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## Income-based family typology and child development: Evidence from the UK

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# Income-based family typology and child development: Evidence from the UK

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## Abstract

Our paper contributes to the literature studying how household conditions can influence children's development, focusing on the type of family model where children grow up, defined on the basis of parental employment status and relative earnings. The traditional "male-breadwinner" model is no longer the only type of family that has been observed throughout recent decades; the "dual-breadwinner" family model is currently widespread across all developed countries and an additional household type is becoming more prevalent: the one in which the woman is the sole or main wage-earner, the so-called "female-breadwinner" arrangement. How do different family models influence the development of children's skills? We use data from the Millennium Cohort Study (UK) to investigate the association between different typologies of families and cognitive and socio-emotional outcomes, focusing on children aged 7 and 11.

We find that, compared to children growing up in male-breadwinner households, only children who have at least one parent who does not work at all are worse off in some socio-emotional outcomes. Children growing up in other types of arrangements (equal earners or female-breadwinner) do not differ in their cognitive or socio-emotional outcomes.

**Keywords:** Child development; female breadwinner; dual breadwinner; male breadwinner; household employment; Millennium Cohort Study

**JEL classification:** J13, J24, D10

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## INTRODUCTION

The traditional “male-breadwinner-female-homemaker” model characterised families throughout most of the 20th century, but it is no longer the main family typology: the “dual-breadwinner” family model is currently widespread across all developed countries (Esping-Andersen, 1999; Gornick and Meyers, 2009; Von Gleichen and Seeleib-Kaiser, 2018). The proportion of couples with two wage-earners has certainly increased, whereas the share with one wage-earner has declined (Daly, 2011; Lewis, 2001; Lewis et al., 2008). In addition, the potential for women to earn the same or more than their male partners has increased in many countries due to a steep rise in women’s labour force participation (Kanji, 2011) and women’s educational performance overtaking that of men. An additional kind of household type is becoming more prevalent among couples: one in which the woman is the sole or main wage-earner, the so-called “female-breadwinner” arrangement.

Several studies have emerged in the last decade analysing the determinants of such an arrangement (Vitali and Arpino, 2016, Klesment and Van Bavel, 2016), its characteristics (Kowalewska and Vitali, 2020), and its effect on union dissolutions (Kanji and Schober, 2014), marital satisfaction (Blom and Hewitt, 2020), or division of housework and childcare duties (Chelsey and Flood, 2016).

Family structure is a fundamental aspect of children's lives and has a significant impact on their development. This paper’s aim is to assess whether or not there is correlation between the type of family in which children grow up and their development, paying particular attention to the female-breadwinner model. In recent decades, there has been a marked increase in family diversity, with a growing number of families deviating from the

traditional male breadwinner model; however, research on the impact of these different family typologies on children's development remains limited.

Questions have arisen about how these changes might impact the well-being of children as traditional gender roles have shifted and as women have taken on greater economic roles. Previous research has focused primarily on the outcomes for children of single-parent families, but relatively little is known about the impact of families with different breadwinner arrangements.

This paper aims to explain the relationship between parental income and employment status on both children's cognitive and socio-emotional outcomes. What differentiates this work from others is the classification of families into six typologies according to parental employment status and relative income. This allows us to study not only the relation between household income and parental employment on child development, something that to the best of our knowledge has never been used before to study the relations considered here, but also permits us to distinguish these two measures between the mother and the father. Indeed, although household income remains an important independent variable, the focus here is on parental relative earnings: since the existing evidence agrees on a positive effect of family income on child outcomes, then we must ask if it matters whether it is earned mainly (or fully, in case one parent is unemployed) by the mother or the father. Alternatively, is it better that both parents earn similar salaries?

In order to do so, we use data from the Millennium Cohort Study (<https://cls.ucl.ac.uk/cls-studies/millennium-cohort-study/>) which focused on children born in the UK, and we assess how living in different typologies of families influences cognitive (verbal skills) and socio-emotional outcomes (emotional symptoms, conduct problems,

hyperactivity/inattention, peer relationship problems, and prosocial behaviour) when the children are 7 and 11 years old.

We consider six types of families: both parents are non-working, father is working and mother is non-working (and vice versa), both parents are working and they are equal earners, both parents are working and the father earns more than the mother (male-breadwinner), and both parents are working and the mother earns more than the father (female-breadwinner). Exploiting the data's longitudinal structure, we employ three main models: contemporaneous inputs only (where we control for a series of background characteristics and current family arrangement), value-added model (where we add past outcomes to the controls), and cumulative value-added model (where we also add past family arrangements to the equation).

Our main findings show that only kids whose parents (one or both) do not work are worse off in some socio-emotional outcomes, compared to children growing up in male-breadwinner families – our reference category – and that this is particularly true for children whose mother does not work and whose father is the only income provider, and for children with both parents who don't work. Children growing up in other types of arrangement (equal earners or female-breadwinner) do not differ in their cognitive and socio-emotional outcomes.

#### BACKGROUND

The relationship between the home environment and children's development has been widely studied. Several studies focus on the effect of household income: both the theory and the empirical evidence point towards a positive effect on children's development, with children coming from low-income households scoring worse than their wealthier peers in

all measures of cognitive and non-cognitive development (for a systematic review, see Cooper and Stewart, 2021). Conversely, scholars have investigated the impact of parents' employment status, focusing especially on the maternal one. Parental work has both positive and negative consequences on children's development: it can be beneficial because it provides income that parents can invest in their children in order to provide them with a wide range of resources that are beneficial to a child's development, such as high quality child care, health care and education, rich learning experiences, and a better environment (i.e., better housing in safe neighbourhoods). Moreover, working parents can be positive role models for their kids, because working can increase one's self-esteem and sense of control over one's life, for instance (Duncan and Chase-Lansdale, 2001). Conversely, however, if parents work, then they can spend less time with their children, thereby possibly weakening their bond and parental monitoring of their offspring, and the stress deriving from their job could, in turn, become deflected onto the whole family. Focusing on the mother, an initial possible downside of working is that employed mothers may have less time to spend with their kids (Brooks-Gunn et al., 2010) and this may hinder a mother's ability to form a strong bond with the child, thereby negatively affecting child's development, though this may be at least partially offset by other factors, such as higher-quality early child care (for instance, see NICHD and Duncan, 2003); it may also be offset by the fact that it has been shown that working mothers reduce the time spent on routine activities, but not on educational and recreational activities, such as helping with homework, reading, drawing, or playing (Hsin and Felfe, 2014). Eventually, evidence on how maternal or parental employment affects child development is mixed, both in the very early years and later on (Heinrich, 2014). What the literature does agree on, however, is that parents' job characteristics, such as the level of job security, the degree of flexibility,



or the presence and generosity of paid family leave play a central role. Generally speaking, the evidence suggests that children in poorer households are more likely to be negatively affected by their parents' work, not just because of the low family income, but also because low-paid jobs are those that usually lack the other positive job characteristics. Overall, it is possible to conclude that the existing literature suggests that household income has a positive effect on child development, but that the impact of parental employment is less clear-cut.

There has been a significant shift in the traditional gender roles and family structures in recent decades, resulting in a growing number of families with non-traditional breadwinner arrangements. However, little research exists on the effects of different family typologies on children's cognitive and non-cognitive development. Some hypotheses on how family structure can affect children's development, therefore, can be made.

Children in female breadwinner families may face an increased exposure to gender equality and this could lead them to have better emotional well-being and self-esteem than those in male breadwinner families. However, conversely, children in female breadwinner families may also experience more stress due to the potential for conflicting gender role expectations and social stigma.

Children in male breadwinner families usually face greater economic stability and resources, which can be correlated with better academic achievement and to the acquisition of social skills. However, children in male breadwinner families may have more traditional gender role attitudes and less involvement from fathers in childcare and education, which could impact them negatively.

Equal earner families, in which both parents share breadwinner and caregiving roles equally, can experience a greater sharing of domestic and childcare responsibilities and the increased likelihood of both parents being involved in children's education; this can lead to higher social skills, as well as to higher levels of self-esteem and emotional well-being. However, despite the growing interest in this area, the literature remains limited in its understanding of the link between different family typologies and children's outcomes. We aim to fill this gap with this paper.

#### DATA AND SAMPLE SELECTION

The data used in the analysis come from the Millennium Cohort Study (MCS), which is a longitudinal survey conducted in the UK by the Centre for Longitudinal Studies (CLS). The aim of the study is to capture the influence of early family context on child development and outcomes throughout childhood, into adolescence, and subsequently through adulthood. In order to do so, the survey tracks the lives of around 19,000 young people born in the UK in 2000/2001 and provides measures of their physical, socio-emotional, cognitive, and behavioural development over time. The study provides information on children's daily life and experiences, as well as details about their families, such as socio-economic conditions, parenting style, relationships, and family life which is made available from both resident parents. There is information on both parents' working status and income. The survey was conducted in different sweeps; namely, when the children were 9 months, 3, 5, 7, and 11 years old. Around 10% of the sample was lost due to attrition at each new wave. We focus on children who participated in the survey up to wave 4 and 5, when they were 7 and 11 years old respectively. One sample will be used for estimation at wave 4, and a different smaller sample will be used for estimation at wave 5. The reference

samples are, therefore, the one from the fourth wave for the analysis when the children were 7, and the one from the fifth wave for the analysis when the children were 11 years old. We exclude twins from the original sample and we focus on children whose main respondent is the mother (99% of the original sample). The main variable of interest is the family type, defined as how the income is divided between the mother and the father; therefore, we keep only children whose parents are still together as of wave 4 and 5, thereby excluding kids born from single mothers and kids whose parents divorced over the course of the years (8,704 children left in wave 4 and 6,328 in wave 5). We exclude children who have missing values in the main cognitive and non-cognitive outcomes measured at wave 3, 4, and 5, leaving a sample of 7,787 children in wave 4 and 5,704 in wave 5.

Finally, we have to exclude children whose parents cannot be classified in any of the 6 typological groups: mostly because the income variable is missing, but they both declared that they were in employment (see Annex 1 for more details on the construction of the “family type” variable), resulting in the final working sample of 6,900 children in wave 4 and 5,265 in wave 5.

#### *Classification of the typology of family*

Families can be classified according to the parents’ employment status and relative earnings.

We first divided families into four groups, according to parental employment status. There is a variable indicating whether each of the parents is in work or not at the time of the interview in all MCS sweeps; this allows us to define four types of families: families where both parents are not in work, families where only the father works, families where only the mother works, and families where both work.

Following Kanji et al. (2014), families where both parents work were divided into three further groups according to their relative earnings: male-breadwinner families (i.e., families where the father earns more than the mother), equal-earners families (i.e., both respondents earn similar wages), and female-breadwinner families (i.e., characterised by a mother earning more than her partner). The classification used by Kanji et al. (2014) defines “male-breadwinner families” as households where the father earns at least 20% more than the mother; “equal earners” are households where their salaries differ by less than 20%; “female-breadwinner families” is a household where the mother earns at least 20% more than the father.

Unlike Kanji et al. (2014), who do not distinguish between male-breadwinner (female-breadwinner) families and families where only the father (mother) is employed, they are considered as separate groups in this paper since they clearly represent two different arrangements (Kowalewska and Vitali, 2020). Details on how the income variable is built are reported in Appendix B.

The final sample for the analysis when children were 7 (wave 4) is 6,900, whereas the final sample when kids were 11 (wave 5) is 5,265, distributed across family types as shown in Table 1.

TABLE 1: FREQUENCY DISTRIBUTION OF THE FAMILY TYPOLOGIES.

Family type	W4- age 7	W5- age 11
Both not working	300 (4.35%)	227 (4.31%)
Only father working	1,860 (26.96%)	1,054 (20.02%)
Male-breadwinner	3,632 (52.64%)	2,906 (55.19%)
Equal earners	483 (7.00%)	439 (8.34%)
Female-breadwinner	481 (6.97%)	483 (9.17%)
Only mother working	144 (2.09%)	156 (2.96%)
Total	6,900	5,265

The most represented group by far is that of male-breadwinner families, with more than 50% of observations belonging to it at both sweeps, followed by families where only the father works at the time of the interview, representing about one fourth of the sample at wave 4 and one fifth at wave 5. Equal-earners and female-breadwinner households have similar shares at both waves. The less common typologies of family are those where both parents do not work (less than 5%) and those where only the mother was in employment at the time of the interview (less than 3% of the sample).

#### *Outcomes of interest*

We are interested in two sets of outcomes included in the Millennium Cohort Study, which measure both cognitive and socio-emotional skills.

##### 1) Cognitive outcomes.

To assess cognitive development we will use: the BAS Naming Vocabulary Test taken at age 5 (third sweep), which will be used only as a control (see section 3), the Word Reading Test taken at age 7 (fourth sweep), and the Verbal Similarities Test taken at

age 11 (fifth sweep) which is aimed at measuring verbal ability. These three tests do not measure the exact same outcome. However, we use them as a unique measure of verbal ability in a fashion similar to other scholars (e.g., Del Bono, 2016).

The Naming Vocabulary is a test taken from the Early Years battery aimed at assessing the spoken vocabulary of children. The scale measures expressive language ability and successful performance depends on the child's previous development of a vocabulary of nouns. The Word Reading is a test aimed at assessing children's reading ability taken from the School Age battery. Finally, the Verbal Similarities Test (School Age battery) is aimed at assessing children's verbal reasoning and verbal knowledge.

The scores of each test are provided as standardised values with mean 0 and standard deviation 1 so that they are easily interpretable and comparable.

## 2) Socio-emotional outcomes.

Socio-emotional skills are usually defined in economics as those traits other than cognitive abilities, measured by IQ tests or similar, that are important determinants of educational and labour market outcomes, such as behaviour, personality, self-esteem, motivation, etc. (see Heckman et al., 2006 and Humphries and Kosse, 2017).

Socio-emotional outcomes are assessed through the Strengths and Difficulties Questionnaire (SDQ) in the Millennium Cohort Study, which specifically evaluates children's socio-emotional or behavioural, skills. The SDQ is a brief behavioural screening questionnaire for children aged from 3 to 16 developed by Goodman (1997).

The SDQ asks about 25 attributes, some positive and some negative, that can be divided into five groups; namely, "emotional symptoms", "conduct problems", "hyperactivity/inattention", "per relationship problems", and "prosocial behaviour",

each of them consisting of 5 attributes. Raw variables vary between 0 and 10 and have been standardised so as to have 0 mean and 1 standard deviation.

Lower scores identify positive traits for the first four dimensions, whereas a higher score identifies more positive traits in terms of prosocial behaviour. Since the first four groups have a negative connotation, the lower their score, the less problematic the child's behaviour is, but it is desirable to have a large score in the fifth group.

Figures A.1 and A.2 in Appendix A summarise the cognitive and socio-emotional outcomes when kids were aged 7 and 11. A full description of the outcomes is presented in Appendix C.

#### *Control variables*

A set of several control variables is included in all of the models that will be run, as will be discussed in Section 3.

Table 2 reports the descriptive statistics for such variables. Following Meroni et al. (2022), they can be thought of as being divided into two categories:

- Parental investment variables: they provide information on parents' choices in the months following the birth of the child, with respect to breastfeeding, maternal leave length, father's involvement in looking after the cohort member, and formal childcare arrangements when the child was 30 months old for instance. Moreover, parental education was included. Given their nature, such variables are fixed over time.
- Socio-demographic variables: they refer to the cohort member, their parents, and the household.

Those concerning the child regard their gender, age, nationality, weight at birth, and number of siblings at birth. Additionally, three variables on the cohort members' communicative, motor, and motion development at the first sweep were considered.

Regarding the parents, two variables concern the quality of the relationship between the cohort member and their mother measured at wave 2 (closeness between the mother and the child, and whether there are conflicts between them), one concerns the mother's locus of control, two variables measured at sweep 4 regard the mother's personality type, with a focus on whether she is neurotic and/or extrovert, and two variables concern parental mental health (one for each parent). Details on the construction of the mother's personality type and parental mental health variables can be found in Appendix C.

Concerning the household, variables on the presence of siblings in the current wave and on whether those siblings are new-borns, and household location (England, Northern Ireland, Scotland, and Wales) are included. We also control for the household's total income; this was obtained summing the mother's and the father's incomes, and the number of weekly hours worked by the parents.



TABLE 2: SUMMARY STATISTICS OF CONTROL VARIABLES AT WAVES 4 AND 5.

	Wave 4 – age 7		Wave 5 – age 11	
	Mean	SD	Mean	SD
British	0.88	0.32	0.88	0.32
Girl	0.50	0.50	0.50	0.50
Birthweight	3.42	0.57	3.43	0.57
Wales	0.14	0.35	0.14	0.35
Scotland	0.13	0.34	0.13	0.33
Northern Ireland	0.10	0.30	0.10	0.30
England	0.63	0.48	0.63	0.48
Communicative development (9 months old)	-0.08	0.96	-0.09	0.96
Motor development (9 months old)	0.01	0.95	0.00	0.95
Motion development (9 months old)	0.11	0.71	0.11	0.73
Number of siblings at birth	0.88	0.98	0.86	0.94
Mother with tertiary education	0.46	0.50	0.49	0.50
Breastfeeding for at least 1 month	0.54	0.50	0.56	0.50
Mother back to work by when the child was 6 months old	0.42	0.49	0.42	0.49
Formal childcare when the child was 30 months old	0.30	0.46	0.30	0.46
Father with tertiary education	0.43	0.50	0.46	0.50
Father looks after the child on his own	0.60	0.49	0.60	0.49
Mother's locus of control - w1	0.84	0.37	0.84	0.36
Mother-child conflicts - w2	16.75	5.68	16.69	5.62
Mother-child closeness- w2	33.74	2.03	33.74	1.99
Mother neurotic-w4	23.79	4.69	23.90	4.64
Mother extrovert -w4	19.50	4.54	19.39	4.54
<b>Wave specific variables:</b>				
Age in months	86.59	2.91	133.8	3.84
At least 1 sibling in the HH	0.92	0.27	0.91	0.28
Mother's weekly working hours	16.48	14.56	19.61	15.30
Mother's mental health	2.65	3.34	3.23	3.68
Father's weekly working hours	40.08	14.33	40.56	15.53
Father's mental health	2.85	3.32	3.63	3.67
Presence of new-borns	0.11	0.32	0.03	0.18
Total household income	3,860	6,158	4,738	18,186
<b>Number of observations</b>	<b>6,900</b>		<b>5,265</b>	

**Note:** The table reports the mean and standard deviation of the variables used as controls, in wave 4 and wave 5, when children were 7 and 11 years old respectively. HH stands for household.

Our aim is to estimate the association between the different typologies of family presented above; one is cognitive and five are socio-emotional outcomes. Given the database's panel structure, three different specifications will be presented, following Todd and Wolpin (2003; 2007) and Fiorini and Keane (2014); namely, a contemporaneous inputs model (OLS), a value-added model (VA, which has contemporaneous inputs and lagged output), and a cumulative value-added model (CU-VA, which includes previous inputs and output). Results are shown for outcomes at age 7 (wave 4) and 11 (wave 5).

*The contemporaneous inputs model (OLS)*

Through the contemporaneous inputs model, we estimate the following linear equation with OLS for each outcome, once for outcomes at age  $t=7$ , once for outcomes at age  $t=11$ :

$$Y_{i,t} = \alpha_t + A'_{i,t}\beta_{1t} + Z'_{i,t}\beta_{4t} + \varepsilon_{i,t} \quad (1)$$

Where:

$Y_{i,t}$  = one of the outcomes for child  $i$  at age  $t$ ;

$A_{i,t}$  = vector that indicates the different family types, at age  $t$ ;

$Z_{i,t}$  = vector of the control variables of child  $i$  at age  $t$  or before age  $t$  (see section 2.6).

The contemporaneous inputs model relates children's cognitive and socio-emotional outcomes to contemporaneous measures of family typology exclusively. The assumptions underlying this specification are:

- i) Only contemporaneous inputs (i.e., the current family type) matter to children's current outcome;

or

- ii) Inputs do not change over time, so that current input measures capture the entire history of inputs;
- iii) Vector Z is a good proxy for any unobserved inputs and for the child's unobservable characteristics (such as innate ability);
- iv) There is no remaining unobserved heterogeneity that correlates with current family typology.

Indeed, Z contains a rich set of control variables (see section 2.3), including total household income. Thus, the  $\beta_{1t}$  coefficients exclusively capture the effect of the different sources of this income (father and mother). The advantage of such a model is that it can also be implemented with limited data, since you only need measures of contemporaneous inputs and outcomes.

*The contemporaneous inputs and the lagged output model (value-added model – VA)*

With the value-added model, for each child's socio-emotional skill, we estimate the following linear equation with OLS, once for outcomes at age  $t=7$ , once for outcomes at age  $t=11$ :

$$Y_{i,t} = \alpha_t + A'_{i,t}\beta_{1t} + \beta_{3t}Y_{i,t-m} + Z'_{i,t}\beta_{4t} + \varepsilon_{i,t} \quad (2)$$

Where:

$Y_{i,t}$  = one of the outcomes for child  $i$  at age  $t$ ;

$Y_{i,t-m}$  = one of outcomes for child  $i$  at age  $t-m$ ;

$A_{i,t}$  = vector that indicates the different family types, at age  $t$ ;

$Z_{i,t}$  = vector of the control variables of child  $i$  at age  $t$  or before age  $t$ .

The subscript  $m$  is equal to 2 for outcomes at age  $t=7$  (MCS4) since the previous sweep of the Millennium Cohort Study considered five-year-old children (MCS3) and is equal to 4 when estimating the effects at age 11 (MCS5).

Compared to the contemporaneous specification, an additional feature here is the inclusion of a lagged outcome measure as a control variable, which is considered to be a sufficient statistic for unobserved previous inputs and unobservable characteristics of the child, such as unobserved ability. The aim is to control for most of the differences across children when including previous outcomes. This model's main limitation is that the inclusion of a lagged outcome measure as a control variable makes the model highly susceptible to endogeneity bias when data on some relevant independent variables are missing. Moreover, an additional necessary assumption is that the effect of inputs and child's characteristics declines with age at the rate  $\beta_3$ . This model is equivalent to comparing the skills of two children at age 7 (11) who used to have the same outcome at the previous wave, but may have different family typologies in the current one.

#### *The cumulative value-added model (CU-VA)*

With the cumulative value-added model, we estimate the following linear equation with OLS, once for outcomes at age  $t=7$ , once for outcomes at age  $t=11$ :

$$Y_{i,t} = \alpha_t + A'_{i,t}\beta_{1t} + A'_{i,t-m}\beta_{2t} + \beta_{3t}Y_{i,t-m} + Z'_{i,t}\beta_{4t} + \varepsilon_{i,t} \quad (3)$$

Where:

$Y_{i,t}$  = one of the outcomes for child  $i$  at age  $t$ ;

$Y_{i,t-m}$  = one of outcomes for child  $i$  at age  $t-m$ ;

$A_{i,t}$  = vector that indicates the different family types, at age  $t$ ;

$A_{i,t-m}$  = vector that indicates the different family types, at age  $t-m$ ;

$Z_{i,t}$  = vector of the control variables of child  $i$  at age  $t$  or before age  $t$ .

The subscript  $m$  is equal to 2 (4) when we estimate the effects at age 7 (11), including family type and outcomes measured at age 5 (7).

This model includes both information about the previous typology of family and information about the cohort members' cognitive or socio-emotional outcomes at the previous sweep.

The assumptions underlying the model are:

- i) Vector  $Z$  and in  $Y_{i,t-m}$  are good proxies for any unobserved inputs and the child's unobservable characteristics;
- ii) There is no remaining unobserved heterogeneity that correlates with current family typology;
- iii) The effect of unobserved inputs and child's characteristics declines with age at the rate  $\beta_3$ .

This model is equivalent to comparing the skills of two children at age 7 (11) who both used to have the same family type and outcomes at the previous wave, but who may have changed family typology in the current one.

## RESULTS

This section will present the results of the estimation of the models discussed above for the cognitive and socio-emotional outcomes when children were 7 and 11 years old.

A positive coefficient means that family typology is associated with larger behavioural problems for the first four socio-emotional outcomes. Results must be interpreted in the opposite way for the last outcome (i.e., the child's prosocial behaviour), hence a positive coefficient signals a positive relationship between a certain type of family and the child's prosocial behaviour. The reference category is the male-breadwinner one, given that it is the most common one. Results are reported in Tables 3 to 8, showing the estimated coefficients and the corresponding standard errors.

With respect to male-breadwinner families, living in a family in which only the father is working is associated with higher emotional symptom problems. This holds true for the three specifications when children were 7 and 11 years old.

As for conduct problems, we see that living in families where both parents do not work (age 7) is associated with higher conduct problems in the OLS specification. However, the effect vanishes as soon as we control for the outcome's previous values. We do observe an association between past family arrangements, measured in the previous wave: kids whose both parents were not working when they were aged 5 show higher conduct problems at age 7. When children were 11 years old, living in families where both parents do not work is associated with higher conduct problems in all of the models considered, and living in a female breadwinner family is also associated with higher conduct problems, but not in the CU-VA model. Kids whose mothers do not work or who did not work when they were 7 show higher conduct problems at age 11.

The three models provide different suggestions at different ages when estimating the models using peer problems as outcome. Overall, we can say that when the kids were aged 7 and 11, living in families where only the father worked is associated with higher peer problems. When children were 7, we observe a reduction in the peer problems for children living in an equal earner or female breadwinner family, while children whose mother did not work show more peer problems. When kids were aged 11, children living in families where only the mother worked show higher peer problems in all of the specifications.

When kids were 7, all family types are associated with higher hyperactivity problems than the male-breadwinner type – with the exception of the ones where only the mother was working. This effect fades away when we control for the past value of the outcomes, with the exception of female-breadwinner families. No differences are detected if we also include the previous arrangement (column 3), except for children whose mothers did not work. When kids were 11, they showed higher hyperactivity problems and living in female-breadwinner families and families where only the mother or the father works, but only in the contemporaneous inputs model, while children living in living in families where both parents were unemployed, both during the current wave and in the previous wave, show higher hyperactivity problems in the cumulative value-added model. Finally, children living in equal earning families have higher hyperactivity problems; this was detected in all three models.

Finally, consider the outcome variable of whether the cohort member has a prosocial behaviour. When kids were 7, only kids whose parents did not work showed less prosocial behaviour (detected by the contemporaneous input in the first two models and by the previous input in the last one). When kids were 11, only kids living in families where the mother was not working at age 7 showed worse prosocial behaviour.

Considering the measure of cognitive skills, verbal ability, when the kids were 7 years old, the only family type showing significant coefficients is the one in which both parents did not work. In particular, children in such households have a lower verbal ability than their peers in male-breadwinner families when considering the contemporaneous family type, both with the contemporaneous inputs and value-added specification. We see that what matters was having both parents not working in the previous wave for the cumulative value-added one. When the kids were 11, however, no significant coefficients are associated to any contemporaneous or past family typology.

To conclude, it seems that the cohort members with the worst cognitive or socio-emotional outcomes, with respect to households where the male-breadwinner model is in place, are those who live in families where at least one parent was not in work at the time of the interview or during the previous sweep; once both parents work, it does not matter who the main earner is. Children currently living in a female-breadwinner family do not differ substantially from their peers living in a male-breadwinner family: they only show higher hyperactivity issues – in some models – but less peer problems.

In terms of size, the estimated effects for the socio-emotional outcomes vary between 0.04 and 0.34: living in families where at least one of the parents is not working leads to 0.04 and 0.34 standard deviation (s.d.) (negative) difference in behavioural dimensions, with the largest coefficient associated to the families where both parents do not work compared to living in the male-breadwinner families. As we are not aware of studies tackling the research questions exposed in this paper, we can glean some insight of the magnitude of these effects by focusing on studies documenting the impacts of ad hoc interventions targeting socio-emotional outcomes: on average, they find effects of 0.15–0.30 s.d., depending on the programme, the outcome, and the time that elapsed between the



intervention and observed outcome (Algan et al., 2014; Sorrenti et al., 2020; Kosse et al., 2020). The meta-analysis by Durlak (2011), which collected data on school-based programmes expressly and was designed to improve students' social and emotional development, suggests that those ad hoc programs have a mean effect of around 0.2 s.d. on outcomes similar to ours (prosocial behavior, conduct problems, and emotional distress). This suggests two things: first, the family type that children grow up in influences their socio-emotional skills, but that the effect is relatively small compared to what one finds when studying the effectiveness of ad hoc programmes aiming explicitly at improving such skills; second, well-targeted interventions directed towards those children could offset the negative difference detected.

TABLE 3: EMOTIONAL SYMPTOMS.

	OLS- w4	VA- w4	CU-VA- w4	OLS- w5	VA- w5	CU-VA- w5
REF: Male breadwinner, time $t$	-	-	-	-	-	-
Both not working, time $t$	0.10 (0.08)	0.02 (0.07)	0.00 (0.08)	-0.00 (0.10)	0.03 (0.09)	0.10 (0.09)
Only father working, time $t$	0.11*** (0.03)	0.08*** (0.03)	0.08** (0.03)	0.08** (0.04)	0.07** (0.03)	0.08** (0.04)
Equal earners, time $t$	-0.00 (0.04)	-0.00 (0.04)	0.02 (0.05)	0.03 (0.04)	0.01 (0.04)	0.02 (0.04)
Female breadwinner, time $t$	0.05 (0.04)	0.07* (0.04)	0.07 (0.05)	0.00 (0.05)	-0.01 (0.04)	-0.01 (0.05)
Only mother working, time $t$	-0.01 (0.09)	0.02 (0.07)	0.01 (0.08)	0.10 (0.09)	0.09 (0.08)	0.07 (0.09)
Standardised values of emotional time $t-1$		0.46*** (0.01)	0.46*** (0.01)		0.43*** (0.02)	0.44*** (0.02)
REF: Male breadwinner, time $t-1$	-	-	-	-	-	-
Both not working, time $t-1$			0.03 (0.07)			-0.14 (0.09)
Only father working, time $t-1$			0.01 (0.03)			-0.02 (0.03)
Equal earners, time $t-1$			-0.04 (0.05)			-0.03 (0.05)
Female breadwinner, time $t-1$			0.00 (0.05)			0.01 (0.05)
Only mother working, time $t-1$			0.04 (0.08)			0.15 (0.09)
Observations	6,900	6,900	6,900	5,265	5,265	5,265

**NOTE:** The table report the estimates of Equations 1, 2, and 3 when kids were aged 7 (columns 1, 2, and 3) and aged 11 (column 4, 5, and 6) on emotional symptoms. The reference family typology is the male-breadwinner. All of the control variables reported in Section 2.3 are included, but coefficients were not reported. Standard errors in parentheses

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

TABLE 4: CONDUCT PROBLEMS.

	OLS- w4	VA- w4	CU-VA- w4	OLS- w5	VA- w5	CU-VA- w5
REF: Male breadwinner, time $t$	-	-	-	-	-	-
Both not working, time $t$	0.25*** (0.08)	0.06 (0.07)	-0.05 (0.07)	0.30*** (0.10)	0.22*** (0.08)	0.17* (0.09)
Only father working, time $t$	0.03 (0.03)	0.02 (0.02)	0.00 (0.03)	0.10*** (0.03)	0.04 (0.03)	-0.01 (0.03)
Equal earners, time $t$	0.05 (0.04)	0.02 (0.04)	0.02 (0.04)	0.04 (0.04)	0.02 (0.04)	0.03 (0.04)
Female breadwinner, time $t$	0.06 (0.04)	0.05 (0.04)	0.06 (0.05)	0.10** (0.04)	0.06* (0.04)	0.04 (0.04)
Only mother working, time $t$	0.06 (0.09)	0.01 (0.07)	-0.03 (0.07)	0.07 (0.08)	0.03 (0.07)	0.02 (0.07)
Standardised values of conduct time $t-1$		0.49*** (0.01)	0.49*** (0.01)		0.49*** (0.02)	0.49*** (0.02)
REF: Male breadwinner, time $t-1$	-	-	-	-	-	-
Both not working, time $t-1$			0.17*** (0.06)			0.05 (0.09)
Only father working, time $t-1$			0.02 (0.03)			0.09*** (0.03)
Equal earners, time $t-1$			0.01 (0.05)			-0.03 (0.04)
Female breadwinner, time $t-1$			-0.02 (0.05)			0.08 (0.05)
Only mother working, time $t-1$			0.08 (0.07)			-0.02 (0.09)
Observations	6,900	6,900	6,900	5,265	5,265	5,265

**NOTE:** The table report the estimates of Equations 1, 2, and 3 when kids were aged 7 (columns 1, 2, and 3) and aged 11 (column 4, 5, and 6) on conduct problems. Reference family typology is the male-breadwinner. All of the control variables reported in Section 2.3 were included, but coefficients were not reported. Standard errors in parentheses \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

TABLE 5: PEER PROBLEMS.

	OLS- w4	VA- w4	CU-VA- w4	OLS- w5	VA- w5	CU-VA- w5
REF: Male breadwinner, time $t$	-	-	-	-	-	-
Both not working, time $t$	0.21*** (0.08)	0.17** (0.07)	0.09 (0.09)	0.13 (0.09)	0.04 (0.08)	0.01 (0.09)
Only father working, time $t$	0.11*** (0.03)	0.08*** (0.03)	0.06* (0.03)	0.15*** (0.04)	0.09*** (0.03)	0.09** (0.04)
Equal earners, time $t$	-0.07* (0.04)	-0.04 (0.03)	-0.07* (0.04)	-0.03 (0.04)	-0.01 (0.04)	-0.02 (0.05)
Female breadwinner, time $t$	-0.07 (0.04)	-0.06* (0.04)	-0.11** (0.05)	-0.01 (0.05)	-0.00 (0.04)	-0.04 (0.05)
Only mother working, time $t$	-0.01 (0.08)	-0.02 (0.07)	-0.05 (0.07)	0.20* (0.11)	0.20** (0.09)	0.18* (0.09)
Standardised values of peer problems time $t-1$		0.47*** (0.02)	0.47*** (0.02)		0.44*** (0.02)	0.44*** (0.02)
REF: Male breadwinner, time $t-1$	-	-	-	-	-	-
Both not working, time $t-1$			0.12 (0.07)			0.07 (0.09)
Only father working, time $t-1$			0.05 (0.03)			0.00 (0.04)
Equal earners, time $t-1$			0.05 (0.04)			0.02 (0.05)
Female breadwinner, time $t-1$			0.07 (0.05)			0.08 (0.05)
Only mother working, time $t-1$			0.02 (0.08)			0.05 (0.10)
Observations	6,900	6,900	6,900	5,265	5,265	5,265

**NOTE:** The table report the estimates of Equations 1, 2, and 3 when kids were aged 7 (columns 1, 2, and 3) and aged 11 (column 4, 5, and 6) on peer problems. Reference family typology is the male-breadwinner. All of the control variables reported in Section 2.3 were included, but coefficients were not reported. Standard errors in parentheses

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

TABLE 6: HYPERACTIVITY.

	OLS- w4	VA- w4	CU-VA- w4	OLS- w5	VA- w5	CU-VA- w5
REF: Male breadwinner, time $t$	-	-	-	-	-	-
Both not working, time $t$	0.34*** (0.07)	0.09 (0.06)	0.06 (0.07)	0.17** (0.08)	0.09 (0.07)	0.15** (0.08)
Only father working, time $t$	0.08*** (0.03)	0.03 (0.02)	0.04* (0.03)	0.03 (0.03)	-0.03 (0.03)	-0.04 (0.03)
Equal earners, time $t$	0.08* (0.04)	0.03 (0.03)	0.03 (0.04)	0.12*** (0.05)	0.07* (0.04)	0.08** (0.04)
Female breadwinner, time $t$	0.08* (0.04)	0.06* (0.03)	0.07 (0.04)	0.11** (0.04)	0.04 (0.04)	0.03 (0.04)
Only mother working, time $t$	0.12 (0.09)	0.04 (0.07)	0.04 (0.07)	0.19** (0.09)	0.05 (0.07)	0.05 (0.07)
Standardised values of hyperactivity time $t-1$		0.61*** (0.01)	0.61*** (0.01)		0.60*** (0.01)	0.60*** (0.01)
REF: Male breadwinner, time $t-1$	-	-	-	-	-	-
Both not working, time $t-1$			0.04 (0.06)			-0.15* (0.08)
Only father working, time $t-1$			-0.02 (0.02)			0.01 (0.03)
Equal earners, time $t-1$			-0.01 (0.04)			-0.03 (0.04)
Female breadwinner, time $t-1$			-0.02 (0.05)			0.03 (0.05)
Only mother working, time $t-1$			-0.00 (0.06)			0.03 (0.08)
Observations	6,900	6,900	6,900	5,265	5,265	5,265

**NOTE:** The table report the estimates of Equations 1, 2, and 3 when kids were aged 7 (columns 1, 2, and 3) and aged 11 (column 4, 5, and 6) on hyperactivity. Reference family typology is the male-breadwinner. All of the control variables reported in Section 2.3 were included, but coefficients were not reported. Standard errors in parentheses

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

TABLE 7: PROSOCIAL BEHAVIOR.

	OLS- w4	VA- w4	CU-VA- w4	OLS- w5	VA- w5	CU-VA- w5
REF: Male breadwinner, time $t$	-	-	-	-	-	-
Both not working, time $t$	-0.15* (0.08)	-0.14* (0.07)	-0.04 (0.09)	-0.04 (0.09)	-0.02 (0.09)	-0.01 (0.09)
Only father working, time $t$	0.04 (0.03)	0.03 (0.03)	0.05 (0.03)	-0.03 (0.04)	-0.02 (0.03)	0.02 (0.04)
Equal earners, time $t$	-0.04 (0.04)	-0.02 (0.04)	-0.00 (0.05)	0.04 (0.04)	0.04 (0.04)	0.03 (0.04)
Female breadwinner, time $t$	0.00 (0.04)	-0.00 (0.04)	0.04 (0.05)	0.00 (0.04)	0.02 (0.04)	0.02 (0.05)
Only mother working, time $t$	-0.09 (0.09)	-0.10 (0.08)	-0.05 (0.08)	-0.02 (0.09)	-0.04 (0.08)	-0.02 (0.08)
Standardised values of prosocial time $t-1$		0.44*** (0.01)	0.44*** (0.01)		0.43*** (0.02)	0.43*** (0.02)
REF: Male breadwinner, time $t-1$	-	-	-	-	-	-
Both not working, time $t-1$			-0.15* (0.08)			0.00 (0.09)
Only father working, time $t-1$			-0.02 (0.03)			-0.07** (0.04)
Equal earners, time $t-1$			-0.02 (0.05)			0.01 (0.05)
Female breadwinner, time $t-1$			-0.06 (0.06)			-0.01 (0.05)
Only mother working, time $t-1$			-0.09 (0.08)			-0.12 (0.09)
Observations	6,900	6,900	6,900	5,265	5,265	5,265

**NOTE:** The table report the estimates of Equations 1, 2, and 3 when kids were aged 7 (columns 1, 2, and 3) and aged 11 (column 4, 5, and 6) on prosocial behavior. Reference family typology is the male-breadwinner. All of the control variables reported in Section 2.3 were included, but coefficients were not reported. Standard errors in parentheses  
\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

TABLE 8: VERBAL ABILITY.

	OLS- w4	VA- w4	CU-VA- w4	OLS- w5	VA- w5	CU-VA- w5
REF: Male breadwinner, time <i>t</i>	-	-	-	-	-	-
Both not working, time <i>t</i>	-0.28*** (0.08)	0.22*** (0.07)	-0.10 (0.08)	-0.12 (0.09)	-0.08 (0.09)	-0.06 (0.10)
Only father working, time <i>t</i>	-0.04 (0.03)	-0.03 (0.03)	-0.03 (0.03)	-0.03 (0.04)	-0.00 (0.03)	-0.01 (0.04)
Equal earners, time <i>t</i>	0.03 (0.04)	0.05 (0.04)	0.06 (0.05)	0.02 (0.05)	0.03 (0.05)	0.03 (0.05)
Female breadwinner, time <i>t</i>	-0.03 (0.04)	-0.04 (0.04)	-0.03 (0.06)	-0.01 (0.05)	-0.00 (0.04)	-0.03 (0.05)
Only mother working, time <i>t</i>	-0.00 (0.09)	-0.00 (0.09)	0.05 (0.09)	0.06 (0.09)	0.09 (0.09)	0.09 (0.09)
Standardised values of verbal ability time <i>t-1</i>		0.29*** (0.01)	0.29*** (0.01)		0.24*** (0.02)	0.24*** (0.02)
REF: Male breadwinner, time <i>t-1</i>	-	-	-	-	-	-
Both not working, time <i>t-1</i>			-0.18** (0.08)			-0.08 (0.09)
Only father working, time <i>t-1</i>			0.01 (0.03)			0.02 (0.04)
Equal earners, time <i>t-1</i>			-0.02 (0.05)			0.00 (0.05)
Female breadwinner, time <i>t-1</i>			-0.01 (0.06)			0.08 (0.06)
Only mother working, time <i>t-1</i>			-0.10 (0.08)			0.00 (0.10)
Observations	6,900	6,900	6,900	5,265	5,265	5,265

**NOTE:** The table report the estimates of Equations 1, 2, and 3 when kids were aged 7 (columns 1, 2, and 3) and aged 11 (column 4, 5, and 6) on verbal ability. Reference family typology is the male-breadwinner. All of the control variables reported in Section 2.3 were included, but coefficients were not reported. Standard errors in parentheses  
\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

## CONCLUSIONS

In this paper, we studied how growing up in different family types contributes to children's cognitive and socio-emotional development. We considered six different types of family arrangements: both parents do not work, only the father/mother works, both parents work and earn a similar share of money, and where both work and the father/mother earns more than the partner.

Using data from the Millennium Cohort Study allowed us to use three different models: contemporaneous inputs only (i.e., where we controlled for a series of background characteristics and current family arrangement), value-added model (i.e., where we added past outcomes to the controls), and cumulative value-added model (i.e., where we also added past family arrangements to the equation). We used one measure of cognitive skills (verbal ability) and the five measures of behavioural skills derived from the Strengths and Difficulties Questionnaire: emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems and prosocial behaviour, measured when the children were aged 7 and 11 as main outcomes.

Overall, our main findings showed that the cohort members with the worst cognitive or socio-emotional outcomes, with respect to households where the male-breadwinner model was in place, are those who live in families where at least one parent was not in work at the time of the interview or during the previous sweep. It does not matter who is the main earner once both parents work. Finally, children currently living in a female-breadwinner family do not differ substantially from their peers who live in a male-breadwinner family: they only show higher hyperactivity and conduct issues, but fewer peer problems.



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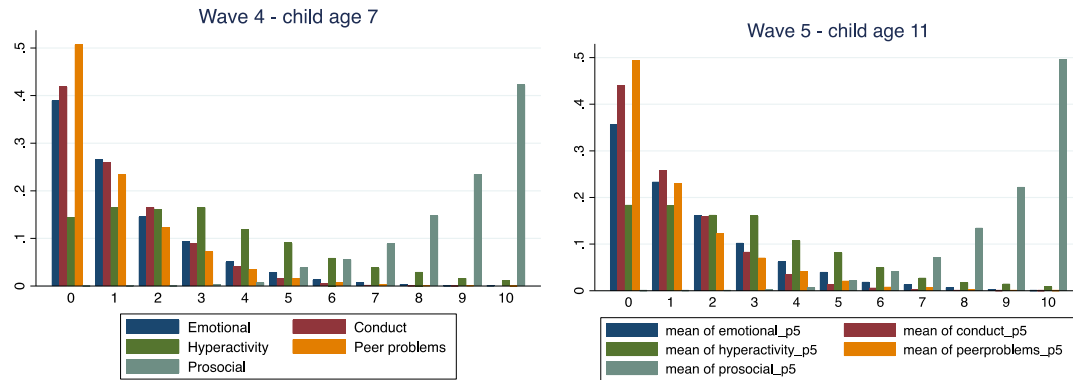
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# Appendix

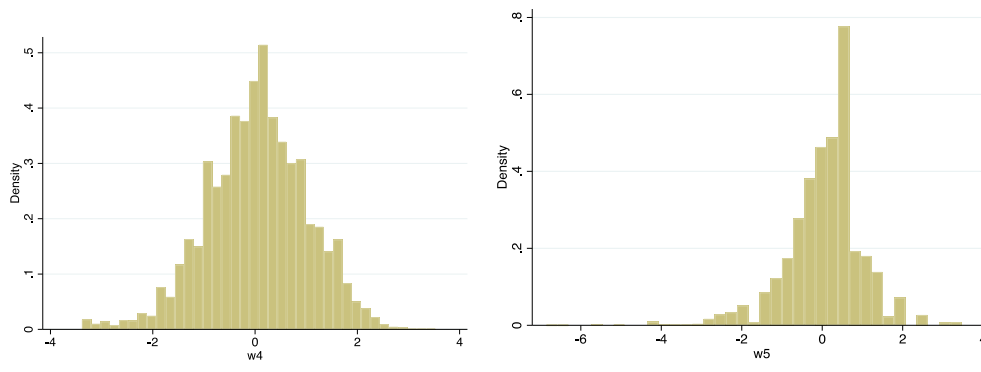
## APPENDIX A: ADDITIONAL FIGURES

FIGURE A.1: SOCIO-EMOTIONAL OUTCOMES DISTRIBUTION.



**Note:** Children’s socio-emotional skills. The five colours represent the five socio-emotional indicators (emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems, and prosocial behaviour). Each indicator goes from 0 to 10, depending on the answers that the caregivers gave to the five questions about each child’s socio-emotional dimension. 0 means ‘absence of problems’ and 10 ‘presence of all problems’ for the first four indicators, whereas 10 means ‘absence of problems’ and 0 ‘presence of all problems’ for prosocial behaviour.

FIGURE A.2: COGNITIVE OUTCOME DISTRIBUTION.



**Note:** Children’s cognitive outcomes, measured by reading ability in wave 4 and by verbal ability in wave 5.

## APPENDIX B: CONSTRUCTION OF THE INCOME VARIABLE

In the survey, both parents were asked to state their employment status and their gross and net salary. More precisely, the variables related to earned income report cohort members’ parents pay in their main job in wave 3 to 5. However, there is not always correspondence between the variable about the employment status and the variables

relative to earnings. So, there can be respondents who state that they are in work at the time of the interview, but who do not disclose their wage and informants who say that they are not working, but who still report a positive wage. We decided to give priority to the employment status dummies when building our definitions. Namely, we defined the first three typologies of family, where at least one parent is unemployed, based on those dummies without looking at the salary.

TABLE B.1: TAX RATES AND INCOME BANDS IN UK AT EACH SWEEP.

<b>Years</b>	<b>Tax rates</b>	<b>Amount (%)</b>	<b>Income bands (£, annual)</b>
2001/2002 (MCS1)	Starting rate	10	0 – 1,880
	Basic rate	22	1,881 – 29,400
	Higher rate	40	Over 29,400
2004/2005 (MCS2)	Starting rate	10	0 – 2,020
	Basic rate	22	2,021 – 31,400
	Higher rate	40	Over 31,400
2006/2007 (MCS3)	Starting rate	10	0 – 2,150
	Basic rate	22	2,151 – 33,300
	Higher rate	40	Over 33,300
2008/2009 (MCS4)	Starting rate	-	-
	Basic rate	22	0 – 34,800
	Higher rate	40	Over 34,800
2011/2012 (MCS5)	Starting rate	10	0 – 2,710
	Basic rate	20	2,711 – 35,000
	Higher rate	40	35,001 – 150,000
	Additional rate	50	Over 150,000

It is possible to define the family types where both parents work. In the survey, respondents were asked about their gross and net salary, but not all parents reported values for both measures. Moreover, they were not asked to provide the pay earned over a specific time period, and this resulted in having amounts referring to many different time frames, ranging from one hour to one year (overall, the reference period “Calendar month” is the most common one, followed by weekly and annual salary). Hence, in order to be able to compare mothers’ and fathers’ earnings, we created a variable representing their gross monthly salary as follows for each respondent.

First of all, we transformed all salaries into the corresponding monthly amount, obtaining values for the monthly gross and net salary.

Then, for those respondents who did not state their gross wage, we used their net salary, if any, to retrieve the corresponding gross value by adding the income tax. Table A.1 summarises the tax rates and the income bands for the years of interest. Note that the starting rate at MCS5 was not used because it applies only to savings income.

Starting from the net income declared by the respondents, we computed the monthly gross salary for each income band. Then, by summing the amounts across bands, we obtained the value for the monthly gross salary for each parent. This allowed us to retrieve approximately 1%-2% observations at each wave.

Moreover, some respondents also reported their self-employed income, hence we added it as well to the previous sum. Similarly to the gross monthly salary, computed starting from the net salary, the self-employed income is assigned only to those respondents who did not report a value for their gross salary in the questionnaire.

Once there is a value (either positive or equal to zero) in the dataset for the gross monthly salary of each parent, then it is possible to categorise the remaining families according to the parents’ relative earnings in the categories discussed in section 2.1. At this stage, there is one additional category with respect to those summarised in Table 1; namely, families where both parents work, but at least one of them does not disclose their salary, making their classification impossible. This category accounts for 9%-15% of families in the last three waves, hence their share is not irrelevant.

In order to reduce the number of families in this category, we decided to classify such households as male-breadwinner families if the female, who reports no salary, states that she is in work at the time of the interview, but at the same time answers “Not applicable” to the variable “Main – Employment status in job”, instead of answering “Employee” or “Self-employed” and answers to the questions on job search, this means that she was not working at the time of the interview. In so doing, we reduced the percentage of families in this residual category by approximately 1 percentage point.

Finally, given the dataset’s panel structure, it is possible to further decrease the number of families where both parents state of being in work, but at least one of them does not report the salary. Indeed, starting from the second sweep, it is possible to assign the salary they declared at the previous wave to such respondents, if any. If, by doing so, both working parents now have a positive salary, then it is possible to compare their wages to define the family typology (either male-breadwinner, equal earners, or female-breadwinner households). Since the salary from the previous sweep is an approximation, we decided to reclassify the type of family from the residual one to the three stated above only if the typology resulting at the “new” wave is the same as the one from the previous sweep. This translated into halving the size of the residual category. The remaining observations in this group were dropped.

We obtain the sample described in Table 1 once those families where at least one of the outcomes of interest or a control variable that we considered important (e.g. household income) is missing at one of the last three sweeps are dropped.

#### APPENDIX C: OUTCOMES AND CONTROL VARIABLES DETAILS

##### *Cognitive outcomes*

The Naming Vocabulary is a test taken from the Early Years battery aimed at assessing the spoken vocabulary of children. It consists of a book of coloured pictures of objects that the child is shown one at a time and asked to name. The scale measures expressive language ability, and successful performance depends upon the child’s previous development of a



vocabulary of nouns. Picture recognition is also crucial, but the pictures are large and brightly coloured and are unlikely to cause problems except for children with major visual impairments or with no experience of picture books. The items require the child to recall words from long-term memory, rather than to recognise or understand the meaning of words or sentences.

The Word Reading is a test aimed at assessing children's reading ability taken from the School Age battery. The child is asked to read some words aloud to the interviewer. Words are organised into nine blocks of ten words each in ascending order of difficulty, for a total of 90 words. All of the children in MCS4 started at the first item, as this was the starting point for children of their age, but then the cohort member's progression through the test depends on the number of words read correctly; indeed, if a child makes eight errors in a single block, then the assessment stops.

Finally, the Verbal Similarities Test (School Age battery) is aimed at assessing children's verbal reasoning and verbal knowledge. The test is such that the interviewer reads out three words to the child who must then say how the three things are similar or go together. All of the children in MCS5 start at the 16<sup>th</sup> item, as this was the starting point for 11-year-old children. There are decision points after items 28 and 33 where the child's performance up to that point decides whether the test stops or continues to the next set of questions. The test stops at the decision point unless the child has fewer than three failures on all items so far. In this case, they are routed to the next set of questions. If the child has obtained fewer than three passes, however, they are routed back to the previous starting point.

#### *Non-cognitive outcomes*

The SDQ version used in the MCS is the one that has to be answered by the child's mother. Specifically, they had to comment with "Not true" (=1), "Somewhat true" (=2), and "Certainly true" (=3) on the following statements referring to their child:

- i) Emotional Symptoms Scale
  - Complains of headaches/stomach aches/sickness
  - Often seems worried
  - Often unhappy
  - Nervous or clingy in new situations

- Many fears, easily scared
- ii) Conduct Problems
  - Often has temper tantrums
  - Generally obedient\*
  - Fights with or bullies other children
  - Can be spiteful to others
  - Often argumentative with adults
- iii) Hyperactivity Scale
  - Restless, overactive, cannot stay still for long
  - Constantly fidgeting
  - Easily distracted
  - Can stop and think before acting\*
  - Sees tasks through to the end\*
- iv) Peer Problems
  - Tends to play alone
  - Has at least one good friend\*
  - Generally liked by other children\*
  - Picked on or bullied by other children
  - Gets on better with adults
- v) Pro-social Scale
  - Considerate of others' feelings
  - Shares readily with others
  - Helpful if someone is hurt, upset or ill
  - Kind to younger children
  - Often volunteers to help others

The answers to each question are combined within each group to generate a single total score ranging from 0 to 10 for each group (the score of items denoted with \* is reversed when generating the overall score). The groups of five answers are combined into a single total score for each socio-emotional dimension, ranging from 0 to 10.

### *Control variables*

#### 1. Neuroticism sub scale

The neuroticism (=tendency to experience negative emotions) sub scale is derived using the sum of the valid responses to the following questions (categorical variables): do I get stressed out easily?, do I get angry easily?, do I feel threatened easily?, do I get overwhelmed by emotions?, do I take offence easily?, do I get caught up in my problems?, and do I grumble about things?

#### 2. Extrovert sub scale

The extrovert sub scale is derived using the sum of the valid responses to the following questions (categorical variables): do I take charge?, do I talk a lot?, do I talk to a lot of different people at parties?, do I bottle up my feelings? (reversed), am I s very private person? (reversed), do I wait for others to lead the way? (reversed), do I feel at ease with people?, and am I skilled in handling social situations? Both the neuroticism and the extrovert subscales are a simplified version of the NEO Five-Factor Inventory, aimed at assessing the so-called Big Five personality traits of the OCEAN scale (openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism). The NEO FFI is composed of 60 items measured on a 5-points scale, but they considered only 7 items for the neuroticism subscale and 8 items for the extrovert one in the MCS. Hence, their scores range between 8/7 and 40/35. High scores signal emotional instability and recklessness, while low scores signal lack of emotion and social isolation respectively for both scales.

#### 3. Parental mental health variables

These variables are measured at each wave with the Kessler K6 Scale (see Kessler et al., 2003). In particular, they are derived by summing, for each parent, the reversed scores to the following questions (categorical variables): during the last 30 days, about how often:

- did you feel so depressed that nothing could cheer you up?
- did you feel hopeless?
- did you feel restless or fidgety
- did you feel that everything was an effort?
- did you feel worthless?

- did you feel nervous?

Each item is coded 0-4, with 4 corresponding to “all of the time” and 0 corresponding to “none of the times”. Hence, the scale ranges between 0 and 24, with lower values signalling mental health problems.