
Working Paper Series

32/17

USE OF EXTRA-SCHOOL TIME AND CHILD NON-COGNITIVE DEVELOPMENT. EVIDENCE FROM THE UK

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Use of extra-school time and child non-cognitive development

Evidence from the UK

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Abstract

Increasingly, scientists from different disciplines have dedicated their efforts to understand how childhood conditions influence the development of an individual. School and family play a role in this process. More prepared and motivated children today lead to more successful adults tomorrow, in the labor market as well as in all other life dimensions (health, civic participation, parenthood responsibilities), with benefits for the whole society. Between the end of school-day and bedtime, time can be used for more or less structured activities, with other children and adults. Very little is known on how children from different families spend this time and which consequences it can have on their development and wellbeing; nothing is known on how participation in extra-curricular activities depends on offer and prices. Evidence from US shows that participation in extra-curricular activities is becoming, together with other traits (family stability, parenting style, economic and cultural resources), a further distinctive of diverging destinies of “our kids”. Children from more advantaged families have access to better opportunities in their extra school time, potentially increasing inequality. Yet there is no study in Europe that addresses this issue. We contribute to the topic by studying the relationship between the use of extra-school time and child non-cognitive development, using UK longitudinal data. We find that different extra-school activities influence the behavioural dimension of the child. Time with parents, time spent in household chores, and sport have beneficial effects while time spent on TV and computer have detrimental effects. The dimension which appears more easily influenced is the prosocial behaviour of the child.

Keywords: child time use, extra-curricular activities, non-cognitive skills, Strengths and Difficulties questionnaire, longitudinal data, Millennium Cohort Study

JEL codes: J13, D1

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1. Introduction

Increasingly, in the last years, scientists from different disciplines have dedicated their efforts to understand how childhood conditions influence the development of an individual. The school and the family play a role in this process, by making children able to fully enhance their potential abilities.

In particular, interest has grown in the role of early care: “good” inputs when the child is under the age of 3 have been shown to be very effective. “A return to society of more than \$17 for every dollar invested in the early care and education program” is documented in one of the most-cited evaluation studies on the Perry Preschool, an educational program targeted to children from disadvantaged family backgrounds in the US (Heckman et al., 2010). Consequently, much of the literature has studied the impact of different kinds of care in the first years on later child outcomes, in particular by comparing the effects of maternal care, institutionalized care in crèches, and care provided by grandparents (Ruhm, 2004; Brilli et al., 2016; Del Boca et al., 2017). Over time and across regions there has been considerable heterogeneity in the way very young children are looked after, given the differences in the labor market participation of women, in the availability of crèches, in social policies, and in the geographic proximity of grandparents.

After the age of 3, about 85% of children in Europe are enrolled in kindergarten or pre-school (OECD, 2014). However, apart from differences in the quality of schools attended, whose effects have been already thoroughly investigated, children are exposed to other heterogeneous sources of development opportunities. In particular, between the end of the day at school and bedtime at home, there is lag of time which can be used for more or less structured activities: for example, doing sport in a team rather than playing freely in the park. Children can take part in these activities together with other children (mates, siblings, cousins) or with other adults (non-working parents, grandparents, instructors).

Very little is known on how children from different family backgrounds spend this time and what consequences it can have on their development and wellbeing. Moreover, little is known about the determinants of children’s participation in extra-curricular activities (such as sport, foreign languages and music). Most of these activities are not for free, so a child’s participation may depend on the parents’ preferences, time and income constraints, the child’s own inclinations and talents, and even on what activities the child’s peers take part in. Parents may hold different beliefs about the importance of these extra-curricular activities for their children; alternatively, even if convinced of their values, they may not be able to afford them or manage the logistics. For example, they may not have the time to shuttle the child from school to a certain activity, and they may not want (or not be able to afford to have) someone else do it in their stead. In families with children of different

ages, the situation is even more complicated. It is thus easy to expect that children from different family backgrounds have access to different opportunities. Evidence from US shows that inequality in opportunities is increasing across children, making the American dream less and less realistic. Children's lives and learning opportunities are strongly determined by the family in the form of marital stability, supportive parenting style, economic and cultural resources. Participation in extra-curricular activities is becoming a further distinctive of these diverging destinies (Putnam, 2015).

Another issue is how the use of extra-school time influences child development and wellbeing. Are extra-curricular activities good for children? If so, is it a waste of time letting children engage in free, unorganized play? Is it important to take advantage of how easily young children learn (foreign languages, for example) and to keep children "busy" in extra-curricular activities? Or do children need their spare time to remain spare? This is an important issue, given the potential consequences that different use of time may have on children's quality of life, cognitive and non-cognitive development, which undoubtedly affects their future wellbeing, employability, and welfare use. It is also an important issue for parents who have to juggle work and school schedules at the beginning of each school year.

Despite the potential heterogeneity in the use of extra-school time, there is no comprehensive study in Europe on their implications for child development and wellbeing. The only (non-European) studies are those by Hofferth and Sandberg (2001) (with American data) and by Fiorini and Keane (2014) (with Australian data). Hofferth and Sandberg (2001) use data from the 1997 Child Development Supplement to the Panel Study of Income Dynamics (around 2,000 children aged 0-12) and find that learning activities such as reading are positively correlated with higher achievement, as is structured time spent playing sports or social activities; time spent eating meals with the family is associated with fewer behavioural problems. Fiorini and Keane (2014) use time-diaries from the Longitudinal Study of Australian Children (around 1,300 children aged 4-9) to study the trade-off between benefits among alternative activities. The result of their research is a ranking of time inputs (from the most to the least productive): time spent in educational activities, particularly with parents, is the most productive input for cognitive skill development. Different models are used to assess causality and the results show that the ranking is robust across all models. Regarding single activities, very few studies have focused on the effects of time spent reading, using a personal computer, watching TV, using a mobile phone, learning a musical instrument, or participating in religious activities. The majority of studies instead look at the effect of taking part in sports, and among these, most use American data, reflecting the traditional importance of sport in American schools and colleges. However, such studies fail to address the question of the substitute activity, or the "trade-off" in the words of Fiorini and Keane (2014): we know, for example, that

doing sport is good... but which is the counterfactual? What else would be better or worse? And compared to what other outcomes? How can the value of extra-school activities be ranked so as to best advise parents, educators, and policy makers?

We contribute to the topic by studying the relationship between the use extra-school time and child non-cognitive development, using UK longitudinal data. We will use available information on child assessments and on child time use up to age 11 from the Millennium Cohort Study. At the European level, the Millennium Cohort Study is the best source of information currently available by tracking the lives of a sample of about 19,000 babies born in the UK in the year 2000/2001. The dataset has two great advantages: many of the questions and child indicators are repeated over time, and it provides ample information about the child and the family from the time of the birth, information that may prove important to control for. We will follow the model proposed by Todd and Wolpin (2003, 2007) and investigate different human capital production functions, controlling for lagged outcome, and a large set of current and lagged inputs. We focus mainly on non-cognitive outcomes, such as emotional symptoms, conduct problem, hyperactivity/inattention, peer problems and prosocial behaviour.

The paper is organized as follows: in Section 2 we describe the Millennium Cohort Study, the selection of the sample, and the variables used through the analysis; in Section 3 we present the methods employed for the empirical analysis; Section 4 comprises the results. Conclusions follow (Section 5).

2. Data and sample selection

The Millennium Cohort Study is a longitudinal survey conducted by the Centre for Longitudinal Studies, which tracks the lives of a sample of about 19,000 babies born in the UK in the year 2000/2001. The survey is conducted in different waves, with the first one concentrating on the circumstances of pregnancy and birth, the first few months of life, and the socio-economic background of the family into which the child is born. Families and children were re-interviewed when the cohort-child reached about 3, 5, 7, and 11 years of age.

The initial sample in wave 1 is composed by 18,818 children in 18,552 families; interviews took place when children were roughly 9 months old. Not all families participated for the entire duration of the survey: we lose around 10% of the sample between the second and third wave and another 10% percent between the third and the fourth wave and slightly less between the fourth and the fifth wave. We exclude twins; in each of the two waves considered for the outcomes (fourth and fifth) we focus on the sample of children for which we have completed information up to that wave. Our

final samples consist of roughly 10,900 children in wave 4- children aged 7- and 9,590 in wave 5 – children aged 11 (Table A1, in Appendix).

The study has repeated measurements of child's cognitive and non-cognitive outcomes and contains rich information about parental socio-economic background, employment status, child care arrangements, and specific parental inputs at various points in time. Of particular interest for the present research are the variables reporting extra-curricular activities and indicators of the child's development and wellbeing when she/he is 5, 7 and 11 years old.

We will focus on non-cognitive outcomes, in particular on outcomes derived from the strength and difficulties questionnaire. The questionnaire is composed of 25 items that ask to the parents about behavioural attributes of the child and are combined to form five subscales (composed of 5 items each). The subscales measure emotional symptoms, conduct problems, hyperactivity/inattention, peer relationships, and prosocial behaviour.

The *emotional symptoms* subscale contains items referring to fears, worries, misery, nerves, and somatic symptoms; the *conduct problems* subscale inquiries about tantrums, obedience, fighting, lying, and stealing; and the *hyperactivity/inattention* subscale covers restlessness, fidgeting, concentration, distractibility, and impulsivity. The *peer relationships* subscale items include questions about popularity, victimization, isolation, friendship, and ability to relate to children as compared to adults. The *prosocial* subscale covers consideration of others, ability to share, kindness to younger children, helpfulness when other children are distressed, and willingness to volunteer to comfort.

The original subscales vary between 0 and 10.⁴ For all the subscales except the prosocial subscale, high scores indicate difficulties. As the prosocial items ask about the presence of prosocial behaviour, the subscale measures the strengths of the child in this area, and increasing scores represent increasingly prosocial behaviour, unlike the other sub-scales where increasing score represents increasing impairment. The distributions of the outcomes when children are aged 7 and 11 are reported in Figure 1. In the Figure we notice that, for each of the outcomes, roughly 30 to 40% of children do not show any problem (an exception being hyperactivity where almost everybody show to have some problems).

We decided to further recode these variables into dummies, which take value 1 if the child has a score greater than 0 (for the prosocial subscale we create a dummy taking value 1 if the child has a value lower than 10, so the dummy takes value 1 if the child has some problems in the prosocial

⁴ The strength and difficulties questionnaire is composed by 25 questions about the child that parents fill in. To each item the parent can reply if the statement is "Not true"; "Somewhat true" or "Certainty true", and respectively a score of 0, 1 or 2 is assign to each item. Each subscale is the sum of the points given in the 5 item, and thus varies between 0 and 10, but it cannot be read as an ordinal categorical variable.

sphere, so the interpretation is in line with the remaining variables: increasing score represents increasing impairment). Summary statistics about the recoded outcome variables are presented in Table 1.

The main independent variables in our analysis are the extra school activities taken by children in their free time. In the data we have information about the following activities: play a musical instrument, go to the library, attend religious service or class, do sport or physical activities, do sport with friends or siblings, spend time with friends, do household chores, look after old people, watch TV, use computer or electronic games, play sport or physically active games outdoors with parents, play with parents indoor, use a bike, talk to parents. In wave 4, we also have several other activities done with the parents: parents read to the child, parents play music with the child, parents draw with the child. Descriptive statistics are presented in Table 2. Most of the activities are dummies, which take value 1 if the child does the activities at least once per week and 0 otherwise, unless differently specified in Table 2.⁵

The interpretation of results with so many variables of interest can be hard and some of the reported variables are likely to capture types of activities that are relatively similar to each other; thus, we implement a principal component analysis (PCA), aimed at developing better insight into the number of common latent dimensions that the different activities may share.

Given the binary nature of the variables, we use polychoric correlations to construct the covariance matrix from which the eigenvalues and eigenvectors are calculated. To choose the number of components retained, we apply the Kaiser criterion, selecting a number of components equal to the number of eigenvalues greater than 1. Finally, to facilitate the interpretation of the extracted components, we rely on orthogonal rotation using the varimax approach.

In wave 3, we obtain four components, while in wave 4 and 5 we obtain six components. We summarize in Table A2 the grouping of activities in the different components, which we named: 1) Library & Religious; 2) Sports; 3) Activities with parents; 4) TV & Computer; 5) Household chores; 6) School.

3. Empirical methods

The Millennium Cohort Study contains many indicators of child development and ample child/family information. The MCS is not ideal in the way time-use information is collected, since it fails to indicate what children do when not involved in the asked activities. However, it does have

⁵ We tried three different specifications, including activities as dummy variables (doing a certain activity at least once per week), as continuous variables (number of days in a month doing a certain activity), and as dummy variables, assigning value 1 if the child was doing the activity more than the mode (e.g. assume the mode for doing sport is 1 per day, we assign 1 to all the children doing sport at least once per day, 0 otherwise). Results are pretty stable independently on the definition used.

two great advantages: the availability of measures of child indicators over time, and the incredible supply of variables concerning child and family background that can represent important confounding factors. Suppose, for example, that more extroverted mothers engage their children more frequently in structured activities with other children (like sport in team or reciting in a theatre). We can expect that children of more extroverted parents are also more social (it could be the case that parents have often friends for dinner at home, for example). Omitting parents' habits information could lead to overestimation of the true effect of sport on child's pro-social behaviour. Being able to analyse data with such a rich battery of potential confounding factors is a great advantage. We will follow the model proposed by Todd and Wolpin, (2003, 2007) and investigate different human capital production functions. We start with an OLS using contemporaneous input, and we subsequently include lagged input and lagged output. This complete model can be written as:

$$Y_{ija} = f(A_{ija}; A_{ijt-1}; Y_{i,t-1}; X_{ija})$$

Where child i 's outcome in household j at age a (Y_{ija}) is a function of activities A at age a (A_{ija}); of past activities (A_{ijt-1}); of past outcomes ($Y_{i,t-1}$); and of present and past household and schools inputs (X_{ija}). Information on child outcomes is taken at age 7 and 11 (time t), information on extra-school time at age 5, 7 and 11, while control variables are taken from the interview after childbirth onward.

We first estimate the following equation:

- (i) $\text{child_social}_t = f(\text{extra-school time}_t, \text{extra-school time}_{\text{before}_t}, \text{child_social}_{\text{before}_t}, \text{control variables})$

With model (i) we add information of past use of time of the child (allowing to have a "lagged" effect) and information on child's starting level, which can control for most of the differences across children. This model is equivalent to compare the prosocial behaviour of two children at age 11 who used to have similar prosocial behaviour at age 7, but may have use their time in a different way between age 7 and 11.

Then, we exploit the panel nature of the data, by also estimating the following equation:

- (ii) $(\text{child_emotional}_t - \text{child_emotional}_{t-3}) = f((\text{extra-school time}_t - \text{extra-school time}_{t-3}), \text{control variables}_0)$

With model (ii), with child fixed-effects, we exploit within child information: we observe whether a change in extra-school time use between age 7 and 11 explains part of the difference in his/her prosocial dimension over time, cleaning out the effect of child's preferences and talents.

We include different subsets of **control** variables. We consider a number of variables that describes the environment that children face when not in school and not involved in the extra-curricular activities, which we call "*counterfactual*". "Counterfactual" variables are measured at the current wave (at age 7 and 11). We distinguish between variables related to schools (time dedicated to homework, whether child attends before or afterschool clubs, whether the child attends extra classes in school related subject, outside school normal time) and variables related to the household (presence in the household of the mother, the father, siblings, the grandparents, number of hours worked by the mother and the father). A second set of variables takes into consideration previous *parental investments* (before age 7), related to things done by the parents when the child was younger and that can have an influence on current outcomes. These variables include: whether the child was breastfed, how long the mother stayed at home after birth, type of childcare when the child was 30 months, and father involvement with the child when the child was 9 months.

We also include pure control variable, distinguishing between controls about the *child* and controls about the *parents* and the *household*. Controls about the child are measured at wave 1: gender, nationality, birth weight, age at first interview, number of hospitalizations and accident during the first year, number of siblings in wave 1, three indicators of behavioural development at wave 1 (child express himself through hands; child can sit, stand, walk; child can pick, grab). Controls about the *parents* and the *household* are the following ones: level of education of the parents, locus of control of the mother (wave 1), child-parent relationship (wave 2), parental personality type and parental mental wellbeing (current wave), presence of new born siblings (current wave), household equivalent income (current wave), household location (England, Scotland, Wales, Northern Ireland), and whether the child has been on holidays outside the UK in the past year.

Finally, we include one variable measuring the child's cognitive ability at the current wave, which is calculated through a factor analysis of the three variables capturing cognitive performance Table A3, in Appendix): naming vocabulary, pattern construction and picture similarity in wave 4 (age 7); and word reading standard, pattern construction and math standards in wave 5 (age 11). Tables 3-5 report the descriptive statistics about all the control variables.

4. Results

The effects of the extra-school activities (summarized through factors) on child behaviour are presented in Tables 6-10. Hereafter, the main significant effects are summarized. We do not refer to

the sign of the results, but to their interpretation: with “positive” we refer to a reduction of emotional/conduct/hyperactivity/peer problems, and to an improvement in prosocial behaviour, while with “negative” we refer to an increase in problems and to a reduction in prosocial behaviour. Having a higher value of the factor “activities with parents” is associated with higher prosocial behaviour and less hyperactivity. Children with high value of the factor “sport” have fewer peer problems and higher prosocial behaviour. Children who take part in “household chores” have fewer conduct problems and better prosocial behaviour. Having a higher value of the factor “TV & Computer” is associated with negative consequences: more emotional problems and worse prosocial behaviour.

5. Conclusions

In this paper, we study the relationship between the use of extra-school time and child non-cognitive development, using UK longitudinal data. We find that different extra-school activities influence the behavioural dimension of the child. Time with parents, time spent in household chores, and sport have beneficial effects while time spent on TV and computer have detrimental effects. The dimension which appears more easily influenced is the prosocial behaviour of the child.

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Tables & Figures

Figure 1: Distribution of the 5 considered outcomes in the two relevant waves

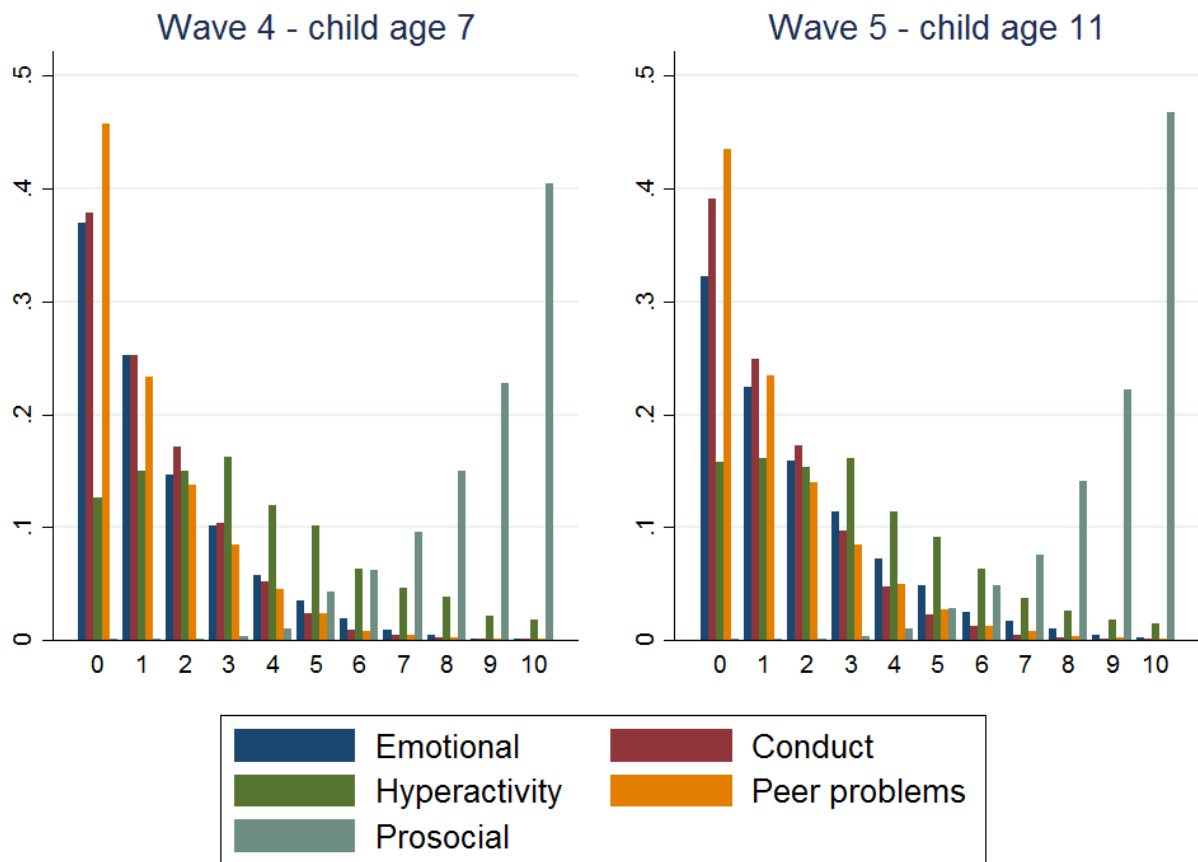


Table 1: Summary statistics – non-cognitive outcomes

	Wave 4			Wave 5		
	Obs.	Mean	Sd	Obs.	Mean	Sd
Emotional problems	10,597	0.62	0.48	9,462	0.67	0.47
Conduct problems	10,597	0.62	0.49	9,462	0.60	0.49
Hyperactivity problems	10,597	0.87	0.33	9,462	0.84	0.37
Peer problems	10,597	0.53	0.50	9,462	0.56	0.50
Prosocial behaviour	10,597	0.59	0.49	9,462	0.53	0.50

NOTE: In the Table we present summary statistics- number of observations, mean value and standard deviation - on the outcomes we consider: columns 1&2&3 refer to age 7 and columns 4&5&7 to age 11.

Table 2: Summary statistics - activities

	Wave 3		Wave 4		Wave 5	
	Obs.	Mean	Obs.	Mean	Obs.	Mean
Library (1 pw)	10,597	0.09	10,597	0.08	9,462	0.08
Religious service (1 pw)	10,597	0.19	10,597	0.21	9,462	0.20
Sport-physical activities (1 pw)	10,597	0.27	10,597	0.44	9,462	0.77
Sport-physical with parents (1 pw)	10,597	0.70	10,597	0.78		
Parents read to child (1 pw)	10,597	0.95	10,597	0.90		
Parents tell story (1 pw)	10,597	0.56	10,597	0.46		
Parents play music (1 pw)	10,597	0.87	10,597	0.77		
Parents draw (1 pw)	10,597	0.66	10,597	0.44		
Parents play sports active games (1 pw)	10,597	0.60	10,597	0.50	9,462	0.30
Parents play indoors (1 pw)	10,597	0.86	10,597	0.69	9,462	0.45
Parents to the park-playground (1 pw)	10,597	0.61	10,597	0.50		
Watch tv/videos (1 h pd)	10,597	0.79	10,597	0.80	9,462	0.83
Uses computer (1 h pd)	10,597	0.22	10,597	0.35	9,462	0.45
Read (1 pw)			10,597	0.83		
Club (1 pw)			10,597	0.14		
Sport-physical with friends (1 pw)			10,597	0.94	9,462	0.91
HH chores (1 pw)			10,597	0.79	9,462	0.79
Homework (1 h pd)			10,597	0.66	9,462	0.85
Extra classes (1 pw)			10,581	0.05	9,442	0.19
Plays a music instrument (1 pw)					9,462	0.42
Bike (1 pw)					9,462	0.50
Look after elderly fam members (1 pw)					9,462	0.09
Parents talk to child (1 pw)					9,462	0.97

NOTE: In the Table we present summary statistics- number of observations and mean value - on the extra school activities done by children at age 5 (columns 1&2), age 7(columns3&4) and age 11 (columns5&6). In brackets we show intensity of each activity: “1pw” stand for “At least once per week”; “1h pd” stands for “At least one hour per day”; “1 pd” stands for “At least once per day”.

Table 3: Summary statistics - counterfactual at time t

	Wave 4		Wave 5	
	Obs.	Mean	Obs.	Mean
Mother present	10,597	0.99	9,462	0.98
Father present	10,597	0.77	9,462	0.65
Step father present	10,597	0.05	9,462	0.06
At least 1 sibling in hh	10,597	0.88	9,462	0.88
At least 1 grandp in hh	10,597	0.06	9,462	0.03
At least 1 other in hh	10,597	0.06	9,462	0.04
Mother's hours worked pw	10,504	16.34	9,334	19.28
Father's hours worked pw	7,533	39.25	6,794	39.36
Mother mental well-being	10,458	3.00	9,181	3.77
Father mental well-being	7,327	2.87	6,618	3.70
Holiday outside UK	10,597	0.50	9,460	0.47
Homeworks - minutes pw	10,375	85.04	9,425	131.48
After school - hours pw	10,581	0.83	9,441	0.61
Before school - hours pw	10,581	0.40	9,442	0.46
Attend extraclasses	10,581	0.05	9,442	0.19

* in the regression, we will put a variable `mis_father=1` if there isn't the father nor the step father

Table 4: Summary statistics - investments before t

	Wave 4		Wave 5	
	Obs.	Mean	Obs.	Mean
Mother highly educated	10,583	0.40	9,451	0.42
Father highly educated	8,342	0.40	7,556	0.41
Breastfed 1 month	10,591	0.49	9,457	0.50
Mother back to work in 6 m	10,597	0.39	9,462	0.40
Formal childcare	10,597	0.30	9,462	0.29

Table 5: Summary statistics – “pure” controls

	Wave 4		Wave 5	
	Obs.	Mean	Obs.	Mean
British	10,575	0.88	9,444	0.88
Girl	10,597	0.49	9,462	0.50
Birthweight	10,586	3.39	9,452	3.39
Injuries	10,594	0.09	9,460	0.08
Hospital	10,594	0.17	9,460	0.17
Communicative develop	10,540	-0.05	9,409	-0.06
Motor develop	10,540	0.02	9,409	0.03
Motion develop	10,540	0.07	9,409	0.07
Siblings w1	10,597	0.90	9,462	0.89
Mother locus of control	10,432	0.80	9,322	0.81
Mother conflicts (PIANTA scale)	9,524	17.05	8,542	17.01
Mother closeness (PIANTA scale)	9,355	33.62	8,397	33.65
Mother Neurotic (OCEAN scale)	10,064	23.63	9,016	23.64
Mother Extrovert (OCEAN scale)	9,744	19.56	8,730	19.55
Father looks after on own	8,350	0.61	7,561	0.61
England	10,597	0.62	9,462	0.62
Wales	10,597	0.16	9,462	0.15
Scotland	10,597	0.12	9,462	0.12
Northern Ireland	10,597	0.10	9,462	0.10
Age child (in months)	10,597	86.71	9,462	133.98
HH Equivalent Income*	10,447	343.28	9,462	422.23
Newborn siblings	10,597	0.11	9,462	0.05

* Weekly income in wave 4, Annual income in wave 5

Table 6: The effects of child's activities on emotional problems

	(1) CV- w4	(2) CV - w5	(3) FE
F-Activities with parents	0.022 (0.014)	0.014 (0.013)	0.012 (0.013)
F-Sports	-0.011 (0.014)	-0.058*** (0.013)	-0.014 (0.013)
F-Library & Religious Service	-0.019 (0.016)	-0.003 (0.017)	-0.007 (0.016)
F-TV & Computer (+) Music (-)	0.031** (0.012)	0.021+ (0.012)	0.027* (0.012)
F-Household chores	-0.031* (0.014)	0.010 (0.014)	-0.018 (0.013)
F-School	-0.003 (0.012)	0.008 (0.013)	-0.000 (0.012)
Cognitive ability, t-1	-0.009+ (0.005)	-0.027*** (0.005)	0.009 (0.007)
Emotional, t-1	0.318*** (0.010)	0.258*** (0.010)	
F-Activities with parents, t-1	0.016 (0.016)	-0.013 (0.013)	
F-Sports, t-1	-0.004 (0.011)	-0.003 (0.015)	
F-TV & Computer (+) Music (-), t-1	0.013 (0.013)	0.005 (0.012)	
F-Library & Religious Service, t-1	-0.003 (0.014)	-0.017 (0.016)	
F-Household chores, t-1		-0.008 (0.014)	
F-School, t-1		-0.008 (0.013)	
Observations	10597	9462	18924

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7: The effects of child's activities on hyperactivity

	(1) CV- w4	(2) CV - w5	(3) FE
F-Activities with parents	-0.002 (0.009)	-0.033*** (0.010)	-0.024* (0.010)
F-Sports	0.006 (0.010)	0.013 (0.010)	0.008 (0.010)
F-Library & Religious Service	-0.006 (0.011)	-0.002 (0.013)	0.006 (0.012)
F-TV & Computer (+) Music (-)	0.009 (0.008)	0.031*** (0.009)	0.014 (0.009)
F-Household chores	-0.030*** (0.008)	-0.007 (0.010)	0.003 (0.010)
F-School	0.008 (0.009)	-0.015 (0.010)	-0.004 (0.009)
Cognitive ability, t-1	-0.021*** (0.003)	-0.030*** (0.004)	-0.007 (0.005)
Hyperactivity, t-1	0.307*** (0.015)	0.312*** (0.015)	
F-Activities with parents, t-1	-0.015 (0.011)	0.001 (0.010)	
F-Sports, t-1	-0.021** (0.008)	-0.003 (0.011)	
F-TV & Computer (+) Music (-), t-1	-0.003 (0.009)	0.006 (0.009)	
F-Library & Religious Service, t-1	-0.031** (0.011)	-0.016 (0.013)	
F-Household chores, t-1		-0.032** (0.010)	
F-School, t-1		-0.005 (0.010)	
Observations	10597	9462	18924

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 8: The effects of child's activities on conduct problems

	(1) CV- w4	(2) CV - w5	(3) FE
F-Activities with parents	-0.003 (0.013)	-0.039** (0.013)	-0.005 (0.013)
F-Sports	-0.009 (0.014)	-0.017 (0.013)	-0.002 (0.013)
F-Library & Religious Service	-0.024 (0.016)	0.014 (0.017)	-0.014 (0.016)
F-TV & Computer (+) Music (-)	0.008 (0.011)	0.033** (0.012)	0.004 (0.011)
F-Household chores	-0.042** (0.013)	-0.031* (0.014)	-0.030* (0.012)
F-School	-0.007 (0.012)	-0.044*** (0.013)	0.002 (0.011)
Cognitive ability, t-1	-0.022*** (0.005)	-0.019*** (0.005)	0.002 (0.006)
Conduct, t-1	0.362*** (0.010)	0.347*** (0.011)	
F-Activities with parents, t-1	-0.027+ (0.015)	-0.011 (0.013)	
F-Sports, t-1	0.006 (0.011)	-0.006 (0.015)	
F-TV & Computer (+) Music (-), t-1	0.016 (0.012)	-0.010 (0.012)	
F-Library & Religious Service, t-1	0.014 (0.014)	-0.014 (0.017)	
F-Household chores, t-1		0.004 (0.014)	
F-School, t-1		-0.037** (0.013)	
Observations	10597	9462	18924

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 9: The effects of child's activities on peer problems

	(1) CV- w4	(2) CV - w5	(3) FE
F-Activities with parents	0.008 (0.014)	0.015 (0.013)	-0.002 (0.014)
F-Sports	-0.067*** (0.015)	-0.108*** (0.014)	-0.024+ (0.014)
F-Library & Religious Service	0.025 (0.016)	0.032+ (0.017)	0.011 (0.017)
F-TV & Computer (+) Music (-)	-0.008 (0.012)	0.027* (0.012)	-0.005 (0.012)
F-Household chores	0.005 (0.014)	0.014 (0.014)	-0.010 (0.013)
F-School	-0.011 (0.013)	-0.021 (0.014)	0.006 (0.012)
Cognitive ability, t-1	-0.022*** (0.005)	-0.020*** (0.005)	-0.014* (0.007)
Peer problems, t-1	0.308*** (0.010)	0.287*** (0.010)	
F-Activities with parents, t-1	-0.002 (0.016)	-0.005 (0.014)	
F-Sports, t-1	-0.020+ (0.011)	-0.067*** (0.015)	
F-TV & Computer (+) Music (-), t-1	0.011 (0.013)	0.028* (0.012)	
F-Library & Religious Service, t-1	-0.020 (0.015)	-0.002 (0.017)	
F-Household chores, t-1		0.000 (0.015)	
F-School, t-1		-0.018 (0.013)	
Observations	10597	9462	18924

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 10: The effects of child's activities on prosocial behaviour

	(1) CV- w4	(2) CV - w5	(3) FE
F-Activities with parents	-0.057*** (0.014)	-0.075*** (0.014)	-0.036** (0.014)
F-Sports	-0.038* (0.015)	-0.042** (0.015)	-0.018 (0.014)
F-Library & Religious Service	-0.005 (0.016)	-0.001 (0.018)	0.007 (0.017)
F-TV & Computer (+) Music (-)	0.023* (0.012)	0.026* (0.013)	0.017 (0.012)
F-Household chores	-0.085*** (0.014)	-0.094*** (0.015)	-0.037** (0.014)
F-School	-0.039** (0.013)	-0.076*** (0.014)	-0.030* (0.012)
Cognitive ability, t-1	0.001 (0.005)	-0.009+ (0.005)	0.004 (0.007)
Prosocial, t-1	0.313*** (0.010)	0.281*** (0.010)	
F-Activities with parents, t-1	-0.019 (0.016)	-0.044** (0.014)	
F-Sports, t-1	0.006 (0.012)	-0.024 (0.016)	
F-TV & Computer (+) Music (-), t-1	-0.015 (0.013)	-0.016 (0.013)	
F-Library & Religious Service, t-1	-0.000 (0.015)	-0.006 (0.018)	
F-Household chores, t-1		-0.068*** (0.015)	
F-School, t-1		-0.027+ (0.014)	
Observations	10597	9462	18924

Standard errors in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix

Table A1: Sample selection

	Wave 1		Wave 4		Wave 5		Wave 1-4	Wave 1-5
	Obs.	Mean	Obs.	Mean	Obs.	Mean	Sig. Diff.	Sig. Diff.
Mother highly educated	18,191	0.33	11,519	0.39	10,277	0.40	***	***
Father highly educated	12,992	0.36	9,006	0.39	8,144	0.40	***	***
Breastfed 1 month	18,227	0.45	11,529	0.49	10,283	0.50	***	***
Mother back to work in 6 m.	18,256	0.35	11,538	0.38	10,290	0.39	***	***
British	18,208	0.81	11,513	0.85	10,270	0.85	***	***
Girl	18,256	0.49	11,538	0.49	10,290	0.50	***	***
Birthweight	18,212	3.36	11,522	3.38	10,276	3.38	***	***
Injuries	18,234	0.08	11,532	0.08	10,286	0.08		
Hospital	18,234	0.20	11,532	0.17	10,286	0.17	***	***
Communicative develop.	18,137	0.01	11,471	-0.03	10,230	-0.04	***	***
Motor develop.	18,137	0.01	11,471	0.02	10,230	0.02	*	*
Motion develop.	18,137	0.00	11,471	0.05	10,230	0.06	***	***
Siblings w1	18,256	0.94	11,538	0.93	10,290	0.92	***	***
Mother locus of control	17,611	0.77	11,233	0.79	10,029	0.80	***	***
Father looks after on own	13,013	0.62	9,016	0.61	8,151	0.61	***	***
England	18,256	0.62	11,538	0.63	10,290	0.63	***	***
Wales	18,256	0.15	11,538	0.15	10,290	0.15	*	
Scotland	18,256	0.13	11,538	0.12	10,290	0.12	***	***
Northern Ireland	18,256	0.10	11,538	0.10	10,290	0.10	**	

Table A2: Factor analyses for activities in the three waves

	Wave3	Wave4	Wave5
Library (1 pw)			
Religious service (1 pw)			
Sport-physical activities (1 pw)			
Sport-physical with parents (1 pw)			
Parents read to child (1 pw)			
Parents tell story (1 pw)			
Parents play music (1 pw)			
Parents draw (1 pw)			
Parents play sports active games (1 pw)			
Parents play indoors (1 pw)			
Parents to the park-playground (1 pw)			
Watch tv/videos (1h pd)			
Uses computer (1h pd)			
Read (1 pw)			
Club (1 pw)			
Sport-physical with friends (1 pw)			
HH chores (1 pw)			
Homework (1 h pd)			
Extra classes (1 pw)			
Plays a music instrument (1 pw)			
Bike (1 pw)			
Look after elderly fam members (1 pw)			
Parents talk to child (1 pw)			

- F1 Library&Religiuos
- F2 Sports
- F3 Activities with parents
- F4 TV&Computer
- F5 Househols Chores
- F6 School

Table A3: Factor analyses for child cognitive indicators

Age 7	Factor1	Uniqueness
Naming Vocabulary T	.7426633	.4484512
Pattern Construction T	.7613579	.4203342
Picture Similarity T	.7411931	.4506327

Age 11	Factor1	Uniqueness
Word Reading Standard	.7702381	.4067333
Pattern Construction	.7453773	.4444127
Maths 7 Standardised	.8520678	.2739804