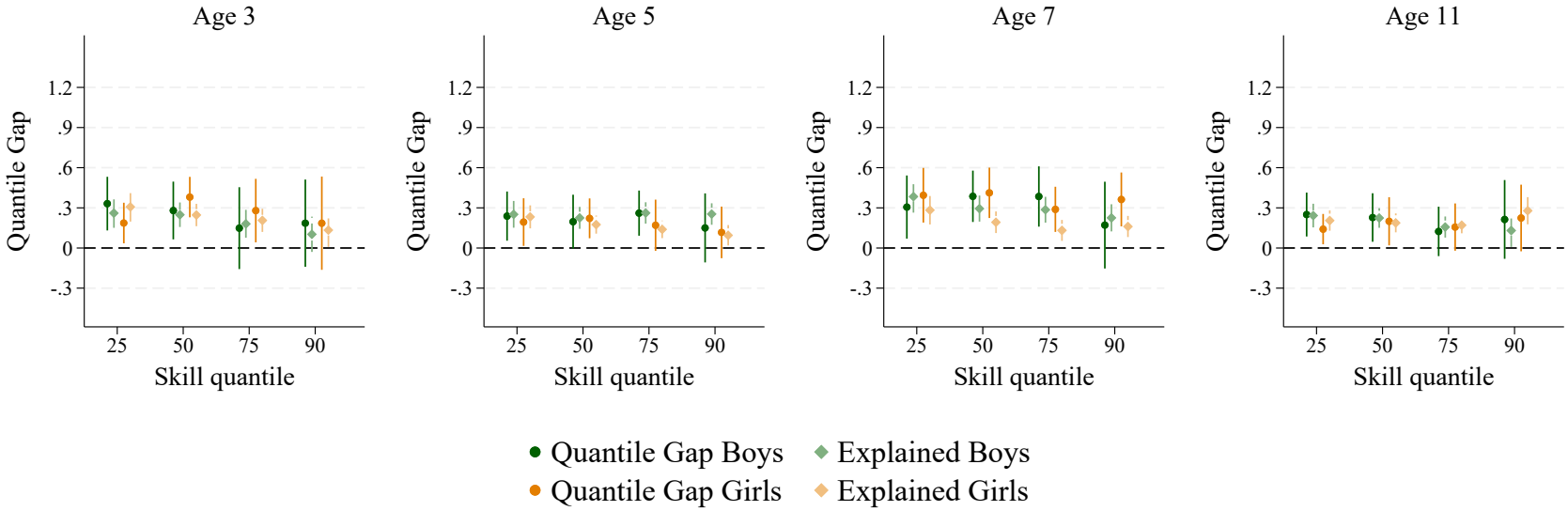
(b) Socio-emotional skills



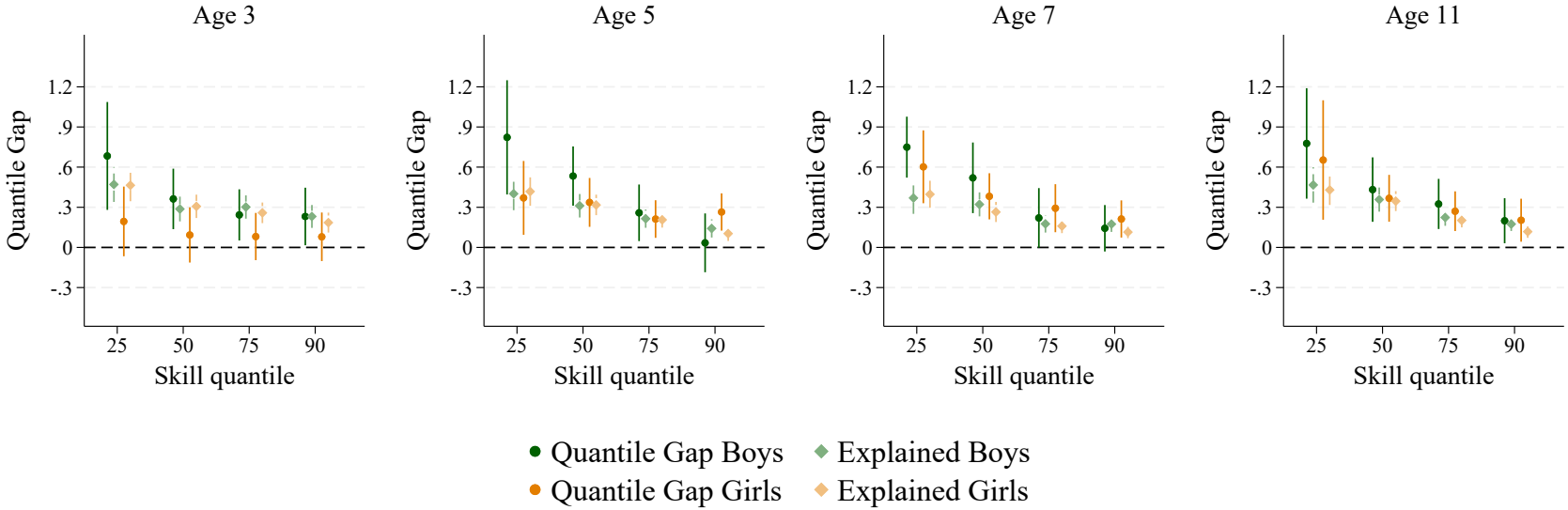
Notes: The figures shows the detailed decomposition across the skills distributions for cognitive skills (Panel A) and socio-emotional skills (Panel B). The variables used to explain the gap are the same as Table 3. Each bar indicates the proportion of the explained part (reported in Figure 1) due to parental education, financial resources and interparental conflicts respectively. Bar indicates 95% confidence interval.

Figure 3: Decomposition across the skills distribution, by gender

(a) Cognitive skills



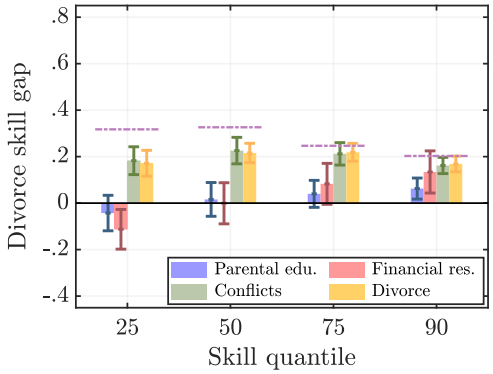
(b) Socio-emotional skills



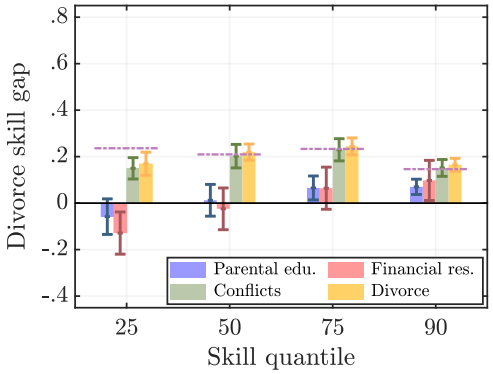
Notes: Children cognitive (Panel A) and socio-emotional skills (Panel B) are in standard deviations. The variables used to explain the gap are the same as Table 3. The quantile gap is the difference in skills between children of non divorced parents and children of divorced parents in the corresponding quantile (25-50-75-90). The explained part indicates the part of the corresponding quantile gap that is explained by observable characteristics (compositional effect). Bar indicates 95% confidence interval. Tables A.13 and A.14 in the Appendix report the results of the decomposition of the mean divorce skill gaps by gender.

Figure 4: Counterfactual analysis: offsetting differences in observable characteristics between groups $j = 0$ and $j = 1$

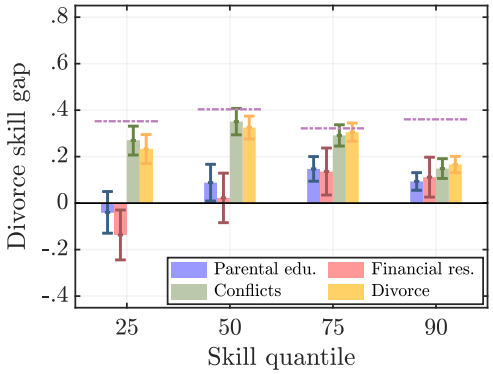
(a) Cognitive skills age 3



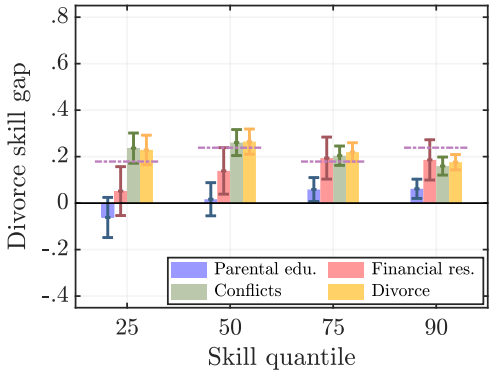
(b) Cognitive skills age 5



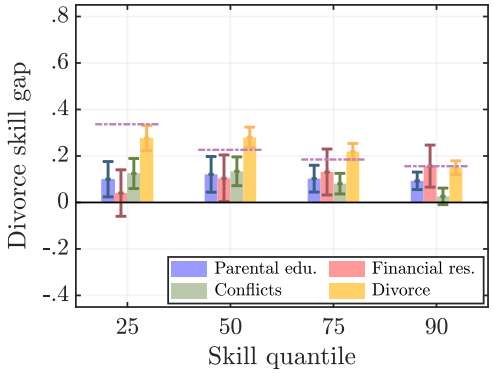
(c) Cognitive skills age 7



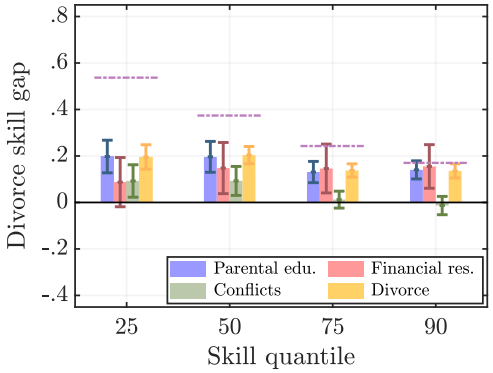
(d) Cognitive skills age 11



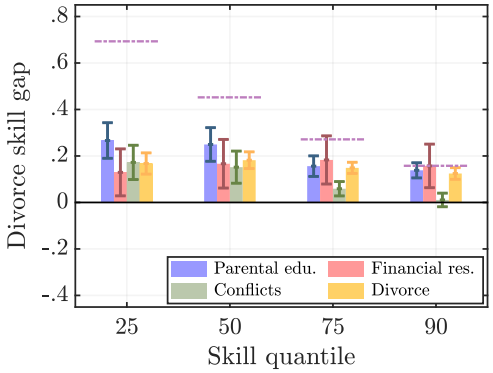
(e) Socio-emotional skills age 3



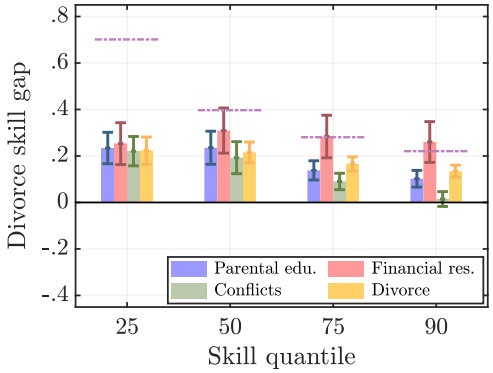
(f) Socio-emotional skills age 5



(g) Socio-emotional skills age 7



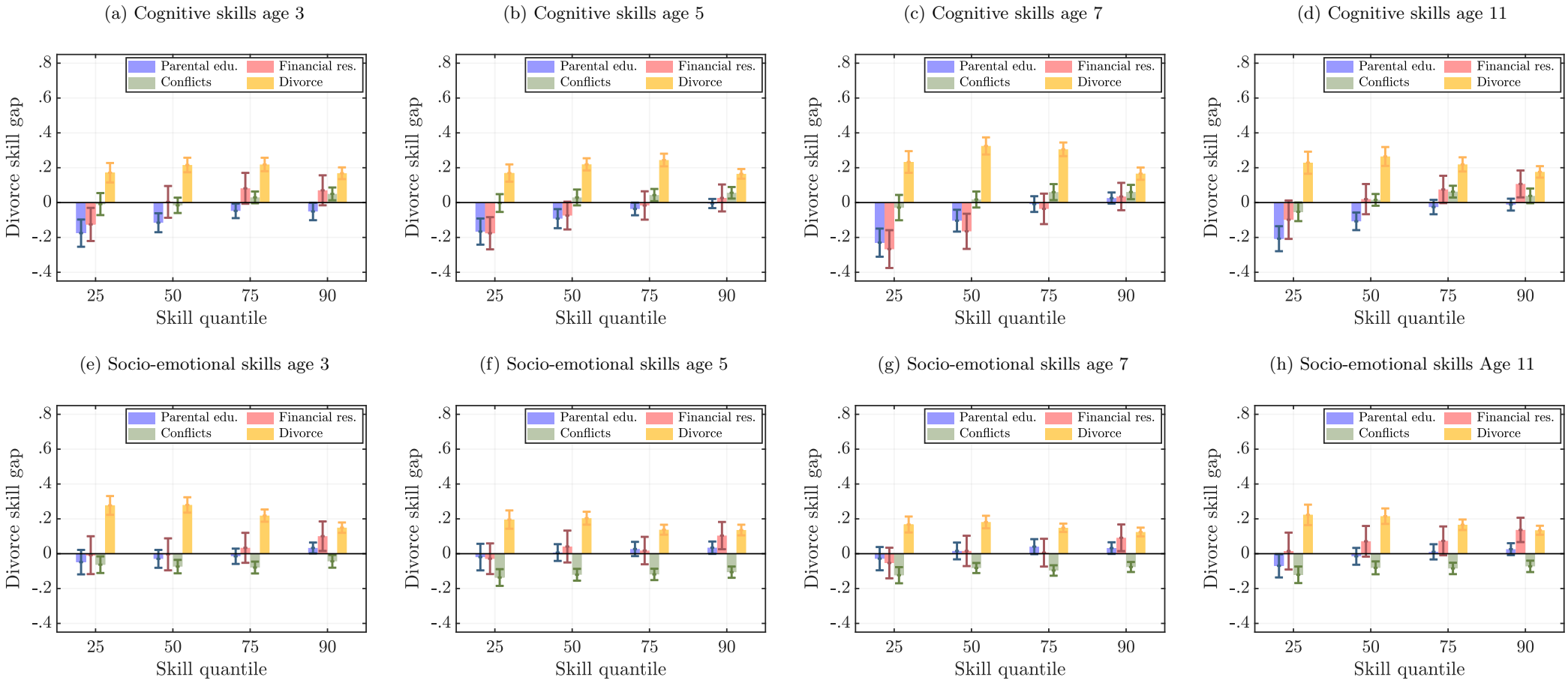
(h) Socio-emotional skills Age 11



Source: UK Millennium Cohort Study.

Notes: This figure plots the divorce skill gap that remains between children in group $j = 0$ and group $j = 1$, in each counterfactual scenario, at different quantiles of the skill distribution. The purple dashed line corresponds to the divorce skill gap in the raw data at the respective quantile of the skill distribution. The blue bars correspond to the scenario where we offset differences in parental education, the red bars are the scenario where we offset differences in family financial resources, and the green bars are the skill gaps that remain in the counterfactual where we offset differences in inter-parental conflicts. The yellow bars are the corresponding gaps when we change only the divorce decision. The top panel of sub-figures a, b, c, and d show counterfactual divorce skill gaps for cognitive skills at ages 3, 5, 7, and 11 respectively. The bottom panel, sub-figures e, f, g, and h, show corresponding divorce skill gaps for socio-emotional skills. 95% confidence intervals from 100 bootstrap replications are indicated by the error bars.

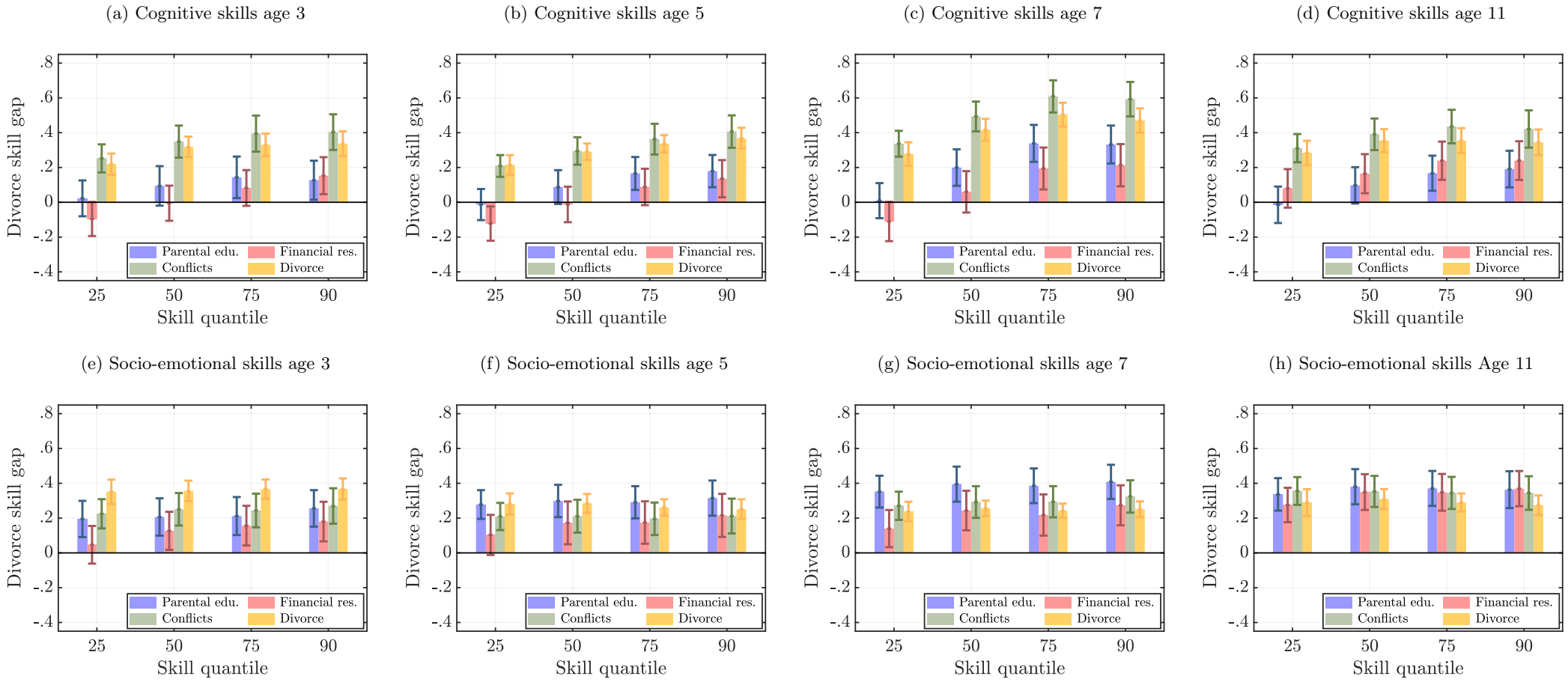
Figure 5: Counterfactual analysis: endogenous skill gap between children in group $j = 0$ and group $j = 1''$



Source: UK Millennium Cohort Study.

Notes: This figure plots the divorce skill gap that remains between children in group $j = 0$ and group $j = 1''$, in each counterfactual scenario, at different quantiles of the skill distribution. The purple dashed line corresponds to the divorce skill gap in the raw data at the respective quantile of the skill distribution. The blue bars correspond to the scenario where we offset differences in parental education, the red bars are the scenario where we offset differences in family financial resources, and the green bars are the skill gaps that remain in the counterfactual where we offset differences in inter-parental conflicts. The yellow bars are the corresponding gaps when we change only the divorce decision. The top panel of sub-figures a, b, c, and d show counterfactual divorce skill gaps for cognitive skills at ages 3, 5, 7, and 11 respectively. The bottom panel, sub-figures e, f, g, and h, show corresponding divorce skill gaps for socio-emotional skills. 95% confidence intervals from 100 bootstrap replications are indicated by the error bars.

Figure 6: Counterfactual analysis: endogenous skill gap between children in group $j = 0$ and group $j = 1'$



Source: UK Millennium Cohort Study.

Notes: This figure plots the divorce skill gap that remains between children in group $j = 0$ and group $j = 1'$, in each counterfactual scenario, at different quantiles of the skill distribution. The purple dashed line corresponds to the divorce skill gap in the raw data at the respective quantile of the skill distribution. The blue bars correspond to the scenario where we offset differences in parental education, the red bars are the scenario where we offset differences in family financial resources, and the green bars are the skill gaps that remain in the counterfactual where we offset differences in inter-parental conflicts. The yellow bars are the corresponding gaps when we change only the divorce decision. The top panel of sub-figures a, b, c, and d show counterfactual divorce skill gaps for cognitive skills at ages 3, 5, 7, and 11 respectively. The bottom panel, sub-figures e, f, g, and h, show corresponding divorce skill gaps for socio-emotional skills. 95% confidence intervals from 100 bootstrap replications are indicated by the error bars.

Table 1: Descriptive statistics of the outcome variables, by divorce

	(1) Non divorced		(2) Divorced		(3)	
	Mean	sd	Mean	sd	Difference	Percentile Difference
Cognitive skills (Age 3)	0.195	0.939	-0.055	0.988	0.250***	11
Cognitive skills (Age 5)	0.216	0.855	-0.004	0.880	0.220***	11
Cognitive skills (Age 7)	0.192	0.913	-0.162	0.948	0.354***	16
Cognitive skills (Age 11)	0.153	0.898	-0.113	0.975	0.266***	19
Socio-emotional skills (Age 3)	0.146	0.915	-0.190	1.154	0.337***	13
Socio-emotional skills (Age 5)	0.188	0.858	-0.254	1.122	0.443***	16
Socio-emotional skills (Age 7)	0.204	0.839	-0.299	1.137	0.503***	19
Socio-emotional skills (Age 11)	0.191	0.868	-0.346	1.193	0.537***	19
Observations	4666		337		5003	

Sources: UK Millennium Cohort Study

Notes: Sample includes all singleton children interviewed at 9 months and ages 3,5,7 and 11, for whom the main respondent is the natural mother and the partner respondent is the natural father, who are either married or cohabiting and that have no missing observations in our set of relevant variables. Column (3) indicates the mean difference between the two groups with statistical significance difference at the 1, 5 and 10 percent levels indicated by ***, ** and *.

Table 2: Descriptive statistics of the explanatory variables, by divorce

	(1) Non divorced		(2) Divorced		(3)
	Mean	sd	Mean	sd	Difference
Child characteristics					
Female	0.514	0.500	0.510	0.501	0.004
Birth weight (Kg)	3.448	0.542	3.360	0.564	0.088**
Demographic characteristics					
Number of siblings	0.847	0.920	0.766	0.897	0.081
Cohabitation	0.201	0.401	0.576	0.495	-0.375***
Duration of relationship	5.709	3.829	3.706	3.118	2.003***
Planned pregnancy	0.710	0.454	0.487	0.501	0.223***
Mother's religion	0.617	0.486	0.418	0.494	0.199***
Mother's age	30.649	4.840	26.243	5.808	4.405***
Father's age	32.978	5.528	29.223	6.651	3.756***
Mother's ethnicity					
White	0.931	0.254	0.970	0.170	-0.040***
Mixed	0.004	0.064	0.006	0.077	-0.002
Indian, Pakistani, Bangladeshi, Black	0.055	0.228	0.018	0.132	0.037***
Other	0.010	0.101	0.006	0.077	0.004
Father's ethnicity					
White	0.929	0.256	0.944	0.231	-0.014
Mixed	0.006	0.079	0.006	0.077	0.000
Indian, Pakistani, Bangladeshi, Black	0.057	0.231	0.047	0.213	0.009
Other	0.008	0.089	0.003	0.054	0.005
Mother's education					
GCSE/O-level(or eq)	0.314	0.464	0.475	0.500	-0.161***
A level or more but below university	0.153	0.360	0.178	0.383	-0.025
University degree or higher	0.488	0.500	0.231	0.422	0.256***
No qualification	0.045	0.207	0.116	0.320	-0.071***
Father's education					
GCSE/O-level(or eq)	0.311	0.463	0.427	0.495	-0.117***
A level or more but below university	0.160	0.367	0.190	0.393	-0.030
University degree or higher	0.465	0.499	0.211	0.408	0.254***
No qualification	0.064	0.245	0.172	0.378	-0.108***
Parents' health					
Mother health:Good	0.878	0.328	0.789	0.408	0.089***
Father health:Good	0.881	0.324	0.816	0.388	0.065**
Financial resources					
OECD equivalised income	398.893	206.631	274.561	158.517	124.332***
House tenure					
Own	0.849	0.358	0.493	0.501	0.356***
Rent	0.130	0.336	0.466	0.500	-0.336***
Other	0.021	0.145	0.042	0.200	-0.020
Mother's occupational status					
Managerial and Professional	0.442	0.497	0.187	0.390	0.255***
Intermediate	0.251	0.434	0.193	0.395	0.058**
Routine and manual	0.284	0.451	0.558	0.497	-0.274***
Not in work	0.023	0.148	0.062	0.242	-0.040**
Father's occupational status					
Managerial and Professional	0.493	0.500	0.231	0.422	0.262***
Intermediate	0.182	0.386	0.151	0.359	0.031
Routine and manual	0.315	0.464	0.599	0.491	-0.285***
Not in work	0.010	0.099	0.018	0.132	-0.008
Quality of parental realtionship					
Interparental conflicts	-0.182	0.878	0.589	1.168	-0.771***
Observations	4666		337		5003

Sources: UK Millennium Cohort Study

Notes: Sample includes all singleton children interviewed at 9 months and age 3,5,7 and 11, for whom the main respondent is the natural mother and the partner respondent is the natural father, who are either married or cohabiting and that have no missing observations in our set of relevant variables. Column (3) indicates the mean difference between the two groups with statistical significance difference at the 1, 5 and 10 percent levels indicated by ***, ** and *.

Table 3: Mean divorce skills gaps, by child age

	(1) Age 3	(2) Age 5	(3) Age 7	(4) Age 11
Panel A: Cognitive skills				
Mean Gap	0.250***	0.220***	0.354***	0.266***
	(0.058)	(0.051)	(0.055)	(0.057)
Decomposition				
Explained	0.229***	0.213***	0.282***	0.242***
	(0.029)	(0.024)	(0.028)	(0.026)
Unexplained	0.022	0.007	0.072	0.024
	(0.059)	(0.054)	(0.057)	(0.060)
Panel B: Socio-emotional skills				
Mean Gap	0.337***	0.443***	0.503***	0.537***
	(0.067)	(0.065)	(0.066)	(0.069)
Decomposition				
Explained	0.358***	0.340***	0.316***	0.360***
	(0.030)	(0.029)	(0.028)	(0.029)
Unexplained	-0.022	0.102	0.187***	0.177**
	(0.067)	(0.067)	(0.068)	(0.069)
Observations	5003	5003	5003	5003

Source: UK Millennium Cohort Study.

Notes: Children cognitive (Panel A) and socio-emotional skills (Panel B) are in standard deviations. The variables used to explain the gap are: (i) *child characteristics* that are child sex and birth weight; (ii) *demographic characteristics* which are number of siblings, whether parents were cohabiting or married at birth, duration of relationship between the parents at birth, whether the pregnancy was planned, mother's religiosity, parents age, parents ethnicity; (iii) *parental education*; (iv) *health characteristics* that are parents general health; and (v) *family financial resources* which are family income, housing tenure, parents' social class based on NS-SEC (National Statistics Socio-Economic Classification); (vi) *interparental conflicts*. Statistical significance at the 1, 5 and 10 percent indicated by ***, ** and *.

Table 4: Detailed decomposition of the mean divorce skills gaps, by child age

	(1) Age 3	(2) Age 5	(3) Age 7	(4) Age 11
Panel A: Cognitive skills				
Mean Gap	0.250***	0.220***	0.354***	0.266***
	(0.058)	(0.051)	(0.055)	(0.057)
Explained				
Child characteristics	0.012	0.011*	0.012**	0.005
	(0.008)	(0.006)	(0.005)	(0.004)
Demographic characteristics	-0.033	-0.000	-0.017	0.023
	(0.021)	(0.018)	(0.018)	(0.019)
Parent's education	0.084***	0.070***	0.100***	0.092***
	(0.013)	(0.012)	(0.015)	(0.014)
Parent's health	0.006	0.003	0.007	-0.006
	(0.004)	(0.004)	(0.005)	(0.004)
Financial Resources	0.143***	0.117***	0.163***	0.109***
	(0.022)	(0.019)	(0.022)	(0.021)
Interparental conflicts	0.017	0.013	0.018	0.018
	(0.011)	(0.011)	(0.012)	(0.011)
Total	0.229***	0.213***	0.282***	0.242***
	(0.029)	(0.024)	(0.028)	(0.026)
Panel B: Socio-emotional skills				
Mean Gap	0.337***	0.443***	0.503***	0.537***
	(0.067)	(0.065)	(0.066)	(0.069)
Explained				
Child characteristics	0.005	0.004	0.003	0.005
	(0.006)	(0.007)	(0.008)	(0.007)
Demographic characteristics	0.036*	0.034*	0.035**	0.060***
	(0.019)	(0.018)	(0.018)	(0.019)
Parent's education	0.054***	0.025**	0.017	0.044***
	(0.013)	(0.012)	(0.011)	(0.012)
Parent's health	0.020***	0.019***	0.021***	0.031***
	(0.006)	(0.006)	(0.006)	(0.008)
Financial Resources	0.114***	0.120***	0.127***	0.105***
	(0.021)	(0.021)	(0.020)	(0.021)
Interparental conflicts	0.130***	0.138***	0.113***	0.116***
	(0.016)	(0.017)	(0.015)	(0.015)
Total	0.358***	0.340***	0.316***	0.360***
	(0.030)	(0.029)	(0.028)	(0.029)
Observations	5003	5003	5003	5003

Source: UK Millennium Cohort Study.

Notes: Children cognitive (Panel A) and socio-emotional skills (Panel B) are in standard deviations. The variables used to explain the gap are: (i) *child characteristics* that are child sex and birth weight; (ii) *demographic characteristics* which are number of siblings, whether parents were cohabiting or married at birth, duration of relationship between the parents at birth, whether the pregnancy was planned, mother's religiosity, parents age, parents ethnicity; (iii) *parental education*; (iv) *health characteristics* that are parents general health; and (v) *family financial resources* which are family income, housing tenure, parents' social class based on NS-SEC (National Statistics Socio-Economic Classification); (vi) *interparental conflicts*. Statistical significance at the 1, 5 and 10 percent indicated by ***, ** and *.

Table 5: Reweighted detailed decomposition of the divorce gap, by child age

	(1) Age 3	(2) Age 5	(3) Age 7	(4) Age 11
Panel A: Cognitive skills				
Mean Gap	0.250***	0.220***	0.354***	0.266***
	(0.058)	(0.051)	(0.055)	(0.057)
Explained				
Child characteristics	0.024**	0.014**	0.014**	0.004
	(0.010)	(0.006)	(0.006)	(0.008)
Demographic characteristics	-0.051	-0.033	-0.097*	0.023
	(0.086)	(0.040)	(0.060)	(0.044)
Parent's education	0.177***	0.156***	0.217***	0.158***
	(0.030)	(0.028)	(0.033)	(0.029)
Parent's health	0.020	0.015	0.016	-0.021*
	(0.013)	(0.012)	(0.013)	(0.012)
Financial Resources	0.163***	0.137***	0.205***	0.187***
	(0.047)	(0.044)	(0.051)	(0.050)
Interparental conflicts	0.056	0.009	0.024	0.044
	(0.039)	(0.027)	(0.029)	(0.031)
Total Explained	0.390***	0.298***	0.379***	0.395***
	(0.110)	(0.060)	(0.082)	(0.070)
Specification error	-0.055	0.015	0.110	-0.007
	(0.107)	(0.072)	(0.087)	(0.083)
Total Unexplained	-0.109**	-0.095***	-0.124***	-0.126***
	(0.043)	(0.021)	(0.031)	(0.028)
Reweighting error	0.025	0.002	-0.010	0.003
	(0.031)	(0.021)	(0.024)	(0.023)
Panel B: Socio-emotional skills				
Mean Gap	0.337***	0.443***	0.503***	0.537***
	(0.067)	(0.065)	(0.066)	(0.069)
Explained				
Child characteristics	0.014**	0.013*	0.014*	0.010
	(0.007)	(0.008)	(0.008)	(0.007)
Demographic characteristics	-0.021	0.069	0.025	0.032
	(0.048)	(0.049)	(0.042)	(0.039)
Parent's education	0.097***	0.057**	0.061***	0.078***
	(0.027)	(0.025)	(0.024)	(0.022)
Parent's health	0.028**	0.018**	0.018*	0.031***
	(0.013)	(0.009)	(0.010)	(0.010)
Financial Resources	0.144***	0.132***	0.191***	0.193***
	(0.045)	(0.041)	(0.043)	(0.045)
Interparental conflicts	0.238***	0.263***	0.201***	0.201***
	(0.033)	(0.029)	(0.027)	(0.026)
Total Explained	0.500***	0.552***	0.510***	0.545***
	(0.076)	(0.070)	(0.062)	(0.059)
Specification error	0.003	0.068	0.148*	0.163**
	(0.090)	(0.086)	(0.084)	(0.083)
Total Unexplained	-0.157***	-0.185***	-0.153***	-0.159***
	(0.028)	(0.026)	(0.023)	(0.022)
Reweighting error	-0.009	0.008	-0.003	-0.011
	(0.023)	(0.022)	(0.021)	(0.021)

Source: UK Millennium Cohort Study.

Notes: Children cognitive (Panel A) and socio-emotional skills (Panel B) are in standard deviations. The variables used to explain the gap are the same as Table 3. Statistical significance at the 1, 5 and 10 percent indicated by ***, ** and *.

Table 6: Mean divorce skills gaps, by child age - using as reference group the children of divorce

	(1) Age 3	(2) Age 5	(3) Age 7	(4) Age 11
Panel A: Cognitive skills				
Mean Gap	0.250***	0.220***	0.354***	0.266***
	(0.058)	(0.051)	(0.055)	(0.057)
Decomposition				
Explained	0.214***	0.220***	0.348***	0.194***
	(0.075)	(0.068)	(0.069)	(0.062)
Unexplained	0.037	-0.001	0.006	0.072
	(0.089)	(0.081)	(0.078)	(0.076)
Panel B: Socio-emotional skills				
Mean Gap	0.337***	0.443***	0.503***	0.537***
	(0.067)	(0.065)	(0.066)	(0.069)
Decomposition				
Explained	0.441***	0.327***	0.237***	0.353***
	(0.082)	(0.079)	(0.074)	(0.079)
Unexplained	-0.105	0.116	0.266***	0.185**
	(0.080)	(0.082)	(0.087)	(0.093)
Observations	5003	5003	5003	5003

Source: UK Millennium Cohort Study.
Notes: Children cognitive (Panel A) and socio-emotional skills (Panel B) are in standard deviations. The variables used to explain the gap are the same as Table 3. Statistical significance at the 1, 5 and 10 percent indicated by ***, ** and *.

Table 7: Mean divorce skills gaps, by child age - using as reference group the pooled sample of children of intact and divorced families

	(1) Age 3	(2) Age 5	(3) Age 7	(4) Age 11
Panel A: Cognitive skills				
Mean Gap	0.250***	0.220***	0.354***	0.266***
	(0.055)	(0.049)	(0.053)	(0.055)
Decomposition				
Explained	0.224***	0.209***	0.284***	0.237***
	(0.028)	(0.023)	(0.027)	(0.025)
Unexplained	0.027	0.010	0.070	0.029
	(0.056)	(0.051)	(0.055)	(0.057)
Panel B: Socio-emotional skills				
Mean Gap	0.337***	0.443***	0.503***	0.537***
	(0.064)	(0.062)	(0.063)	(0.066)
Decomposition				
Explained	0.368***	0.341***	0.308***	0.360***
	(0.029)	(0.028)	(0.027)	(0.029)
Unexplained	-0.032	0.102*	0.195***	0.178***
	(0.061)	(0.061)	(0.064)	(0.065)
Observations	5003	5003	5003	5003

Source: UK Millennium Cohort Study.
Notes: Children cognitive (Panel A) and socio-emotional skills (Panel B) are in standard deviations. The variables used to explain the gap are the same as Table 3. Statistical significance at the 1, 5 and 10 percent indicated by ***, ** and *.

Table 8: Mean divorce skills gaps, by child age - common support

	(1) Age 3	(2) Age 5	(3) Age 7	(4) Age 11
Panel A: Cognitive skills				
Mean Gap	0.243***	0.207***	0.341***	0.260***
	(0.058)	(0.051)	(0.055)	(0.057)
Decomposition				
Explained	0.230***	0.209***	0.281***	0.238***
	(0.029)	(0.024)	(0.028)	(0.026)
Unexplained	0.013	-0.002	0.060	0.022
	(0.059)	(0.053)	(0.057)	(0.060)
Panel B: Socio-emotional skills				
Mean Gap	0.330***	0.428***	0.497***	0.533***
	(0.067)	(0.065)	(0.066)	(0.069)
Decomposition				
Explained	0.352***	0.333***	0.311***	0.356***
	(0.030)	(0.029)	(0.027)	(0.029)
Unexplained	-0.022	0.095	0.186***	0.177**
	(0.067)	(0.067)	(0.068)	(0.070)
Observations	4954	4954	4954	4954

Source: UK Millennium Cohort Study.

Notes: Children cognitive (Panel A) and socio-emotional skills (Panel B) are in standard deviations. The variables used to explain the gap are the same as Table 3. Statistical significance at the 1, 5 and 10 percent indicated by ***, ** and *.

A Appendices

A.1 Institutional background

This section describes the institutional background characterizing the UK and our sample. The most important divorce reform in the UK was the Divorce Reform Act 1969, strengthened in the Matrimonial Causes Act 1973 which still contains the divorce law UK is subject to today. This reform yielded remarkable changes because, in addition to the three grounds of divorce of adultery, behavior and desertion, already present in the previous Matrimonial Causes Act 1937, it adds grounds for divorce, based on two years' consensual separation, or five years' if one of the party is non-consensual. This legislation removed the concept of 'matrimonial offences' and introduced some elements of no-fault divorce, although a formal 'no fault' divorce has not been introduced yet in the UK with a still ongoing debate. The divorce reform, together with the change in attitudes and expectations toward marriage, and the higher women's employment rate[45], has followed by a sharp increase in the number of divorced couples from around 50,000 per year in the early '70s to 150,000 in the '80s.[46] Then the number of divorces remain stable for 20 years until recently, when it has fallen steadily, together with the number of marriages.[47] More precisely, the number of divorcing couples in England and Wales in 2013 was 114,720, involving 94,864 children under 16. Among these children, 21% were under 5 and 64% were under 11 years old.[48]

In addition to the divorce law the UK has implemented, there are other policies indirectly related to divorce, e.g. pro-marriage policies. In 2015 the UK has introduced a new public policy called *Married couples allowance*, aimed to reduce the tax bill each year if a couple is married or in a civil partnership.[49] This policy promotes marriages and civil partnerships and discourages divorce, without considering the possible drawback of reshaping the incentive to divorce and convincing conflictual couples to stay married.[50] If these policies are motivated by promoting two-parents families as the best environment for child development, we need to establish that the negative association between parental separation and children outcomes cannot be entirely explained by selection.

[45] Evidence on no-fault divorce law and female labour supply is provided for US (Genadek et al., 2007).

[46] González and Viitanen (2009) analyze the effect on divorce rate of no-fault divorce reform in Europe and find a sizeable effect of the reform in increasing the divorce rate.

[47] A similar figure characterizes the US (Rotz, 2016).

[48] Source: Office from National Statistics.

[49] A similar policy, the *Temporary Assistance to Needy Families* (TANF) introduced in 1997 can be found in the US.

[50] Consider McLanahan (2007), Amato and Furstenberg (2007), and Frimmel et al. (2014) for evaluation of pro-marriage policies.

Finally, Child Maintenance policies may indirectly affect divorce decisions (Walker and Zhu 2006 for the UK and Nixon 1997 for the US). During our sample period (2000-2012) child maintenance has been regulated by the Child Support Agency (CSA) introduced in 1993, a reform that mandated child support payment for the first time. In 2003 a simplified scheme was introduced, where the amount of financial support provided by the non-resident parent depend on his/her net weekly income. In addition, this scheme included the possibility of shared care for parents, meaning that the non-resident parent pays lower maintenance if he/she stays with the child for at least 52 nights a year.[51] More recently, the Children and Families Act 2014 replaced the CSA with the Child Maintenance Service which includes the possibility of 50-50 shared parenting and requires the parents to attend a Mediation Information and Assessment Meeting before applying to court.[52] This procedure is aimed at encouraging cooperation between the parents and at reducing conflicts in the best interest of the child. Although this scheme does not regard our sample it is important to mention it for policy implication purposes.

A.2 Re-weighted Oaxaca-Blinder decomposition

As discussed previuosly, a limitation of the O-B decompositions (as well as the generalized O-B) is that, if the conditional mean function is not linear, the decompositions may not provide consistent estimates of the components. One possible solution to this problem is to compute the decomposition using a reweighting approach as in DiNardo et al. (1996) and Barsky et al. (2002).

Specifically, we use the re-weighted decomposition methodology such that we first construct a counterfactual sample of children of intact families weighted to have the same characteristics as children of divorce, and then calculate the explained and unexplained components. Once the appropriate counterfactual has been constructed, then the differences between the children's outcomes from this counterfactual sample of children of divorce represent the true divorce skill gaps, ruling out misspecification error due to the nonlinearity of the underlying conditional expectation (Fortin et al., 2011).

One drawback of this decomposition however, is that it does not offer a simple way of performing a detailed decomposition of the difference in mean and quantiles. For this reason, we combine weights and the generalized O-B methods to appropriately compute counterfactual of the statistic of interest. More precisely, the regression of the RIF for the

[51] Source: www.csa.gov.uk
[52] Source: www.gov.uk

children of intact families is estimated with weighted least squares:

$$RIF(y_0) = \mathbf{X}_0\boldsymbol{\beta}_{\mathbf{0}}^{WR} + u_0 \tag{14}$$

with weights computed as

$$w(X) = \frac{P(j=1|X)P(j=0)}{P(j=0|X)P(j=1)} \tag{15}$$

where j takes value 0 for children of intact families (reference group) and value 1 for children of disrupted families, and $P(j=0|X)$ is the conditional probability of being a child of intact family estimated with a logit model. In other words, we reweight the sample of children of intact families so that the distribution of their characteristics (X) is similar to that of children of divorce. As noted by Roams and Rotnitzky (1995), this method is double-consistent because the estimation of the weighted regression is consistent if either the estimated weights (i.e. the logit model) are correct *or* if the specification of the linear regression model is correct.

Then, we consider as a counterfactual children of intact families (reference group) as if they have the same distribution of characteristics of children of divorce (comparison group), i.e. $\overline{\mathbf{X}_1}\boldsymbol{\beta}_{\mathbf{0}}^{WR}$ and finally compute the re-weighted decomposition of the mean gap as follows:

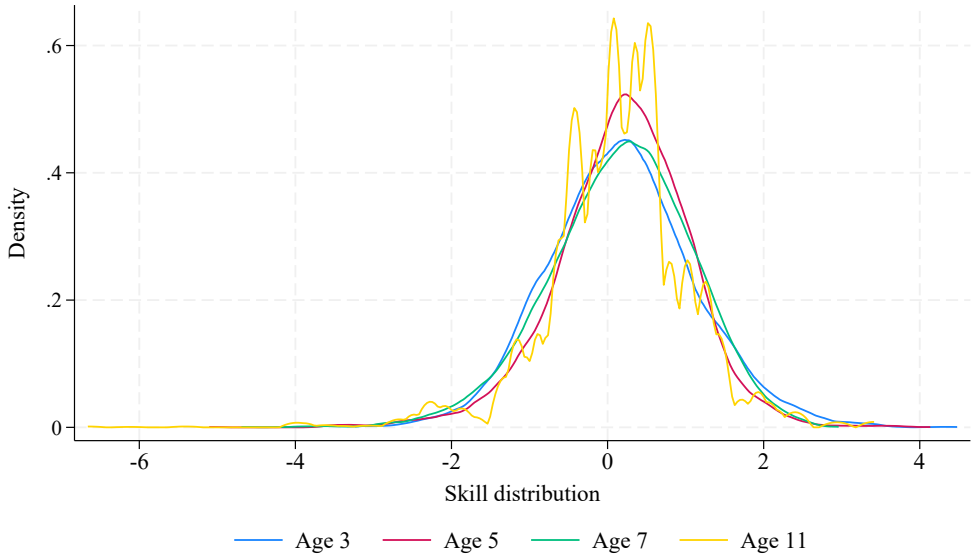
$$\begin{aligned} \overline{y}_0 - \overline{y}_1 &= \overline{\mathbf{X}}_0\boldsymbol{\beta_0} - \overline{\mathbf{X}}_1\boldsymbol{\beta_1} + \overline{\mathbf{X}}_1\boldsymbol{\beta}_{\mathbf{0}}^{WR} - \overline{\mathbf{X}}_1\boldsymbol{\beta}_{\mathbf{0}}^{WR} \\ &= [(\overline{\mathbf{X}}_0\boldsymbol{\beta_0} - \overline{\mathbf{X}}_1\boldsymbol{\beta}_{\mathbf{0}}^{WR}] + [\overline{\mathbf{X}}_1(\boldsymbol{\beta}_{\mathbf{0}}^{WR} - \boldsymbol{\beta_1})] \end{aligned} \tag{16}$$

where the two terms in the square brackets represent the composition effect and the residual effect respectively. According to Firpo et al. (2007) and Fortin et al. (2015) the composition effect consists of two parts, i.e. the pure composition effect and the specification error in the linear model. Therefore, if the model is linear, the specification error should be zero. If the composition effect computed with the reweighting approach and the composition effects computed with the generalized O-B are similar, we can rely on the detailed decomposition results provided by the generalized O-B.

The empirical results described in the following section are based on the mean and the generalized O-B decomposition to estimate compositional and residual effects, with the reweighting approach used for robustness checks.

Figure A.1: Decomposition across the skills distribution

(a) Cognitive skills



(b) Socio-emotional skills

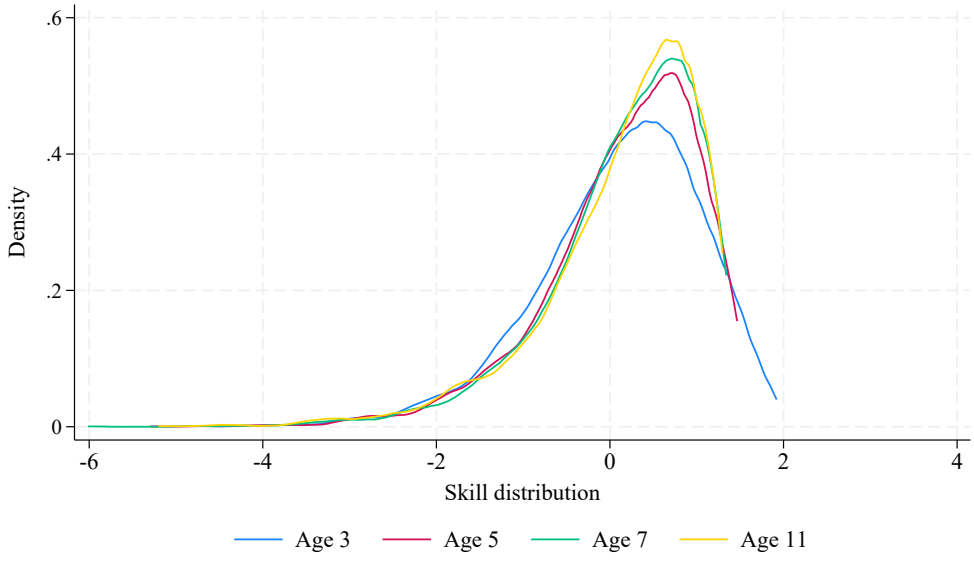
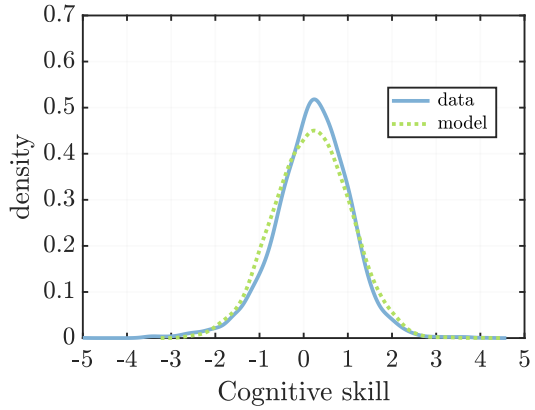
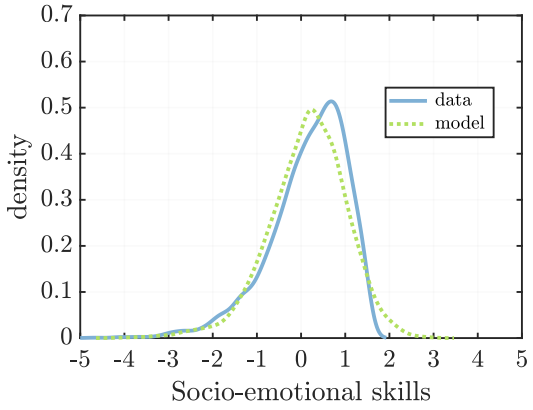


Figure A.2: Model Fit: densities of cognitive and socio-emotional skills

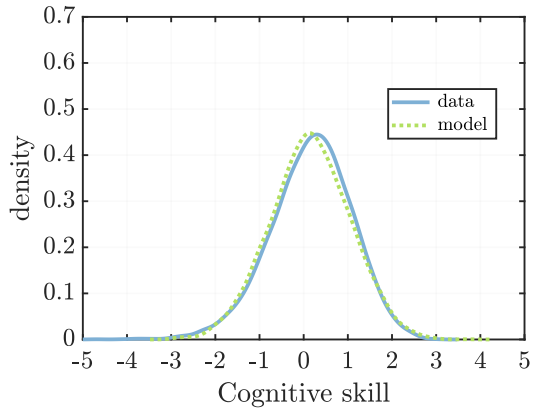
(a) Cognitive skills (θ_t^c): $t = 2$



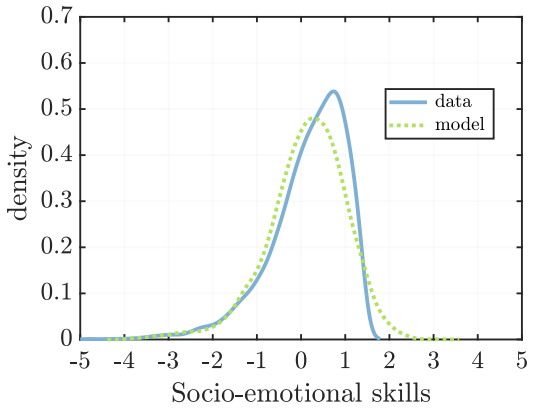
(b) Socio-emotional skills (θ_t^e): $t = 2$



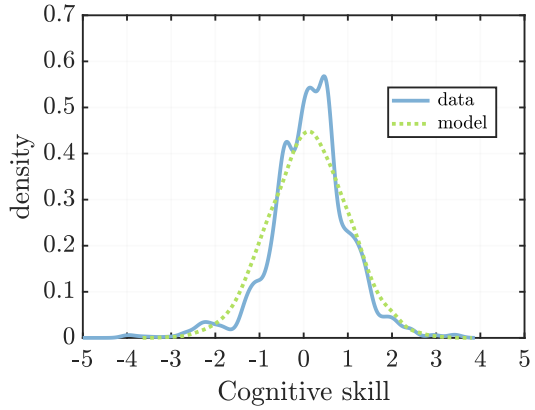
(c) Cognitive skills (θ_t^c): $t = 3$



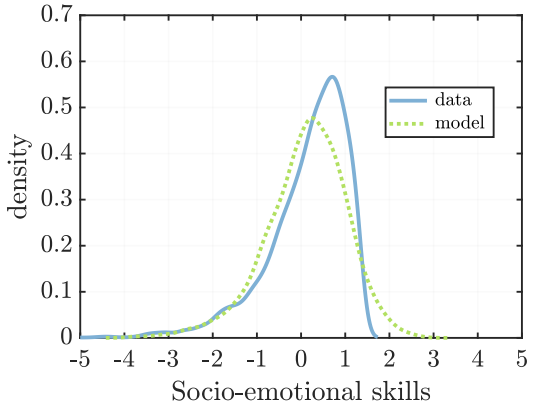
(d) Socio-emotional skills (θ_t^e): $t = 3$



(e) Cognitive skill (θ_t^c): $t = 4$



(f) Socio-emotional skill (θ_t^e): $t = 4$



Source: UK Millennium Cohort Study.

Notes: This figure shows kernel density plots for cognitive skills (sub-figures a, c, e), and socio-emotional skills (sub-figures b, d ,f) in the data (solid blue line) and predicted by the empirical model (dashed green line). Sub-figures a and b correspond to child skills at age 5, while sub-figures c and d correspond to skills at age 7. Sub-figures e and f correspond to skills at age 11.

Table A.1: Assessment, by child age

Assessment	Age 3	Age 5	Age 7	Age 11
Cognitive skills				
Bracken School Readiness Test	X			
BAS Naming Vocabulary	X	X		
BAS Picture Similarity		X		
BAS Pattern Construction		X	X	
BAS Word Reading			X	
BAS Verbal Similarities				X
NFER Number Skills			X	
Socio-emotional skills				
SDQ (Strenght and Difficulties Questionnaire)	X	X	X	X

Sources: UK Millennium Cohort Study

Notes: The table shows the tests available by child's age. The Bracken School Readiness test evaluates their understanding of educational concepts in sub-tests or categories such as colours, letters, numbers, sizes, comparisons and shapes. The Picture Similarity Test measures child's problem solving abilities by asking the child to choose two similar pictures from a row of 4 pictures. The Pattern Construction Test instead asks the child to build a pattern by combining coloured flat squares or solid cubes. This test provides information about child accuracy, speed and spatial awareness as well as dexterity and coordination. The BAS Word Reading Test assesses child's reading ability by asking the child to read aloud a list of 90 words shown on a card. The NFER test instead is a maths assessment which initially tests all children equally and then, based on their score, they are asked easier, medium or harder questions. For the NFER Test we use an adjusted test score which adopts an item response scaling method (Rasch) to adjust the results of the easy, medium and hard subtest scores to the correspondent raw scores. The BAS Verbal Similarities Test informs about verbal reasoning and verbal knowledge by asking the child to recognise similarities among three words read out by the interviewer. The Strength and Difficulties questionnaire consists of five sub-scales measuring: (i) Emotional Problems; (ii) Conduct Problems; (iii) Hyperactivity; (iv) Peer Relationship Problems and (v) Pro-social Behavior.

Table A.2: Cognitive skills - Factor loadings

	(1) Factor Loadings	(2) Signal
Age 3		
BAS Naming vocabulary	0.874	0.764
Braken School Readiness Test	0.874	0.764
Age 5		
BAS Naming vocabulary	0.711	0.506
BAS Pattern construction	0.727	0.528
BAS Picture Similarity	0.735	0.540
Age 7		
BAS Word Reading	0.768	0.590
BAS Pattern construction	0.731	0.534
BAS Mathematical Skills	0.843	0.710

Sources: UK Millennium Cohort Study
Notes: Column (1) shows the factor loading and Column (2) shows the signal that is the proportion of the variance of each measure explained by the latent factor.

Table A.3: Socio-emotional skills - Factor loadings

	(1) Factor Loadings	(2) Signal
Age 3		
Emotional Symtoms	0.521	0.272
Peer Problems	0.616	0.379
Conduct Problems	0.744	0.554
Hyperactivity Problems	0.699	0.488
Prosocial Behaviour	0.594	0.353
Age 5		
Emotional Symtoms	0.554	0.307
Peer Problems	0.605	0.366
Conduct Problems	0.598	0.358
Hyperactivity Problems	0.707	0.500
Prosocial Behaviour	0.598	0.358
Age 7		
Emotional Symtoms	0.575	0.331
Peer Problems	0.625	0.391
Conduct Problems	0.767	0.588
Hyperactivity Problems	0.725	0.526
Prosocial Behaviour	0.612	0.375
Age 11		
Emotional Symtoms	0.646	0.417
Peer Problems	0.661	0.436
Conduct Problems	0.765	0.586
Hyperactivity Problems	0.742	0.551
Prosocial Behaviour	0.593	0.351

Sources: UK Millennium Cohort Study
Notes: Column (1) shows the factor loading and Column (2) shows the signal that is the proportion of the variance of each measure explained by the latent factor.

Table A.4: Interparental Conflicts - Factor loadings

	(1) Factor Loadings	(2) Signal
Interparental conflicts (age 9 months)		
Partner sensitive and aware of needs	0.728	0.530
Partner doesnt listen	0.721	0.520
Sometime lonely when with partner	0.725	0.526
Relationship full of joy and excitement	0.695	0.483
Wishes was more warmth and affection	0.731	0.535
Suspects on brink of separation	0.561	0.315
Can make up quickly after argument	0.434	0.189
Frequency go out as a couple	0.233	0.054
Happy/Unhappy with relationship	0.608	0.369

Sources: UK Millennium Cohort Study
Notes: Column (1) shows the factor loading and Column (2) shows the signal that is the proportion of the variance of each measure explained by the latent factor.

Table A.5: Detailed decomposition of the mean divorce skills gaps, by child age - unexplained component when significant

	(1) Age 7	(2) Age 11
Panel B: Socio-emotional skills		
Unexplained		
Child characteristics	0.309	-0.182
	(0.365)	(0.427)
Demographic characteristics	-0.103	-0.411
	(0.622)	(0.551)
Parent's education	-0.032	0.016
	(0.041)	(0.044)
Parent's health	-0.131	-0.217
	(0.185)	(0.192)
Financial Resources	0.035	-0.167
	(0.173)	(0.181)
Interparental conflicts	-0.059*	-0.015
	(0.035)	(0.035)
Constant	0.168	1.151
	(0.695)	(0.736)
Total	0.187***	0.177**
	(0.068)	(0.069)
Observations	5003	5003

Source: UK Millennium Cohort Study.
Notes: Socio-emotional skills are in standard deviations. The variables used to explain the gap are the same as Table 3. The table shows the detailed decomposition of the unexplained component when significant (see Table 3). Column (1) corresponds to the detailed decomposition of the unexplained component of the divorce skills gap of socio-emotional skills at age 7 as reported in Table 3, Panel B Column (3). Column (2) corresponds to the detailed decomposition of the unexplained component of the divorce skills gap of socio-emotional skills at age 11 as reported in Table 3, Panel B Column (4). Statistical significance at the 1, 5 and 10 percent indicated by ***, ** and *.

Table A.6: Detailed decomposition of the mean divorce skills gaps, by child age - additionally controlling for mother's mental distress (Explained part)

	(1) Age 3	(2) Age 5	(3) Age 7	(4) Age 11
Panel A: Cognitive skills				
Mean Gap	0.259***	0.215***	0.357***	0.268***
	(0.058)	(0.052)	(0.055)	(0.057)
Explained				
Child characteristics	0.012	0.010*	0.012**	0.005
	(0.008)	(0.006)	(0.005)	(0.004)
Demographic characteristics	-0.032	-0.001	-0.016	0.023
	(0.021)	(0.018)	(0.018)	(0.019)
Parent's education	0.085***	0.070***	0.101***	0.094***
	(0.013)	(0.012)	(0.015)	(0.014)
Parent's health	0.005	0.003	0.007	-0.006
	(0.004)	(0.004)	(0.005)	(0.004)
Financial Resources	0.141***	0.117***	0.162***	0.109***
	(0.022)	(0.020)	(0.022)	(0.021)
Interparental conflicts	0.015	0.012	0.020	0.019
	(0.012)	(0.012)	(0.012)	(0.012)
Mother's distress	0.002	0.000	-0.004	-0.001
	(0.006)	(0.006)	(0.006)	(0.005)
Total	0.229***	0.212***	0.281***	0.242***
	(0.029)	(0.024)	(0.028)	(0.026)
Panel B: Socio-emotional skills				
Mean Gap	0.336***	0.440***	0.505***	0.537***
	(0.067)	(0.065)	(0.066)	(0.069)
Explained				
Child characteristics	0.005	0.003	0.003	0.005
	(0.006)	(0.007)	(0.008)	(0.007)
Demographic characteristics	0.034*	0.030*	0.032*	0.056***
	(0.019)	(0.017)	(0.017)	(0.018)
Parent's education	0.053***	0.025**	0.016	0.045***
	(0.013)	(0.012)	(0.011)	(0.012)
Parent's health	0.013**	0.009*	0.014**	0.022***
	(0.006)	(0.005)	(0.005)	(0.007)
Financial Resources	0.111***	0.116***	0.124***	0.101***
	(0.021)	(0.021)	(0.020)	(0.020)
Interparental conflicts	0.102***	0.104***	0.086***	0.086***
	(0.015)	(0.015)	(0.014)	(0.014)
Mother's distress	0.044***	0.054***	0.043***	0.045***
	(0.010)	(0.012)	(0.010)	(0.011)
Total	0.360***	0.342***	0.317***	0.361***
	(0.031)	(0.031)	(0.029)	(0.031)
Observations	4990	4990	4990	4990

Source: UK Millennium Cohort Study.
Notes: Children cognitive (Panel A) and socio-emotional skills (Panel B) are in standard deviations. The variables used to explain the gap are the same as Table 3 and also include mother's mental distress as additional variable. Mother's mental distress is assessed using a modified version of the Malaise Inventory as included in the MCS when the child is 9 months. Example questions asked include whether the mother feels (i) tired most of the time, (ii) often miserable or depressed (iii) often worried about things, etc. (Rutter et al., 1970). Statistical significance at the 1, 5 and 10 percent indicated by ***, ** and *.

Table A.7: Detailed decomposition of the mean divorce skills gaps, by child age - among parents with high conflicts (Explained part)

	(1) Age 3	(2) Age 5	(3) Age 7	(4) Age 11
Panel A: Cognitive skills				
Mean Gap	0.131	0.133	0.263***	0.172**
	(0.091)	(0.082)	(0.082)	(0.083)
Explained				
Child characteristics	0.013	0.018	0.021*	0.013
	(0.010)	(0.011)	(0.011)	(0.012)
Demographic characteristics	-0.051	0.042	-0.013	0.006
	(0.045)	(0.040)	(0.041)	(0.042)
Parent's education	0.069***	0.030	0.061**	0.064***
	(0.024)	(0.023)	(0.026)	(0.023)
Parent's health	0.003	0.000	0.008	0.004
	(0.006)	(0.005)	(0.007)	(0.006)
Financial Resources	0.152***	0.120***	0.156***	0.072*
	(0.040)	(0.037)	(0.042)	(0.042)
Interparental conflicts	-0.005	0.003	-0.003	-0.010
	(0.017)	(0.015)	(0.018)	(0.015)
Total	0.180***	0.213***	0.230***	0.149***
	(0.055)	(0.048)	(0.054)	(0.050)
Panel B: Socio-emotional skills				
Mean Gap	0.221**	0.230**	0.292***	0.402***
	(0.105)	(0.099)	(0.098)	(0.108)
Explained				
Child characteristics	-0.000	0.001	0.004	0.008
	(0.015)	(0.012)	(0.012)	(0.011)
Demographic characteristics	0.075*	0.012	0.033	0.039
	(0.045)	(0.043)	(0.043)	(0.047)
Parent's education	0.052**	0.044*	0.025	0.031
	(0.024)	(0.025)	(0.024)	(0.023)
Parent's health	0.018	0.014	0.014	0.021*
	(0.012)	(0.010)	(0.010)	(0.013)
Financial Resources	0.125***	0.174***	0.131***	0.133***
	(0.043)	(0.047)	(0.042)	(0.045)
Interparental conflicts	-0.005	0.002	0.005	0.006
	(0.017)	(0.018)	(0.020)	(0.019)
Total	0.266***	0.248***	0.211***	0.238***
	(0.057)	(0.057)	(0.052)	(0.054)
Observations	1094	1094	1094	1094

Source: UK Millennium Cohort Study.

Notes: Children cognitive (Panel A) and socio-emotional skills (Panel B) are in standard deviations. The variables used to explain the gap are the same as Table 3. The sample is restricted to the children whose parents have an high level of parental conflicts defined by a level higher than the median level of conflicts of divorced parents. Statistical significance at the 1, 5 and 10 percent indicated by ***, ** and *.

Table A.8: Detailed decomposition of the mean divorce skills gaps, by child age - among parents with high conflicts (Unexplained part)

	(1) Age 3	(2) Age 5	(3) Age 7	(4) Age 11
Panel A: Cognitive skills				
Mean Gap	0.131	0.133	0.263***	0.172**
	(0.091)	(0.082)	(0.082)	(0.083)
Unexplained				
Child characteristics	0.512	-0.288	-0.098	0.952*
	(0.507)	(0.607)	(0.533)	(0.488)
Demographic characteristics	-0.691	0.490	-0.767	0.174
	(0.879)	(0.767)	(0.717)	(0.661)
Parent's education	0.121**	-0.026	-0.001	-0.025
	(0.053)	(0.047)	(0.049)	(0.048)
Parent's health	0.118	-0.029	-0.050	0.242
	(0.199)	(0.180)	(0.184)	(0.193)
Financial Resources	0.012	-0.054	-0.136	-0.292
	(0.253)	(0.240)	(0.203)	(0.245)
Interparental conflicts	-0.138	-0.249	0.056	0.075
	(0.191)	(0.181)	(0.160)	(0.156)
Constant	0.017	0.076	1.030	-1.103
	(0.940)	(1.033)	(0.898)	(0.848)
Total	-0.050	-0.080	0.034	0.022
	(0.100)	(0.090)	(0.092)	(0.093)
Panel B: Socio-emotional skills				
Mean Gap	0.221**	0.230**	0.292***	0.402***
	(0.105)	(0.099)	(0.098)	(0.108)
Unexplained				
Child characteristics	-0.310	0.665	0.728	-0.403
	(0.610)	(0.545)	(0.559)	(0.596)
Demographic characteristics	1.257	0.713	1.138	-0.431
	(0.924)	(0.780)	(0.886)	(0.956)
Parent's education	0.118*	0.003	-0.007	-0.022
	(0.062)	(0.065)	(0.065)	(0.069)
Parent's health	0.122	-0.069	-0.157	-0.228
	(0.256)	(0.250)	(0.252)	(0.249)
Financial Resources	-0.049	0.152	-0.228	-0.123
	(0.230)	(0.219)	(0.210)	(0.246)
Interparental conflicts	0.460**	0.388*	0.246	0.274
	(0.216)	(0.201)	(0.205)	(0.191)
Constant	-1.643	-1.870*	-1.640	1.097
	(1.103)	(0.979)	(1.043)	(1.230)
Total	-0.045	-0.017	0.080	0.164
	(0.113)	(0.110)	(0.108)	(0.115)
Observations	1094	1094	1094	1094

Source: UK Millennium Cohort Study.

Notes: Children cognitive (Panel A) and socio-emotional skills (Panel B) are in standard deviations. The variables used to explain the gap are the same as Table 3. The sample is restricted to the children whose parents have an high level of parental conflicts defined by a level higher than the median level of conflicts of divorced parents. Statistical significance at the 1, 5 and 10 percent indicated by ***, ** and *.

Table A.9: Mean divorce skills gaps, by child age - divorce between age 3 and 5 of the child

	(1) Age 5	(2) Age 7	(3) Age 11
Panel A: Cognitive skills			
Mean Gap	0.138***	0.283***	0.246***
	(0.049)	(0.054)	(0.053)
Explained			
Child characteristics	0.010*	0.011**	0.005
	(0.006)	(0.005)	(0.003)
Demographic characteristics	0.011	-0.004	0.021*
	(0.012)	(0.011)	(0.012)
Parent's education	0.044***	0.058***	0.057***
	(0.009)	(0.011)	(0.010)
Parent's health	0.003	0.006	-0.003
	(0.003)	(0.004)	(0.003)
Financial Resources	0.076***	0.116***	0.070***
	(0.013)	(0.015)	(0.013)
Interparental conflicts	0.007	0.009	0.006
	(0.006)	(0.007)	(0.006)
Total	0.152***	0.195***	0.156***
	(0.019)	(0.021)	(0.019)
Panel B: Socio-emotional skills			
Mean Gap	0.304***	0.362***	0.319***
	(0.057)	(0.063)	(0.056)
Explained			
Child characteristics	0.003	0.001	0.003
	(0.007)	(0.008)	(0.007)
Demographic characteristics	0.014	0.012	0.029**
	(0.010)	(0.010)	(0.011)
Parent's education	0.015**	0.011	0.025***
	(0.008)	(0.007)	(0.008)
Parent's health	0.016***	0.016***	0.024***
	(0.005)	(0.005)	(0.007)
Financial Resources	0.075***	0.086***	0.078***
	(0.013)	(0.013)	(0.013)
Interparental conflicts	0.087***	0.071***	0.066***
	(0.012)	(0.011)	(0.010)
Total	0.210***	0.196***	0.225***
	(0.021)	(0.020)	(0.022)
Observations	6011	6011	6011

Source: UK Millennium Cohort Study.
Notes: Children cognitive (Panel A) and socio-emotional skills (Panel B) are in standard deviations. The variables used to explain the gap are the same as Table 3. Statistical significance at the 1, 5 and 10 percent indicated by ***, ** and *.

Table A.10: Mean divorce skills gaps, by child age - divorce between age 5 and 7 of the child

	(1) Age 7	(2) Age 11
Panel A: Cognitive skills		
Mean Gap	0.128**	0.102*
	(0.061)	(0.059)
Explained		
Child characteristics	0.007	0.004
	(0.006)	(0.004)
Demographic characteristics	0.003	0.026**
	(0.009)	(0.010)
Parent's education	0.046***	0.045***
	(0.011)	(0.010)
Parent's health	0.002	-0.001
	(0.003)	(0.002)
Financial Resources	0.089***	0.058***
	(0.015)	(0.012)
Interparental conflicts	0.007*	0.004
	(0.004)	(0.003)
Total	0.153***	0.134***
	(0.022)	(0.020)
Panel B: Socio-emotional skills		
Mean Gap	0.253***	0.326***
	(0.061)	(0.060)
Explained		
Child characteristics	-0.000	0.001
	(0.008)	(0.007)
Demographic characteristics	0.003	0.019**
	(0.008)	(0.009)
Parent's education	0.008	0.016**
	(0.007)	(0.007)
Parent's health	0.008*	0.013**
	(0.005)	(0.006)
Financial Resources	0.074***	0.062***
	(0.013)	(0.012)
Interparental conflicts	0.040***	0.037***
	(0.010)	(0.009)
Total	0.133***	0.148***
	(0.021)	(0.021)
Observations	6256	6256

Source: UK Millennium Cohort Study.
Notes: Children cognitive (Panel A) and socio-emotional skills (Panel B) are in standard deviations. The variables used to explain the gap are the same as Table 3. Statistical significance at the 1, 5 and 10 percent indicated by ***, ** and *.

Table A.11: Decomposition across the cognitive skills distribution, by child age

	(1) 25th Quantile	(2) 50th Quantile	(3) 75th Quantile	(4) 90th Quantile
Panel A: Age 3				
Quantile Gap	0.312***	0.327***	0.236**	0.197*
	(0.073)	(0.066)	(0.092)	(0.116)
Explained				
Total	0.298***	0.225***	0.202***	0.117**
	(0.038)	(0.031)	(0.036)	(0.047)
Unexplained				
Total	0.014	0.102	0.034	0.080
	(0.077)	(0.068)	(0.096)	(0.122)
Panel B: Age 5				
Quantile Gap	0.232***	0.209***	0.228***	0.142*
	(0.070)	(0.060)	(0.065)	(0.080)
Explained				
Total	0.245***	0.187***	0.195***	0.175***
	(0.032)	(0.026)	(0.027)	(0.032)
Unexplained				
Total	-0.013	0.022	0.033	-0.033
	(0.074)	(0.064)	(0.068)	(0.085)
Panel C: Age 7				
Quantile Gap	0.347***	0.401***	0.316***	0.357***
	(0.077)	(0.069)	(0.072)	(0.082)
Explained				
Total	0.347***	0.244***	0.213***	0.204***
	(0.038)	(0.031)	(0.031)	(0.035)
Unexplained				
Total	0.000	0.157**	0.103	0.152*
	(0.081)	(0.073)	(0.076)	(0.086)
Panel D: Age 11				
Quantile Gap	0.168***	0.229***	0.101	0.223**
	(0.060)	(0.062)	(0.065)	(0.097)
Explained				
Total	0.238***	0.233***	0.174***	0.230***
	(0.029)	(0.028)	(0.026)	(0.042)
Unexplained				
Total	-0.070	-0.004	-0.073	-0.008
	(0.064)	(0.065)	(0.069)	(0.104)
Observations	5003	5003	5003	5003

Source: UK Millennium Cohort Study.

Notes: Children cognitive skills are in standard deviations. The variables used to explain the gap are the same as Table 3. Statistical significance at the 1, 5 and 10 percent indicated by ***, ** and *.

Table A.12: Decomposition across the socio-emotional skills distribution, by child age

	(1) 25th Quantile	(2) 50th Quantile	(3) 75th Quantile	(4) 90th Quantile
Panel A: Age 3				
Quantile Gap	0.333***	0.222***	0.180***	0.153**
	(0.109)	(0.080)	(0.067)	(0.072)
Explained				
Total	0.483***	0.331***	0.270***	0.215***
	(0.042)	(0.033)	(0.030)	(0.032)
Unexplained				
Total	-0.150	-0.109	-0.090	-0.062
	(0.109)	(0.082)	(0.071)	(0.077)
Panel B: Age 5				
Quantile Gap	0.531***	0.370***	0.238***	0.178***
	(0.108)	(0.077)	(0.066)	(0.062)
Explained				
Total	0.419***	0.325***	0.220***	0.145***
	(0.039)	(0.031)	(0.024)	(0.024)
Unexplained				
Total	0.113	0.045	0.018	0.033
	(0.109)	(0.079)	(0.068)	(0.066)
Panel C: Age 7				
Quantile Gap	0.685***	0.448***	0.262***	0.153**
	(0.103)	(0.081)	(0.068)	(0.062)
Explained				
Total	0.386***	0.300***	0.200***	0.122***
	(0.038)	(0.029)	(0.022)	(0.019)
Unexplained				
Total	0.299***	0.149*	0.062	0.032
	(0.105)	(0.082)	(0.069)	(0.064)
Panel D: Age 11				
Quantile Gap	0.686***	0.395***	0.288***	0.222***
	(0.138)	(0.075)	(0.061)	(0.058)
Explained				
Total	0.431***	0.353***	0.221***	0.136***
	(0.042)	(0.030)	(0.022)	(0.019)
Unexplained				
Total	0.255*	0.042	0.067	0.086
	(0.136)	(0.075)	(0.063)	(0.060)
Observations	5003	5003	5003	5003

Source: UK Millennium Cohort Study.

Notes: Children socio-emotional skills are in standard deviations. The variables used to explain the gap are the same as Table 3. Statistical significance at the 1, 5 and 10 percent indicated by ***, ** and *.

Table A.13: Mean divorce skills gaps, by child age - boys

	(1) Age 3	(2) Age 5	(3) Age 7	(4) Age 11
Panel A: Cognitive skills				
Mean Gap	0.256***	0.257***	0.362***	0.275***
	(0.091)	(0.081)	(0.088)	(0.089)
Decomposition				
Explained	0.211***	0.241***	0.328***	0.223***
	(0.041)	(0.036)	(0.042)	(0.039)
Unexplained	0.046	0.016	0.034	0.051
	(0.092)	(0.085)	(0.090)	(0.094)
Panel B: Socio-emotional skills				
Mean Gap	0.497***	0.535***	0.534***	0.585***
	(0.102)	(0.105)	(0.099)	(0.106)
Decomposition				
Explained	0.365***	0.335***	0.327***	0.383***
	(0.046)	(0.045)	(0.042)	(0.045)
Unexplained	0.132	0.200*	0.207**	0.202*
	(0.104)	(0.108)	(0.104)	(0.109)
Observations	2432	2432	2432	2432

Source: UK Millennium Cohort Study.
Notes: Children cognitive (Panel A) and socio-emotional skills (Panel B) are in standard deviations. The variables used to explain the gap are the same as Table 3. Statistical significance at the 1, 5 and 10 percent indicated by ***, ** and *.

Table A.14: Mean divorce skills gaps, by child age - girls

	(1) Age 3	(2) Age 5	(3) Age 7	(4) Age 11
Panel A: Cognitive skills				
Mean Gap	0.243***	0.183***	0.347***	0.258***
	(0.076)	(0.068)	(0.074)	(0.076)
Decomposition				
Explained	0.244***	0.185***	0.235***	0.246***
	(0.043)	(0.033)	(0.040)	(0.037)
Unexplained	-0.001	-0.002	0.112	0.012
	(0.083)	(0.072)	(0.079)	(0.082)
Panel B: Socio-emotional skills				
Mean Gap	0.181**	0.352***	0.471***	0.490***
	(0.088)	(0.081)	(0.092)	(0.094)
Decomposition				
Explained	0.336***	0.336***	0.300***	0.341***
	(0.039)	(0.038)	(0.036)	(0.038)
Unexplained	-0.154*	0.016	0.171*	0.149
	(0.090)	(0.087)	(0.097)	(0.096)
Observations	2571	2571	2571	2571

Source: UK Millennium Cohort Study.
Notes: Children cognitive (Panel A) and socio-emotional skills (Panel B) are in standard deviations. The variables used to explain the gap are the same as Table 3. Statistical significance at the 1, 5 and 10 percent indicated by ***, ** and *.

Table A.15: Skill production function elasticity parameters, γ_t^k and Γ_t^k

	(1)	(2)	(3)	(4)	(5)	(6)
	Cognitive skills			Socio-emotional skills		
	Age 5	Age 7	Age 11	Age 5	Age 7	Age 11
γ_c^k	0.28***	0.45***	0.18***	-0.05***	-0.02*	-0.01
	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)
γ_{cc}^k	-0.03**	-0.00	-0.01	-0.01	-0.02***	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
γ_{ce}^k	-0.01	-0.08***	-0.07***	0.02	0.01	-0.00
	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
γ_{cp}^k	0.02	-0.01	-0.01	-0.00	-0.01	-0.01
	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
γ_e^k	-0.05***	-0.01	-0.04**	0.35***	0.39***	0.37***
	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
γ_{ee}^k	0.00	0.03***	0.01	0.02	0.07***	0.08***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
γ_{ep}^k	0.01	0.01	0.01	0.05***	0.04**	0.04**
	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)
γ_p^k	-0.02	-0.02	-0.02	-0.12***	-0.07***	-0.10***
	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)
γ_{pp}^k	0.00	0.00	0.00	0.02***	0.02*	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)

Source: UK Millennium Cohort Study.
Notes: In this table the coefficients correspond to estimates of the elasticity parameters γ_t^k and Γ_t^k of the skill production functions in equation 10. Statistical significance from 100 bootstrap replications, at the 1, 5 and 10 percent indicated by ***, ** and *. Standard errors in parentheses.

Table A.16: TFP parameter estimates for the production of cognitive skills, $A_t^k(\cdot)$

	(1)	(2)	(3)	(4)
	Age 3	Age 5	Age 7	Age 11
divorce	-0.02	0.00	-0.07	-0.01
female	0.20***	0.06**	-0.00	-0.11***
birth weight (Kg)	0.09***	0.07***	0.06***	0.01
Number of siblings	-0.19***	-0.05***	-0.00	-0.08***
Cohabitation	0.07*	-0.05*	0.03	0.00
Duration of relationship	-0.01	0.00	-0.00	0.00
Planned pregnancy	-0.04	-0.03	0.03	-0.05*
Mother's religion	-0.02	0.01	-0.02	0.09***
Mother's age	0.00	-0.00	-0.01	-0.00
Father's age	0.00	0.00	0.00	0.01**
Mother white	0.21**	0.14**	-0.22***	-0.03
Father white	0.30***	0.01	-0.07	0.03
Mother GCSE	-0.03	-0.00	0.09	0.05
Mother A-level	0.02	0.01	0.16**	0.16**
Mother University degree	0.13*	0.05	0.19***	0.19**
Father GCSE	-0.01	0.03	0.05	0.08
Father A-level	0.06	0.06	0.15***	0.13**
Father University degree	0.13**	0.15***	0.17***	0.19***
Mother good health	0.01	-0.01	0.07**	-0.05
Father good health	-0.03	0.02	-0.06*	-0.04
OECD equiv. income	-0.01	-0.01	0.06***	-0.01
Own house	-0.12***	-0.02	-0.05	-0.11**
Rent house	-0.18**	-0.04	-0.04	-0.17**
Mother managerial occ.	-0.07**	-0.09***	-0.05	-0.07*
Mother intermediate occ.	-0.19***	-0.15***	-0.11***	-0.05
Mother routine occ.	-0.44***	-0.25***	-0.03	-0.13
Father managerial occ.	-0.07**	-0.03	-0.15***	0.02
Father intermediate occ.	-0.18***	-0.09***	-0.19***	-0.10***
Father routine occ.	-0.17	0.05	-0.29**	0.12
constant	-0.79***	-0.31***	-0.40***	-0.19*

Source: UK Millennium Cohort Study.
Notes: In this table the coefficients correspond to estimates of the TFP parameters $A_t^k(\cdot)$ in the production of cognitive skills, equation 11. Statistical significance from 100 bootstrap replications, at the 1, 5 and 10 percent indicated by ***, ** and *. Standard errors omitted for brevity and are available upon request.

Table A.17: TFP parameter estimates for the production of socio-emotional skills, $A_t^k(\cdot)$

	(1)	(2)	(3)	(4)
	Age 3	Age 5	Age 7	Age 11
divorce	0.04	-0.06	-0.12**	-0.09*
female	0.19***	0.13***	0.13***	0.10***
birth weight (Kg)	0.01	0.01	0.00	0.03**
Number of siblings	0.04***	-0.02*	0.01	0.02*
Cohabitation	-0.05	0.03	-0.02	0.01
Duration of relationship	-0.01*	0.00	0.00	-0.00
Planned pregnancy	-0.03	-0.00	0.01	0.02
Mother's religion	0.06**	0.02	0.01	0.06***
Mother's age	-0.00	-0.00	-0.00	-0.00
Father's age	0.00	0.00*	-0.00	0.00
Mother white	0.14*	-0.00	0.03	-0.14**
Father white	0.04	-0.00	-0.01	0.07
Mother GCSE	0.09	0.00	0.01	0.02
Mother A-level	0.17**	-0.01	0.02	0.03
Mother University degree	0.20**	0.00	0.02	0.07
Father GCSE	-0.01	0.06	-0.00	0.05
Father A-level	0.04	0.10**	0.03	0.07
Father University degree	0.05	0.06	0.01	0.08
Mother good health	0.10**	0.07**	0.09***	0.18***
Father good health	0.10**	-0.01	0.01	0.04
OECD equiv. income	-0.01	-0.01	-0.01	-0.03**
Own house	-0.12***	-0.09***	-0.06**	-0.12***
Rent house	-0.26***	-0.13*	-0.03	-0.18**
Mother managerial occ.	-0.04	-0.05*	-0.02	0.02
Mother intermediate occ.	-0.18***	-0.09***	-0.09***	-0.03
Mother routine occ.	-0.23**	-0.19***	-0.17**	-0.03
Father managerial occ.	0.03	0.00	-0.00	-0.04
Father intermediate occ.	-0.10***	-0.04	-0.08***	-0.06***
Father routine occ.	0.15	0.10	-0.06	-0.06
constant	-0.74***	-0.06	0.03	-0.23***

Source: UK Millennium Cohort Study.
Notes: In this table the coefficients correspond to estimates of the TFP parameters $A_t^k(\cdot)$ in the production of socio-emotional skills, equation 11. Statistical significance from 100 bootstrap replications, at the 1, 5 and 10 percent indicated by ***, ** and *. Standard errors omitted for brevity and are available upon request.

Table A.18: Unobserved heterogeneity (π^k) and error variance (σ_η^2) estimates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Cognitive skills				Socio-emotional skills			
	type share	Age 3	Age 5	Age 7	Age 11	Age 3	Age 5	Age 7	Age 11
Type 1	0.12	-0.16	-0.07	-0.07	-0.07	-0.16	-0.81	-0.81	-0.81
Type 2	0.45	0.51	0.33	0.33	0.33	0.51	0.20	0.20	0.20
Type 3	0.02	-0.50	-0.33	-0.33	-0.33	-0.50	-2.21	-2.21	-2.21
Type 4	0.12	0.88	0.52	0.52	0.52	0.88	0.29	0.29	0.29
Type 5	0.29	0	0	0	0	0	0	0	0
$\sigma^2_{\eta_t^k}$		0.42	0.39	0.30	0.13	0.27	0.08	0.44	0.10

Source: UK Millennium Cohort Study.
Notes: This table shows estimates of the unobserved heterogeneity parameters, π^k, and the error variance $\sigma^2_{\eta_t^k}$ for the skill production technologies, equation 10. Share corresponds to the probability of a given type.

Table A.19: Inter-parental conflicts (P_i) and parental divorce (D_i) parameter estimates

	(1) Inter-parental conflicts (δ^p)	(2) Divorce (δ^d)
Inter-parental conflicts	-	0.63***
female	0.00	-0.07
birth weight (Kg)	0.00	-0.17
Number of siblings	-0.01	0.17
Cohabitation	0.17***	0.70***
Duration of relationship	0.02***	-0.08**
Planned pregnancy	-0.12***	-0.20
Mother's religion	-0.05*	-0.30**
Mother's age	0.00	-0.07***
Father's age	0.00	-0.00
Mother white	0.13	0.83
Father white	-0.22**	-0.06
Mother GCSE	0.16**	-0.21
Mother A-level	0.17**	-0.13
Mother University degree	0.17**	-0.38
Father GCSE	-0.15***	-0.20
Father A-level	-0.21***	-0.16
Father University degree	-0.19***	-0.49*
Mother good health	-0.40***	-0.02
Father good health	-0.14***	-0.08
OECD equiv. income	-0.12***	-0.06
Own house	0.05	0.78***
Rent house	0.05	0.68*
Mother managerial occ.	0.00	0.06
Mother intermediate occ.	0.03	0.12
Mother routine occ.	0.10	0.17
Father managerial occ.	0.07*	-0.24
Father intermediate occ.	0.06	0.14
Father routine occ.	0.16	0.15
constant	0.82***	2.69**

Source: UK Millennium Cohort Study.
Notes: In this table the coefficients correspond to estimates of the parameters δ^d and δ^p in the reduced-form equations for inter-parental conflicts and parental divorce, equations 8 and 9 respectively. Statistical significance from 100 bootstrap replications, at the 1, 5 and 10 percent indicated by ***, ** and *. Standard errors omitted for brevity and are available upon request.

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