UNIVERSITY of York

Discussion Papers in Economics

No. 18/16

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4 November, 2018

Abstract

To what extent does parental selection into divorce explain the gap in skills between children of intact and disrupted families? Using the UK Millennium Cohort Study this paper shows that the disadvantage in skills typically found among children of divorce mainly reflects the selection effect, whereby more disadvantaged parents are more likely to divorce. In an Oaxaca-Blinder decomposition of children's cognitive and noncognitive skills up until age 11, evidence indicates that pre-divorce characteristics, namely parents' education, family financial resources and interparental conflicts are the most important factors accounting for the divorce gaps in children's skills, implying a negligible impact of divorce itself. Interparental conflicts are often neglected in the literature but are shown to play a major role particularly for noncognitive skills of children. These results suggest that to reduce the disadvantage in skills among children of divorce, interventions targeting these pre-divorce characteristics would be potentially more effective than policies discouraging divorce.

JEL Classificiation: J12, J13, J24, C21, D1

Keywords: Divorce, Interparental conflicts, Cognitive and Noncognitive skills, Decomposition

*University of York, Department of Economics and Related Studies, gm889@york.ac.uk. I would like to thank my supervisors Cheti Nicoletti and Emma Tominey for great guidance. I would also like to thank Gianluca Antonecchia, Vigyan D.Ratnoo, Madison Kerr and Nicolas Salamanca for helpful discussions. Finally, I thank participants at University of York Departmental seminars, Workshop on Labour and Family economics (2016), Interdisciplinariy Network of Economics and Philosophy (2016), 22nd Spring Meeting for Young economist (2017), Royal Economic Society Conference (2017), European Society for Population Economics Conference (2017), Family Mediators Association Conference (2017).

1 Introduction

The increasing rates of marital instability over the last few decades have sparked political and public debates about the relationship between parental divorce and child development. A common finding is that children of divorce experience behavioral and intellectual disadvantages compared to children of intact families.[1] At the same time, parental selection into divorce, whereby disadvantaged parents are more likely to divorce, implies considerable differences across socio-economic status between parents who decide to divorce or those who decide to stay married.[2] To close the skills gap between children of intact and disrupted families, policy could either discourage divorce, e.g. making divorce more costly, or target the characteristics driving the parental selection into divorce.

This paper investigates the extent to which parental selection into divorce explains the *divorce skills gap* of children, defined as the mean difference between the skills of children of intact families and children of disrupted families.[3] In an attempt to explore an area of research that has received less attention to date - compared to the literature on the impact of divorce on child outcomes - this paper answers the following questions: (i) What accounts for the divorce gaps in cognitive and noncognitive skills of children? (ii) Are there any inequalities in the divorce gaps across the children's skills distribution and across gender? We use data from the UK Millennium Cohort Study (2000-2011) to explain the divorce skills gaps at ages of 3, 5, 7 and 11 of the child when the divorce occurs before the age of 3.

Inequalities in cognitive and noncognitive abilities among children from different socio-economic background emerge before starting school, indicating that family plays a crucial role in shaping these abilities.[4] Therefore, a shock to the family structure, such as divorce, has the potential to affect the human capital formation of children. A large number of empirical studies find a negative correlation between parental separation and children's achievements, with mixed results when attempting to establish the causality in this relationship. Several identification startegies have been adopted, e.g. exploiting the introduction of changes in divorce law (Corak, 2001; Gruber, 2004), the sibling difference approach (Er-

[1] McLanahan et al. (2013) provide a comprehensive survey of this literature.

[2] Lundberg et al. (2016) document the emergence of a socio-economic gradient in several family structure including, divorce, cohabitation and non marital childbearing.

[3] Note that the terms "skills" and "abilities" are used interchangeably.

[4] Parents determine children skills through genetics, parental investments, and through the choice of child environment (Cunha and Heckman, 2007; Borghans et al., 2008; Almlund et al., 2011). Examples of papers looking at other determinants of children's achievements such as, mother's employment, parental time investment, financial resources can be found in Haveman and Wolfe 1995; Ruhm 2004; Björklund and Salvanes 2011; Almond and Currie 2011; Ermisch et al. 2012; Del Bono et al. 2016; Carneiro et al. 2015.

misch and Francesconi, 2001; Björklund and Sundström, 2006; Francesconi et al., 2010), instrumental variables (Francesconi et al., 2010; Frimmel et al., 2016; Finlay and Neumark, 2010) or fixed effect models (Aughinbaugh et al., 2005; Pronzato and Aassve, 2017; Fitzsimons and Villadsen, 2018).[5] Although this remains the strand of literature most related to this paper, we distance ourselves from this by focusing on parental selection into divorce, therefore providing a comprehensive picture of the pre-divorce factors explaining the divorce gap in cognitive and noncognitive skills of children. The pre-divorce factors we consider are: child characteristics, family demographic characteristics, parental education, parental health, family financial resources and interparental conflicts.

Our first contribution to the literature is to include an often unobserved measure of *interparental conflicts* in the list of pre-divorce characteristics,[6] along with a large set of parental and family background variables. Children exposed to interparental conflict are more likely to have behavioral problems such as conduct disorders, aggressive behavior, anxiety, depression and withdrawal as well as lower academic achievement (Amato et al., 1995; Grych and Fincham, 2001). Neglecting to account for this aspect would miss out that part of the divorce skills gap that can be accounted for by the parental conflicts.

In a second contribution, we capture the multidimensional aspect of child human capital, i.e. cognitive and noncognitive skills. Previous literature has highlighted the differences in the determinants of child cognitive and noncognitive abilities.[7] For this reason we expect to find some dissimilarities between the two, either in the size of the divorce skills gaps or in the accounting power of the factors driving these gaps.

Our third contribution is to provide the first evidence of how the divorce skills gaps decomposition varies across the distribution of child skills. In light of the *diathesis stress framework* proposed in the psychological literature (Beck, 1967; Monroe and Simons, 1991; Hilsman and Garber, 1995), we expect low-skilled children to have larger gaps than high-

[5]The endogeneity of parental divorce issue is well-recognized in the literature (Manski et al., 1992). Stevenson and Wolfers (2006) point out that not even changes in divorce law can be considered a valid instrument because they may directly affect the bargaining power within the family with potential implication for children outcomes. Criticisms can be directed to fixed models too as, although these models account for any time invariant unobservable, they do not allow the production of child human capital to change over the different stages of childhood, something that has been recently established by the human capital formation literature (see for example Heckman 2000).

[6]There are however few exceptions of recent papers including measures of conflicts. Tartari (2015) includes in her analysis a measure of parental conflicts but focuses exclusively on children cognitive outcomes. Amato et al. (1995) and Ribar et al. (2017) look at how the impact of divorce on children vary by the level of conflict. Fitzsimons and Villadsen (2018) explore the heterogeneity of the impact of father's departure from the house across parent relationship quality.

[7]See for example (Heckman, 2000; Cunha et al., 2006; Almlund et al., 2011; Del Bono et al., 2016)

skilled children. This is because, a stressful event - e.g. parental divorce - can trigger the manifestation of noncognitive disorders if the child has a predisposition to such disorder. However, this is not necessarily valid for cognitive skills.

In a fourth contribution, we follow a growing literature documenting gender differences in the development of children's skills and provide comparison between boys and girls of both - the mean divorce skills gap and the divorce skills gaps across the distribution of children's abilities.[8]

The empirical analysis includes two steps. In the first step, we conduct an Oaxaca-Blinder (O-B) decomposition analysis of the divorce skills gaps.[9] Using this approach we decompose the mean child skills gaps into two components: one explained by differences in observed characteristics (*explained/compositional effect*) and the other given by the differences in the return to these characteristics (*unexplained/ residual effect*). Then, the explained component is further decomposed to establish the contribution of each set of observed characteristics in explaining the divorce gaps. In a second step, to overcome some of the O-B drawbacks, we adopt the methodology introduced by Firpo et al. (2007, 2009) to analyze the decomposition of the gaps across the children's skills distribution, focusing on the differences between cognitive and noncognitive skills. This more flexible method allows children at the lower tail of the distribution to present different compositional or residual effects compared to children at the upper tail. Similarly to Longhi et al. (2012, 2013) and Nandi and Nicoletti (2014) we address the limits of the O-B decompositions by carrying out a set of sensitivity analysis (i) using the reweighted decomposition method (DiNardo et al., 1996), (ii) changing the counterfactuals in the decomposition and (iii) imposing a common support between the two groups of children.

Overall, our results indicate that the mean divorce skills gaps mainly reflect the parental selection into divorce. This is because these gaps are, in most of the cases, entirely explained by compositional effects, i.e. by the differences in pre-divorce characteristics between children of intact and disrupted families. In addition, we find that the divorce gap in cognitive and noncognitive abilities can be ascribed to different factors. Cognitive gaps are largely explained by differences in parents' education (about 35%) and family financial resources (about

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

[9]The decomposition approach has been extensively used in labour economics to analyze the wage gap between different subsample of the population, e.g. between men and women, between ethnic groups and between disable and non-disable workers; but also to study ratial differences in health insurance, health gaps by socio-economic status and sentencing in judicial elections. See 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; Johar et al. 2013; Carrieri and Jones 2017; Park 2016.

60%), whilst noncognitive gaps are mostly explained by interparental conflicts (about 35%) and financial resources (about 35%). Since parental education largely explains cognitive skills disparities and interparental conflicts largely explains noncognitive skills disparities, our results suggest that the intergenerational transmission of abilities is an important driver of the gaps. Finally, and consistently with the *diathesis stress framework*, we find that more vulnerable children, i.e. children with lower level of noncognitive abilities, present larger divorce gaps, especially among boys. On the basis of this evidence, interventions aimed at increasing parents' education, reducing interparental conflicts and providing financial support, may more effectively narrow the inequalities between children of intact and disrupted families than policies discouraging divorce.

The outline 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 skills gaps, the description of the accounting factors of the gap and the decomposition across the distribution of children's skills. Section 5 shows that our results are robust to several sensitivity analysis, conducted to address the main drawbacks of the O-B methodology such as the linearity assumption, the choice of the counterfactual and the common support assumption. Section 6 concludes with a discussion of the results.

2 Description of data

2.1 Millennium Cohort Study

We use data from the UK Millennium Cohort Study (MCS), a multidisciplinary cohort member longitudinal survey which comprises a representative sample of children born in the UK between September 2000 and January 2002. The cohort members are followed across 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 detailed information regarding child cognitive and noncognitive skills. More precisely, child cognitive skills are assessed by trained interviewers using appropriate tests, whereas child socio-emotional skills are assessed asking questions to the parent, usually the mother. In addition, the survey includes a wide variety of other variables on social, demographic and economic circumstances at parental, child and family level.

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

The sample is selected to include all singleton children interviewed at 9 months with married or cohabiting natural parents. This selection reduces our original sample size by 31.8 percent, consisting of 13,131 children. We consider a balanced panel of cohort members with non-missing information on a set of variables on family and child characteristics excluding those 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 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 rest of the paper, the notion of divorce and separation will be used interchangeably.[11]

2.2 Children outcomes

2.2.1 Cognitive skills

The dataset offers several measures of cognitive abilities, mainly from the British Ability Scales (BAS), a widely used age-varying test (Elliott et al., 1996, 1997).[12] At age 3, child cognitive skills are evaluated using the BAS Naming Vocabulary Test and the Bracken School Readiness test. The first assesses the child's expressive verbal ability by asking the child to name objects shown in a set of pictures. The second evaluates the understanding of educational concepts in sub-tests or concept categories such as colours, letters, numbers, sizes, comparisons and shapes.

At 5 years old, child cognitive abilities are assessed using the BAS Naming Vocabulary Test, the BAS Picture Similarity and the BAS Pattern Construction. The Picture Similarity

[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.

[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. The ability scores however are not age-adjusted so that children of a different ages (in months) take the same BAS tests. Since on average older children tend to score higher, we need to control for age in months in our analysis.

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.

When the child is 7 years old, cognitive abilities are evaluated with three tests, the BAS Pattern Construction test, the BAS Word Reading Test and an adapted version of the National Foundation for Educational Research Progress in Maths Test (NFER). The 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.[13]

Finally, 11-years-old children's cognitive abilities are measured with the BAS Verbal Similarities Test, which informs about verbal reasoning and verbal knowledge by asking the child to recognise similarities among three words read out by the interviewer. For ease of interpretation all tests at each age are standardized to have mean 0 and standard deviation of 1.[14] Since at ages 3, 5 and 7 we have more than one cognitive ability measure, rather than using them separately, we use latent factor models to reduce the measurement error and to construct a single and more exhaustive measure of cognitive abilities for these ages. Table A2 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.

2.2.2 Noncognitive skills

Noncognitive 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 age 3, the parent is asked to complete the SDQ questionnaire consisting of 25 items on psychological attributes (Goodman, 1997, 2001). The parent is asked whether the item is 'true', 'somewhat true' or 'not true' in respect to the child and, final scores are such that the higher the score the higher the level of behavioral problems. The 25 items are grouped in five sub scales measuring: (i) Emotional Problems; (ii) Conduct

[13]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.

[14] Table A1 in the Appendix shows the list of cognitive tests available in our dataset by age of the child. For a more precise description and interpretation of all the tests consider Connelly (2013) and Hansen (2014).

Problems; (iii) Hyperactivity; (iv) Peer Relationship Problems and (v) Pro-social Behavior. These broader subscales 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 noncognitive scores are standardized to have mean 0 and standard deviation 1 and are reverse coded, so that positive values mean higher level of noncognitive skills and negative values mean lower level of noncognitive skills.[15]

As with cognitive abilities, rather than using many different measures of noncognitive 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 behavior. The estimated factors indeed represent a summarizing measure of psychological attitudes such as anxiety, depression and withdrawal, but also aggression, irritation, disobedience and pro-social behavior at each age. We take these factors as our measures of behavioral problems for each age (Factor Loadings and signals shown in Table A3 in the Appendix).

Table 1 features the descriptive statistics of children cognitive and noncognitive skills by parental separation, where - for comparability - each measure has mean zero and standard deviation of 1. The table clearly shows the existence of a *divorce skills gap*, both for cognitive and noncognitive skills, with children of intact families having higher cognitive and noncognitive skills at every age. A potential explanation for the divorce skills gaps is that the characteristics, experiences and environment of children from disrupted families differ systematically from the characteristics, experiences and environment of children from intact families, in ways that are related to children's cognitive skills and behavioral problems. This study aims at understanding how much of this gap can be explained by these differences, and what the main pre-divorce determinants of these gaps are.

2.3 Explanatory variables

2.3.1 Quality of interparental relationship

The quality of interparental relationship, often referred as relationship quality (RQ) or marital conflict, is a crucial aspect in family and child developmental research, especially in the psychology literature. It has been linked to psychological and physical health of the

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

partners (depressive symptoms, eating disorders, male alcoholism), but also with some key aspects of family environment such as domestic violence, lower parenting skills, children's disadvantages, parent-child conflict, and conflict between siblings (Grych and Fincham, 2001; Fincham, 2003). Partners satisfied with their relationship are healthier, they communicate more effectively with each other, have higher parenting skills and tend to raise their children authoritatively, using less harsh discipline, spending more time with their children, with less risk of a marital breakup. (Jones, 2010).

The MCS provides detailed information about the quality of 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, and 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 relationships, behavior in the relationship and agreement with the partner (Chiorri et al., 2014). Specifically, 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.[16]

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.[17]

Given that we expect the quality of parental relationship to have some accounting power in explaining the divorce skills gaps, it is important to rule out the measurement issues associated with this variable. If conflicts are under/over-reported then the accounting power of conflicts may be over/under-estimated. We use latent factor models to estimate a latent

[16]These last two items of the quality of interparental relationship are not included in GRIMS but represent additional information on the quality of relationship. Item (ix) for example is an overall measure of satisfaction with the relationship widely used in the literature and included also in other surveys such as, the National Child Development Study (NCDS) in the UK.

[17]Notice that 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.

factor measuring interparental conflicts to address measurement problems related to this variable. In addition, the use of factor models allows us to reduce the dimensionality of the measures explaining the interparental conflicts without arbitrarily imposing that all the measures are related to the latent factor with equal weights.[18] Table A4 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 interparental conflicts perceived by the mother. The use of latent factor models is motivated by the fact that the amount of information contained in each measures varies across the measures and is much lower than 1, suggesting that measurement error needs to be accounted for.

2.3.2 Other control variables

Our analysis includes a set of child, parental and family variables that are all time-invariant or observed before separation, but the age of the child that is expressed in months and varies for each model considered. A fundamental aspect of the MCS is that it includes a large set of background characteristics, thereby making the selection on observables assumption - implicit in linear regression models - more plausible. 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 age in months, 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, parents' ethnicity and whether parents have the same ethnicity; (iii) *parental education*; (iv) *psychological-health characteristics* like parents' general health and whether child's grandparents were separated; and (v) *family financial resources* such as family income, housing tenure, number of rooms in the house, parents' social class based on NS-SEC (National Statistics Socio-Economic Classification).

[18] We use the information reported by the mother to construct our measure of interparental conflict. Related literature on GRIMS questionnaire implemented in the MCS survey showed that women in 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 interparental conflicts are measured with errors, they are possibly under-reported and therefore we might expect the accounting power of the quality of relationship to be at most underestimated.

Table 2 reports the descriptive statistics of all the explanatory variables by parental separation. According to the 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 class 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 varies between the two groups as well, 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 are more disadvantaged than children of intact families. If children who grew up in more advantaged families are also less likely to experience parental breakup and also perform better at cognitive and noncognitive tests, either because of higher innate ability or because their environmental background improves these outcomes, then the association between separation and cognitive and noncognitive skills shown in Table 1 might well be spurious and largely explained by these observable differences between the two groups.

3 Empirical Strategy

3.1 Oaxaca-Blinder decomposition

The existence of a gap in mean outcomes between two groups has been often investigated using decomposition analysis to estimate how much of the gap can be attributed to differences in observable characteristics between the two groups. The approach, widely used by labour economists, stems from the seminal papers of Oaxaca (1973) and Blinder (1973), with the original 'Oaxaca-Blinder' (O-B) decomposition using linear regressions estimated separately for the two groups. We use the O-B method to decompose the mean of divorce skills gaps of children into the component explained by differences in observed characteristics (*composition effect*) and the unexplained component (*residual effect*).

Separate regressions are estimated for each group, so that the mean regression of the cognitive or noncognitive skills may be expressed as follows:

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

where y_{ji} is cognitive or noncognitive 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:

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

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 $\overline{\mathbf{X}}_1\beta_0$, 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:

$$\begin{aligned} \overline{y}_0 - \overline{y}_1 &= \overline{\mathbf{X}}_0\beta_0 - \overline{\mathbf{X}}_1\beta_1 \\ &= \overline{\mathbf{X}}_0\beta_0 - \overline{\mathbf{X}}_1\beta_1 + \overline{\mathbf{X}}_1\beta_0 - \overline{\mathbf{X}}_1\beta_0 \\ &= (\overline{\mathbf{X}}_0 - \overline{\mathbf{X}}_1)\beta_0 + \overline{\mathbf{X}}_1(\beta_0 - \beta_1) \end{aligned} \tag{3}$$

where $(\overline{\mathbf{X}}_0 - \overline{\mathbf{X}}_1)\beta_0$ describes the composition effect and is the mean differences in covariates $\mathbf{X}$ between the reference and the comparison group, whereas the second component $\overline{\mathbf{X}}_1(\beta_0 - \beta_1)$ describes the residual or the unexplained 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:

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

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.

For ease of interpretation of our results, we split X_k into 6 different sets as to include: (i) *child characteristics* such as child age in months, 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, parent's age, parent's ethnicity and whether parents have the same ethnicity; (iii) *parental education*; (iv) *parental psychological-health characteristics* like parents' general health and whether child's grandparents were separated; and (v) *family financial resources* such as family income, housing tenure, number of rooms in the house, parents' social class based on NS-SEC (National Statistics Socio-Economic Classification); (vi) and the factor describing the *interparental conflicts*.[19]

Besides the compositional effects of the divorce skills gaps, ascribed to different observed mediating factors available in our data, there can be also residual skills gaps arising from different sources. A few examples 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); (ii) failure of cooperative behavior between parents due to union dissolution;[20] (iii) differences in the return to parents' characteristics between children of separated and non-separated parents such as parents' education and interparental conflicts;[21] (iv) differences in unobservables potentially correlated with children's outcomes and parental divorce.

In spite of the popularity of the O-B approach and its appealing property of providing the exact contribution of each variable to the explained and unexplained component, its drawbacks are also well-recognized. First of all, O-B provides the decomposition of the mean gap but, in our setting for example, divorce skills gaps may be larger at the lower tail of the children skills distribution because lower skilled children may be more vulnerable. Secondly, it relies on linearity assumptions between dependent and explanatory variables. The following Sections (Section 4.2 and 4.3) explain the econometric extensions of the basic model used to address these two drawbacks of the O-B methodology.

In addition to that, in Section 5 we also address other two shortcomings of the methodology: (i) the choice of the counterfactual, which may affect the decomposition results and

[19] See Section 2 for description of each of this variable.

[20] The role of institutions is fundamental to compensate for the lower investment of one of the parents and for mitigating the effects of conflictual circumstances between the parents after separation (Del Boca, 2003; González and Özcan, 2013). The Child Maintenance Service that has replaced the CSA in the UK since 2014 represents a typical example of an institution with such an aim. A detailed institutional background for the UK is provided in the Appendix.

[21] For instance, the higher level of education of both parents may be more productive in transmitting abilities when the parents are together rather than when they are separated. Similarly the detrimental effects of interparental conflicts may be exacerbated in non-divorced families because it allows children to perceive them less intensely (Kalil et al., 2011; Barumandzadeh et al., 2016).

(ii) the common support assumption to avoid out of sample predictions.

3.2 Generalized Oaxaca-Blinder decomposition

To overcome the first limitation of the O-B, the fact that it provides only the decomposition of the mean gap, we apply the decomposition at various quantiles of the children's skills distributions to analyse the divorce skills gaps, by identifying the explained and unexplained component across the entire distribution of children's skills. This extension is based on the Recentered Influence Function (RIF) method of Firpo et al. (2009). 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 skills gaps.[22]

More specifically, it can be shown that 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 $y \leq q_\tau$.[23]

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) $E_X E_y[RIF(y, q_\tau)|X] = q_\tau$. Given these properties, we 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 :

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

where, as before, j is the group indicator (j=0,1), $\mathbf{X}_j$ is a vector of K explanatory variables

[22]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)

[23]For estimation of the RIF we use the Stata ado file *rifreg* written by Firpo et al. (2009)

including the intercepts, $\beta(q_\tau)$ 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) $\beta_j(q_\tau)$ as the marginal effect of X on the unconditional quantile of children outcome. Given the properties of the RIF it can also be shown that:

$$\begin{aligned} q_{0\tau} - q_{1\tau} &= E_y[RIF(y_0, q_\tau|\mathbf{X}_0)] - E_y[RIF(y_1, q_\tau|\mathbf{X}_1)] \\ &= [RIF(Y_0, q_{0\tau})] - [RIF(Y_1, q_{1\tau})] \\ &= \overline{\mathbf{X}}_0\beta_0(q_\tau) - \overline{\mathbf{X}}_1\beta_1(q_\tau) \\ &= (\overline{\mathbf{X}}_0 - \overline{\mathbf{X}}_1)\beta_0(q_\tau) + \overline{\mathbf{X}}_1(\beta_0(q_\tau) - \beta_1(q_\tau)) \end{aligned} \tag{7}$$

where the last equivalence follows the O-B decomposition method and shows that the gap in quantiles can be decomposed into two additive components, the composition effects and the residual effects as in the mean O-B. We call this decomposition the *generalized Oaxaca-Blinder method*; this differs from the O-B method only because the dependent variable in the regression model is the RIF rather than y. Similarly to what we had in Equation 3, the first term is the differential in children skills that is explained by differences in observed characteristics between the two groups and the second term measures the unexplained component.

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 as:

$$q_{0\tau} - q_{1\tau} = \sum_k (\overline{x}_{0k} - \overline{x}_{1k})\beta_{0k}(q_\tau) + \overline{\mathbf{X}}_1(\beta_0(q_\tau) - \beta_1(q_\tau)) \tag{8}$$

This method allows us to overcome the first drawback of the O-B method by providing a decomposition of the gap at different quantiles in addition to the mean. Despite this, the generalized O-B method continues to rely on the linearity assumption and may consider out of sample counterfactuals when the ranges of the covariates differ between the two groups (Barsky et al., 2002). For this reason, as a robustness check we implement the reweighted O-B decomposition as explained in the next section.

3.3 Reweighted 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 reweighted 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 skills 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 children of intact families is estimated with weighted least squares:

$$RIF(y_0) = \mathbf{X}_0\beta_0^{WR} + u_0 \tag{9}$$

with weights computed as

$$w(X) = \frac{P(j=1|X)P(j=0)}{P(j=0|X)P(j=1)} \tag{10}$$

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. $\overline{X_1}\hat{\beta}_0^{WR}$ and finally compute the reweighted decomposition of the mean gap as follows:

$$\begin{aligned} \overline{y}_0 - \overline{y}_1 &= \overline{\mathbf{X}}_0\hat{\beta}_0 - \overline{\mathbf{X}}_1\hat{\beta}_1 + \overline{\mathbf{X}}_1\hat{\beta}_0^{WR} - \overline{\mathbf{X}}_1\hat{\beta}_0^{WR} \\ &= [(\overline{\mathbf{X}}_0\hat{\beta}_0 - \overline{\mathbf{X}}_1\hat{\beta}_0^{WR}] + [\overline{\mathbf{X}}_1(\hat{\beta}_0^{WR} - \hat{\beta}_1)] \end{aligned} \tag{11}$$

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.

4 Empirical Results

This section unfolds all the results from the decomposition analysis. It starts by describing the results of the standard Oaxaca Blinder decomposition and then it lays out the detailed Oaxaca Blinder decomposition in order to disentangle the contribution of each of the factors in explaining the divorce gap. Finally, it reports the results of the divorce skills gap decomposition across the children skills distribution with details on the differences between boys and girls.

4.1 Decomposing the mean divorce skills gaps

Table 3 summarises the results of the Oaxaca Blinder decomposition at the mean of the explained and unexplained components for cognitive (Panel A) and noncognitive skills (Panel B) respectively, both standardized with mean 0 and standard deviation 1. The first rows in both panels show what we call the *divorce skill gap*, i.e. the raw mean gap of cognitive and noncognitive skills between children of intact and disrupted families. The second rows in both panels report the amount of the divorce skill gap that is explained by the O-B decomposition method which represents the difference between the actual mean and the counterfactual, i.e. the outcomes that the children of intact families would have if they had the same characteristics as the children of divorce. The third rows in both panels show the unexplained part, which is the difference between the mean skill gap and the explained component.

With regard to cognitive skills, the gaps entirely reflect compositional differences in the covariates between the two groups of children with residual components never statistically significant, in the short or long term.[24] A 3 years old child whose parents divorced during the early childhood (between 9 months and age 3), has on average 25% of a 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, with insignificant unexplained component. Similar results are found at ages 5, 7, and 11 respectively with a raw gap of 22% 35% and 26% of a standard deviation. Of these gaps, 21, 28, 24 percentage points, respectively for ages 5, 7, and 11, are explained by differences in observed characteristics with the unexplained components being insignificant.

To understand how important these gaps are, we can compare our divorce skill gaps with the results of other studies that utilise the MCS to analyse child development. For instance, Del Bono et al. (2016) find that a standard deviation increase in maternal time investment increases cognitive outcomes significantly by 13% of a standard deviation at age 3. Similarly, they show that having a mother with at least a university degree is associated with an increase of cognitive abilities of 33% of a s.d. compared to having a mother without qualification. Therefore, the magnitude of the divorce cognitive skill gaps found in our analysis, ranging from 22% to 35%, is substantial.

Panel B of Table 3 features the mean noncognitive skills gaps by child age which appear to be larger than the cognitive skills gaps.[25] Compared to cognitive skills the portions ascribed to composition effects, i.e. the explained part, account largely but not entirely for the gap in noncognitive skills. Moreover, noncognitive skills gaps appear to increase over time, going from 0.337 at age 3 to 0.537 at age 11. This suggests that experiencing divorce in early childhood has a larger adverse impact on noncognitive skills compared to cognitive, and this tends to be exacerbated in the long run. A 3 years old child with divorced parents has 33.7% of a standard deviation lower noncognitive skills compared to his counterpart from an intact family. Of this gap, the differences in observed characteristics accounts for the gap entirely. The same is valid for the noncognitive gap observed at age 5. Overall, similar to what we found for cognitive skills, the divorce noncognitive skills gaps appear to be largely explained by compositional differences. However, some unexplained gap is found at ages 7 and 11, with 18.8 percentage points (pp) and 17.7 pp of the gap left unexplained respectively.

It is important to remark that our aim is to describe the divorce skills gaps rather than

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

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

to provide a causal interpretation of the results. However, according to Słoczyński (2015), the presence of some significant residual components in explaining the gaps between two groups is consistent with significant treatment effect of the variable distinguishing the two groups, in this case of divorce. These results are in line with the related empirical literature finding a negative impact of divorce on both children's (e.g. Amato and Anthony 2014) and adolescent/adult's outcomes (e.g.Frimmel et al. 2016).

4.2 What accounts for the mean divorce skills gaps?

Given the major role played by the *compositional effects* in explaining the divorce skills gaps, appropriate policy responses to narrow the gaps potentially depend on the factors that mainly contribute to explain these differences. We consider six sets of factors such as child characteristics, demographic characteristics, parents' education, parent's health, family financial resources and quality of parental relationship, and we identify the relative importance of these factors in explaining the divorce skills gaps.

We report the detailed decomposition of the explained divorced cognitive skills gaps by age in Panel A of Table 4 and the same for noncognitive skills in Panel B. Starting with cognitive skills, the most notable fact is that, regardless of the age at which the gap is observed, the two groups of variables that appear to contribute mostly to the explained cognitive skills gaps are parents' education and the financial resources of the family. For 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 disrupted families were removed, the divorce skill gap would be reduced by 33.6% (0.084/0.250= 0.336, other things being equal). Parental education contributes 0.069 out of 0.213, 0.098 out of 0.281, and 0.090 out of 0.241 of the explained gaps in cognitive skills, at ages 5, 7 and 11 respectively (columns 2,3 and 4). Overall, the contribution of parental education to the explained gap is around 35%.

With regard to the the set of variables on financial resources, the differences between the two groups of children at age 3 explain a large part of the differences in cognitive skill gaps (0.142 out of 0.250). This means that if the differences in financial resources between the two groups were removed, the implied reduction in the divorce skill gap would be 62%. (0.142 / 0.250= 0.620, other things being equal). For the cognitive skills gap, financial resources explain 0.121 out of 0.213 of explained cognitive skills gap at age 5, 0.169 out of 0.281 at age

7 and 0.115 out of 0.241 at age 11. In general, differences in financial resources account for around 60% of the explained divorce differences in cognitive skills.

None of the other groups of variables seems to play any significant role in accounting for the explained divorce cognitive gaps. If significant, their contribution is very little in proportion to the contribution of parental education and family financial resources.

There are several mechanisms through which we might explain how these two sets of factors, i.e. parental education and financial resources, are strongly correlated with children's cognitive development and how they account for most of the divorce skills gaps, for example: (i) better financial circumstances may imply higher financial investment on child development; (ii) a higher level of parental education may increase investments in child's human capital in terms of access to additional resources or networks; (iii) parents with a higher level of education may have higher parenting skills and therefore may invest more or more effectively in child development; (iv) parental education is likely to be correlated with parental cognitive abilities: if cognitive abilities are transmitted from parents' to children, then parental education is likely to be correlated with children's cognitive skills. This conveys a pattern of intergenerational transmission of cognitive abilities which accounts for a substantial part of the gap.

In Panel B of Table 4, we present the detailed decompositions of the explained divorce noncognitive skills gaps over time. As pointed out earlier, the gap in noncognitive skills is larger, and unlike for cognitive skills almost all groups of variables contribute significantly in explaining the gap. This is consistent with the higher malleability of noncognitive skills compared to cognitive skills (Heckman, 2000). Furthermore, it appears that different dimensions of skills have different factors contributing to their corresponding divorce gaps. The sets of factors that mostly contribute to the noncognitive gaps are the interparental conflicts and the financial resources of the family.

For 3 years old children's noncognitive skills (column 1), differences in interparental conflicts account for 0.130 out of 0.337 of the explained gap. This suggests that if the average differences in interparental conflicts between the two groups of children were removed, then the divorce noncognitive skills gap would narrow by 38.5% (0.130/0.337= 0.385, other things being equal). For the noncognitive skills gap, interparental conflicts explain 0.138 out of 0.340 of explained noncognitive skills gap at age 5, 0.113 out of 0.315 at age 7 and 0.116 out of 0.360 at age 11. It therefore appears that interparental quality of relationship not only matters but it is able to largely explain the difference in behavioral problems between children of disrupted and intact families and indeed is one of the most important factors contributing

to the gap. Overall, interparental conflicts has an explanatory power of around 35% of the explained gap.

What could be the mechanisms that drive these relationships between interparental conflicts and children's noncognitive development? Few possibilities are (i) families with a better interparental relationship can collaborate in parenting activities more easily and effectively and this is likely to influence parent-child relationship quality and in turn child wellbeing (Adamsons et al., 2007; Fine and Kurdek, 1995; Hanson et al., 1996; Carlson and Magnuson, 2011); (ii) interparental conflicts is likely to be correlated with parental noncognitive abilities, such as particular personality traits and psychological distress. If noncognitive abilities are intergenerationally transmitted either directly or indirectly, then the interparental relationship is likely to be correlated with children's noncognitive skills.[26]

Another set of variables that has consistent explanatory power in terms of the noncognitive skills gaps, regardless of child age, is that related to financial resources. Financial resources account for 0.116 out of 0.337 of the divorce skills gaps at age 3 with an overall explanatory power of around 35% of the explained component. This implies that, around 70% of the explained divorce noncognitive skills gaps are accounted for by the quality of parental relationship that the child is exposed to and the financial circumstances of the family before divorce.

Unlike the results for cognitive development, parents' education does not seem to play a major role in explaining the noncognitive skills gaps. In contrast, the quality of relationship between parents is one of the key variable to account for the divorce noncognitive gaps.

Our results indicate that neglecting to control for interparental conflicts when trying to establish the impact of separation on child or adolescent or later outcomes may bias the results upwards. This is because, although conflicts appear to impact only child noncognitive outcomes, there is a consistent evidence in the literature showing that both cognitive and noncognitive skills are determinants of later outcomes such as education and labour market (Almond and Currie, 2011). This finding may offer an explanation for the mixed results found in the literature on the impact of divorce on children later outcomes.

Taken together, our results indicate that different dimensions of skills have different factors contributing to the corresponding divorce gaps, with interesting patterns emerging. The role of financial resources is significant across cognitive and noncognitive skills, although

[26]The psychological literature shows that there are various channels through which conflicts may affect children noncognitive outcomes. For example, the presence of interparental conflict may lead the child to self-blame and develop problems such as anxiety and depression (Grych et al., 2000)

the impact is larger for the former. Beyond financial resources, cognitive and noncognitive 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 noncognitive development is explained by the interparental quality of relationship. Since, on the one hand, parental education is highly correlated with parental cognitive abilities and, on the other, interparental conflicts are correlated with parents' noncognitive skills, there is room for interpreting our results in terms of one the most important mechanisms of intergenerational transmission, which is the transfer of abilities from parents to children.[27]

4.3 Divorce skills gaps across the children's skills distributions

Figure 1 features the results of the Oaxaca-Blinder decomposition at the 25th, 50th, 75th, 90th percentile distribution of cognitive and noncognitive skills and includes total mean differences (circle), the explained component (diamond) and the unexplained component (triangle). The first row of graphs in Figure 1 shows the results of the decomposition for cognitive skills over time and the second row for noncognitive skills.

With regard to cognitive skills, results show that children of intact families score higher on cognitive tests at all quantiles of cognitive skills distribution, consistent with our previous analysis. Looking at the different components of the decomposition, cognitive skills do not seem to have any clear pattern of pronounced inequalities across children cognitive skills' distributions. These results therefore provide a robustness analysis of the mean decomposition suggesting that the average decomposition of the divorce cognitive skills gaps is able to capture the main features characterizing the divorce gap. We provide the full Table of the correspondent results, including the standard errors in Table A7. Consistent with our decomposition results at the mean, the raw gap is mainly explained by compositional differences in covariates with the residual component rarely different from zero at standard significance levels.[28,29]

A different pattern arises when looking at noncognitive skills. As noticed in previous analysis, the divorce noncognitive gaps are much lager than the cognitive skills gaps, and the

[27]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 available upon request.

[28]The only exception is the decomposition of cognitive skills at age 7 in the 50th and in the 90th quantiles that show some unexplained effect statistically different from zero.

[29]Considering the detailed decomposition across the distribution we find that each group of covariates in proportion contributes equally across the distribution. Results are available upon request.

decomposition across the distribution show that this is valid at all levels of noncognitive skills. In addition, this extension of the Oaxaca Blinder decomposition highlights another difference between divorce gaps in cognitive and noncognitive skills. We find a pronounced pattern of decreasing differentials across the distribution of noncognitive abilities. The full Table of the correspondent results, including the standard errors, can be found in the Appendix in Table A8. For example, the divorce noncognitive skills gaps decreases from 0.333 at the 25th quantile to 0.153 at the 90th quantile at age 3, and from 0.531 at the 25th to 0.178 at the 90th at age 5. In accord with the results at the mean, the noncognitive divorce gap increases in the long run, e.g. at the 25th quantile the divorce gap goes from 0.333 at age 3 to 0.686 at age 11. This sharp increase however, is not entirely reflected in the explained component, as at the lower tail of the distribution there is some significant residual part left unexplained at age 7 and 11 a the bottom of the distribution.[30] These results highlight the presence of unexplained component in the noncognitive skills distribution mainly for children with lower noncognitive skills. 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 event, e.g. parental separation.

4.3.1 Gender differences in the divorce skills gaps across the children's skills distributions

Figures 2 and 3 depicts the same decomposition accross children skills distrubution by gender. Results are similar when comparing the divorce skills gaps in cognitive skills between boys and girls, whereby the gaps appears to be quite homogeneous across child's skills irrespective of the gender. However, there is a clear gender difference in the divorce gaps in noncognitive skills, with boys showing a more pronounced pattern of decreasing gap across the distribution of noncognitive skills, and with larger divorce gap among children with high behavioral problems. The raw gap among boys at the 25th percentile is around 80% of a standard deviation whereas for girls is around 60%. The gender differences diminish with the level of noncognitive skills, with divorce gap of around 20% of a standard deviation for both gender at the 90th percentile.[31] These results are in line with a recent contribution by Bertrand

[30] Considering the detailed decomposition across the distribution we find that each group of covariate in proportion contributes equally across the distribution. Results are available upon request.

[31] For comparison, we also report in Table A5 and A6 in the Appendix the results of the decomposition of the mean divorce skills gap by gender. At the mean the gender differences are not as evident as they are when looking across the distribution of child's skills. However, boys seems to have larger mean noncognitive skills gaps than girls at younger ages. This is confirmed by the decomposition results across child's skills

and Pan (2013), which analyses the role of home and school environment in child disruptive behavior, and 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 noncognitive skills gaps are more pronounced at the lower tail of the distribution rather than at the upper tail, especially for boys.

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): (i) reweighted O-B decomposition, (ii) choice of the counterfactual (iii) common support.

5.1 Reweighted Oaxaca-Blinder decomposition

As discussed in Section 3.3, the detailed decomposition of the explained component provided by the O-B method is reliable only if the composition effects estimated with a reweighted O-B method are similar to the composition effects estimated with the unweighted O-B method. We decompose the divorce skills gaps at the mean using the more robust reweighted decomposition methodology (DiNardo et al., 1996; Fortin et al., 2011) to separate composition effects from residual effects.[32] More precisely, we construct a counterfactual sample of children of intact families reweighted 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 skills gaps, with no misspecification error due to the nonlinearity of the underlying conditional expectation. As explained in Section 3.3, we use a logit model to compute the appropriate weights with the same explanatory variables used in the rest of our analysis.

Table 5 and 6 report the results for the mean divorce skills gaps using the reweighted method for cognitive and noncognitive skills respectively. Overall, the reweighted method

distribution.

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

confirms the findings that composition effects largely explain the differences between the two groups of children, for both cognitive and noncognitive skills. In fact, the reweighted decomposition results indicate that the composition effect over-explains the divorce gap for both cognitive and noncognitive skills, which suggests that, given the difference in the covariates, children from intact families should have even higher skills compared to children of divorce. The differences between the two models can be attributable to some specification error due to the presence of nonlinearity. If anything the composition effects computed with the unweighted methodology would be underestimated, which would suggest that the accounting power of the factors that mainly explain the divorce skills gap might be as well underestimated. 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 counterfactual

Another limitation of the Oaxaca–Blinder 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. We therefore assume that the model for children of intact families represents the true model and that ideally the return to the characteristics of children of divorce would be equivalent to those for children of intact families.

To test for the robustness of our results that may depend on the choice of the counterfactual, we consider two alternative counterfactuals: (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. Results are shown in Table 7 and 8 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 less than the minimum or greater 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 less than the minimum or greater 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 9 shows the results of the decomposition when imposing the common support restriction, for cognitive (Panel A) and noncognitive 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

Using the Millennium Cohort Study from the UK, this paper investigates which factors from a set of plausible suspects - child characteristics, demographic characteristics, parents' education and health, family financial resources and interparental conflicts - are relatively more important in accounting for the divorce gaps in cognitive and noncognitive skills of children. In addition, it explore for the first time in the literature the heterogeneity in the decomposition of the gaps across the distribution of children's abilities. Differently from other studies that focus on the impact of divorce on children's later outcomes, we aim at determining the drivers of the divorce skills gaps in the short and medium term up until age 11. Given the malleability of skills in early childhood and the higher effectiveness of early intervention in reducing inequalities arising in early childhood, it becomes crucial to understand the channels through which the divorce skills gaps can be explained.

Our findings show that the divorce gaps in cognitive and noncognitive skills are mostly explained by compositional differences in the covariates that characterize children of intact

and disrupted families, indicating a negligible role of divorce itself. Our analysis further illustrates that the driving factors of the divorce gaps differ between different skill dimensions. Cognitive gaps are explained by parental education and family financial resources, but they are almost completely insensitive to any other family characteristics including interparental conflicts. Conversely, noncognitive gap are mostly explained by interparental conflicts and family financial resources. Adding this measure of interparental conflicts to the set of variables commonly used in the literature does not make a big difference in explaining the disparities in cognitive skills, but it does strongly explain the noncognitive disparities. This offers much needed insight that, to an extent, reconciles the ambiguous evidence obtained so far in the literature looking at the impact of separation on children, adolescent and adult outcomes. We also go beyond the mean divorce skills gaps by looking at the entire distribution of child abilities, and provide the first evidence that there is a wider gap in noncognitive skills for children, particularly among low skilled boys.

In the political, economic and public debate about the relationship between divorce and child development, this paper give a more comprehensive view of the disparities arising between children whose parents are separated and those who decide to stay married. The results highlight the importance of the characteristics that make a family to select into divorce, with differences in parent's education, interparental conflicts and financial resources being the main factors accounting for the gaps. Digging deeper into our results and comparing the determinants of the cognitive and noncognitive gaps, our results indicate that the intergenerational transmission of skills is one of the main mechanisms for the lower achievements of children of divorce.

On the basis of this evidence, our findings suggest that potential policies to reduce the disadvantage in abilities commonly found among children of divorce are those policy instruments aimed at addressing poverty, interparental conflicts and parental education. Given the critical role played by the quality of parental relationship for the inequalities arising in noncognitive skills, our findings emphasize that any interventions aimed at encouraging parental cooperation and making parents aware of the potential negative impact of conflicts, may represent an effective response to reduce the divorce gaps, especially if targeted towards boys with higher behavioral problems.

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

	(1)		(2)		(3)
	Non divorced		Divorced		
	Mean	sd	Mean	sd	Difference
Cognitive skills (Age 3)	0.195	0.939	-0.055	0.988	0.250***
Cognitive skills (Age 5)	0.216	0.855	-0.004	0.880	0.220***
Cognitive skills (Age 7)	0.192	0.913	-0.162	0.948	0.354***
Cognitive skills (Age 11)	0.153	0.898	-0.113	0.975	0.266***
Noncognitive skills (Age 3)	0.146	0.915	-0.190	1.154	0.337***
Noncognitive skills (Age 5)	0.188	0.858	-0.254	1.122	0.443***
Noncognitive skills (Age 7)	0.204	0.839	-0.299	1.137	0.503***
Noncognitive skills (Age 11)	0.191	0.868	-0.346	1.193	0.537***
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 religion	0.617	0.486	0.418	0.494	0.199***
Mother age	30.649	4.840	26.243	5.808	4.405***
Father 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, Paki, Ban, 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 uni	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 uni	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
Number of rooms	5.850	1.578	5.036	1.311	0.815***
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 12, 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 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 gap	0.229***	0.213***	0.281***	0.241***
	(0.029)	(0.024)	(0.028)	(0.026)
Unexplained gap	0.022	0.007	0.073	0.025
	(0.059)	(0.054)	(0.057)	(0.060)
Panel B: Noncognitive skills				
Mean gap	0.337***	0.443***	0.503***	0.537***
	(0.067)	(0.065)	(0.066)	(0.069)
Decomposition				
Explained gap	0.358***	0.340***	0.315***	0.360***
	(0.030)	(0.029)	(0.028)	(0.029)
Unexplained gap	-0.022	0.103	0.188***	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 noncognitive skills (Panel B) are in standard deviations. The variables used to explain the gap are: (i) *child characteristics* that are child age in months, 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 and whether parents have the same ethnicity; (iii) *parental education*; (iv) *psychological-health characteristics* that are parents general health and whether child's grandparents were separated; and (v) *family financial resources* which are family income, housing tenure, number of rooms in the house, 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 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 gap				
Child characteristics	0.012	0.011*	0.012**	0.005
	(0.008)	(0.006)	(0.005)	(0.004)
Demographic chracteristics	-0.032	-0.003	-0.021	0.019
	(0.021)	(0.018)	(0.018)	(0.019)
Parents' education	0.084***	0.069***	0.098***	0.090***
	(0.013)	(0.012)	(0.015)	(0.014)
Parents' health	0.006	0.003	0.006	-0.006
	(0.004)	(0.004)	(0.005)	(0.005)
Financial Resources	0.142***	0.121***	0.169***	0.115***
	(0.022)	(0.020)	(0.023)	(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***	0.281***	0.241***
	(0.029)	(0.024)	(0.028)	(0.026)
Panel B: Noncognitive skills				
Mean Gap	0.337***	0.443***	0.503***	0.537***
	(0.067)	(0.065)	(0.066)	(0.069)
Explained gap				
Child characteristics	0.005	0.004	0.003	0.005
	(0.006)	(0.007)	(0.008)	(0.007)
Demographic chracteristics	0.034*	0.032*	0.033*	0.056***
	(0.019)	(0.018)	(0.018)	(0.019)
Parents' education	0.053***	0.024**	0.016	0.043***
	(0.013)	(0.012)	(0.011)	(0.012)
Parents' health	0.020***	0.019***	0.021***	0.031***
	(0.006)	(0.006)	(0.006)	(0.008)
Financial Resources	0.116***	0.123***	0.129***	0.110***
	(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***	0.315***	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 noncognitive skills (Panel B) are in standard deviations. The variables used to explain the gap are: (i) *child characteristics* that are child age in months, 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 and whether parents have the same ethnicity; (iii) *parental education*; (iv) *psychological-health characteristics* that are parents general health and whether child's grandparents were separated; and (v) *family financial resources* which are family income, housing tenure, number of rooms in the house, 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 in cognitive skills by age

	(1) Age 3	(2) Age 5	(3) Age 7	(4) Age 11
Mean gap	0.250***	0.220***	0.354***	0.266***
	(0.058)	(0.051)	(0.055)	(0.057)
W=1				
Child characteristics	0.024**	0.014**	0.015**	0.005
	(0.010)	(0.006)	(0.007)	(0.008)
Demographic characteristics	-0.054	-0.038	-0.110	0.013
	(0.086)	(0.041)	(0.063)	(0.044)
Parents' education	0.182***	0.157***	0.218***	0.158***
	(0.031)	(0.028)	(0.034)	(0.030)
Parents' health	0.020	0.015	0.015	-0.021
	(0.014)	(0.012)	(0.014)	(0.012)
Financial resources	0.166***	0.143***	0.213***	0.193***
	(0.048)	(0.044)	(0.052)	(0.050)
Interparental Conflicts	0.057	0.012	0.027	0.044
	(0.040)	(0.028)	(0.029)	(0.031)
Total explained gap	0.395***	0.304***	0.379***	0.392***
	(0.112)	(0.060)	(0.084)	(0.071)
Specification error	-0.059	0.013	0.115	0.000
	(0.108)	(0.072)	(0.088)	(0.083)
Total unexplained gap	-0.111***	-0.101***	-0.128***	-0.129***
	(0.044)	(0.021)	(0.032)	(0.027)
Reweighting error	0.026	0.004	-0.011	0.003
	(0.031)	(0.021)	(0.025)	(0.023)
Observations	5003	5003	5003	5003

Source: UK Millennium Cohort Study.

Notes: Children cognitive (Panel A) and noncognitive skills (Panel B) are in standard deviations. The variables used to explain the gap are: (i) *child characteristics* that are child age in months, 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 and whether parents have the same ethnicity; (iii) *parental education*; (iv) *psychological-health characteristics* that are parents general health and whether child's grandparents were separated; and (v) *family financial resources* which are family income, housing tenure, number of rooms in the house, 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 6: Reweighted detailed decomposition of the divorce gap in noncognitive skills by age

	(1) Age 3	(2) Age 5	(3) Age 7	(4) Age 11
Mean Gap	0.337***	0.443***	0.503***	0.537***
	(0.067)	(0.065)	(0.066)	(0.069)
W=1				
Child characteristics	0.014**	0.013	0.014*	0.010
	(0.007)	(0.008)	(0.008)	(0.007)
Demographic characteristics	-0.024	0.061	0.020	0.026
	(0.048)	(0.050)	(0.043)	(0.040)
Parents' education	0.096***	0.054**	0.062**	0.075***
	(0.027)	(0.025)	(0.024)	(0.022)
Parents' health	0.027**	0.018**	0.018*	0.031***
	(0.013)	(0.009)	(0.010)	(0.010)
Financial resources	0.153***	0.142***	0.197***	0.200***
	(0.046)	(0.041)	(0.043)	(0.045)
Interparental Conflicts	0.237***	0.263***	0.201***	0.201***
	(0.033)	(0.029)	(0.027)	(0.026)
Total explained gap	0.504***	0.550***	0.512***	0.543***
	(0.077)	(0.071)	(0.063)	(0.060)
Specification error	0.002	0.072	0.148*	0.166**
	(0.090)	(0.086)	(0.084)	(0.084)
Total unexplained gap	-0.161***	-0.186***	-0.155***	-0.161***
	(0.028)	(0.028)	(0.023)	(0.022)
Reweighting error	-0.008	0.007	-0.002	-0.011
	(0.024)	(0.023)	(0.021)	(0.021)
Observations	5003	5003	5003	5003

Source: UK Millennium Cohort Study.

Notes: Children cognitive (Panel A) and noncognitive skills (Panel B) are in standard deviations. The variables used to explain the gap are: (i) *child characteristics* that are child age in months, 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 and whether parents have the same ethnicity; (iii) *parental education*; (iv) *psychological-health characteristics* that are parents general health and whether child's grandparents were separated; and (v) *family financial resources* which are family income, housing tenure, number of rooms in the house, 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 7: Mean divorce skills gaps by 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 gap	0.215***	0.228***	0.359***	0.198***
	(0.075)	(0.068)	(0.068)	(0.062)
Unexplained gap	0.035	-0.009	-0.005	0.068
	(0.090)	(0.081)	(0.078)	(0.075)
Panel B: Noncognitive skills				
Mean gap	0.337***	0.443***	0.503***	0.537***
	(0.067)	(0.065)	(0.066)	(0.069)
Decomposition				
Explained gap	0.443***	0.330***	0.243***	0.364***
	(0.081)	(0.078)	(0.073)	(0.079)
Unexplained gap	-0.106	0.112	0.260***	0.173*
	(0.079)	(0.081)	(0.086)	(0.091)
Observations	5003	5003	5003	5003

Source: UK Millennium Cohort Study.
Notes: Children cognitive (Panel A) and noncognitive skills (Panel B) are in standard deviations. The variables used to explain the gap are: (i) *child characteristics* that are child age in months, 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 and whether parents have the same ethnicity; (iii) *parental education*; (iv) *psychological-health characteristics* that are parents general health and whether child's grandparents were separated; and (v) *family financial resources* which are family income, housing tenure, number of rooms in the house, 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 8: Mean divorce skills gaps by 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 gap	0.224***	0.209***	0.284***	0.237***
	(0.028)	(0.023)	(0.027)	(0.025)
Unexplained gap	0.027	0.011	0.071	0.029
	(0.056)	(0.051)	(0.054)	(0.057)
Panel B: Noncognitive skills				
Mean gap	0.337***	0.443***	0.503***	0.537***
	(0.064)	(0.062)	(0.063)	(0.066)
Decomposition				
Explained gap	0.368***	0.341***	0.307***	0.359***
	(0.029)	(0.028)	(0.027)	(0.029)
Unexplained gap	-0.032	0.102*	0.196***	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 noncognitive skills (Panel B) are in standard deviations. The variables used to explain the gap are: (i) *child characteristics* that are child age in months, 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 and whether parents have the same ethnicity; (iii) *parental education*; (iv) *psychological-health characteristics* that are parents general health and whether child's grandparents were separated; and (v) *family financial resources* which are family income, housing tenure, number of rooms in the house, 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 9: Mean divorce skills gaps by 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***	0.261***
	(0.058)	(0.051)	(0.055)	(0.057)
Decomposition				
Explained gap	0.231***	0.209***	0.281***	0.240***
	(0.029)	(0.024)	(0.028)	(0.026)
Unexplained gap	0.013	-0.002	0.060	0.021
	(0.060)	(0.053)	(0.057)	(0.061)
Panel B: Noncognitive skills				
Mean gap	0.330***	0.427***	0.497***	0.532***
	(0.067)	(0.065)	(0.066)	(0.069)
Decomposition				
Explained gap	0.352***	0.330***	0.309***	0.354***
	(0.030)	(0.029)	(0.027)	(0.029)
Unexplained gap	-0.022	0.097	0.187***	0.178**
	(0.067)	(0.067)	(0.068)	(0.070)
Observations	4949	4949	4949	4949

Source: UK Millennium Cohort Study.
Notes: Children cognitive (Panel A) and noncognitive skills (Panel B) are in standard deviations. The variables used to explain the gap are: (i) *child characteristics* that are child age in months, 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 and whether parents have the same ethnicity; (iii) *parental education*; (iv) *psychological-health characteristics* that are parents general health and whether child's grandparents were separated; and (v) *family financial resources* which are family income, housing tenure, number of rooms in the house, 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 *.

Figure 1: Decomposition across the skills distribution

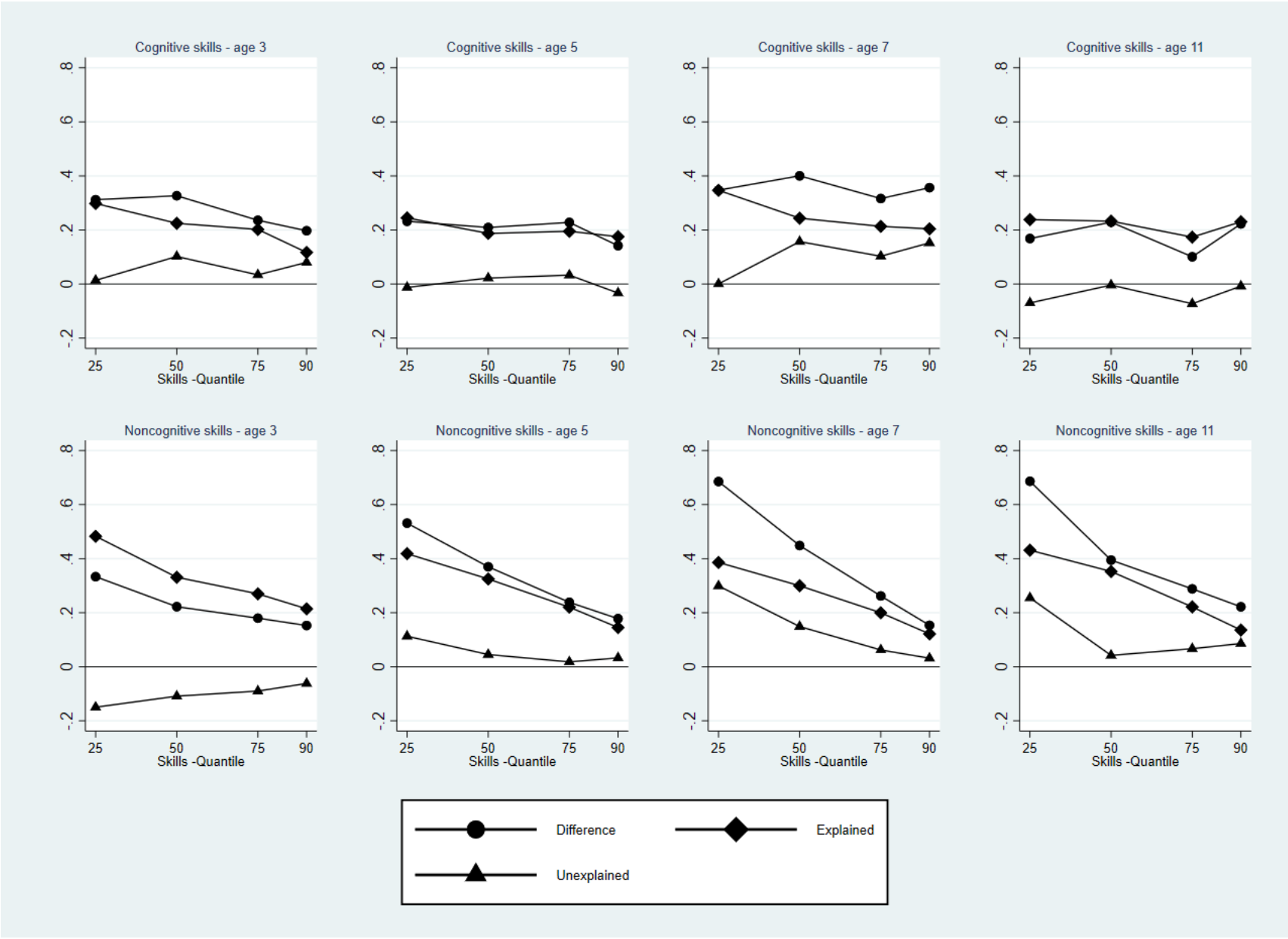


Figure 2: Decomposition across the skills distribution- Boys

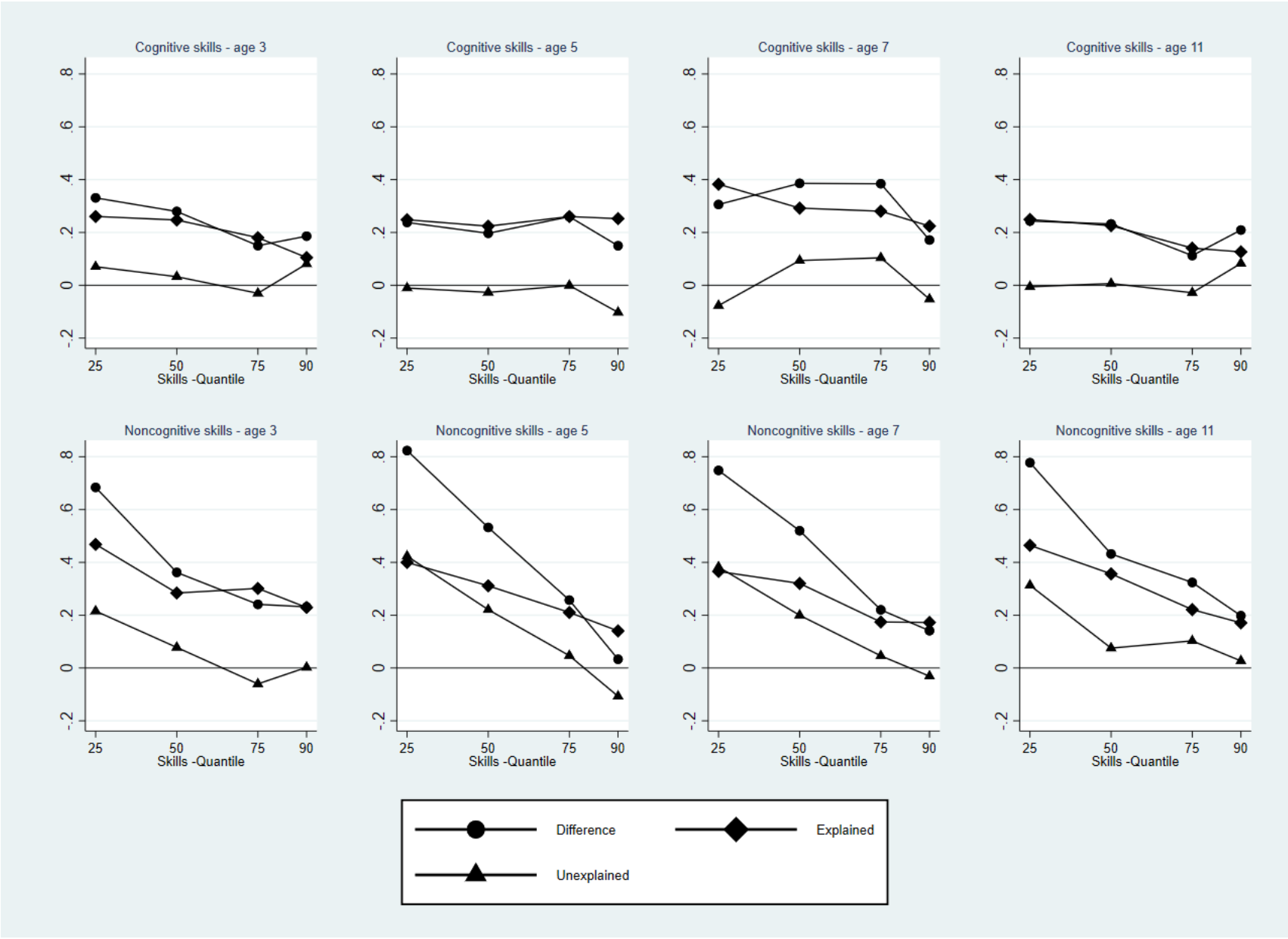
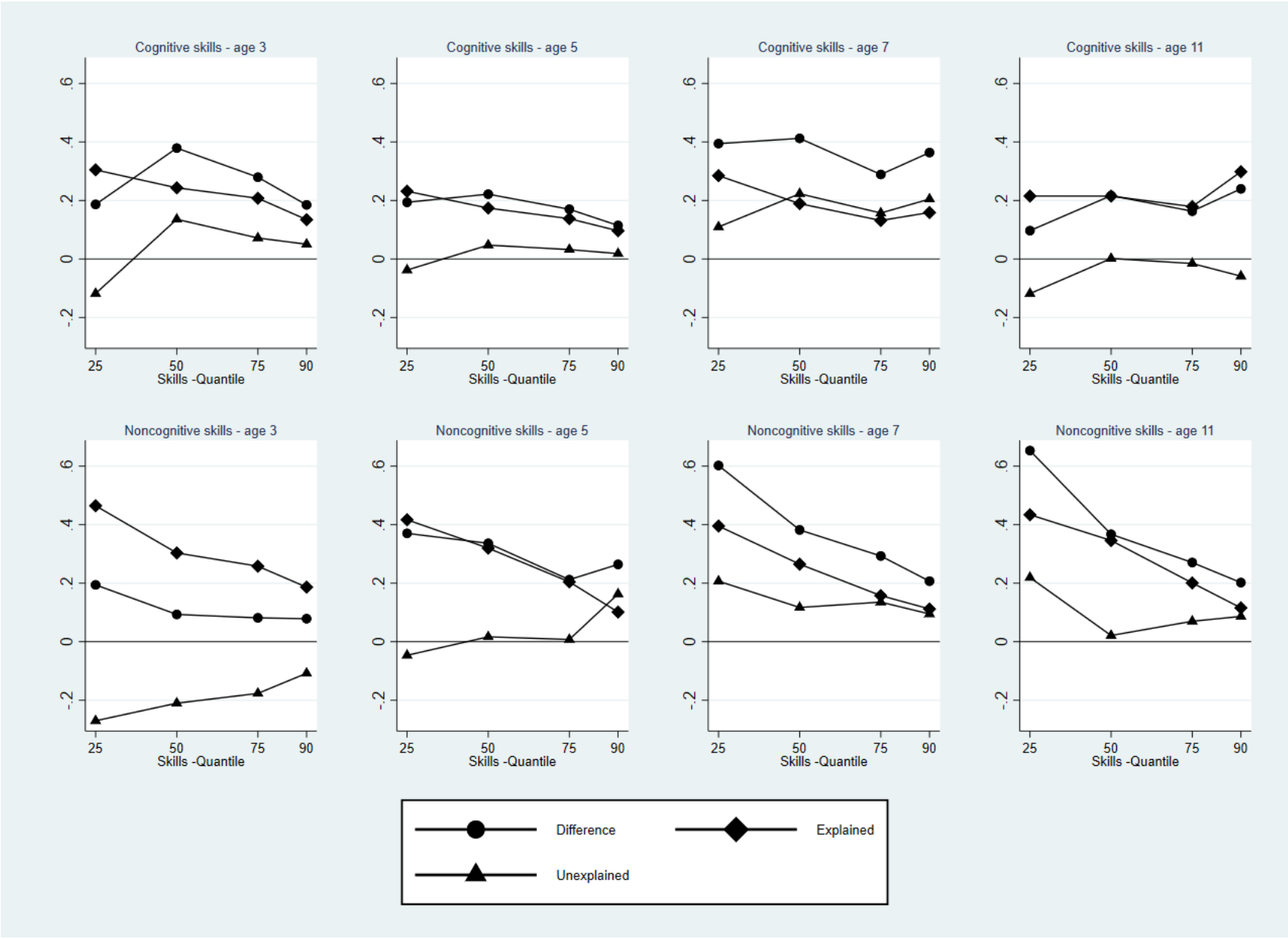


Figure 3: Decomposition across the skills distribution- Girls



A Appendix

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 on 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[33], 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.[34] Then the number of divorces remain stable for 20 years until recently, when it has fallen steadily, together with the number of marriages.[35] 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.[36]

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.[37] 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.[38] 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

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

[34]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.

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

[36]Source: Office from National Statistics

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

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

cannot be entirely explained by selection.

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.[39] 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.[40] 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.

[39]Source: www.csa.gov.uk
[40]Source: www.gov.uk

A Appendix

Table A1: Assessment by child age

Assessment	Age 3	Age 5	Age 7	Age 12
Cognitive skills				
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	
Non-cognitive skills				
SDQ (Strenght and Difficulties Questionnaire)	X	X	X	X

Table A2: Cognitive skills: Factor Loadings

	Variables	Factor Loadings
Age 5	BAS naming vocabulary	0.5437
	Picture Similarity	0.5623
	Pattern Construction	0.5488
	% Total variance explained by the factor	30.43
Age 7	BAS Word Reading	0.6027
	Mathematical Skills	0.7202
	Pattern Construction	0.5668
	% Total variance explained by the factor	40.10

Table A3: Noncognitive skills: Factor Loadings

	Variables	Factor Loadings
Age 3	Emotional Symptoms	0.4216
	Peer Problems	0.4879
	Conduct Problems	0.6208
	Hyperactivity Problems	0.5705
	Pro-social Behaviour	0.4500
	% Total variance explained by the factor	26.58
Age 5	Emotional Symptoms	0.4539
	Peer Problems	0.5062
	Conduct Problems	0.6614
	Hyperactivity Problems	0.6144
	Pro-social Behaviour	0.4986
	% Total variance explained by the factor	30.52
Age 7	Emotional Symptoms	0.4948
	Peer Problems	0.5428
	Conduct Problems	0.6925
	Hyperactivity Problems	0.6427
	Pro-social Behaviour	0.5163
	% Total variance explained by the factor	33.97
Age 12	Emotional Symptoms	0.5483
	Peer Problems	0.5765
	Conduct Problems	0.6850
	Hyperactivity Problems	0.6560
	Pro-social Behaviour	0.5022
	% Total variance explained by the factor	35.69

Table A4: 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 A5: Mean divorce skills gaps by 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)	(0.082)	(0.088)	(0.089)
Decomposition				
Explained gap	0.211***	0.240***	0.327***	0.222***
	(0.041)	(0.036)	(0.042)	(0.038)
Unexplained gap	0.046	0.017	0.035	0.052
	(0.092)	(0.085)	(0.090)	(0.094)
Panel B: Noncognitive skills				
Mean gap	0.497***	0.535***	0.534***	0.585***
	(0.103)	(0.105)	(0.099)	(0.106)
Decomposition				
Explained gap	0.364***	0.334***	0.327***	0.382***
	(0.046)	(0.045)	(0.042)	(0.045)
Unexplained gap	0.133	0.201*	0.208**	0.203*
	(0.104)	(0.109)	(0.104)	(0.109)
Observations	2432	2432	2432	2432

Source: UK Millennium Cohort Study.
Notes: Children cognitive (Panel A) and noncognitive skills (Panel B) are in standard deviations. The variables used to explain the gap are: (i) *child characteristics* that are child age in months, 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 and whether parents have the same ethnicity; (iii) *parental education*; (iv) *psychological-health characteristics* that are parents general health and whether child's grandparents were separated; and (v) *family financial resources* which are family income, housing tenure, number of rooms in the house, 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 A6: Mean divorce skills gaps by 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)	(0.077)
Decomposition				
Explained gap	0.244***	0.185***	0.235***	0.246***
	(0.043)	(0.033)	(0.039)	(0.037)
Unexplained gap	-0.001	-0.002	0.112	0.012
	(0.083)	(0.072)	(0.078)	(0.082)
Panel B: Noncognitive skills				
Mean gap	0.181**	0.352***	0.471***	0.490***
	(0.088)	(0.081)	(0.092)	(0.094)
Decomposition				
Explained gap	0.336***	0.336***	0.300***	0.341***
	(0.039)	(0.038)	(0.036)	(0.038)
Unexplained gap	-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 noncognitive skills (Panel B) are in standard deviations. The variables used to explain the gap are: (i) *child characteristics* that are child age in months, 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 and whether parents have the same ethnicity; (iii) *parental education*; (iv) *psychological-health characteristics* that are parents general health and whether child's grandparents were separated; and (v) *family financial resources* which are family income, housing tenure, number of rooms in the house, 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 A7: Decomposition across the cognitive skills distribution by age

	(1) 25th Quantile	(2) 50th Quantile	(3) 75th Quantile	(4) 90th Quantile
Panel A: Age 3				
Mean gap	0.312***	0.327***	0.236**	0.197*
	(0.073)	(0.066)	(0.092)	(0.116)
Explained gap				
Total	0.298***	0.225***	0.202***	0.117**
	(0.038)	(0.031)	(0.036)	(0.047)
Unexplained gap				
Total	0.014	0.102	0.034	0.080
	(0.077)	(0.068)	(0.096)	(0.122)
Panel B: Age 5				
Mean gap	0.232***	0.209***	0.228***	0.142*
	(0.070)	(0.060)	(0.065)	(0.080)
Explained gap				
Total	0.245***	0.187***	0.195***	0.175***
	(0.032)	(0.026)	(0.027)	(0.032)
Unexplained gap				
Total	-0.013	0.022	0.033	-0.033
	(0.074)	(0.064)	(0.068)	(0.085)
Panel C: Age 7				
Mean gap	0.347***	0.401***	0.316***	0.357***
	(0.077)	(0.069)	(0.072)	(0.082)
Explained gap				
Total	0.347***	0.244***	0.213***	0.204***
	(0.038)	(0.031)	(0.031)	(0.035)
Unexplained gap				
Total	0.000	0.157**	0.103	0.152*
	(0.081)	(0.073)	(0.076)	(0.086)
Panel D: Age 11				
Mean gap	0.168***	0.229***	0.101	0.223**
	(0.060)	(0.062)	(0.065)	(0.097)
Explained gap				
Total	0.238***	0.233***	0.174***	0.230***
	(0.029)	(0.028)	(0.026)	(0.042)
Unexplained gap				
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 (Panel A) and noncognitive skills (Panel B) are in standard deviations. The variables used to explain the gap are: (i) *child characteristics* that are child age in months, 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 and whether parents have the same ethnicity; (iii) *parental education*; (iv) *psychological-health characteristics* that are parents general health and whether child's grandparents were separated; and (v) *family financial resources* which are family income, housing tenure, number of rooms in the house, 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 A8: Decomposition across the noncognitive skills distribution by age

	(1) 25th Quantile	(2) 50th Quantile	(3) 75th Quantile	(4) 90th Quantile
Panel A: Age 3				
Mean gap	0.333***	0.222***	0.180***	0.153**
	(0.109)	(0.080)	(0.067)	(0.072)
Explained gap				
Total	0.483***	0.331***	0.270***	0.215***
	(0.042)	(0.033)	(0.030)	(0.032)
Unexplained gap				
Total	-0.150	-0.109	-0.090	-0.062
	(0.109)	(0.082)	(0.071)	(0.077)
Panel B: Age 5				
Mean gap	0.531***	0.370***	0.238***	0.178***
	(0.108)	(0.077)	(0.066)	(0.062)
Explained gap				
Total	0.419***	0.325***	0.220***	0.145***
	(0.039)	(0.031)	(0.024)	(0.024)
Unexplained gap				
Total	0.113	0.045	0.018	0.033
	(0.109)	(0.079)	(0.068)	(0.066)
Panel C: Age 7				
Mean gap	0.685***	0.448***	0.262***	0.153**
	(0.103)	(0.081)	(0.068)	(0.062)
Explained gap				
Total	0.386***	0.300***	0.200***	0.122***
	(0.038)	(0.029)	(0.022)	(0.019)
Unexplained gap				
Total	0.299***	0.149*	0.062	0.032
	(0.105)	(0.082)	(0.069)	(0.064)
Panel D: Age 11				
Mean gap	0.686***	0.395***	0.288***	0.222***
	(0.138)	(0.075)	(0.061)	(0.058)
Explained gap				
Total	0.431***	0.353***	0.221***	0.136***
	(0.042)	(0.030)	(0.022)	(0.019)
Unexplained gap				
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 cognitive (Panel A) and noncognitive skills (Panel B) are in standard deviations. The variables used to explain the gap are: (i) *child characteristics* that are child age in months, 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 and whether parents have the same ethnicity; (iii) *parental education*; (iv) *psychological-health characteristics* that are parents general health and whether child's grandparents were separated; and (v) *family financial resources* which are family income, housing tenure, number of rooms in the house, 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 *.