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The long-term effects of parental separation on childhood multidimensional deprivation: a lifecourse approach

Marion Leturcq · Lidia Panico

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Abstract A large literature has documented the impact of parental separation on children's financial poverty. However, income has been increasingly criticized as an indicator of childhood living conditions and deprivation. In this paper, we propose a conceptual framework and adapt existing measures of adult multi-domain deprivation to produce childhood deprivation indicators that are age-specific and child-centred. These new indicators allow within-individual, longitudinal analyses to measure the impact of a shock on children's living conditions. We apply this method to consider the long term effects of parental separation on childhood deprivation, considering four dimensions of children's lives: leisure; material conditions; parenting behaviours and routines; and basic material goods. We track children over the first decade of life by using a nationally representative UK cohort of over 18,000 children.

Using a fixed-effects framework, we find that, while the increase in income poverty after parental separation is large, the impact on childhood deprivation was more mixed. Our results suggest that, while facing strong financial constraints, separated parents cut back on normative but costly activities such as holidays and outings, but attempt to maintain children's basic material circumstances and their day-to-day parenting and routines, at least around separation. However, heterogeneous effects exist, suggesting that parents' pre-separation social and economic capital may play an important role. This approach therefore adds more precision and nuance to our understanding of the processes around parental separation and its impacts on children.

Keywords child poverty · deprivation indicators · family instability · longitudinal methods · United Kingdom

JEL classification: J12; J13; I32

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1 Introduction

Driven by a number of socio-demographic phenomena summarized by the Second Demographic Transition (Van de Kaa, 2001), children increasingly experience parental divorce or separation during childhood. In 2010-11, a third of all UK children aged under 17 were not living with both of their birth parents (DWP, 2013), some of the highest levels in the OECD. A range of literature has concerned itself with the effects of parental separation on family well-being (Kiernan and Mensah, 2009; Osborne et al., 2012) and child outcomes (Amato, 2005, 2001; Waldfogel et al., 2010). A key mechanism explored in the literature through which parental separation may affect children is through changes in income around separation (Amato, 2005; McMunn et al., 2001). However, income has been increasingly criticized as a marker of deprivation for children (Guio et al., 2009), and this may be especially the case around separation, when parents may prioritize resources towards children. Multi-dimensional deprivation measures have been increasingly put forward as a tool to fully understand how economic well-being impacts individuals (Stiglitz et al., 2009), however such concepts have not been applied to the study of how separation impacts children. This may be because conceptualizing and measuring multi-domain deprivation longitudinally for children is difficult, as children's requirements and needs change drastically over time, especially over early childhood: an infant will require different inputs from a school-aged child. Furthermore, as parental separation does not occur at the same age for all children, indicators need allowing comparability over time to study within-individual changes.

In this paper, we propose a framework and methods to adapt existing measures of adult multi-domain deprivation, such as those presented by Bourguignon and Chakravarty (2003) and Alkire and Foster (2011), to construct longitudinal, age-relevant measures of childhood multi-domain deprivation. We employ a child-centered conceptualization of deprivation to highlight the experience of children: for example, rather than maternal mental well-being, which a child may not directly experience, we explore parenting activities and involvement, which children do experience first-hand. This approach, together with the data we use, allow us to go beyond relatively short-term effects usually observed in the literature, and observe how families recover in the longer-term after an initial deterioration to their financial and living standards after separation. The Millennium Cohort Study, a nationally-representative cohort of over 18,000 children born in 2000-2 and living in the UK shortly after birth, allow studying the effects of parental separation on children over the first decade of life. We compare the dynamics of multi-domain deprivation to classic measures of financial constraint (income poverty); we then question through what recovery channels (if recovery happens) they improve. We consider whether these processes may differ according to the parents' previous social and economic capital. Life course theory emphasizes the possibility that family characteristics such as poverty and living conditions may have differing and combined effects on child outcomes across their ages, pointing to the importance of the timing of family changes in these circumstances, as well as their duration and stability (Ben-Shlomo and Kuh 2002; Ferraro and Shippee 2009; Jackson, Kiernan, McLanahan, 2017). An originality of our analyses is that is we place lifecourse approaches are at the center of our framework, both in the conceptualisation of deprivation and in the modeling strategy, which focuses on the timing of the transition.

The paper is set out as follows: after a summary of the relevant literature and a presentation of our conceptual model and the data, we present the methods to measure multi-dimensional deprivation and describe the resulting indicators; we then focus on the estimation and results of our main substantive question.

2 Review of the literature

2.1 The impact of separation on children: pathways to child well-being

Parental divorce has been associated with a range of negative child outcomes, including educational, psychosocial and behavioural outcomes (Amato, 2005; Cherlin et al., 1998; Carlson and Corcoran, 2001). While selection appears to be a non-negligible issue and the issue of causality is strongly debated (Steele et al., 2009), the impact of father absence is robust to a number of modeling approaches (McLanahan et al., 2013; Amato and Anthony, 2014). Beyond the issue of whether there is a causal impact of separation on children, a smaller literature has attempted to focus on underlying pathways underscoring this association. This approach is both complementary to the causal literature, as well as being policy relevant, however, few studies have managed to identify pathways within a causal setting, both because of data and methods restrictions. Pathways put forward underlying the relationship between parental separation and child well-being focus on the resources available to families post-separation (Thomson et al., 1994; Thomson and McLanahan, 2012). A first resource often explored is money: this pathway suggests that at least some of the negative effects of separation on children are due to a deterioration in financial well-being (Amato, 2005; McMunn et al., 2001; Schoon et al., 2010). In the general population, a long-standing line of research has shown that divorce means a drop in income, especially for women with dependent children (McLanahan and Sandefur, 1994; Brewer et al., 2014; Fisher and Low, 2015; Aassve et al., 2007; McKeever and Wolfinger, 2001; Jenkins, 2008). A smaller literature focusing on households with young children has also shown that family transitions are marked by significant changes in income (Panico et al., 2010; Kiernan and Mensah, 2010). Overall, few of these studies have been able to take a long-term view how of financial resources vary after a separation, or look beyond income poverty and extend to living conditions, nor can do so within a causal framework.

A second resource relates to quantity and quality of the parenting received by the child (Amato, 2005). First, as separation implies one partner leaving the household, the quantity of parenting a child receives may decrease. Second, the quality of the parenting might be affected, through an increase in family conflict and stress. This strand of literature is based on the family stress model, which posits that stressors such as poverty affect child outcomes through poor parental mental health and increased parental conflict, which in turn degrade parenting quality (Conger et al., 1992; Masarik and Conger, 2017; Schoon et al., 2010). Although to our knowledge this framework has not been empirically applied to study the impact of parental separation on children, the family stress model could easily be adapted to this question: stressors, such as union dissolution and its financial implications, could impact the quality of the parenting families are able to provide through increased conflict and parental psychological distress. Measuring simultaneously and within a causal setting the impact of separations on both measures of financial and material deprivation, as well as on parenting processes and activities as sug-

gested by the family stress model, has not been previously tested. Such an additional insight would help unpack and distinguish different concurrent, interlinked processes such as financial stress and parenting.

The relative importance of these pathways, as well as the effect of separation on children more generally, may vary according to the context within which this transition occurs. Two important sources of heterogeneity should be considered: parental characteristics and the timing of the transition. First, parents experiencing union dissolution are not a homogeneous group and their post-separation trajectories may differ according to their pre-separation characteristics such as their age, marital status, educational level, etc. (Phoenix, 1996). The direction of the impact of initial background and resources is not intuitive. On the one hand, research suggests that union dissolution may have a smaller impact on children born to more disadvantaged parents because separation is more normative in these groups than among more advantaged groups (Ryan et al., 2015). This may result in less stigma and hence less family stress. Furthermore, union dissolution in more disadvantaged groups may imply smaller *declines* in resources than in more advantaged groups as baseline levels of resources are already low. On the other hand, a different perspective suggests that single parents from more advantaged backgrounds have access to more financial and material resources to draw on during a crisis period than those from more disadvantaged backgrounds (Rowlingson and McKay, 2005), therefore being better able to protect their children's living conditions from the impact of separation. It is therefore not currently clear how pre-separation background will shape post-separation trajectories of financial resources and living conditions.

Second, lifecourse theories suggest that the impact of parental separation on children might also not be homogenous across childhood, and that the timing of transitions might be important. Studies suggest a dynamic relationship between separation and childhood living conditions that evolves both with time since separation, and according to child age. First, timings in terms of child age: experiencing changes in family structure in early childhood may have more negative effects on child behaviour than later transitions (Ryan and Claessens, 2013). Second, time from separation: income drops appear to be particularly important in the first and second year post-separation and then, for women with dependent children, recover about 3 years post-separation, with a large heterogeneity (Brewer et al., 2014). Because of the relatively short-term time frame of most studies, there is no work incorporating both these potential sources of timing heterogeneity within the same framework. For separating households, incomes appear to recover largely through re-partnering, a key post-separation channel especially for women's incomes (Dewilde and Uunk, 2008; Jansen et al., 2009). Jansen and colleagues (2009) have looked at mothers specifically, finding that the benefits of re-partnering outweigh the benefits of re-entering the labour force or increasing work hours. Other channels have been less explicitly tested and this could be problematic as they could be particularly significant for parents with young children. Aside from maternal labour force participation, the new partner's employment status might also be significant, as jobless partners could add additional strains on household resources. Parents may attempt to maintain living conditions by moving in with another adult, such as a grandparent, to leverage economies of scale. Finally, child maintenance and its regularity might also vary at different time points post-separation: it might become more stable after court judgments or as other living arrangements fall into place. Integrating all these potential recovery channels in one model would help bet-

ter measure the relative importance of each. To our knowledge, this has not yet been rigorously tested empirically.

2.2 A better understanding of the experience of childhood deprivation to better understand the impact of separations

Most work on how separation impacts children focuses on financial measures such as income; such measures assume that household income is a reliable guide to the resources available to children. This assumption has been increasingly challenged (Guio et al., 2009). First, income data is not always reliable, particularly at the poorer end of the scale where earnings can be erratic and from multiple sources (Moore, Stinson and Welniak, 2000). Second, families' financial security and disposable income are not only based on current household income but also on savings and debt, housing tenure, financial help from the wider family, etc (Attanasio and Rios-Rull, 2003). Third, some families may be better equipped than others in managing their incomes or prioritize resources towards children: income-based indicators ignore the intra-household redistribution of resources (Ravallion, 1996), whereby a child may be in a low income household but not be deprived, and *vice versa*. Finally, income does not take account of benefits and services such as health care, child care and schooling which may be subsidized or free for some groups (Fusco, Guio and Marlier, 2010), and are often aimed at, or extensively used by, children. These issues with the measurement of children's deprivation might be particularly marked for children experiencing a parental separation: parents may be less likely to accurately report changing incomes from increasingly diverse and unstable sources; housing tenure and costs might change; and parents may be more likely to prioritize diminishing resources towards their children at "crisis" points such as around a separation. Therefore, it is important to move beyond simple measures such as income to fully describe and understand children's experiences of separation.

More importantly, work over the past decades by sociologists like Peter Townsend (1979) and economists like Amartya Sen (1999) has demonstrated that poverty is about more than simply being able to meet basic needs. Those in poverty define their deprivation as multifaceted, with both financial and non-financial dimensions (such as housing quality, health etc.) regarded as important (Narayan et al., 2000). People value being able to afford participating in a range of social activities, and social integration is known to be critical for well-being. Recognition of the importance of exclusion from normative or customary social activities has led to definitions of poverty expanding to incorporate aspects of relative deprivation. For example, Unicef (Unicef et al., 2013) measures childhood deprivation by defining a list of 14 items considered normal or essential for a child living in a developed country (such as having 3 meals a day, money to participate in school activities, a quiet place to do homework, some new clothes).

However, such constructs are difficult to operationalize. First, while an index such as Unicef's is useful when comparing school-aged children, it is less useful when comparing different age groups, especially younger children, who will have different needs. An indicator based on age-specific needs will capture the experience of deprivation of children better and will be more useful in describing the dynamics of deprivation over time (Dickerson and Popli, 2015). Second, research suggests that a number of potential dimensions matter to child development; the

literature increasingly considers childhood disadvantage - measuring multiple factors in childhood beyond poverty - to describe and explain childhood inequalities (Bradshaw et al., 2007; Tomlinson et al., 2008; Oroyemi, 2009; Nolan et al., 2011).

This conceptualization therefore requires rich, longitudinal and multi-disciplinary data, relating to different domains, and has so far not been applied to the study of parental separation. Notable exceptions include Dickerson and Popli (2015), who use the Millennium Cohort Study to look at how dynamics of deprivation affect child cognitive skills. Their results suggest that many but not all children classed as income poor are also deprived, that multi-dimensional deprivation is more persistent over time than income poverty, and that it had a negative impact on child cognition over and above income poverty. They construct an indicator of multi-dimensional deprivation by using two waves (at age 5 and 7), therefore looking only at short-term effects, and choosing items that are consistent from wave to wave, therefore not allowing indicators to change with child age and excluding potentially pertinent indicators from their instrument when not present at both waves.

3 Research questions

The main aim of this paper is to bring together these two strands of literature: the economic literature conceptualizing dynamic, multi-dimensional deprivation; and a more demographic body of work on the effects of parental separation on children's living conditions.

Our approach to childhood deprivation is guided by studies such as Duncan and Magnuson (2013), who suggest that poverty affects child outcomes through 'what money can buy' (for example, cognitive stimulation, school quality etc.) and 'family processes' (for example, parenting behaviours such as reading to the child, but also parental characteristics such as their own well-being etc.). Within this framework, different disciplines have emphasized different proximal pathways through which poverty may influence children's lives. The purchase of goods and services can be used to invest in the health or human capital of children (Becker 1981; Mayer 1997; Blau 1999); more economic resources therefore increase the ability to access inputs such as high quality after-school activities and quality housing. Psychologists and social scientists have explored the impact of poverty on family dynamics and relationships. These models suggest that fewer financial difficulties improve parents' psychological well-being and therefore their ability to maintain high quality parenting interactions and family routines (Kiernan and Mensah, 2009; Schoon et al., 2010).

We establish our conceptualization of childhood deprivation as child-centered, by choosing items that are life-stage appropriate, and differentiating between variables that are distal and proximal to the child (Bronfenbrenner, 1986). Several factors can change around separation: drops in income; one less parent in the household; having to move house. However, from the child's point of view, the "proximal" factors he or she experiences might not change: parents might redistribute income towards the child to keep their living conditions constant; they may prioritize time with the child to maintain the same activities and routines; new housing might be chosen to

maintain living standards for the child, perhaps at the detriment of parental living conditions.

We apply this conceptual framework and fixed-effects techniques to answer the following questions: How does parental separation affect the experience of childhood poverty and multi-domain deprivation over the first ten years of life? Do different domains of deprivation react similarly to separation? What are the post-separation channels through which recovery occurs? Because the literature suggests that the timing of separation might matter, we consider the impact of parental separation for two groups of children who experience separation at relatively younger and older ages. Finally, because these trajectories and processes might vary according to pre-separation social and economic resources, we check whether the effects are similar across a number of groups, including by maternal education, maternal age, and household income at baseline.

4 Data

4.1 The Millennium Cohort Study

Our data were drawn from the Millennium Cohort Study (MCS), a nationally representative prospective cohort in the UK. The initial sample included 18,818 children in 18,552 families living in the UK at 9 months of age and born between 2000 and 2002 (Dex and Joshi, 2005). Additional families were included at wave 2, but we exclude them for our analysis as we need to observe the relationship status of the parents at baseline. The sample is clustered at the electoral ward level, over-sampling areas with high ethnic density, of high child poverty, and the three smaller countries of the UK. The study mainly consisted of interviews with the primary caregiver. This was the mother in 98 percent of cases at wave 1. Information about the primary caregiver’s resident partner was also collected in a separate interview with them. Five waves of data are considered, when the cohort children were about 9 months of age, as well as 3, 5, 7, and 11 years old.

4.2 Selection of analytical sample, attrition and survey weights

In order to observe separations, our analytical sample includes children whose biological parents are in a co-resident relationship at baseline (wave 1, when the cohort child is 9 months old), live with their mother throughout the study period, and are observed in wave 1 and in at least another wave. As we assume that twins and triplets living in the same household will experience similar levels of poverty and deprivation, we keep one case per household by randomly choosing one child in case of multiple births¹. Our analytical sample is made up of 11,179 children.

¹ The survey weights have been corrected to be representative of all children, including twins and triplets. As we keep only one Millennium child per household, we multiplied by 2 children born with a twin, and we multiply by 3 children born with triplets. There are 240 pairs of twins in the sample and 10 households with triplets. We observe parental separation for 38 households with twins, and 2 parental separations for households with triplets.

In the analytical sample, we observe the following attrition, as compared to wave 1: 19.3% of observations are not in wave 2, 21% by wave 3, 27.7% by wave 4, and 32% by wave 5. As in most longitudinal surveys, in the Millennium Cohort households that are more disadvantaged and more mobile are more likely to be lost to follow up (Ketende, 2008). Therefore, attrition may be related to both parental separation and poverty. Children may be more difficult to follow after separation because they are more likely to experience a residential move, especially if their mother repartners (Gambaro and Joshi, 2016). Moreover, parents experiencing more precarious living conditions may be less willing to answer questions on their child’s living conditions, which might impact item non-response. We return to this issue and the potential biases it may introduce in the study in the Discussion. Applying the correct survey weights is therefore important. Using the British Household Panel Study, Jenkins (2008) and Fisher and Low (2015) have discussed the issue of attrition when studying separations. Similarly to Jenkins, we computed inverse probability weights to correct for attrition as suggested by Fitzgerald et al. (1998) and Wooldridge (2002). The weights from this correction are very similar to the longitudinal weights computed by the MCS team. For ease of replication, we therefore use the MCS longitudinal survey weights, which take account of differential sampling and attrition across waves (Hansen, 2012; Plewis et al., 2007).

4.3 Variables construction

To model income, we construct a continuous annual income variable at each wave, using information reported by the mother which refers to the coresident partners’ joint earnings, including any benefits, child maintenance and other sources of revenues generated by the co-resident partners. Income is given in brackets, we draw an income corresponding to the reported bracket assuming that it is distributed uniformly within the bracket. When no information is reported, we impute using the predicted income computed by the MCS team. We constructed the household equivalized income using as an equivalence scale the square root of the number of persons living in the household (OECD, 2009). We class households whose incomes are 60% of median equivalized income as income poor. We compute this poverty line for each wave, taking account of the full MCS sample (and not just our analytical sample)².

To look at separation, we measure, at each wave, the number of years before or since separation we are observing the household at. We use the household grid to construct a dummy variable indicating whether the father is still present in the household. If they are no longer living in the household and do not come back in a subsequent wave, we consider to be observing a separation. We consider the date of separation to be the date the father has left the household. When no date is indicated, we assign a date randomly (following a uniform distribution) between the two interview dates. We also construct a variable indicating child age at separation (measured in months); from this variable, we construct two timing variables: the first variable relates to the time since separation at each wave³; the second is a binary variable measuring whether the child was older than the

² We have tested the robustness of our results to the different definitions of the equivalence scale and to different poverty thresholds. While the magnitude of the impact is slightly affected by the choice of the equivalence scale and the poverty line, the overall evolution of the impact is not affected. The relevant table can be found in the Online Appendix, table 3.

³ We prefer to construct a series of dummies indicating whether the current child observation is 0-1 years after separation, 2-3 years, 4-7 years, and 8 to 11 years. We do not use a linear variable of time (in months) since separation to avoid making linear assumptions between time and the impact of separation, and to be able to measure short versus long term effects.

median age at separation in our analytical sample (4.4 years).

Children’s financial poverty and multi-dimensional deprivation might be influenced by socio-demographic characteristics which are also linked to parental separation. Thus, we include a range of time-varying covariates in our empirical model. These include socio-demographic controls, constructed at each wave: maternal age; child age; parental education, equal to the maximum educational attainment of the co-resident partners and expressed in NVQs (National Vocational Qualifications)⁴; country of residence; the number of children in household, including full, half- and step-siblings; occupational class, a binary indicator capturing whether maternal occupational class is a routine or semi-routine occupation. Additionally, in descriptive analyses, we include two time-invariant controls⁵ child’s ethnicity, a binary indicator measuring whether the child was identified by the mother as being from a majority-White group; and child’s sex.

We explore a number of potential recovery channels through which financial conditions and deprivation might improve following separation. These are entered in a time-varying manner. For maternal repartnering, we include a binary variable indicating whether the main respondent is currently in a co-resident relationship (this does not include new non-residential romantic unions), and whether the co-resident partner is employed. For maternal labour market participation, we look at whether the mother is employed, and whether she works more than 20 hours per week. Living with a grandparent is constructed as a binary variable indicating whether any grandparent lives in the household. Child maintenance is a categorical variable indicating whether the mother receives regular, irregular, or no payments.

Finally, for robustness checks, we consider contact with the non-resident parent. Ideally, we would like to measure the quantity and quality of the contact with the non-resident father. The variable most closely approximating this concept (available only for waves 3, 4 and 5) indicates how often the child stays overnight with the absent father. We dichotomize this variable to capture children who stay ”often” (as opposed to sometimes, rarely or never), as declared by their mother. 35 to 40% of children in our sample are classed as staying ”often” overnight with their non-resident father.

5 Multi-dimensional child deprivation

5.1 Framework and Methodology

To construct our measures of child deprivation, we draw on existing definitions and methodologies of multidimensional poverty (Bourguignon and Chakravarty, 2003; Alkire and Foster, 2011; Neubourg et al., 2013; Dickerson and Popli, 2015), modifying them to construct longitudinal measures that adapt over time to account for chil-

⁴ Briefly, the National Vocational Qualifications is a system of competence-based education and training that aims to record individual levels of competence. Briefly, an NVQ5 is equivalent to a graduate degree; an NVQ3 is equivalent to two A-levels, a high-school qualification. NVQ levels correspond to: NVQ5 - Higher degree, NVQ4 - First degree/diploma, NVQ 3 - A/AS levels, NVQ 2 - GCSE grades A-C, NVQ 1 - GCSE grades D-G

⁵ These variables are included in the descriptive statistics but not in the analysis because we used a fixed-effect framework.

dren’s changing needs and allow within individual analyses.

The construction of the index relies on the identification of different dimensions of childhood deprivation, which are important at all ages of childhood: material deprivation, extreme material deprivation, deprivation from leisure activities, and parenting involvement. Each dimension is composed of items identifying the lack of a specific good or activity, which we allow to vary over time to remain age-relevant. The way we identify potential items and dimensions is described in the next section.

We consider D dimensions of childhood deprivation, fixed at 4 dimensions for each wave. The living conditions of a child i of age a can be written as an array $X_{ia} = (X_{ia1}, \dots, X_{iaD})$. A vector X_{iad} describes the dimension d of childhood deprivation (material deprivation, parental involvement, etc.). It is composed of items x_{iak} specific to the dimension d , that describes the attainment of child i at age a for the item k . We code x_{iak} in such a way that the higher x_{iak} , the more severe the deprivation. Items are age-specific and the number of items considered can change with the age of the child and the dimension, but the number of dimensions is fixed across ages.

For each item x_{iak} , we define a threshold z_{ka} and a binary variable g_{iak} indicating that the child is considered as deprived in this item if $x_{iak} \geq z_{ka}$. Then, we define a score c_{ida} for each dimension d counting the number of items the child is considered as deprived. For each dimension d , we define a threshold \tilde{z}_{ad} and a binary variable δ_{ida} indicating that the child is considered as deprived in the dimension d if $c_{ida} \geq \tilde{z}_{ad}$. In order to define the overall deprivation status of the child, we compute a score of deprivation over dimensions C_{ia} , which counts the number of dimensions in which the child is considered as deprived. We define a threshold Z_a and a binary variable Δ_{ia} indicating that the child is considered as overall deprived if $C_{ia} \geq Z_a$.

The identification of deprived children is based on a double counting approach, as we count the number of items of deprivation in each dimension and the number of dimensions in which the child is considered as deprived to define overall deprivation status. This double counting approach imposes the triple cut-off methodology (adapted from the dual cut-off methodology (Alkire et al., 2014)), in order to define: (1) deprivation for each item, (2) deprivation for each dimension, and (3) overall deprivation in each wave.

This methodology allows following children over time and analysing intra-individual changes as we keep constant the main dimensions of deprivation, while taking into account the changing needs of children according to their age, as the item composition of each dimensions varies with child age. This methodology and the resulting indicators do not aim at comprehensively describing childhood deprivation in the UK in a representative manner, but provide the best indicators for our research questions, given the available data and our conceptual framework. Because MCS is a household-based survey, we focus on deprivation felt by children within their homes, and not in their schools, neighborhoods etc. While these are important dimensions of deprivation, as depicted by Bronfenbrenner (1986) ecological systems theory, they are not fully explorable in our dataset.

5.2 Description of the domains of child deprivation

The different items and dimensions of deprivation are presented in table 1. They include material deprivation (mostly including housing-quality variables such as whether the home is damp, but also variables relating to owning and being able to replace expensive goods); extreme material deprivation (capturing extreme living conditions: not being able to afford a coat or appropriate shoes, and, for older children, not having a computer or internet connection); leisure deprivation (cannot afford: holidays, celebrating birthdays, paying activities such as cinema outings and sports, having friends over); and parenting involvement (including free activities such as reading, singing, helping with homework, going to the playground, etc., but also markers of routines such as having regular bedtimes, and for older children, attending parenting-teacher evenings).

To select items and identify dimensions of deprivation, some normative choices have been made. We first identify potential items that may measure child-centered deprivation. Variable selection is guided by data availability and the relevant literature. For material deprivation, we aimed at capturing missing key household or child items; we distinguished this from extreme material deprivation, which captures a group of children missing items which the majority of children their age in our sample have. For leisure activities, we chose indicators that demonstrate a household's ability to afford normative social events and activities for families and children of that age. For parental involvement, a range of variables tap into routines and the 'home learning environment', which differentiates itself from the 'leisure' dimension as it includes activities usually done for free. Second, we included these variables in a Multiple Component Analysis to explore which clusters of variables emerged and which of potential indicators drove different axes, carried out separately at each wave to account for different importance of different variables at different ages. At this stage, we excluded variables which did not seem to drive axes at each age. Third, taking all items identified in the previous step, we identified discrete dimensions of deprivation, based on our own selection and the Multiple Component analysis; item composition at each age might vary. In this step, some variables identified in the previous steps were not retained (for example, breastfeeding did not seem to cluster with any other variable).

Table 1 also presents the proportion of children deprived on each dimension⁶. It shows that the proportion of children deprived on different dimensions does not change significantly between waves, even though each dimension is not always measured by the same items nor by the same number of items. We identify about 18 to 25% of children as materially deprived at each wave. For extreme deprivation, we identify about 1% to 2% of deprived children. We identify 22 to 26% of children as deprived on the leisure dimension; and 12% to 17% of deprived children on the parenting dimension. We class children as deprived overall if they are deprived on at least 2 of these dimensions in each wave. There is little change in the proportion of children classed as overall deprived over time, with 14% to 16% of children considered as such.

Table 2 explores the relationship between different dimensions of deprivation, the overall deprivation index, and income poverty. The first row shows that about 17% of households were income poor at each wave. Each

⁶ For the same proportions item by item, see Online Resource 1

cell in the table cross-tabulates children classed as income poor with each dimensions of deprivation and overall deprivation. The largest overlap of income poverty is with material deprivation (7 to 9% of children are both income poor and materially deprived) and leisure deprivation (an overlap of about 10%). Income poverty does not always overlap with deprivation. For example, about 8 to 10% of children who are income poor are not materially deprived. *Vice versa*, about 14% of children are not income poor but materially deprived. Even with different items in each wave, the proportion of children in each cell (both income poor and deprived, not income poor but deprived, income poor but not deprived, neither poor nor deprived) is consistent over time, indicating a relative stability of our dimensions. See the Online Resource 2 for more detail on the correlations between the four dimensions of deprivation, both within and between waves. This shows a good auto-correlation of the different dimensions across time, suggesting they are measuring a similar concept across time. For example, material deprivation at wave t with wave $t + 1$ has a correlation of about 0.35 to 0.40, and leisure deprivation from 0.41 to 0.48, indicating that dimensions are comparable over time.

Table 3 presents the odds-ratio from a logit regression estimating who is classed as income poor, overall deprived, and deprived on each dimension, across all waves. This tables confirms that our indicators are correlated to other measures of disadvantage as expected. For example, we observe a strong, consistent educational gradient for both income poverty and all our deprivation indicators. We further see an age gradient, with households with younger mothers more at risk of poverty and deprivation; the gradient plateaus around age 35. The exception is parenting involvement, which presents a U-shaped correlation with maternal age, and the odds ratios are overall smaller, suggesting that maternal age is less important for this dimension than for other deprivations. Non-White children as well as children in larger families are more likely to be income poor or deprived. There are higher levels of income poverty in Wales and Northern Ireland than in England, but fewer levels of material deprivation, suggesting different living costs. In this table, we control for the wave of data collection to take account of differences in the construction of the index.

6 Parental separation and the dynamics of poverty and deprivation

6.1 Estimation strategy

We consider the impact of parental separation on different measures of children’s deprivation y_{it} . For that, we conduct a fixed effect analysis by pooling all the waves and estimating the following linear probability model:

$$y_{it} = \alpha_0 + \alpha_t + \alpha_i + \sum_{\tau} \left(\delta_{1\tau} \mathbf{1}\{Z_{1i} = 1, d_{it} = \tau\} + \delta_{2\tau} \mathbf{1}\{Z_{2i} = 1, d_{it} = \tau\} \right) + \beta X_{it} + \varepsilon_{it} \quad (1)$$

where α_0 is a constant, the α_t are the wave fixed-effects, capturing period shocks such as the Great Recession, but also differences in the item composition of the dimensions across waves. The α_i are individual fixed-effects. They control for all time-invariant characteristics of children, such as parental education, country of birth, etc. These differences are described in section 6.2. They also allow interpreting our results as variation in living conditions of children as compared to their own level before separation. The X_{it} is a set of time-varying demographic

controls: mother’s age, country of residence, number of siblings, highest level of parental education, routine/semi-routine occupation of the mother, child age. The key variable, d_{it} , indicates the duration from separation at wave t . This duration is defined for children whose parents separate, i.e. children for who $Z_{1i} = 1$. The variable Z_{2i} is a binary variable indicating children whose parents separate when they are older.

Among children experiencing parental separation, we distinguish children whose parents separate while they were relatively younger from those whose who separate when they are relatively older. These two groups because they may have different unobserved characteristics that would also affect children’s living conditions, and because post-separation processes might differ for these two groups. Second, without a distinction of these two age groups, long-term effects of the separation would only be estimated on the group of younger children and may not be valid for children whose parents separate later on. Therefore, $\delta_{1\tau}$ gives the change in living conditions τ years after their parents’ separation for children whose parents separate when they are younger. $\delta_{2\tau}$ gives the differentiated impact in living conditions τ years after their parents’ separation for children whose parents separate when they are older. The total impact for children whose parents separate when they are older is given by $\delta_{1\tau} + \delta_{2\tau}$.

In order to understand the potential recovery from separation, we estimate the same model, including a set of time-varying variables indicating potential recovery channels, described in section 4.3.

6.2 Descriptive results

About 23% of parents in our sample of parents who are in a couple at birth will separate before the cohort child turns 11 years old. Only 0.2% of couples have separated by wave 1, when the child is about 9 months old. 6.3% of couples have separated by wave 2 (3 years old), 12.2% by wave 3 (5 years old), 16% by wave 4 (7 years of age). By our last wave (age 11), all couples in our sample who separate will have obviously done so.

Couples who will separate and those who won’t separate differ on several characteristics, as shown in table 4. Couples who separate are more disadvantaged on a number of socio-economic variables (such as maternal education and occupational class, marital status at birth, parental employment etc); their child is more likely to be White.

Looking at just separated versus not separated households conceals an important heterogeneity within the separating group. Table 4 shows that within the separating group, those who separate when the child is younger are more disadvantaged than those who separate later. For example, parents who will separate when the child is younger than 4.4 years are less likely to have been married at birth (45% were married, versus 61% of those who separate when the child is older, and 77% of those who do not separate). Similar statistically-significant differences are seen for other characteristics: 14% of mothers who separate when the child is younger have a higher degree, versus 20% of those who will separate when the child is older, and 34% for those mothers who do not separate during the study period. This gradient is also evident for mother’s age at the child’s birth, maternal

labour market participation and occupational class.

Figure 1 describes how income poverty and deprivation vary on average around parental separation. It shows that poverty and deprivation increase markedly around separation, with little evidence of a return to pre-separation conditions. This increase appears to be less important for parenting involvement, while leisure and material deprivation appear to drive the observed overall deprivation increase. It also shows evidence that both income poverty and deprivation increase more for children whose parents separate when they are younger compared to those who are older, at least in the short-term. However, we don't observe differences between these two groups for parenting involvement.

6.3 Main results

Using our fixed-effects specification (presented in Table 5), we largely confirm our descriptive findings. On average, we observe a large short-term increase in income poverty of 30 percentage points (pp). This attenuates over time, but by 8 to 11 years after separation we still note a 14 pp increase in income poverty⁷. The pattern is similar for overall deprivation, but, as in descriptive analyses, the risk associated with separation is lower than for income poverty. In the short-term, children whose parents separate when they are younger have an increased risk of overall deprivation of 12 percentage points, reducing to 3 pp and non-significance 8 to 11 years after separation. The increased risk in overall deprivation in the short-term is driven by an increase in material and leisure deprivation, while in the longer term, leisure and parenting involvement are more important. We don't find a significant increase in extreme material separation deprivation, except for a small increase 4 to 7 years after separation.

Table 5 also shows that children whose parents separate when they are older tend to be less affected in the short-term than those who were younger at separation: on average, their risk of income poverty is 6 percentage points lower. However, there is no difference after this initial 2 year period post-separation. For overall deprivation, we see no significant differences in the short-term. This lack of differences in the short-term is due to two opposing effects: on the one hand, older children appear to be less materially deprived in the short-term than children who were younger at separation, however, they are more affected when we look at parenting involvement. In the mid-term, children who are older at separation have a lower risk of overall deprivation (of 6 pp) than their peers who are younger at separation from 2 to 3 years after separation. This difference is driven by material and leisure deprivation. Heterogeneous effect (see following section) will show that these differences by child age are not solely driven by differences in baseline characteristics (such as, parental education or age) between these two groups of children.

⁷ We tested the robustness of our results to different equivalence scales and poverty lines. We found that a complete recovery in terms of income poverty occurred 8 to 11 years after separation when more stringent measures of poverty are used (the Oxford equivalent scales or poverty line defined as 50% of the median income). However, whatever the measure of monetary poverty, we always find that the risk of monetary poverty is higher than the risk of deprivation after parental separation.

We consider a number of recovery channels to understand how poverty and deprivation may improve post-separation. These variables are described fully in section 4.3. Here, we describe results relating to maternal repartnering only, as the other channels (maternal employment, living with a grandparent, receiving regular child maintenance) do not change the coefficients of interest (although they are related to childhood deprivation; full results are presented in the Online Resource 4 to 9).

When introducing maternal repartnering and the partner's employment status, we find that income poverty is highly related to both repartnering and the new partner's employment status. As a result, the post-separation risk of income poverty decreases by four-fifths in the short-term, and is close to zero and no longer significant in the longer run. This suggests that a large part of the impact of parental separation on childhood financial poverty is likely linked to the presence (or absence) of a cohabiting, employed partner in the household. The impact of maternal repartnering on the risk of deprivation is similar if less marked: after including the repartnering variables, deprivation is no longer significantly related to separation except for in the short-run, where the increased risk is reduced by half. Interestingly, the presence of an additional source of income through a new employed partner does not decrease material deprivation (which is mostly driven by housing deprivation) right after separation. Unlike models for overall deprivation and income poverty, where having an *employed* partner was important, for leisure activities and parenting involvement we find a smaller importance of partner work status, it appears to be the repartnering *per se* which matters.

6.4 Heterogeneous effects

Finally, we investigate the heterogeneity in the effects presented above by stratifying our sample using several socio-economic variables measured at wave 1. We begin by contrasting households where mothers had at least an A-level (upper secondary qualification) to those who had less than A-levels (the main results are presented in table 6, detail for each dimension of deprivation is in the Online Resource 12 to 14). The results show that the impact of separation on the risk of both income poverty and overall deprivation was greater for children whose mothers were less educated compared children of more educated mothers, in both the long and short-term. When we include maternal repartnering, for both groups the risk of poverty and deprivation decrease. While for children of less educated mothers we still find a small but significant risk of poverty and deprivation (in the short-term), for those of more educated mothers the risk becomes non-significant and even negative in the long-term for income poverty. That is, children of more educated mothers who separate and repartner with an employed partner are better off than before separation. When looking at the individual dimensions of deprivation, the main difference is that children of less educated mothers have a higher risk on the parenting involvement dimension from 2 years after separation than children of more educated mothers.

Turning to maternal age, children of younger and older mothers are equally affected in the short-term, but in the mid- to long-term, children whose mothers are older retain a higher risk of both income poverty and overall deprivation. However, this becomes non-significant when repartnering is taken into account. This suggests that

older mothers re-partner less quickly than their younger counterparts, resulting in a longer term financial and deprivation risks. When looking at parenting involvement, we can also note that younger mothers have a higher mid- to long-term risk than older mothers. In fact, once repartnering is taken into account, older mothers have a negative risk for parenting involvement, implying that parenting quality may even improve in the long-term after separation if they repartner.

Finally, we look at differences by poverty status at baseline. Table 6 shows that children who are not poor at baseline have a doubled risk of income poverty than those who are poor at wave 1, and they are also markedly more likely to be deprived than those who were poor at baseline. This has to be taken into the context of their initial levels of resources. In the short-term, the increased risk of deprivation of the poor group is driven by material and leisure deprivation, while in the longer term, only leisure deprivation persists. In the long-term, the risk in the parenting dimension is higher in the group who is classed as poor at baseline than those who are not classed as poor. Repartnering decreases these risks for both groups.

These stratifications of our main analyses also allow us to check whether the differences observed between children who were older versus younger at separation were not driven by differences in baseline socio-economic characteristics. Looking at the coefficients for the interaction terms with age at separation (reported in the relevant tables in the Online Resource) suggest that: first, among children of less educated mothers, children whose parents separate when they are older are less likely to become income poor right after separation as compared to children whose parents separate when they are younger. But this is not the case for children whose mothers have an A-level or higher. However, children whose parents separate when they are older are more likely to be overall deprived after 2-3 years of separation than children whose parents separate when they are younger among children whose mother is less educated. Second, we do not find that children whose parents separate when they are older are affected by separation differently from other children, in both groups of children of older and younger mothers. Third, among children who were income poor at baseline, children whose parents separate when they are older are more likely to be impacted in terms of overall deprived than other children. Overall, these analyses suggest differential separation processes between children whose parents separate when they are older as compared to children whose parents separate when they are younger, and these differences are only slightly due to having parents with different age, educational and income characteristics.

6.5 Contact with the non-resident father

Given that the MCS surveys one main respondent only, and does not interview non-resident fathers, we know little about the activities children carry out with their non-resident fathers. Therefore, if a child has high levels of contact with their non-resident parent and their non-resident parent contributes significantly to items in our deprivation dimensions, we could be overestimating the impact of post-separation deprivation. To check this is not the case, we include in our main models a variable available for waves 3, 4 and 5 (but not wave 2) which measures whether the child stays the night at least weekly with their non-resident parent (see Online Resource

15). We find no significant difference in the inclusion of this variable in our coefficients of interest, suggesting that our results are robust to this issue.

6.6 Robustness checks

Because we chose to vary the item composition of the deprivation dimensions across waves (in order to stay age-relevant), and because our long-term effects are mechanically driven by estimations on our last wave of observation, we could be finding significant results in the long-term effects due to the items chosen to measure wave 5 deprivation and because of a "real" long-term effects of parental separation on child deprivation. One of our findings is indeed that the increased risk of poverty and deprivation is still evident several years after separation. To check that this finding is not spurious, we first exclude cases where a parental separation is observed. Second, for parents who don't separate, we randomly assign a separation date following the same distribution of the dates of separation in our main analytical sample. Third, we estimate the main models presented in section 6.1. Fourth, we repeat the first three steps 1,500 times. This test shows that the estimated coefficients are not on average statistically different from 0, suggesting that our main results are valid. Moreover, we do not find significant results at the 10% threshold (resp 5% and 1%) in more than 10% of cases (resp. 5% and 1%), again indicating that our results are not spurious. More details can be found in the Online Resource 16.

We provide some further analyses to test the robustness of our results to the cut-offs defining overall deprivation (Online Resources 10 and 11). Online Resource 10 shows the impact of parental separation on the number of dimensions in which a child is classed as deprived. In support to our main results, these analyses show that parental separation increases the number of dimensions on which children are deprived. One year after separation, children are deprived on 0.27 dimensions more than before separation (to be compared to the average number of dimensions on which children are deprived in the total sample of 0.62). Also similarly to our main results, the effect is largest in the first year after separation and then declines with time since separation, until it is no longer significant 8 to 11 years after separation.

Online Resource 11 shows the impact of parental separation on the propensity to be deprived in 0, 1, 2, or 3+ dimensions of deprivations. This allows testing how robust our results are to our chosen cut-off of the number of dimensions for overall deprivation. The table shows that, had we chosen a higher cut-off (3 or 4 dimensions), we would not have seen any impact of separation on deprivation. This could be due to the small number of children being classed as deprived in more than 2 dimensions of deprivations (only 3 to 4% of our analytical sample, irrespective of whether they also experience parental separation). Had we chosen a lower cut-off, the results in Online Resource 11 suggest we would have seen similar trends in deprivation after separation, and that if anything our results would have been even more significant in the long-term, as we would have seen a significant effect of separation on deprivation up until 8 to 11 years after separation.

7 Discussion

This paper documents long-term effects on children of parental separation during the first decade of life on both classic dimensions of financial constraints, as well as a number of domains of deprivation. We constructed a child-centered, longitudinal, and multi-dimensional measure of childhood deprivation which takes account of children's changing ages and needs. Our indicator allows capturing deprivation as felt by children, and offer therefore a more precise estimation of how parental separation impacts children's lives. We base our conceptualisation of childhood deprivation within a 'time and money' framework. These two resources are consistently highlighted in the literature as important to child development (Duncan and Murnane, 2011; Waldfogel et al., 2010) and potentially sensitive to shocks such as parental separation (McLanahan, 2004). Our results suggest that, while financial poverty is simpler to model and interpret, it does not fully capture the full impact of separation on children's lives.

Previous literature has found that income drops are particularly important in the first and second year post-separation but recover in the mid-term (Brewer et al., 2014). In this population of households with young children, we also find evidence of strong negative effects of separation on income poverty, but only a partial catch up, even in the longer run. The trend is similar for overall deprivation but the short-term increase is less striking. Looking at multiple dimensions of deprivation allowed to nuance this finding and describe precisely how children's lives are impacted. While we found strong and long-lasting effects of parental separation on leisure deprivation (for example, being able to afford holidays), we found shorter term effects on material deprivation. This may highlight parental prioritization of reduced resources towards basic goods for their children (after a short-term crisis), possibly at the expense of activities deemed less essential, but which have been shown to be crucial for well-being (Oroyemi, 2009). We do not find a short-term impact of separation on parental involvement, potentially showing that, during the chaotic time around separation, parents focus on maintaining parenting activities and routines with their children. However, when we look at longer term effects, an increased risk for the parenting dimension begins to creep in.

Re-partnering has been consistently highlighted as a key post-divorce channel for women's incomes to recover, outweighing the benefits of increasing her labour market participation. We find that, for this sample of mothers with relatively young children, repartnering appears to be the only channel through which income and deprivation recover. Both repartnering and the new partner's employment status were important processes for recovery. However, these two variables were not equally important for each dimension of deprivation, and feed into our initial concept of 'money and time' as key family resources. Notably, for parenting involvement, it is the repartnering *per se* (and not the partner's employment status) that mattered, while for activities that require both time and money, such as leisure deprivation, both variables mattered. Material deprivation was only linked to the partner's employment status. Repartnering did not decrease the short-term risk of material deprivation, suggesting separation might entail some inevitable changes in housing, driving deprivation in this domain.

Lifecourse approaches have been increasingly used to understand child development (Russ et al., 2014) and family dynamics (Mooyaart and Liefbroer, 2016). Applying this perspective, we found important differences when

taking account of timings, both in terms of time since separation (as described above) but also of child age at separation. If we look at just income poverty, children who are older at separation appear to be less impacted. However, the analysis of multiple dimensions of deprivations suggests varying lifecourse processes. Children who are older at separation are indeed less exposed to an increased risk of material deprivation (driven by expensive items such as housing), however, they are more exposed to an increased risk in leisure and parental involvement deprivation than children who are younger at separation. Here, the time versus money framework can help conceptualize these contrasting results. On the one hand, parents who separate when their children are older are probably further along their own lifecourse trajectories, where perhaps more expensive goods have been accumulated, housing is owned, etc. On the other hand, their children's older ages may have implications for the quantity and quality of parenting required. For example, the parenting dimension for younger children includes 'easier' components such as singing and reading to the child, while as children get older, checking homework and attending school meetings might make this dimension more time consuming, and taking place increasingly outside the home. Furthermore, this dimension requires a more participative role of the child in the parent-child relationship, which might be impacted by separation. For leisure activities, at the intersection of financial and time resources, children's expectations of leisure and holiday activities change may change as they grow up, the cost of holiday travel and accommodation becomes more expensive as children grow, etc.

Subgroup analyses capture the unequal distribution of deprivation(s) across different population groups, who may experience poverty, deprivation *and* separation differently. It allows identifying which households are most at risk of deprivation and in which dimension they are most at risk. Indeed, these analyses suggest that the pre-separation parental social and economic capital may play an important role. The literature is not clear on whether more disadvantaged groups would suffer more or less from separation, we suggest that how initial disadvantage is defined is key to understand these complex interactions. For example, using maternal education as a source of baseline (dis)advantage, we found that children of more educated mothers had lower risks of poverty and deprivation than those of less educated mothers. However, children who were *not* poor at baseline had an increased risk of income poverty and deprivation around separation, compared to those who were poor at baseline. Here it is important to highlight that, because of the fixed-effects framework, results relate to within-individual changes around separation. The 'poor' group start their trajectories from very different levels: on average, 42% of children in poor households at baseline were overall deprived across waves, and separation did not change this figure significantly; the equivalent figure for those who were not poor at baseline is 11%, and, while separation increased the risk by 14% in the short-term, the overall figure for this group remains lower than those who were already poor at baseline.

When interpreting our results, a number of considerations should be noted. First, there is an ongoing debate in the literature about the causality of the relationships between parental separation and family and child outcomes (McLanahan et al., 2013). This is because, as also shown in our descriptive results, there is an important selection into separation which may bias results. In this paper, the longitudinal data and individual fixed-effects framework allow to some extent to account for time invariant selection, approximating a causal interpretation, however, there could be unobserved dynamic processes that impact both the risk of separation and

deprivation. We do include a number of time-varying variables, and, because we observe separations at different dates, we are unlikely to be observing period shocks (for example, the Great Recession at a country level, or, at a neighborhood level, factory closures) that may impact both separations and child outcomes. Second, as is often the case with longitudinal studies, sample attrition in the MCS is greater among disadvantaged and more unstable households than their more advantaged and stable counterparts. Given that children in such households are more likely to experience parental separation and poverty and deprivation, our findings might therefore represent an underestimation of the negative impact of parental separation on childhood poverty and deprivation.

Third, our conceptual model was driven by measuring child-centered dimensions of deprivation. This required an adaptation of existing methods, and the availability of relevant data. The MCS is a cohort of children, however, because of data collection constraints, it remains a household-centered study. Notably given our research question, we did not have much data on child interactions outside the home, especially with their nonresident father. So, for example, the survey asks the coresident parent if they were able to go on holiday in the last year, not whether the child was able to go on holiday in the last year, perhaps with the nonresident parent. Likewise, the survey's focus on interactions within the household of the main respondent, we know little about the quality and quantity of the contact with non-resident fathers. Robustness checks suggest that this is not an issue at these young ages and for this cohort, however as children grow, and shared custody arrangements become more popular, these data concerns might become increasingly important.

In conclusion, constructing multiple dimensions of child deprivation allowed nuancing the experience of children following parental separation. The effect of separation on deprivation was less strong than for income poverty, suggesting that parents somewhat manage to protect children. The financial constraints a separation involves have a short-term impact on material deprivation, and a more pronounced and persistent impact on being able to afford normative, leisure activities such as holidays and other activities which require a financial outlay. Therefore, unpacking different dimensions of child deprivation, while methodologically complex, can contribute to both causal theory, through a better understanding of the underlying post-separation processes, as well as providing concrete avenues for policy that support households with children during the time of separation. Notably, it allows identifying different needs for different groups at different child ages, but also the differing needs in the short-, medium- and long-term after separation.

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Table 1 Definition of deprivation indicators and cut-offs

	Wave 2	Wave 3	Wave 4	Wave 5
Material deprivation				
Phone		No phone		
Car	No car		No car	No car
Replace or repair electrical goods if broken				Cannot afford it
Damp in rooms (excl. Kitchen and bathroom)	From "not much a problem" to "Great Problem"	From "not much a problem" to "Great Problem"	From "not much a problem" to "Great Problem"	From "not much a problem" to "Great Problem"
Share bedroom (not his own bedroom)				share a bedroom
Quiet place where the child is able to make his/her homework				No place
Overcrowding housing (Nb of rooms/Nb of people)	< 1	< 1	< 1	< 1
Central heating (or: No heating, Coal fires, Wood fires or stoves, Gas fires, Electric fires, Paraffin heaters)	No central heating	No central heating	No central heating	
Number of indicators	4	4	4	6
Cut-off	1	1	1	2
Prop. of children material deprived	24.5%	21.7%	24.7%	18.8%
Extreme material deprivation				
Weatherproof coat	Cannot afford it	Cannot afford it	Cannot afford it	
2 pairs of weatherproof shoes		Cannot afford it	Cannot afford it	
Fitted shoes	Cannot afford it			
Computer				No computer
Internet				No internet at home
Number of indicators	2	2	2	2
Cut-off	1	1	1	1
Prop. of children extreme material deprived	0.9%	1.7%	1.8%	0.8%
Leisure activities				
Number of activities (go to: play, museum, zoo, cinema, funpark, sport)		Did 0 or 1 type of leisure activity over the past 12 months	Did 0 or 1 type of leisure activity over the past 12 months	
Go on holiday once a year not staying with relatives	Would like to, but cannot afford it	Would like to, but cannot afford it	Would like to, but cannot afford it	Would like to, but cannot afford it
Have celebration on special occasions, such as birthdays, Christmas or other religious festivals	Did not do anything special on third birthday	Would like to, but cannot afford it	Would like to, but cannot afford it	Would like to, but cannot afford it
Does [child name] have friends around for tea or a snack once a fortnight?				Would like to, but cannot afford
Visit, or had not been visited by, friends who have young children in the last month	Did not			
Number of indicators	3	3	3	3
Cut-off	1	1	1	1
Prop. of children leisure deprived	25.6%	24.5%	22.6%	23.9%
Parenting involvement				
How often read to child	(Once or twice a month or less, someone in hh may) OR (not everyday and no one else does)	None parent reads more than twice a week	Both parents read less than once or twice a month	
How often teach child songs/poems/rhymes	Less than twice a week			
Number of skills child is being helped to learn among: alphabet, counting and sport	0 or 1			
Anyone helps with reading, writing, maths (incl. homework for W3, excl. homework for W4)		None or less than twice a week in at least 1 activity	Less often than once a month in at least two activities	
How often does anyone at home help with [child name]'s homework				Almost never
How often does anyone at home make sure [child's name] has finished [his/her] homework before doing other things				Sometimes or never
Number of activities with parents among : telling stories, music, painting or drawing, go to the park		Do 0 or 1 activity once a month with any parent	Do 0, 1 or 2 activities once a month	
Number of activities with any parent among: active games, in-door games		0 or 1 activity	0 or 1 activity	0 activity
Regular bedtime	Never or sometimes	Never or sometimes	Never or sometimes	Never or sometimes
Regular mealtime	Never or sometimes	Never or sometimes		
Anyone attends parents' evening		No	No	No
Talk with the child about important things to him/her				Less than twice a week with any parent
Number of indicators	5	7	6	6
Cut-off	1	2	2	2
Prop. of children deprived in parental involvement	13.3%	12.5%	13.2%	16.8%
Overall deprivation				
Number of dimensions	4	4	4	4
Cut-off for overall deprivation	2	2	2	2
Prop. of children overall deprived	16.0%	13.9%	15.1%	15.2%
Prop. of children income poor	18.2%	17.7%	18.6%	17.7%
Depth of deprivation				
Deprived in 0 dimension	55%	57%	56%	58%
Deprived in 1 dimension	29%	29%	28%	27%
Deprived in 2 dimensions	13%	11%	12%	12%
Deprived in 3 dimensions	3%	3%	3%	3%
Deprived in 4 dimensions	<1%	<1%	<1%	<1%

Table 2 Relationship between income poverty and deprivation on different dimensions

	Wave 2 (age 3)			Wave 3 (age 5)			Wave 4 (age 7)			Wave 5 (age 11)		
		Not inc. poor	Income poor		Not inc. poor	Income poor		Not inc. poor	Income poor		Not inc. poor	Income poor
		81.8	18.2		82.4	17.6		81.4	18.6		82.3	17.7
Not overall dep.	84.0	73.8	10.2	86.0	75.3	10.7	84.8	74.4	10.4	84.8	74.0	10.8
Overall dep.	16.0	8.0	8.0	14.0	7.1	6.9	15.2	7.0	8.1	15.2	8.3	6.8
Not material dep.	75.5	67.1	8.4	78.2	67.6	10.6	75.2	66.5	8.7	81.2	71.0	10.2
Material deprived	24.5	14.8	9.7	21.8	14.8	7.0	24.8	14.9	9.9	18.8	11.3	7.5
Not extreme mat. dep.	99.1	81.4	17.8	98.3	81.6	16.7	98.2	80.8	17.4	99.2	82.0	17.2
Extreme mat. dep.	0.9	0.4	0.4	1.7	0.7	0.9	1.8	0.6	1.2	0.8	0.3	0.5
Not leisure dep.	74.4	66.3	8.1	75.4	67.9	7.6	77.4	68.6	8.8	76.1	67.8	8.3
Leisure dep.	25.6	15.5	10.1	24.6	14.5	10.1	22.6	12.8	9.8	23.9	14.5	9.4
Not dep. in parental involv.	86.7	72.7	14.1	87.5	74.4	13.2	86.8	72.3	14.5	83.2	70.2	13.0
Dep. in parental involv.	13.3	9.2	4.1	12.5	8.0	4.5	13.2	9.1	4.1	16.8	12.1	4.7

Source: Millennium Cohort Study

Sample includes children whose parents are in couple at birth

Reading notes: Each sub-table sums up to 100. At wave 2, 81.8% of children are not income poor and 84% are overall deprived. 73.8% of children are neither income poor nor overall deprived, 10.1% are income poor but not overall deprived, 8% are overall deprived but not income poor and 8.1% are both income poor and overall deprived.

Table 3 Impact of covariates on the propensity to be income poor, overall deprived or deprived over different dimensions, odds-ratio from a logit regression

	(1)	(2)	(3)	(4)	(5)	(6)
	Income Poor	Overall	Material	Deprivation: Extr. Mat. Leisure Parenting		
Mother's age: 20-24	8.0*** (0.75)	5.0*** (0.47)	4.4*** (0.37)	2.3*** (0.58)	3.3*** (0.29)	1.8*** (0.17)
Mother's age: 25-29	3.1*** (0.19)	2.4*** (0.16)	2.0*** (0.12)	2.2*** (0.38)	2.0*** (0.11)	1.3*** (0.09)
Mother's age: 30-34	1.4*** (0.07)	1.5*** (0.07)	1.3*** (0.05)	1.4** (0.23)	1.3*** (0.06)	1.1** (0.06)
Mother's age: 35-39	ref.	ref.	ref.	ref.	ref.	ref.
Mother's age: 40-44	0.9** (0.05)	0.9 (0.05)	0.9** (0.04)	1.3 (0.22)	0.9*** (0.04)	1.2*** (0.06)
Mother's age: 45-49	1.0 (0.09)	1.0 (0.09)	0.8*** (0.06)	1.1 (0.35)	0.9* (0.07)	1.5*** (0.11)
Mother's age: \geq 50	1.7*** (0.29)	1.0 (0.18)	0.6*** (0.09)	1.6 (0.87)	1.0 (0.16)	1.5*** (0.25)
England	ref.	ref.	ref.	ref.	ref.	ref.
Wales	1.3*** (0.08)	0.9 (0.06)	0.9 (0.06)	0.7** (0.12)	0.9 (0.05)	1.0 (0.06)
Scotland	1.1 (0.07)	1.2** (0.07)	1.1** (0.06)	0.9 (0.16)	1.0 (0.06)	1.2*** (0.07)
Nothern Ireland	1.4*** (0.08)	0.8*** (0.06)	0.6*** (0.04)	0.5*** (0.10)	0.9** (0.05)	1.1** (0.07)
Has no sibling	ref.	ref.	ref.	ref.	ref.	ref.
Has one sibling	1.1 (0.07)	1.1 (0.07)	1.1 (0.06)	1.1 (0.24)	0.9* (0.05)	1.1 (0.07)
Has two siblings or more	2.2*** (0.15)	2.7*** (0.18)	2.7*** (0.16)	2.2*** (0.46)	1.5*** (0.09)	1.6*** (0.11)
Non white	3.7*** (0.25)	3.1*** (0.21)	2.3*** (0.14)	1.4** (0.22)	2.7*** (0.17)	1.9*** (0.12)
Routine/semi routine occ.	0.8*** (0.04)	0.9* (0.05)	1.0 (0.05)	0.5*** (0.09)	1.0 (0.05)	1.0 (0.05)
Parents' education = higher education	0.2*** (0.01)	0.2*** (0.02)	0.5*** (0.02)	0.2*** (0.03)	0.3*** (0.02)	0.4*** (0.02)
Parents' education = A-level or vocational	0.4*** (0.02)	0.4*** (0.03)	0.6*** (0.03)	0.3*** (0.05)	0.6*** (0.03)	0.6*** (0.03)
Parents' education = less than A-level	ref.	ref.	ref.	ref.	ref.	ref.
Female child	1.0 (0.05)	0.9 (0.04)	0.9 (0.04)	1.0 (0.12)	1.0 (0.04)	0.9* (0.04)
Wave 2 (age 3)	ref.	ref.	ref.	ref.	ref.	ref.
Wave 3 (age 5)	1.1*** (0.04)	0.9** (0.04)	0.9*** (0.03)	2.0*** (0.32)	1.0 (0.04)	0.9* (0.04)
Wave 4 (age 7)	1.4*** (0.06)	1.1*** (0.05)	1.2*** (0.05)	2.3*** (0.38)	1.0 (0.04)	1.0 (0.05)
Wave 5 (age 11)	1.5*** (0.09)	1.3*** (0.08)	0.9* (0.05)	1.1 (0.24)	1.2*** (0.06)	1.2*** (0.07)
N	37818	37818	37818	37818	37818	37818
N (clusters)	11179	11179	11179	11179	11179	11179

Exponentiated coefficients (odds-ratio); Standard errors in parentheses, clustered at the child level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Data: Millennium Cohort Study - Sample includes children whose parents are in couple at birth

Table 4 Descriptive statistics on the household's characteristics at wave 1

	Not separated (β_0)	Separation when young child (β_1)	Separation when older child (β_2)	Diff ($\beta_1 - \beta_0$)	Diff ($\beta_2 - \beta_0$)
Proportion of children	78.7%	10.3%	11.0%		
Mother's age at MC birth, years	31.1	27.4	29.6	-3.8 [0.000]	-1.5 [0.000]
Parents' educ: higher educ (%)	34.2	14.3	19.9	-20.0 [0.000]	-14.4 [0.000]
Parents' educ: A-level or vocational (%)	25.1	22.3	28.0	-2.8 [0.043]	3.0 [0.025]
Parents' educ: less than A-level (%)	40.7	63.4	52.1	22.7 [0.000]	11.4 [0.000]
England (%)	81.4	83.5	85.8	2.1 [0.078]	4.4 [0.000]
Wales (%)	5.2	5.1	5.2	-0.1 [0.898]	-0.0 [0.962]
Scotland (%)	9.7	8.7	7.0	-1.0 [0.294]	-2.7 [0.002]
North. Ireland (%)	3.7	2.6	2.1	-1.1 [0.060]	-1.6 [0.003]
No sibling at MC birth (%)	40.2	46.6	37.2	6.4 [0.000]	-3.0 [0.045]
One sibling at MC birth (%)	38.8	31.1	40.1	-7.7 [0.000]	1.3 [0.370]
Two siblings or more at MC birth (%)	21.0	22.3	22.6	1.4 [0.290]	1.7 [0.181]
White (%)	91.0	92.9	95.5	1.9 [0.028]	4.5 [0.000]
Routine/Semi-routine occupation (%)	11.9	17.0	13.2	5.1 [0.000]	1.2 [0.217]
MC is female child (%)	49.5	50.2	49.0	0.7 [0.645]	-0.5 [0.747]
Parents married at birth (%)	77.0	44.9	62.0	-32.1 [0.000]	-15.0 [0.000]
Non working father (%)	6.7	15.9	11.2	9.2 [0.000]	4.6 [0.000]
Mother works \geq 20h/week (%)	37.0	29.0	34.1	-7.9 [0.000]	-2.9 [0.046]
Mother active (%)	63.9	57.2	60.5	-6.7 [0.000]	-3.4 [0.020]
MC's age at separation, years	-	2.5	7.4		
N	8,790	1,203	1,186		

Data: Millennium Cohort Study - Wave 1. P-values into brackets.

Separation when child younger = separation when child younger than 4.4 years-old. Separation when child older = separation when child older than 4.4 years-old.

Table 5 Changes in income poverty, overall deprivation and deprivation over different dimensions around parental separation. Results from fixed-effect regression

	Income Poverty		Deprivation:									
	(1)	(2)	Overall		Material		Extreme Material		Leisure		Parental Involvement	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
0 or 1 year aft. sep.	0.28*** (0.03)	0.05 (0.03)	0.11*** (0.03)	0.06* (0.03)	0.10*** (0.03)	0.12*** (0.03)	0.01 (0.01)	0.01 (0.01)	0.14*** (0.03)	0.03 (0.03)	0.02 (0.03)	-0.06* (0.03)
2 or 3 years aft. sep.	0.23*** (0.03)	0.02 (0.03)	0.06** (0.02)	0.01 (0.03)	0.01 (0.02)	0.02 (0.03)	0.01 (0.01)	0.01 (0.01)	0.05* (0.03)	-0.04 (0.03)	0.08*** (0.02)	0.01 (0.03)
4 to 7 years aft. sep.	0.18*** (0.02)	-0.01 (0.02)	0.07*** (0.02)	0.03 (0.02)	0.03* (0.02)	0.04* (0.02)	0.02** (0.01)	0.02* (0.01)	0.05** (0.02)	-0.03 (0.02)	0.07*** (0.02)	0.01 (0.02)
8 to 11 years aft. sep.	0.13*** (0.03)	-0.04 (0.03)	0.03 (0.03)	-0.02 (0.03)	-0.02 (0.03)	-0.01 (0.03)	-0.01 (0.01)	-0.01 (0.01)	0.05 (0.03)	-0.03 (0.03)	0.06* (0.03)	0.00 (0.03)
0 or 1 year aft. sep. × older at sep.	-0.05 (0.03)	-0.06* (0.03)	0.01 (0.03)	0.00 (0.03)	-0.06* (0.03)	-0.06* (0.03)	0.00 (0.01)	0.00 (0.01)	0.02 (0.03)	0.01 (0.03)	0.09*** (0.03)	0.09*** (0.03)
2 or 3 years aft. sep. × older at sep.	0.02 (0.03)	0.01 (0.03)	0.07** (0.03)	0.07** (0.03)	0.06* (0.03)	0.06* (0.03)	-0.01 (0.01)	-0.01 (0.01)	0.07* (0.04)	0.07* (0.04)	0.04 (0.03)	0.04 (0.03)
No partner		0.31*** (0.02)		0.08*** (0.02)		-0.01 (0.02)		0.00 (0.01)		0.13*** (0.02)		0.10*** (0.02)
Non working partner		0.18*** (0.01)		0.03** (0.01)		0.03*** (0.01)		0.01 (0.01)		0.04*** (0.01)		0.01 (0.01)
Mean (total sample)	0.18		0.15		0.22		0.013		0.24		0.14	
Mean (children whose parents sep.)	0.37		0.27		0.32		0.026		0.40		0.21	
N (clusters × waves)	37818	37818	37818	37818	37818	37818	37818	37818	37818	37818	37818	37818
N (clusters)	11179	11179	11179	11179	11179	11179	11179	11179	11179	11179	11179	11179
Avg number of obs. by cluster	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Standard errors into parenthesis (clustered at the child level)

Sample includes children whose parents are in couple at birth

Control for: mother's age, country, number of siblings, routine/semi routine occupation, age of child, wave

Table 6 Changes in income poverty, overall deprivation and deprivation over different dimensions around parental separation. Results from fixed-effect regression, heterogenous effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Income poverty		Overall deprivation		Income poverty		Overall deprivation	
	Mother's educational attainment lower than A-level and overseas				Mother's educational attainment A-level or higher			
0 or 1 year aft. sep.	0.34*** (0.04)	0.08** (0.04)	0.14*** (0.03)	0.07* (0.04)	0.18*** (0.05)	-0.00 (0.06)	0.06 (0.04)	0.03 (0.05)
2 or 3 years aft. sep.	0.30*** (0.03)	0.07** (0.04)	0.09*** (0.03)	0.02 (0.03)	0.12*** (0.04)	-0.06 (0.04)	0.02 (0.03)	-0.00 (0.04)
4 to 7 years aft. sep.	0.24*** (0.03)	0.04 (0.03)	0.10*** (0.03)	0.03 (0.03)	0.06** (0.03)	-0.08** (0.03)	0.03 (0.02)	0.01 (0.03)
8 to 11 years aft. sep.	0.21*** (0.04)	0.02 (0.04)	0.05 (0.04)	-0.00 (0.04)	0.01 (0.05)	-0.13** (0.05)	-0.03 (0.05)	-0.05 (0.05)
0 or 1 year aft. sep. × older at sep.	-0.08* (0.04)	-0.09** (0.04)	-0.00 (0.04)	-0.00 (0.04)	0.02 (0.06)	0.00 (0.06)	0.03 (0.05)	0.03 (0.05)
2 or 3 years aft. sep. × older at sep.	0.00 (0.04)	-0.01 (0.04)	0.08* (0.04)	0.08* (0.04)	0.05 (0.05)	0.06 (0.05)	0.05 (0.04)	0.05 (0.04)
No partner		0.35*** (0.02)		0.10*** (0.02)		0.22*** (0.03)		0.03 (0.03)
Non working partner		0.22*** (0.02)		0.04*** (0.02)		0.13*** (0.02)		0.01 (0.02)
Mean (total subsample)	27%		22%		7%		7%	
Mean (children whose parents separate)	46%		34%		19%		14%	
Observations	21692	21692	21692	21692	16126	16126	16126	16126
N (clusters)	6632	6632	6632	6632	4547	4547	4547	4547
	Mother's age: lower than median at W1				Mother's age: higher than median at W1			
0 or 1 year aft. sep.	0.29*** (0.04)	0.06 (0.04)	0.09*** (0.03)	0.05 (0.04)	0.26*** (0.05)	0.04 (0.05)	0.14*** (0.04)	0.07 (0.05)
2 or 3 years aft. sep.	0.23*** (0.03)	0.03 (0.03)	0.04 (0.03)	0.00 (0.03)	0.23*** (0.04)	0.02 (0.05)	0.08** (0.04)	0.02 (0.04)
4 to 7 years aft. sep.	0.15*** (0.03)	-0.02 (0.03)	0.05* (0.03)	0.01 (0.03)	0.22*** (0.03)	0.02 (0.04)	0.11*** (0.03)	0.04 (0.03)
8 to 11 years aft. sep.	0.10** (0.04)	-0.05 (0.04)	-0.00 (0.04)	-0.03 (0.04)	0.18*** (0.05)	-0.01 (0.05)	0.06 (0.05)	-0.01 (0.05)
0 or 1 year aft. sep. × older at sep.	-0.02 (0.04)	-0.03 (0.04)	0.02 (0.04)	0.02 (0.04)	-0.06 (0.05)	-0.08 (0.05)	-0.01 (0.05)	-0.01 (0.05)
2 or 3 years aft. sep. × older at sep.	-0.00 (0.04)	-0.01 (0.04)	0.05 (0.04)	0.05 (0.04)	0.06 (0.05)	0.06 (0.05)	0.09* (0.05)	0.09* (0.05)
No partner		0.33*** (0.02)		0.07*** (0.02)		0.27*** (0.02)		0.09*** (0.03)
Non working partner		0.20*** (0.02)		0.03** (0.02)		0.16*** (0.02)		0.02 (0.02)
Mean (total subsample)	25%		20%		12%		10%	
Mean (children whose parents separate)	42%		31%		29%		21%	
Observations	18659	18659	18659	18659	19159	19159	19159	19159
N (clusters)	5677	5677	5677	5677	5502	5502	5502	5502
	Household income poor at wave 1				Household not income poor at wave 1			
0 or 1 year aft. sep.	0.22*** (0.07)	0.04 (0.07)	0.06 (0.06)	0.02 (0.07)	0.30*** (0.03)	0.05 (0.04)	0.13*** (0.03)	0.07** (0.03)
2 or 3 years aft. sep.	0.21*** (0.06)	0.04 (0.06)	0.05 (0.06)	0.02 (0.06)	0.25*** (0.03)	0.02 (0.03)	0.07*** (0.03)	0.01 (0.03)
4 to 7 years aft. sep.	0.20*** (0.06)	0.05 (0.06)	0.12** (0.06)	0.09 (0.06)	0.18*** (0.02)	-0.02 (0.03)	0.06*** (0.02)	0.01 (0.02)
8 to 11 years aft. sep.	0.21*** (0.08)	0.08 (0.08)	0.09 (0.07)	0.06 (0.07)	0.13*** (0.04)	-0.06 (0.04)	0.02 (0.03)	-0.03 (0.03)
0 or 1 year aft. sep. × older at sep.	-0.01 (0.08)	0.00 (0.08)	0.14** (0.07)	0.15** (0.07)	-0.07* (0.04)	-0.08** (0.04)	-0.03 (0.03)	-0.03 (0.03)
2 or 3 years aft. sep. × older at sep.	-0.03 (0.07)	-0.03 (0.07)	0.18** (0.09)	0.18** (0.09)	0.02 (0.04)	0.02 (0.04)	0.04 (0.04)	0.04 (0.04)
No partner		0.30*** (0.04)		0.06* (0.03)		0.31*** (0.02)		0.08*** (0.02)
Non working partner		0.24*** (0.03)		0.05** (0.02)		0.16*** (0.01)		0.02* (0.01)
Mean (total subsample)	57%		42%		12%		11%	
Mean (children whose parents separate)	68%		47%		28%		21%	
Observations	6960	6960	6960	6960	30858	30858	30858	30858
N (clusters)	2230	2230	2230	2230	8949	8949	8949	8949

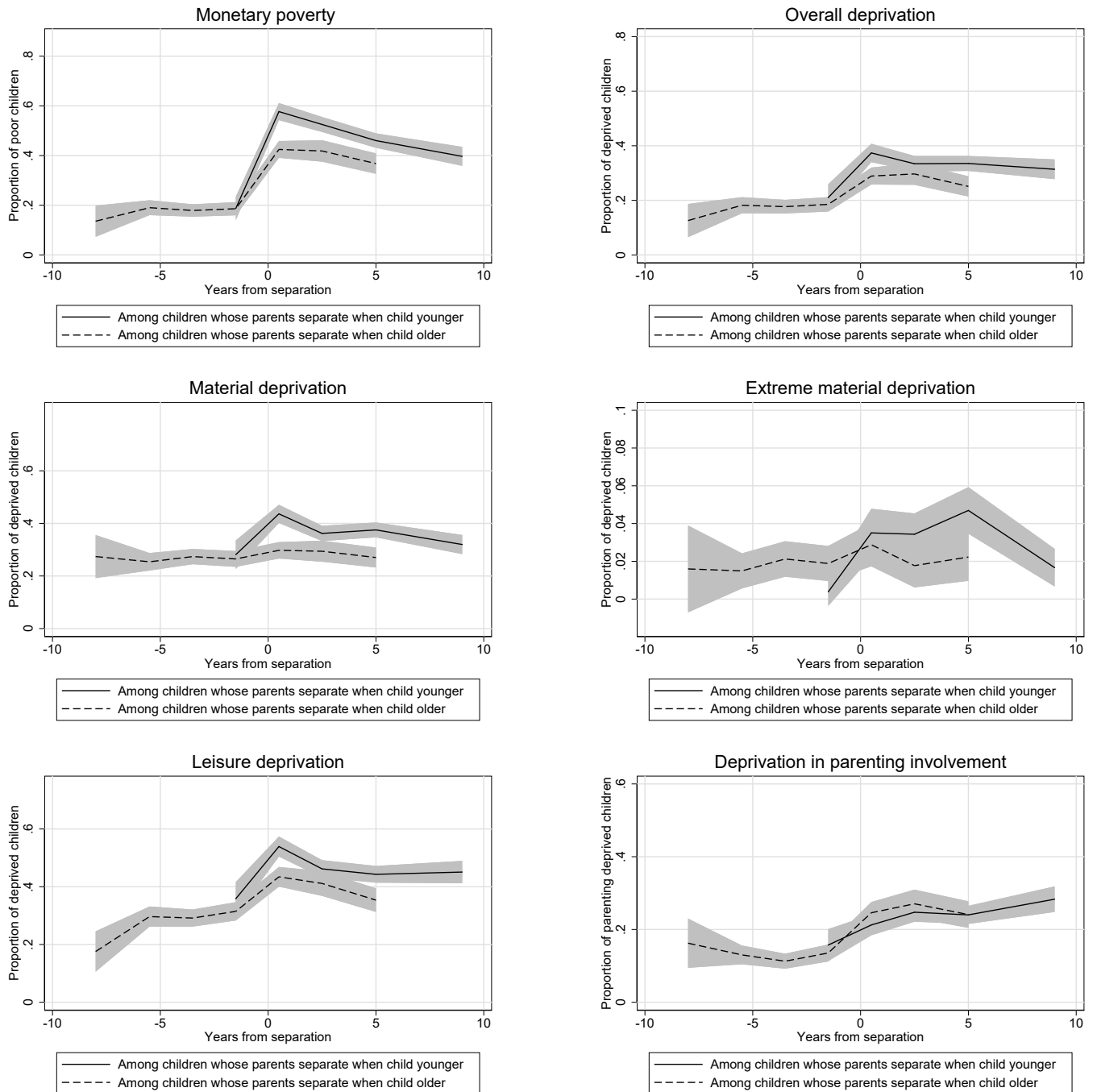
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Standard errors into parenthesis (clustered at the child level)

Sample includes children whose parents are in couple at birth

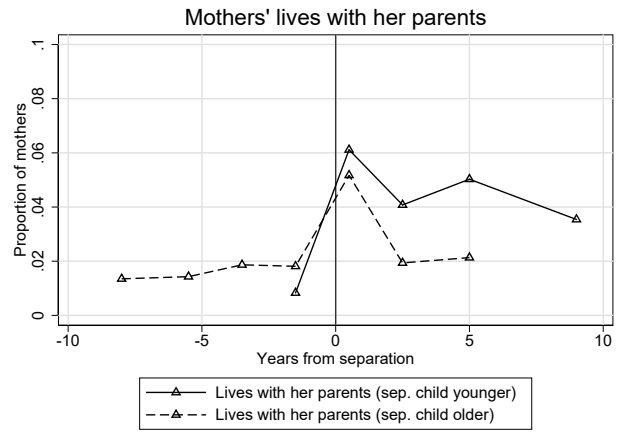
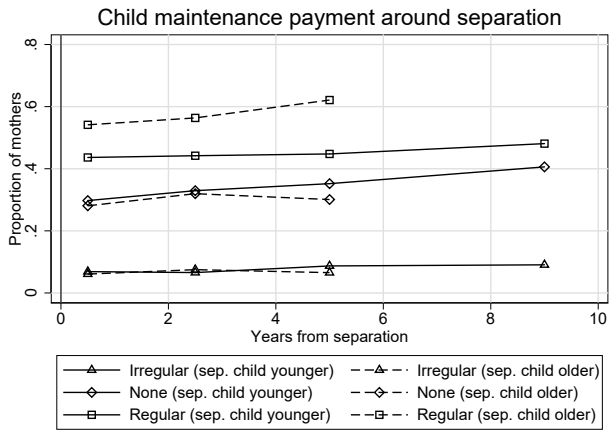
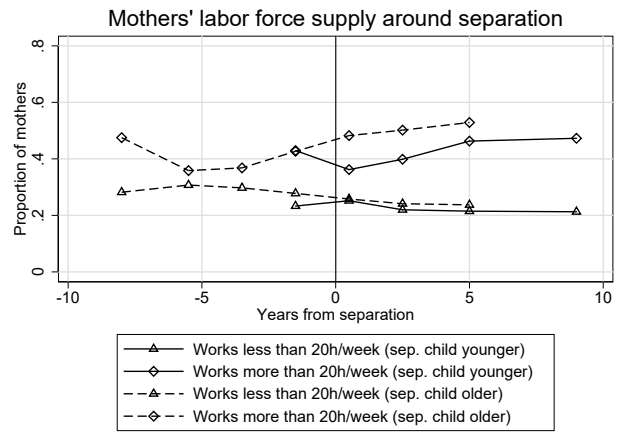
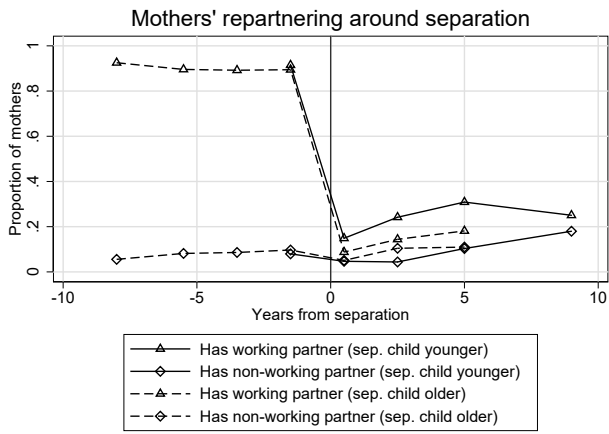
Control for: mother's age, country, number of siblings, routine/semi routine occupation, age of child, wave

Fig. 1 Change in monetary poverty and the multiple deprivation indicators of children around parental separation, according to child's age at separation



Reading notes: "children whose parents separate when child younger" = children who were younger than 4.4 at parents' separation. "children whose parents separate when child older" = children who were older than 4.4 at parents' separation.
 Data: Millennium Cohort Study. Sample includes children whose parents are in couple at birth. Computations by the authors.

Fig. 2 Recovery channels around separation



Reading notes: "children whose parents separate when child younger" = children who were younger than 4.4 at parents' separation. "children whose parents separate when child older" = children who were older than 4.4 at parents' separation.
 Data: Millennium Cohort Study. Sample includes children whose parents are in couple at birth. Computations by the authors.