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Children's Time Allocation and the Socioeconomic Gap in Human Capital*

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Abstract

Children's time investments in various activities may be important for reducing socioeconomic status (SES) gaps in educational and mental health outcomes. Using time use diaries of Australian children aged 4-14, we find children from low SES backgrounds spend more time on digital media and less time on cognitively stimulating out-of-school activities, organised or for leisure. This difference contributes about 4% to the observed SES gap in numeracy skills. The contribution is larger for males, older age groups, and when the cumulative effect on learning is considered. No clear results are found for literacy skills and mental health outcomes.

JEL codes: I14, I24, J22, J24

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1 Introduction

Numerous studies have found that children born into low socioeconomic status (SES) families tend to experience poorer educational outcomes compared to those born into more advantaged families. This gap in cognitive skills is observed from an early age in several Western countries including Britain (Feinstein 2003; Jerrim & Vignoles 2013; Blanden & Machin 2007; Crawford, Macmillan & Vignoles 2014), the US (Cunha et al. 2006*a*), Ireland (Madden 2022) and Australia (Marks 2017). Despite significant public investments in education, the socioeconomic status gap in cognitive skills observed in early childhood persists throughout childhood and into adulthood (Heckman & Mosso 2014, Almond, Currie & Duque 2018). The issue of the SES skills gap is closely related to the literature on intergenerational persistence of education. It has been well-documented that there is a strong correlation between a parent's education level and their child's educational outcomes (Hertz et al. 2008; Bratberg et al. 2017; Björklund, Jäntti & Lindquist 2009; Pekkarinen, Salvanes & Sarvimäki 2017; Chevalier, Denny & McMahon 2009; Macmillan & Tominey 2022). The underlying concern underpinning both literatures is a sense of injustice, that it is not fair that a child born to low SES parents has a lower chance of success because of the lottery of being born into a low SES family.

The causes of this SES skills gap as well as the impact of social policies aimed at reducing the gap have received a great deal of attention, where the majority of evidence relates to early childhood, before the child turns five years of age (see e.g. Almond, Currie & Duque (2018) for an overview). However, much less is known about the 'middle years', the period between starting and finishing compulsory school (Lundborg, Rooth & Alex-Petersen 2022). In this paper we assess the extent of the SES skills gap in Australia from age 4 all the way through to age 14 and consider the impact of children's time allocation in determining this gap. In doing so we aim to understand what changes in time allocation could raise the human capital trajectory of a child from a disadvantaged background to be more like that of a child from an advantaged background, focusing on this under-investigated 'middle' period of childhood. Previous studies have indicated that family SES is associated with certain activities that children participate in, for instance, children of mothers with lower levels of education spend more time watching TV and less time on homework or reading (Bianchi & Robinson 1997, Rokicki & McGovern 2020),

and when families experience financial hardship, children increase the amount of time spent on digital media, particularly passive media (Arnup, Black & Johnston 2021). This suggests that children's time allocation may play a role in development of the SES gap in human capital. To the best of our knowledge, no study has analysed the impact of children's time investments on the SES gap in human capital. This is most likely due to a lack of large representative surveys that include detailed time use diaries and consistent measures of human capital over time.

We additionally extend the analysis of the SES gap to consider mental health, in particular, socio-emotional difficulties. The literature on the socio-emotional difficulties SES gap is less established than that of the cognitive skills SES gap. In the UK, the socio-emotional difficulties SES gap appears to grow throughout childhood (van Poortvliet 2021), in the US the income gap in anti-social behaviour is substantial but fairly stable throughout childhood (Cunha et al. 2006*a*). We use a relatively unique dataset that provides consistent measures of children's socio-emotional difficulties, cognitive skills and their time use from age 4 to 14 to contribute new empirical evidence that measures and explains SES gaps in children's human capital development.

Economic theories of children's human capital development indicate that in addition to parental inputs,[1] the amount of time that children themselves allocate towards relatively more productive activities may be an important investment (Conti, Mason & Poupakis 2019, Heckman 2007). Unlike genetics or parental ability, time use allocation is an input into the production of children's human capital that is malleable. Given the right information, incentives and resources, it is possible for children to allocate their time differently, potentially at little economic cost. While some activities that children and their parents spend time on have been empirically shown to impact cognitive skill development (Caetano, Kinsler & Teng 2019, Del Boca, Monfardini & Nicoletti 2017, Fiorini & Keane 2014, Nguyen et al. 2020, 2022, Attanasio et al. 2020), much of this literature has focused on the earlier years of childhood and on the time that children spend with parents (or other adults). For instance, Fiorini & Keane (2014) examined the relationship between children's time investments and skill development among children aged up to 8 years old, and found educational activities, particularly with parents to be the most productive input

[1]For empirical evidence on the impact of parental resources and investments, see Attanasio et al. (2020), Macmillan & Tominey (2022).

for cognitive skills. Caetano, Kinsler & Teng (2019) examined the relative importance of with whom children spent their time with, and found that time that parents and grandparents spent actively engaged with their child is the most productive input for cognitive skills. It is conceivable that the relative importance of parental time inputs and children's own time investments differs as children age. Indeed, Del Boca, Monfardini & Nicoletti (2017) showed that the time that mothers spend actively engaged with the child during childhood matters more for children's cognitive development than children's own time investments. However, for adolescents, they found the time investments of children themselves to matter much more than those of their mother. Adolescence is a time when children begin to have greater autonomy around decisions on how to spend their time. Yet, there is less known about the relative productivity of specific activities that older children and adolescents today are increasingly spending their time on, such as social media and digital games. Jürges & Khanam (2021), Nguyen et al. (2020, 2022) are the only papers we are aware of that consider digital media time use of older children.

Using a detailed cohort panel survey following children as they age in Australia we find evidence of a large SES gap across measures of numeracy and literacy skills and also internalising and externalising measures of mental health. This gap is clearly observed from an early age (age 4) and remains throughout our observed ages of childhood and adolescence up to age 14. We thereby confirm a general trend observed in Western countries of a SES gap in human capital that is observed from early childhood and maintained throughout childhood. The SES gap observed in Australia is also of similar magnitude to that observed in the US and Great Britain (Cunha et al. 2006*a*, Feinstein 2003) suggesting external relevance for our findings from Australia.

Detailed time use diary data is then utilised to assess to what extent children's time use determines this SES gap. We find that compared to high SES children, children from low SES households increasingly spend their time on digital media as they age, and on average, this is at the expense of organised out-of-school educational activities (such as homework and tutoring/music lessons) or leisure activities that are generally cognitively stimulating (such as playing board games, reading or playing a musical instrument for leisure). Our regression results of the impact of child time use on child human capital development combined with an Oaxaca-Blinder

decomposition (Oaxaca 1973, Blinder 1973) of the SES gap find that differences in contemporaneous time use explain about 4% of the SES gap in numeracy skills. This is largely driven by high SES children spending about 35 minutes more per day on out-of-school educational activities and cognitive leisure activities instead of on passive media (such as watching TV). These results are robust to a number of specification tests, including coefficient stability tests across different specifications and the exogeneity test developed by Caetano (2015) applied to time use variables, which all lend support to our empirical approach. The impact of time use on literacy skills, internalising and externalising problems is less clear.

While time use choices contributing 4% to the SES gap in numeracy skills may seem like a small contribution in absolute terms, it is crucial to consider these in context. First, our main estimates only account for the contemporaneous effects of time use investments. Accounting for the cumulative effect of a permanent (from age 6 years forward) equalisation of time use patterns across the SES groups, we find that the contribution of differences in time use can potentially explain nearly 8% of the numeracy skills SES gap by age 14. Second, compared to other variables included in our model, such as family and household factors (e.g., the primary parent's English proficiency), the contribution of children's time use allocation is generally found to be of the same absolute magnitude or larger than these other important variables. Third, it is also important to acknowledge that our research is part of a broader body of work on the SES gap in human capital, where multiple factors including genetics, pre-school, school type and parenting style have each been found to contribute (Gormley & Gayer 2005, Cascio & Schanzenbach 2013, Weiland & Yoshikawa 2013, Crawford, Macmillan & Vignoles 2017, Gregg & Washbrook 2011, Chowdry, Crawford & Goodman 2011, Dearden, Sibieta & Sylva 2011), and no single solution is evident. For example, Jerrim et al. (2015) show that for three important genes related to reading comprehension, they explain at best 2% of the SES gap in reading test scores. When compared to these genetic contributions, our findings assume relatively more importance.

The current paper contributes to the literature on SES disparities in human capital development in a number of ways. First, we examine whether SES gaps exist in both cognitive skills and mental wellbeing over a longer period of childhood and adolescence than previously docu-

mented. Second we produce estimates of the role of children's time investments in explaining these SES gaps utilising unique detailed time use data. Importantly, we examine the relative productivity of categories of children's time investments over an 8-10 year time span from age 4 to 14 (depending on outcome), providing more detail on activities popular among older children than previous studies. We thereby contribute understanding to what can influence human capital during the 'middle' period of childhood development, a period of development which has received relatively less attention compared to the period of child development before five years of age. Third, we build on the existing human capital production literature, which has generally assumed that time inputs are exogenous given chosen covariates, with little support for this important assumption. By using an exogeneity test, developed by Caetano (2015) and applied by Caetano, Kinsler & Teng (2019), we consider the validity of our choice of covariates to present credible estimates of the contribution of time investments in the production of human capital.

Our results suggest that interventions targeting low SES children that promote a shift towards more time spent on cognitively stimulating activities, either organised out-of-school activities or leisure activities, and away from digital media (particularly passive media) could help reduce the SES gap in numeracy skills, and this reduction in the SES gap would be a meaningful reduction.

2 Background: Investments in Human Capital

Human capital can be described as the knowledge, skills, health and other personal attributes that enable individuals to realise their potential as productive members of society. Our framework of human capital development derives from the pioneering theoretical work on human capital (Becker 1962, 1964, Ben-Porath 1967) and health capital (Grossman 1972, 2000). These frameworks focus on adult human capital, and individual decisions on investing time, goods and services into commodities that produce utility. The more recent literature has focused on conceptualising human capital formation during childhood, with earlier studies emphasising cognitive skill development (Todd & Wolpin 2003, 2007), followed by an increasing emphasis on

socio-emotional skill development and well-being (Cunha & Heckman 2007, Heckman 2007, 2012, Conti, Mason & Poupakis 2019). The process of transforming investments into children's human capital, is typically modelled as a human capital production function (Heckman 2007):

$$\theta_{(t+1)} = f_t(\theta_t, I_t, P_t) \tag{1}$$

where human capital in the next period, $\theta_{(t+1)}$, is produced via a cumulative process at each stage t, through investments I_t, initially from parents, but later also from the individuals themselves. It is also impacted by the level of initial stock of endowed human capital (or cognitive capacity) θ_t, as well as parenting capabilities P_t (such as genes, cognitive skills, education and income). Investments are multidimensional, and can include time spent on stimulating or healthful activities and money spent on goods and services (such as music lessons or private schooling). The focus of this paper is on time investments – specifically the time that children spend on stimulating or productive activities, relative to other activities.

We examine broad categories of activities that have been shown to be associated with physical and mental health (including sleep, physical activity and socialising), and with cognitive skill development (including schooling, homework, learning a musical instrument, and chores) (Fiorini & Keane 2014, Kalb & Van Ours 2014, Loewen et al. 2019, Tepper, Howell & Bennett 2022, Walsh et al. 2018). We also closely examine digital media use because it has been shown to be associated with mental health and academic performance (Hutton et al. 2020, McDool et al. 2020). Although largely shown to be negatively related, digital media use has potentially heterogeneous effects, for instance, video gaming has been shown to improve cognitive skills (Suziedelyte 2015). Therefore measuring the contribution of different types of digital media use is particularly important.

The human capital framework has a number of implications for our empirical analysis. First, the same underlying model can be used to model both mental health and cognitive skills. Second, the cumulative nature of human capital development implies that to estimate the effects of time investments, data on both contemporaneous and historical investments as well as a measure of initial stock of endowed human capital is required. Third, historical measures of human capital

can improve identification of the model. Fourth, detailed contemporaneous and past measures of parent capabilities and resources are required to identify the impacts of investments. We now discuss how the survey data utilised in this study combined with our empirical strategy aims to provide credible estimates of this data demanding empirical question.

3 Data and Measures

3.1 The Longitudinal Study of Australian Children

The main data source for our analysis is the Longitudinal Study of Australian Children (LSAC), an ongoing biennial nationally representative panel survey, which began in 2004.[2] LSAC follows approximately 10,000 children from two cohorts: the Baby or 'B' cohort who were aged 0-1 years in 2004; and, the Kinder or 'K' cohort who were aged 4-5 years in 2004. For this study, we use data on both cohorts from eight waves (2004 to 2018). We focus our analysis on children when they are aged 4 to 14 years as this corresponds to the years when information on cognitive skills and socio-emotional difficulties are available, and allows us to span the crucial years of child development from early childhood through to early adolescence.

LSAC contains a wide range of data on children's cognitive development, health, socio-emotional difficulties, family environment and parental socio-demographic characteristics, which are primarily collected via face-to-face interviews with the main parent (in over 90% of cases this is the mother), but also from the school, teacher and the child themselves at older ages. LSAC is linked to administrative records of the child's national test scores on numeracy and literacy. A strength of the LSAC data is that over the ages of 4 to 14, it collects detailed information on what the child is doing over a 24-hour period using time use diaries (TUDs).[3] This provides a unique opportunity to capture how changes in children's daily activities affect the SES gap in human capital outcomes throughout childhood and into adolescence.

[2]For more information on the study design, see Soloff, Lawrence & Johnstone (2005).

[3]While other large surveys also include time use diaries, they are collected less frequently. For example, the Child Development Supplement from the Panel Study of Income Dynamics (in the United States) includes TUDs for children across three waves every five years, and the Millennium Cohort Study (in the United Kingdom) involves a TUD only during the age-14 wave.

Like most longitudinal studies, the LSAC suffers from attrition and missing responses. We check for the presence of sample selection with respect to the original sample by estimating a linear probability model where the dependent variable equals one if the child is in our estimation sample at each age and zero otherwise. The independent variables are child and family socio-demographic characteristics measured at age 4. Results for the estimation sample for literacy score and internalising problems are shown in Appendix Tables A1 and A2 respectively.[4] Overall, children in our sample across the ages tend to have older parents, fewer older siblings and better educated parents. By age 14, the only characteristics that are significantly associated with being in our sample are parental age and being from Cohort B. We include these variables as controls to ensure internal validity.

3.2 Time Use Diaries

Reflecting different capabilities and activities of children as they age, there are two types of time use diaries (TUDs). For children under 10, diaries are recorded by the main parent, while for older children (aged 10+), TUDs are completed by the child (and checked/clarified by the LSAC interviewer). For parent-completed TUDs, parents were asked to complete two; one on a weekday and one on a weekend day. The parent was asked to record what the child was doing from 4:00am on the allocated day until 4:00am the next day in 15 min intervals, using a pre-specified list of activities. From age 10 onwards, each child is asked to complete one TUD on the day before their scheduled LSAC interview. Unlike parent-completed diaries, child-completed diaries follow an 'activity episode' format where the child records the activity and the start time.

TUDs are collected every wave, with the exception of wave 4 (ages 6-7) and wave 5 (8-9) for Cohort B. Therefore, for the B cohort, we only consider TUDs from age 10 onwards. A full description of the TUD data available for each wave and by cohort as a proportion of the original wave 1 sample is shown in Appendix Table A3. We exclude TUDs with missing data about the day of diary completion (which accounts for approximately 5% of the parent-reported time use TUD entries) and those that do not add up to 24 hours (0.1%). We observe that by age 14,

[4]The results are similar for numeracy score and externalising problems.

51-59% of the original sample, depending on the cohort, completed a TUD. Still, this leaves over 5,000 children with TUDs across both cohorts at age 14.

3.3 Measuring Time Use

The types of activities recorded in TUDs vary as children age. To enable comparability over time, we categorise all recorded activities into ten broad, mutually exclusive time use categories: sleep, school, organised out-of-school education activities, physical activities, cognitive leisure activities, social activities, digital media, general care and travel, chores, and other. These categories are carefully selected to capture key activities that are recognised as being associated with human capital development.

Table A4 in the Appendix provides a detailed list of how all 181 available activities were coded into each of the 10 categories by cohort and age. We briefly summarise this work here. Within the *sleep* category, all activities related to sleeping and napping are included. For *school*, we categorise time spent in playgroup/day care and organised school lessons. Organised out-of-school *education activities*, on the other hand, encompass all other education-related activities 'outside of school' that are prescribed or organised by someone other than the child, such as being read to (for children $<$10 years), doing homework, tutoring classes, music lessons and non-active club activities (e.g. chess). It also includes homework done on an electronic device. *Physical activities* cover all types of physical sports and activities, including team sports, individual sports, and outdoor activities such as walking and cycling (including active commuting). *Social activities* include outings, visiting people, attending movies or sporting events. It also includes chatting to people (face-to-face, on the phone and via video, e.g. Skype). *Cognitive leisure activities* refer to interests, hobbies and non-active free play. We refer to this group of leisure activities as 'cognitive' because across all ages, a majority (about 82%) of the activities or pastimes are considered cognitively stimulating, including reading for leisure, playing a musical instrument for leisure, playing chess or board games / crosswords, and doing art/crafts or drawing. While there is some similarity in cognitive leisure activities with those classified as organised out-of-school educational activities, an important distinction is the recreational nature of cognitive leisure activities. These activities are explicitly labeled as being undertaken

for leisure in the TUDs. It is feasible that time spent on cognitively stimulating activities may have a differential impact on human capital gaps if it is prescribed or arranged by a teacher or parent compared with if it is chosen by the child as a leisure activity. We therefore look at these activities separately.

Digital media activities include passive media (95% involves watching television), playing games on an electronic device (e.g. computer, Xbox, Nintendo), and using computers (e.g. application use, internet browsing, downloading content). From age 10, digital media also includes social media use (i.e., social networking sites, texting, online chatting/messaging). *General care* includes activities such as having meals, bathing, dressing, health care use and inactive commuting. *Chores* refer to time spent on household chores, both paid and unpaid. For completeness, we include an *other* category that covers all other activities that do not fit into any of the above categories, including activities that are coded by parents as 'not sure what the child was doing' and time the child spends filling out the diary. Only 0.2% of time across all ages falls under 'other'.[5]

TUDs allow for the recording of concurrent activities within a given time slot. However, to ensure that all activities add up to 24 hours, we consider only the primary (or main) activity. While this is straightforward in child-completed TUDs, where activities are identified as primary or secondary, it is more challenging in parent-completed TUDs, where primary and secondary activities are not distinguished. To address this, we closely follow the order proposed by Fiorini & Keane (2014), which ranks activities based on their likely order of occurrence. Specifically, we assign priority to (1) sleep, (2) school, (3) education activities, (4) physical activities, (5) general care and travel, (6) chores, (7) social activities, (8) cognitive leisure, (9) digital media, and (10) other activities, in that order. For instance, if there are two concurrent activities such as having meals (general care) and watching TV (digital media), we consider having meals as the primary activity.

[5] Any activity that is recorded as 'not sure what the child was doing' or missing between the hours of 10 pm and 6 am is considered as time spent in sleeping.

3.4 Socioeconomic Status

This paper focuses on gaps in human capital by socioeconomic status. The classification of socioeconomic status (SES) is based on the measure of socioeconomic position (SEP). Developed by Blakemore, Strazdins & Gibbings (2009), SEP is a continuous score that calculates the relative position of families in LSAC based on their available social and economic resources. Specifically, it is derived using a combination of factors such as the family's annual income, parents' educational attainment, and occupational status. A key strength of this composite measure is that it provides a more accurate representation of a family's socioeconomic position than any single indicator alone (Krieger, Williams & Moss 1997).

We use terciles to classify SES groups, with the top, medium, and bottom terciles corresponding to high, medium, and low SES, respectively. The SEP score is measured at the baseline age (4 years old) for all analyses.

3.5 Human Capital Outcomes

We focus on two broad indicators of human capital outcomes: cognitive skills and socio-emotional difficulties. Cognitive skills consist of two types, literacy and numeracy, which are measured using standardised tests. Socio-emotional difficulties include measures of internalising and externalising problems capturing children's emotional and behavioural problems. The sections below provide a detailed explanation of each of these measures.

3.5.1 Cognitive Skills

Different tests are used to capture children's cognitive skills as they age. In younger ages (age $<$10 years), we use the Peabody Picture Vocabulary Test (PPVT) to measure literacy skills, and the Matrix Reasoning Test (MRT) to measure numeracy skills. These tests were administered to all LSAC children by the LSAC interviewers at the time of the interview. The PPVT has been shown to reliably measure receptive vocabulary skills (Beres, Kaufman & Perlman 2000), and the MRT has been shown to reliably measure problem solving and reasoning ability (Kaufman

et al. 2006).[6] While the PPVT is first administered at age 4, the MRT is only first administered at age 6.

For children aged 10 and above, we use scores from the National Assessment Program – Literacy and Numeracy (NAPLAN) to measure cognitive skills. NAPLAN is a standardised test administered to all Australian students in Years 3 (8 years), 5 (10 years), 7 (12 years), and 9 (14 years) in the same week (in May) each year.[7] It assesses students' abilities across four domains of reading, writing, language conventions (spelling, grammar and punctuation), and numeracy (Daraganova, Edwards & Sipthorp 2013). To create an overall NAPLAN literacy score, we take the average of the scores for reading, writing and language conventions. The NAPLAN tests broadly reflect aspects of literacy and numeracy taught within the Australian school curriculum and aim to inform students, schools and governments on how students are performing relative to national minimum standards. Tests are administered and anonymously marked by government authorities, which are external to schools. The NAPLAN test scores are designed to enable comparisons over time.

It is important to note that in our modeling of cognitive skills production, we exclude children who have already received the NAPLAN test results prior to completing the TUDs (which accounts for 20% of the sample).[8] This helps to ensure a child's test performance does not influence the choice of time use activities, thereby addressing any potential reverse causality concerns.

To summarise, our measure of literacy skills consists of PPVT scores when children are aged 4 to 8 years, and NAPLAN literacy scores when they are aged 10 to 14 years. Our corresponding numeracy skills measure consists of MRT scores when children are aged 6 to 8 years, and NAPLAN literacy scores when they are aged 10 to 14 years. For ease of interpretation, we

[6]The PPVT is given verbally and no reading is required by the child. Children are presented with four pictures on a page. The examiner speaks a word describing one of the pictures and asks the child to point or say which picture the word describes (Dunn & Dunn 1997). The MRT from the Wechsler Intelligence Scale for Children (4th edition) is a non-verbal test designed to assess a child's ability to analyse and reason abstract visual information. The test consists of a series of abstract patterns with missing pieces, where children are asked to choose the correct missing piece from a set of options.

[7]We do not consider Year 3 scores in our analysis as we have incomplete Year 3 NAPLAN scores for our K cohort. Approximately one quarter of cohort K children were enrolled in Year 3 before NAPLAN was launched in 2008.

[8]This exclusion is necessary due to the timing differences between the LSAC surveys/TUDS, and administration of the NAPLAN test.

standardise literacy and numeracy scores by grade-level to have a mean of zero and standard deviation of one. Given the change in the type of tests used from age 10, we are cautious to interpret any differences in skills gaps that occur between ages 8 and 10 years.

3.5.2 Socio-Emotional Difficulties

The Strengths and Difficulties Questionnaire (SDQ) is used to measure socio-emotional difficulties. The SDQ is a validated behavioural and emotional screening tool for children and adolescents aged 4 to 17 years (Goodman 2001). It consists of 25 questions, divided into five domains: emotional symptoms, peer problems, conduct problems, hyperactivity, and prosocial behaviour. The questions ask the main parent to indicate how closely each psychological attribute applies to the child, using three response options: "not true," "somewhat true," or "certainly true."[9] We consider two composite measures of socio-emotional difficulties: internalising problems and externalising problems (Goodman, Lamping & Ploubidis 2010). Internalising problems refers to problems that are internalised, such as anxiety, depression, loneliness and social withdrawal, and this is measured by summing the emotional and peer problems scales. Externalising problems refers to feelings that manifest as disruptive behaviours, such as losing one's temper, physical aggression, impulsivity, hyperactivity and theft. It is measured by summing the conduct problems and hyperactivity scales.

A strength of the LSAC data is that the SDQ is administered to the primary parent in every wave, enabling us to have a consistent measure of socio-emotional difficulties across all ages (i.e., from 4 to 14).[10] We age-standardise both socio-emotional difficulties scores to have a mean of zero and standard deviation of one.

[9]Emotional symptoms include worries, unhappy, nervous, fears, and somatic symptoms. Peer problems include solitary, has a good friend, liked by others, bullied, and better with adults than children. Conduct problems include tempers, obedient, fights, lies, and steals. Hyperactivity includes restless, fidgety, distractible, persistent, and reflective.

[10]LSAC also includes child-completed SDQs from age 10 onwards. It is recognised that discrepancies in SDQ scores exist between different informants in assessments of children's socio-emotional difficulties child- and parent-completed surveys (Goodman et al. 2000). Our results are qualitatively the same if we replace parent-completed SDQs with child-completed measures from age 10 onwards, or use teacher-reported SDQ scores.

4 Methodology

The empirical methods used consist of two main parts. First, we estimate the productivity of various time inputs in children's human capital development using detailed panel data. Model specification is guided by an objective criterion from a recently developed exogeneity test (Caetano 2015). Second, we decompose the relative importance of time inputs and other factors in explaining the SES gap in human capital, using the Oaxaca-Blinder approach. The details of each approach are elaborated below.

4.1 Estimation of Human Capital Accumulation

Empirically estimating the effect of various investments in the production of human capital is notoriously challenging because heritable traits are unobserved and no dataset contains complete information on the history of production inputs. A further issue is that investments may be selected endogenously with respect to unobserved ability or traits. See Todd & Wolpin (2003, 2007) for a more detailed discussion. Given the lack of data on input histories, the value-added (VA) specification, which includes a lagged or baseline measure of achievement as a regressor, is commonly used to estimate the human capital production function. The lagged achievement measure is taken to sufficiently capture unobserved input histories in addition to the unobserved endowed cognitive capacity.

We utilise an augmentation of this approach, which additionally includes lagged inputs. A similar approach, referred to as the value-added plus (VA+) specification (Todd & Wolpin 2007), has been used by Cunha et al. (2006*b*), Cunha & Heckman (2008), Todd & Wolpin (2003, 2007) to model cognitive and non-cognitive skill production. When compared against alternative model specifications (including within-child fixed-effects, within-siblings fixed-effects and standard VA) using cross-validation criteria and conventional specification tests, Todd & Wolpin (2007) showed that the VA+ specification was the best performing and hence most preferred model. The VA+ is also the preferred specification in recent papers modelling children's early years time use and human capital (Fiorini & Keane 2014).

Specifically, our empirical human capital formation equation is:

$$Y_{i,a} = \beta_0 + \mathbf{TU}'_{i,a}\boldsymbol{\beta}_1 + \mathbf{TU}'_{i,a-2}\boldsymbol{\beta}_2 + \beta_3 Y_{i,a-2} + \mathbf{B}'_{i,a=4}\boldsymbol{\beta}_4 + \mathbf{X}'_{i,a}\boldsymbol{\beta}_5 + \varepsilon_{i,a} \tag{2}$$

where $Y_{i,a}$ is the age standardised score for each of the cognitive and socio-emotional outcomes for child i at age a. $\mathbf{TU}_{i,a}$ is a vector of contemporaneous time use inputs of child i at age a measured in hours and the coefficient vector β_1 provides our coefficients of interest. As discussed in Section 3.5.1 only children who do not yet know their NAPLAN score are included in the sample to ensure no feedback between the cognitive outcomes and the contemporaneous inputs. $Y_{i,a-2}$ denotes the lagged score of the outcome observed when children are two years younger and coefficient β_3 provides the average two-year depreciation rate of prior ability and other unobserved inputs. The vector of lagged time inputs is represented by $\mathbf{TU}_{i,a-2}$ observed when children are two years younger, and coefficient vector β_2 provides the additional rate of depreciation of time use over and above that of β_3. The inclusion of lagged time use inputs allows a relaxation of the assumption in the standard VA model that coefficients associated with observed inputs geometrically decline with the number of years since the input was applied and that the rate of decline is the same for each input. A key assumption of the VA+ model is that if there are omitted inputs, then they are uncorrelated with included inputs and the outcome variable. Standard practice when estimating VA models is typically to include a wide set of covariates and assume that this assumption holds. We explore this further using a series of exogeneity tests (Caetano 2015) in the following section. $\mathbf{B}_{i,a=4}$ is a vector of observable inputs measured at baseline (i.e. at birth or at age 4), and $\mathbf{X}_{i,a}$ includes observed inputs measured contemporaneously at age a that we discuss below. $\varepsilon_{i,a}$ is the error term. We estimate Equation 2 separately for high and low SES terciles to examine if the effects of time use on human capital outcomes differ by SES status.

We include a wide range of covariates that capture child, parent and neighbourhood characteristics that influence investments in the child's human capital. An advantage of the LSAC data is the rich lifetime information about the child. While some of the covariates are measured contemporaneously ($\mathbf{X}_{i,a}$), a majority are measured at baseline ($\mathbf{B}_{i,a=4}$). We can group all of the covariates into four broad categories: 1) child demographics and early cognitive ability; 2)

household and environmental characteristics; 3) parental characteristics and resources; and 4) family life events.

The contemporaneous covariates include child demographics, such as gender, age in months and its square. Household and environmental characteristics, such as single parent indicator, number of older and younger siblings, whether the child's school is government-funded or independent (which captures the school's resources) and an index of neighbourhood disadvantage are also included.

The baseline covariates include an indicator for low birth weight, which may capture in utero investments and developmental capacity, and a preschool cognitive test score (Who am I), taken at age 4, to capture early cognitive ability.[11] Parental characteristics, which are all taken from surveys when the child was aged 4 to reduce endogeneity concerns, include the main parent's gender, age, whether the main language is English, country of birth, university education, employment status, number of work hours, logarithm of household real income and indicator for whether the household experienced financial hardship during the past year. We include several indicators of the parent's parenting style when the child was 4 years old (cold, angry, inconsistent and illogical).[12] We also include indicators of whether the family experienced a specific type of major life event in the past 12 months (such as major illness, death of a family member, financial crisis, theft, relationship separation).

Finally, we include the following variables to account for the timing of the administration of the LSAC survey and time use diary entries: dummy variables for diary type (completed by child or by their parent) and time fixed effects (such as day, month and year FE, school day indicator).[13]

4.2 Testing the Exogeneity of Time Use Inputs

We provide additional support for our choice of the VA+ model as our preferred model over other alternative models by undertaking a series of recently developed tests (Caetano 2015) to

[11] The Who Am I assessment is a tool for evaluating the cognitive abilities required for starting school of children aged 4-5 years. It includes tasks such as copying shapes, writing numbers, letters, words, and sentences.

[12] Results are similar even if we use contemporaneous measures of these variables.

[13] A school day is defined as a weekday with positive school hours, and a non-school day refers to either a weekday with no school hours or a weekend day.

determine whether the final model specification omits any relevant inputs, and consequently whether estimates are plausibly causal. This so-called exogeneity test is particularly well suited to analysing the exogeneity of time use inputs due to the high bunching of observations around zero for most activities, and has been recently applied to estimate the causal effects of whom children spend time with (such as parents or friends) on their skill development (Caetano, Kinsler & Teng 2019).[14]

The Caetano (2015) exogeneity test, which we use in this study, leverages the fact that unobservable confounders tend to vary discontinuously when variables of interest have natural non-negativity constraints (i.e., cannot be less than zero), such as time spent on an activity. Such scenarios lead to specific patterns in the distribution of outcomes and covariates that help in detecting confounding influences. For example, while families that allow children to spend 45 minutes per day on digital media may be similar to families that allow 30 or even 15 minutes, the similarity in families is less likely to hold at zero minutes per day.[15] As a result, families of non-users of digital media are 'discontinuously different' to those who allow even a small amount of digital media use.

The approach is based on the assumption of continuous treatment effects in the variable of interest. The underlying idea is that if there is a discontinuous difference in the human capital outcomes of non-users and positive users of digital media (for example), then unobserved confounders, such as parental screen rules, could be at play. To investigate this, we sequentially add covariates to our model and test whether human capital outcomes vary discontinuously at zero, in which case unobserved confounders remain an issue and we are led to reject the specification.[16] The test is straight forward to implement, using an F-test of the joint significance of the 10 binary indicators of any positive time spent on each activity.

The exogeneity test results for the value added+ model by SES group are shown in Appendix Table A5, Panel A. These results show firstly, as we may expect, that there are large discon-

[14]The approach has also been applied in a range of settings, including financial markets (Ferreira, Ferreira & Mariano 2018), neighbourhood crime (Caetano & Maheshri 2018) and maternal smoking (Caetano 2015).

[15]This may be because children who spend zero time on digital media have parents who have strict rules around digital device use. Parents who have strict screen time rules are also likely to have other confounding traits that relate to both the screen time and mental health of their children.

[16]It has been shown that the exogeneity test has the power to detect not only endogeneity but also functional form misspecification in Equation 2 (Caetano et al. 2021). In other words, failure to reject the null hypothesis rules out two crucial identification threats to any empirical setup: endogeneity and misspecification.

tinuities in all academic and socio-emotional outcomes between children who engage in certain activities and those who do not. This is shown by the large F-stat (significant at 1% level) for the joint significance of binary indicators of any positive time use for each activity in the first row, when no control variables are added. As more control variables are added (shown in subsequent rows), the F-stat reduces, indicating that the control variables are absorbing the potentially endogenous selection into activities. In our preferred specification, which includes all covariates, the models for numeracy and internalising problems all pass the exogeneity test (p-values are >0.1). For literacy, the model passes for high SES, but not for low SES. For externalising problems, the model for the low SES passes the exogeneity test, but the model for high SES group does not ($p<0.05$). We therefore caution against a casual interpretation for the literacy and externalising problems estimates. As a further test we perform the same exogeneity test on alternative human capital accumulation models including the contemporaneous model (no lagged inputs or lagged outcome variable), the VA model, both of which are nested in the VA+ model, and also a within-child estimator (no lagged inputs or outcome score), and sequentially add covariates (shown in Appendix Table A5, Panel B, C and D). We find that the value added+ model more clearly passes the exogeneity test and for more outcomes than the alternative models, supporting our modelling choice.

The advantage of this test is that it allows us to follow an objective criterion to determine whether our selected specification is likely to address concerns of omitted variable bias. However, a limitation of the test is that it only considers discontinuous confounders and does not consider unobserved variables that vary continuously around the bunching point (i.e. at zero hours) that can still bias our estimates. To address this issue, we complement the endogeneity test with a test of the stability of coefficients across dozens of specifications that pass the exogeneity test. Evidence of coefficient stability provides us with more confidence that we have adequately controlled for confounding factors and the addition of other (unobserved) covariates is unlikely to meaningfully change the point estimates.

4.3 Oaxaca-Blinder Decomposition

We apply the Oaxaca-Blinder (OB) Decomposition method (Oaxaca 1973, Blinder 1973) to quantify the contribution of SES differences in time allocation to the SES gap in human capital outcomes. The OB method decomposes the SES gap into two components: the part that is attributed to differences in characteristics (endowments or explained factors) and the part that is attributed to differences in the returns to those characteristics (coefficients or unexplained factors). The explained component measures the differences in outcomes that would exist if the two groups had the same observed characteristics, while the unexplained component measures the differences in outcomes that exist due to variations in the value of those characteristics.

We pool the sample across all ages. We therefore decompose the average SES gap. Our focus is the contribution of the contemporaneous time use inputs in explaining the SES gap. Let $\boldsymbol{Z}$ be a vector that includes all covariates included in our production function Equation 2, we then estimate the following two-fold OB decomposition equation for each of the human capital outcomes:

$$\begin{aligned} E[Y_{High}] - E[Y_{Low}] = (E[\boldsymbol{Z}_{High}] - E[\boldsymbol{Z}_{Low}])'\hat{\boldsymbol{\gamma}}_{Pooled} \\ + \{E[\boldsymbol{Z}_{High}]'(\hat{\boldsymbol{\gamma}}_{High} - \hat{\boldsymbol{\gamma}}_{Pooled}) + E[\boldsymbol{Z}_{Low}]'(\hat{\boldsymbol{\gamma}}_{Pooled} - \hat{\boldsymbol{\gamma}}_{Low})\}, \end{aligned} \tag{3}$$

where $E[Y_{High}] - E[Y_{Low}]$ is the difference in mean outcome scores between high SES and low SES tercile groups. $\hat{\boldsymbol{\gamma}_{Pooled}}$, $\hat{\boldsymbol{\gamma}_{High}}$ and $\hat{\boldsymbol{\gamma}_{Low}}$ denote the vector of coefficients from a regression estimating Equation 2 on a pooled, high and low SES sample respectively.[17] The first term of Equation 3 performs the OB decomposition using the coefficients from a pooled sample regression and provides the detailed composition yielding the contribution of each explanatory variable to the SES gap. We choose to use the estimated coefficients from the pooled sample because it is unclear from a theoretical standpoint which SES group coefficients are most relevant. We present our production equation results separately by SES to understand the sensitivity of this modelling choice.

The second term of Equation 3 enclosed in curly brackets represents the unexplained contribu-

[17] In our pooled equation, we include an indicator variable for whether in the high SES group or not so that unexplained components are not inadvertently transferred to the explained components (Jann 2008).

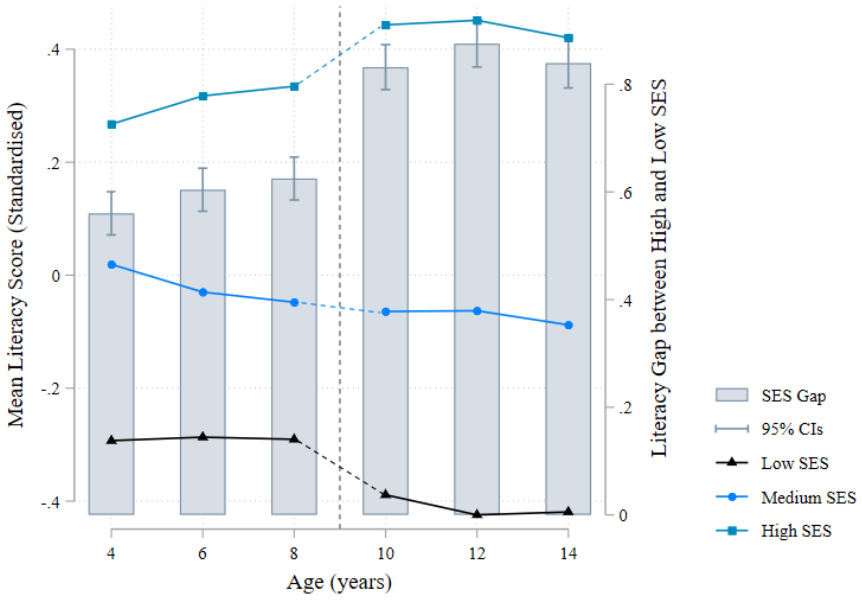
tion. We do not consider this part of the OB decomposition formula in our analysis.

As a test of the functional form of our human capital formation model we allow the time use inputs (and all other covariates) to vary by parent reported/child reported and by school/non-school day by fully interacting the model with dummy variables. These results are combined to calculate the contributions of time use by category and compared to our main more parsimonious specification where only the dummies are included as main effects. This specification test performs two things; it allows for discontinuities across different reporting types and days of the week, but also allows for non-linearities in time use as time use will vary by school/non-school day and by early and late childhood. These results are presented as contributions calculated as the sum across the interaction terms.

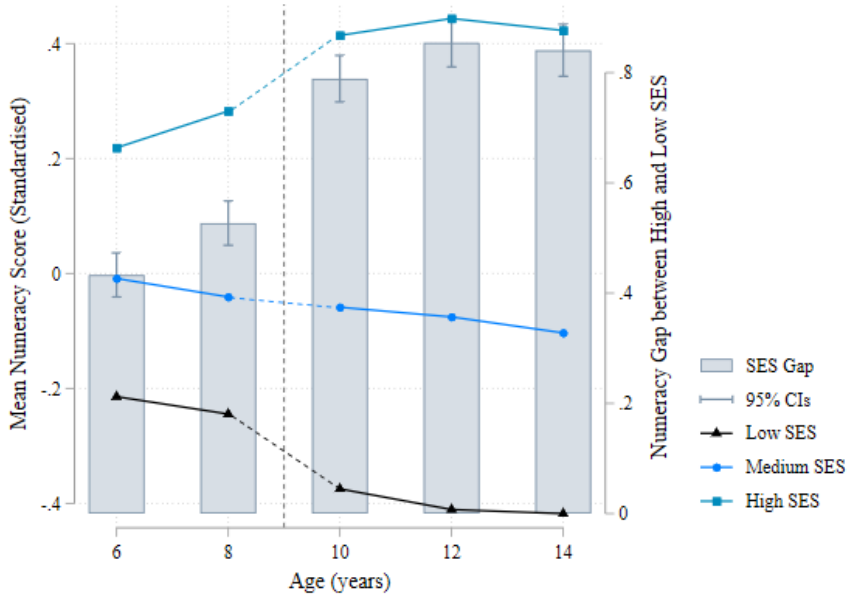
5 Results

5.1 The SES Gap in Cognitive Skills and Socio-Emotional Well-Being

Figure 1 plots the mean standardised literacy and numeracy scores every two years of age by SES tercile. We see substantial gaps in skills, which persist from early childhood through to age 14. Panel a) shows that at age 4, children from high SES families have significantly higher literacy scores (by about 0.2 standard deviations) than children from medium SES families, and these medium SES children are themselves performing significantly better (by about 0.3 standard deviations) than children from low SES families. The gap between the high SES and low SES groups is over 0.5 standard deviations, and does not diminish over the 10-year period. Although the SES gap appears to widen by age 14, we caution against interpreting this as a true widening in the skills gap, given a different literacy test is used from age 10 onwards. The SES gap in scores within the same type of test are relatively stable by age, as shown by the grey bars. A very similar pattern is found for numeracy skills (Panel b).



(a) Literacy Score and Gap by SES



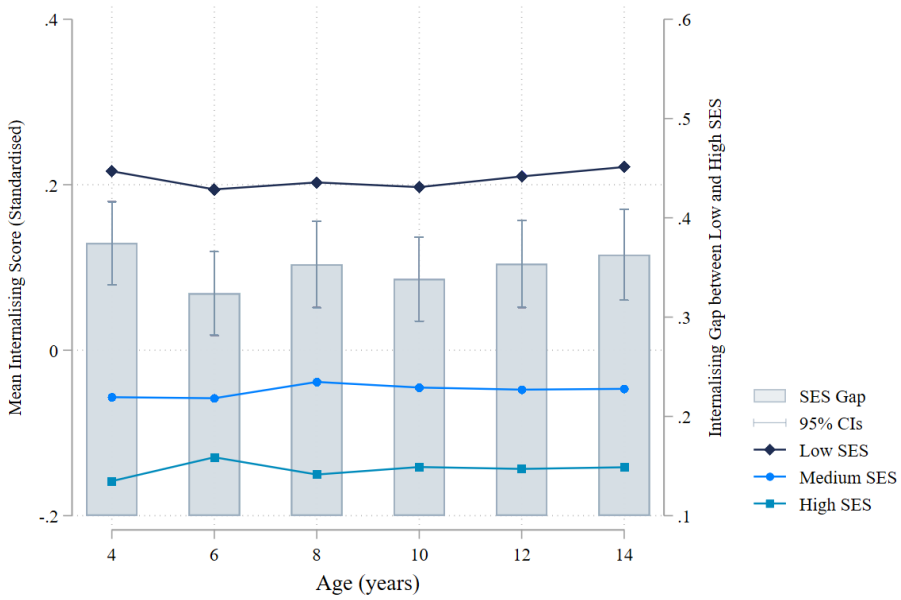
(b) Numeracy Score and Gap by SES

Figure 1: Cognitive Skills by Age and SES

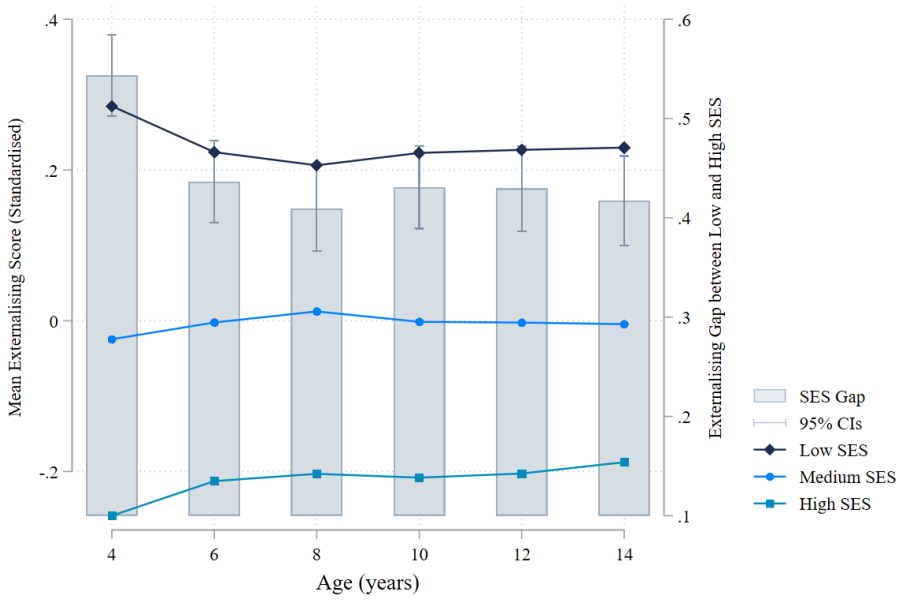
Notes: This figure provides line graphs of the mean standardised score by tercile for each age group (left hand side y-axis) and a bar chart of the SES gap in the standardised score between the highest and lowest tercile by age (right hand side y-axis). Corresponding 95% confidence intervals for the SES gap are shown on top of the bars. The dashed line indicates a change in test type. Prior to age 10, literacy and numeracy are assessed using PPVT and MR scores respectively. From age 10 onwards, NAPLAN scores are used.

Figure 2 plots the mean socio-emotional difficulties scores for a) internalising (emotional and peer) problems, and b) externalising (conduct and hyperactivity) problems every two years by SES tercile. Similar to the pattern in Figure 1, these graphs show that there are substantial gaps

in socio-emotional difficulties by SES. From age 4, children from high SES families have, on average, substantially fewer internalising and externalising problems than children from medium or low SES families, and these differences by SES persist throughout childhood and into adolescence.



(a) Internalising Score and Gap by SES



(b) Externalising Score and Gap by SES

Figure 2: Socio-Emotional Difficulties by Age and SES

Notes: This figure provides line graphs of the mean standardised score by tercile for each age group (left hand side y-axis) and a bar chart of the SES gap in the standardised score between the highest and lowest tercile by age (right hand side y-axis). A higher score indicates a high degree of difficulties. Corresponding 95% confidence intervals for the SES gap are shown on top of the bars.

The proceeding analysis will consider the average SES gap as being the average human capital gap between children from low SES and high SES families over the whole sample, ages 4 through to 14 years. The average SES gaps are similar for the two cognitive skills measures; 0.644 and 0.699 standard deviations for literacy and numeracy scores, respectively. The average SES gaps are also fairly similar for our two socio-emotional difficulties measures; 0.287 and 0.386 standard deviations for internalising problems and externalising problems, respectively. The SES gap is therefore much larger for cognitive skills than that for socio-emotional difficulties. We express the gap in standard deviations, as this is common in the human capital production literature. In order to compare to the SES gap literature we also consider the SES gap expressed in terms of average rank by SES group in Appendix Figure A1. This figure shows that the average percentile gap between our high SES and low SES group is about 20 percentile points for numeracy scores and 10 percentile points for externalising problems. These gaps are of similar magnitude to that found in e.g., Great Britain (Feinstein 2003) and the US (Cunha et al. 2006*a*) suggesting an external relevance to any potential findings from this current study of the Australian population.

In sum, substantial SES gaps in human capital in Australia are observed already from an early age and maintained through childhood and into adolescence. These gaps are maintained despite large public investments in public education, highly subsidised healthcare services and a substantive welfare system. The key question that this paper seeks to explore, is to what extent do differences in how children are spending their time contribute to these large and persistent SES gaps in both cognitive skills and socio-emotional difficulties.

5.2 Differences in Time Investments by SES throughout Childhood

Figure 3 illustrates the mean difference in time allocations (in hours) of children from high SES families compared with those from low SES families. The bars above the zero line indicate activities that children from high SES families are doing more of, while the bars below the zero line indicate activities that children from low SES families are doing more of. The vertical dashed line signifies that there was a change in the time use diary format from parent-reported (up to age 8) to child-reported (from age 10 onwards).

It is clear that children from high SES families are doing more organised out-of-school educational activities (e.g. homework, tutoring and music lessons), shown by the pink bars, from age 4 through to age 14, and also more cognitive leisure activities (e.g. playing board games, reading or playing an instrument for leisure), shown by the yellow bars, than children from low SES families. The largest SES difference is seen in time spent with digital media (e.g. watching TV, video games, social media), shown by the purple bars. Children from low SES families are consistently engaged in substantially more digital media time at all ages. It is important to recognise that children from high SES families do spend a considerable amount of time with digital media - by age 14 they spend on average three and a half hours per day. It is just that children from low SES families spend even more of their time with digital media, totalling on average 4.3 hours by age 14.[18] The SES differences that we see for organised out-of-school education, cognitive leisure and digital media activities are all significant at each age at the 1% level. For other activities, the difference by SES is much smaller on average.[19]

While Figure 3 considers the pooled sample of time use diaries, we consider the SES gaps in time use separately by whether the diary was recorded on a school day or a non-school day in Appendix Figure A2. We also present the mean time spent in each activity by SES group and age, separately by school and non-school day in Tables A7 and A8. Although time spent on certain activities vary by school or non-school day, the SES differences in time use are generally similar across school days and non-school days.

In Table 1 we show the SES differences in time use averaged over the whole sample and by broad age group. Across all years, children from low SES families spend an average of 35 minutes more per day with digital media than children from high SES families. It is noteworthy that the 35 minutes per day more low SES children are spending with digital media approximately equates to the average additional time that high SES children spend on both organised out-of-school education and cognitive leisure activities (36 minutes), implying that there may be a substitution between digital media and out-of-school educational/leisure activities.

[18] For details of the mean time spent in each activity by SES group at each age, see Appendix Table A6.

[19] There is a noticeable switch for general care from an activity that low SES children do more of to one that high SES children do more of. This is driven by low SES children engaging in more non-verbal interactive activities (such as crying, being upset, fighting, being held, and cuddled) than high SES children at younger ages (4-8 years), and high SES children allocating more time to travel at older ages (10-14 years).

When we examine SES differences in time use by age group, it is clear from Table 1 that the difference in digital media time increases with age. Among the younger (aged 4-8) group, children from low SES families spend on average 22 minutes more per day on digital media than high SES children, and this increases to 47 minutes among the older (aged 10-14) group. Given the much larger difference in digital media time among older children and increasing concern about digital media use among adolescents, we undertake a separate Oaxaca-Blinder decomposition analysis that focuses on older children in Section 5.5. There remains a stable average SES difference of 36 minutes per day for organised out-of-school educational and cognitive leisure activities combined in both the younger and older groups, although the breakdown of these two activities varies slightly by age group. Across all years, there is less than 6 minutes difference in the time spent on each of sleep, school, physical activities, general care, chores and social activities. This suggests that it is unlikely that these activities play any meaningful role in explaining the SES gaps that we see in human capital. If time investments were to explain a portion of the SES gap in skills and socio-emotional difficulties, we would expect it to arise from digital media time, educational activities and cognitive leisure activities.

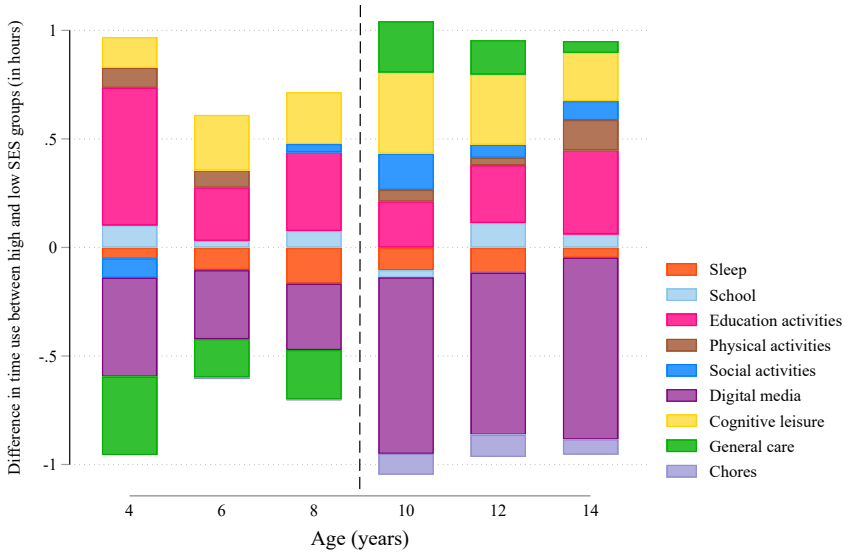


Figure 3: Time Use SES Gaps by Age

Notes: This figure presents mean differences in time use (hours) by low and high SES children by age of the child. Positive difference in time use, means more time spent on an activity by the high SES group, and vice versa for negative. The dashed vertical line illustrates the break in reporting: before age 10 parents report time use, from 10 years of age children report their own time use.

Table 1: Average Differences in Time Use by Age Groups

Time Use Categories	Full Sample (4-14 years)	Young Children (4-8 years)	Older Children (10-14 years)
Sleep	-5.7	-6.7	-4.7
School	5.5	10.1	0.8
Education activities	20.6	24.0	17.2
Physical activities	3.5	2.4	4.6
General Care	-3.9	-16.5	8.8
Chores	-2.7	-0.3	-5.0
Social activities	2.2	-2.0	6.4
Cognitive leisure	15.2	11.9	18.5
Digital media	-34.6	-22.3	-46.9
Unknown	-0.1	-0.6	0.4
No. of observations	22,004	9,322	12,682

Notes: This table presents the average of SES differences in time use (as shown in Figure 3), in minutes, for young and older children separately. Positive value denotes more time on an activity by the high SES group, and vice verse for negative.

5.3 The Effect of Children's Time Allocation on Human Capital

To be able to determine the extent to which time allocation decisions explain the SES gap in cognitive skills and socio-emotional difficulties that we see in Figures 1 and 2, we first estimate a model of the production of cognitive skills and socio-emotional well-being.

In Table 2, we present the contemporaneous time use coefficient estimates from our VA+ model, described in Section 4.1, for cognitive skills and socioemotional difficulties by low and high SES groups. Organised out-of-school educational activities is selected as the reference category. This means the coefficients of other time use categories should be interpreted relative to out-of-school educational activities. This choice was based on Figure 3, which clearly illustrates a trade-off between out-of-school education activities and digital media time use, with children from high SES families spending more time on education activities and children from low SES families spending more time on digital media. Moreover, this choice also allows for comparison of our results with previous studies such as Fiorini & Keane (2014). In robustness specifications, we use digital media time and cognitive leisure time as alternative reference categories.

Table 2: Effects of Children's Time Allocation on Human Capital

	Cognitive Skills				Socioemotional Difficulties			
	(1) Literacy score		(2) Numeracy score		(3) Internalising problems		(4) Externalising problems	
	Low SES	High SES	Low SES	High SES	Low SES	High SES	Low SES	High SES
Ref: Education activities								
Sleep	-0.088***	-0.045***	-0.083***	-0.060***	-0.001	-0.001	0.015	0.004
	(0.020)	(0.015)	(0.026)	(0.018)	(0.017)	(0.009)	(0.013)	(0.008)
School	-0.044*	-0.046**	-0.048*	-0.056**	0.021	0.009	0.032**	0.001
	(0.024)	(0.018)	(0.029)	(0.022)	(0.019)	(0.011)	(0.015)	(0.010)
Physical activities	-0.062***	-0.040***	-0.045*	-0.013	-0.005	-0.007	0.022*	-0.006
	(0.019)	(0.014)	(0.025)	(0.016)	(0.015)	(0.008)	(0.012)	(0.007)
General care	-0.047**	-0.038***	-0.042*	-0.037**	0.005	0.002	0.022*	0.005
	(0.019)	(0.014)	(0.025)	(0.015)	(0.016)	(0.008)	(0.012)	(0.007)
Chores	-0.037	-0.000	-0.038	-0.030	0.015	-0.001	0.024*	-0.005
	(0.024)	(0.018)	(0.027)	(0.020)	(0.017)	(0.010)	(0.014)	(0.009)
Social activities	-0.048**	-0.038***	-0.036	-0.027*	-0.001	0.003	0.013	0.005
	(0.019)	(0.015)	(0.024)	(0.016)	(0.016)	(0.008)	(0.012)	(0.007)
Cognitive leisure	-0.010	0.011	-0.021	0.003	0.001	0.006	0.011	-0.010
	(0.022)	(0.017)	(0.026)	(0.017)	(0.018)	(0.009)	(0.015)	(0.008)
Digital media	-0.048***	-0.039***	-0.059**	-0.025*	0.014	0.012	0.022*	-0.000
	(0.018)	(0.014)	(0.023)	(0.015)	(0.015)	(0.008)	(0.011)	(0.007)
Unknown	-0.012	-0.026	-0.027	0.021	0.062	-0.008	0.024	0.011
	(0.044)	(0.041)	(0.050)	(0.084)	(0.041)	(0.020)	(0.024)	(0.014)
Lagged outcome	0.465***	0.493***	0.512***	0.512***	0.725***	0.762***	0.790***	0.808***
	(0.022)	(0.019)	(0.024)	(0.020)	(0.016)	(0.013)	(0.013)	(0.011)
Observations	2,742	4,117	1,977	2,963	3,847	5,407	3,847	5,408
R-squared	0.360	0.358	0.448	0.424	0.603	0.641	0.714	0.712

Notes: This table presents the coefficients of time use and lagged outcome score and their corresponding standard errors in parenthesis from 8 separate regressions. Each activity refers to the amount of time spent on that activity measured in hours per day. All regression models include the full set of covariates including lagged outcome, lagged time use, diary, time and state FE, child, household, parent controls, parenting styles and life events. Robust standard errors in parenthesis, clustered at individual level. *** p<0.01, ** p<0.05, * p<0.1.

Results in columns (1) and (2) of Table 2 suggest that time spent in organised out-of-school educational activities is relatively more productive for both literacy and numeracy skills than time spent in most other activities, particularly sleeping, physical activity, general care, social activities and digital media. Because the literacy skills specification failed the exogeneity test as discussed in the methods section, we interpret the literacy score results with caution, but note their similarity to the numeracy results. The numeracy skills (Column 2) results show that relative to time spent in organised out-of-school educational activities, an additional hour of time spent on digital media reduces performance in numeracy by 0.06 standard deviations for low SES children (p=0.01), and 0.02 standard deviations for high SES children (p= 0.09). In most cases the effect for low SES children is larger than for high SES children, which suggests that in general, the investment of time in organised out-of-school educational activities has a greater academic return among low SES children and is consistent with the concept of diminishing returns to investments. Given sleep does not appear to play a large part in the SES gap, we place less emphasis on these results.

In Appendix Table A9 we present estimates from an alternative specification which uses digital media time as the omitted category instead of organised out-of-school educational activities. These estimates confirm that time spent doing organised out-of-school educational activities is relatively more productive for literacy and numeracy skills than time spent on digital media. It also shows that time spent on cognitive leisure activities is similarly more productive relative to time spent on digital media activities, which suggests that cognitive leisure activities are likely to be a suitable substitute for organised out-of-school educational activities. We confirm this in Appendix Table A10, which shows the estimates when cognitive leisure time is used as the reference category. Here, the coefficient estimates are very similar to our main results, which use organised out-of-school education activities as the reference category, implying that it matters little whether the cognitively enhancing activities are organised/prescribed or whether they are undertaken as a leisure activity - both are similarly more productive for literacy and numeracy skills than most other activities.

Turning to the results for socio-emotional difficulties, we show in Columns (3) and (4) of Table 2, the regression estimates of the effect of children's time allocation on internalising and extern-

alising problems by low and high SES groups. In contrast to the results for cognitive outcomes, we find that in general, time use has very little effect on socio-emotional difficulties. This is consistent with previous studies on younger children (Fiorini & Keane 2014). All estimates are small and statistically insignificant for internalising problems. For externalising problems, we find some evidence that time spent in organised out-of-school educational activities is relatively more beneficial than time spent in school, physical activities, general care and on digital media, but only for low SES children. However, with the exception of the estimates for school time, these are all weakly significant at the 10% level. It is perhaps less useful to consider time trade-offs between school and organised out-of-school educational activities. However, the significant findings for school could relate to school time offering more opportunities for aggressive or disruptive behaviour towards peers or in the classroom.

The time use coefficients presented in Table 2 are of the contemporaneous effects of TU on contemporaneous outcome score. However, these estimates are independent of the potential effects of past TU on the outcome score. The coefficient on the lagged outcome score (β_3 in Equation 2) suggests there is not full depreciation of knowledge from the prior period, rather depreciation is in the order of 46% to 80% depending on the outcome considered. The inclusion of lagged TU allows the rate of depreciation of previous period human capital to vary by input (the vector β_2 in Equation 2). We find some evidence for this in Appendix Table A11.

To test the sensitivity of our estimates from our preferred specification to alternative covariate sets, in Appendix Tables A12 and A13 we show the estimates of all time use categories from an alternative specification that omits parenting style and life events covariates. The similarity in all the time use coefficient estimates suggests that the estimates are quite stable across these two different specifications. We cannot reject the null that the time use coefficient estimates are the same. To further demonstrate the stability in our coefficient estimates, we present in Appendix Figure A3 coefficient estimates for time spent on digital media from over 40 specifications.[20] In these specifications, we sequentially add each household, parenting style and life event covariate, and further extend our preferred specification by including interaction terms. Specifically, we interact parent's age with each of the household characteristics and parenting styles, and

[20]We illustrate the stability of the coefficients with digital media time as an example, however the same pattern of high stability is found for all time use coefficients.

interact child's early cognitive (WAI) score with household characteristics and parenting styles. The high level of stability of our estimates provide additional support for our specification.

5.4 Decomposing the SES Gap in Cognitive Skills and Socio-Emotional Difficulties

The overall SES gap for each measure of human capital development, and the overall explained contribution of covariates in explaining these SES gaps as estimated by our pooled value added+ model are presented in Table 3. Outcomes are measured as the mean of standardised scores by age. For our cognitive measures we find that the low SES group are behind the high SES group on average by 0.644 and 0.699 standard deviations in literacy and numeracy, respectively. It is a similar story for socio-emotional difficulties, albeit not as big a gap where the low SES group observe 0.287 and 0.363 standard deviations higher score in internalising and externalising problems respectively, compared to the high SES group. The OB decomposition results presented in Table 3 show that our VA+ model of human capital production does a reasonable job of explaining the SES gap in human capital, explaining in the region of 74% to 97% of the SES gap, depending on outcome.

We present the results from the detailed OB decomposition in Figure 4, focusing on the explained contribution of differences in children's contemporaneous time use allocations. In Panels (a), (c), (e), and (g) we show the individual contributions of each main time use category presented as a percentage of the overall SES gap for literacy, numeracy, internalising problems and externalising problems respectively. In Panels (b), (d), (f), and (h) we zoom in on the digital media time use category for literacy, numeracy, internalising problems and externalising problems respectively, breaking this down into the four categories of social media, games, passive media, and other. The reference category, and therefore the currency of the contributions is organised out-of-school educational activities.

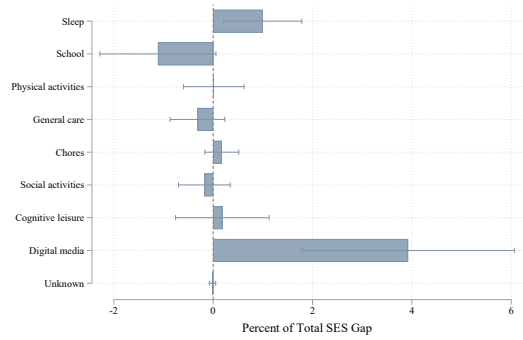
Table 3: Overall SES Gap and Contribution of Covariates

	Cognitive Skills		Socioemotional difficulties	
	(1) Literacy Score	(2) Numeracy Score	(3) Internalising problems	(4) Externalising problems
Mean prediction				
Low SES	-0.254***	-0.254***	0.119***	0.149***
	(0.018)	(0.021)	(0.017)	(0.017)
High SES	0.391***	0.445***	-0.167***	-0.214***
	(0.014)	(0.018)	(0.013)	(0.012)
Difference	-0.644***	-0.699***	0.287***	0.363***
	(0.023)	(0.028)	(0.021)	(0.021)
Decomposition				
Explained	-0.479***	-0.601***	0.278***	0.322***
	(0.031)	(0.036)	(0.025)	(0.024)
Unexplained	-0.165***	-0.098***	0.009	0.041**
	(0.034)	(0.038)	(0.022)	(0.019)
% Explained	74.38	85.98	96.86	88.71
Observations	6,859	4,940	9,254	9,255

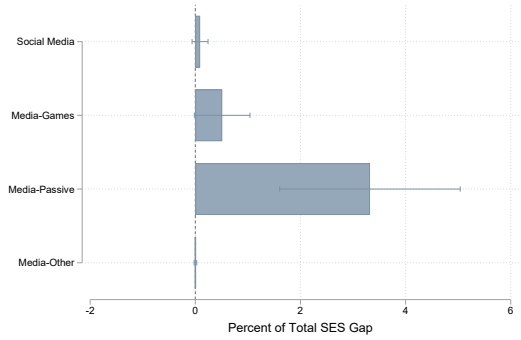
Notes: This table presents estimates of the SES gap in our human capital measures, as measured as the mean of standardised scores by age. The Oaxaca decomposition results are also presented, presenting how much of the estimated gap is explained by covariates, coefficients and the interaction term as described in Equation 3. Robust standard errors in parenthesis, clustered at individual level. *** p<0.01, ** p<0.05, * p<0.1.

The results in Figure 4 Panel (c) show that of all time investments, the largest contribution of the numeracy SES gap is from the contemporaneous time spent with digital media at the cost of organised out-of-school educational activities. This gap in contemporaneous time use contributes about 4 per cent to the observed SES gap in numeracy skills. All other time use activity contributions are small and insignificant, except for sleep which is small (relative to digital media) yet statistically significant. It is also interesting to note there is a similar finding for the literacy skills SES gap, see panel (a), suggesting a common pathway, although these results are less reliably estimated and suggest a smaller contribution. The production function estimates suggested that differences in sleep were very important for determining cognitive skill development, yet the Oaxaca results tell us that differences in sleep patterns by SES are not important for explaining the SES gap in cognitive skills, and this is because contemporaneous sleep time use patterns on average are similar by SES group.[21]

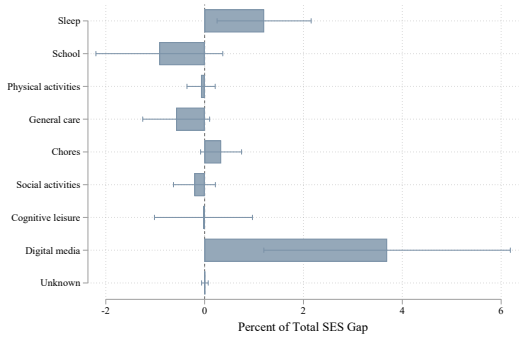
[21] We make no further discussion of the contribution of sleep to the SES gap as not only are the differences in sleep patterns small, the linear conditional expectation functional form assumption used in Equation 3 as required by the OB decomposition procedure is potentially misleading (Barsky et al. 2002).



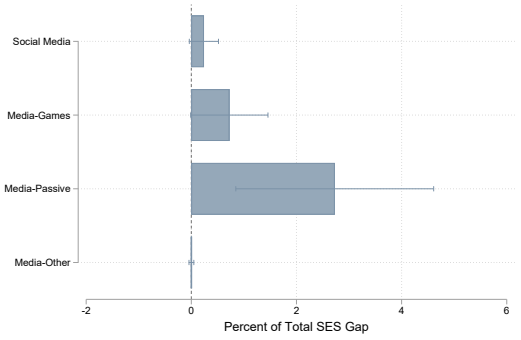
(a) Time Use; Literacy



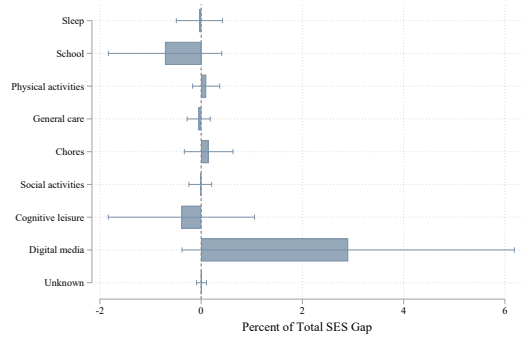
(b) Media Time Use; Literacy



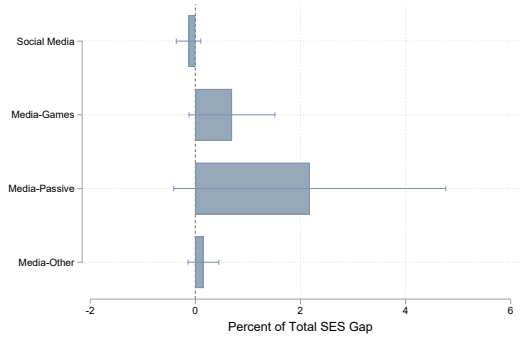
(c) Time Use; Numeracy



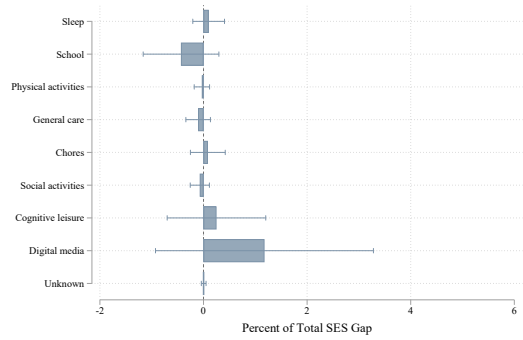
(d) Media Time Use; Numeracy



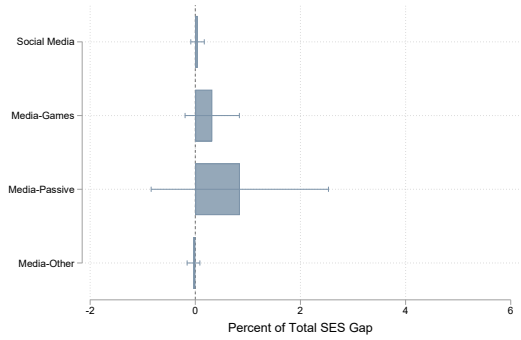
(e) Time Use; Internalising Problems



(f) Media Time Use; Internalising Problems



(g) Time Use; Externalising Problems



(h) Media Time Use; Externalising Problems

Figure 4: Contributions of Time Use to SES Gap

Notes: Each figure presents the % contribution of a time use category to the overall SES standardised score gap, with 95% confidence intervals depicted as spikes on top of the bars.

The 4% contribution of contemporaneous digital media time use to the numeracy skills SES gap indicates that if the low SES group had spent 35 minutes more per day on organised out-of-school educational activities (which is the average gap in time use between low SES and high SES children), then the overall SES gap would be 4% smaller. Panels (b) and (d) of Figure 4 suggest that the SES gap due to digital media use crowding out time spent on organised out-of-school educational activities, is driven specifically by the digital media sub-category of passive media (watching television) .

Turning to the SES gap in socio-emotional difficulties, the results in Figure 4 Panels (e) and (g) show that contemporaneous time spent on digital media at the expense of time spent on organised out-of-school educational activities is again the largest contributing factor, explaining about 3% of the SES gap, but only for internalising problems and this result is imprecise. For externalising problems, all time use categories have economically small and insignificant effects. The OB results suggest that digital media explains the SES gap because it is crowding out 35 mins of extra organised out-of-school educational activities.

In any OB decomposition analysis the choice of reference group can affect the interpretation of the detailed contributions (Fortin, Lemieux & Firpo 2011). In our analysis, we considered organised out-of-school education activities as the reference category. However, since we find that cognitive leisure time is similarly productive for cognitive skills (Appendix Table A10) and observe a trade-off between digital media and organised out-of-school education or cognitive leisure activities (Figure 3), with high SES children spending more time on education/leisure and low SES children spending more time on digital media, we also perform two alternative OB decompositions using digital media time and separately cognitive leisure time as the reference category, instead of organised out-of-school education activities.

Figure A4 in the Appendix presents OB decomposition estimates with the contributions being interpreted relative to digital media activities. The results show that the time spent on organised out-of-school education activities and cognitive leisure activities individually contribute around 1.5% to the SES gap in both literacy and numeracy skills. When combined, the effect of these two activities is approximately equivalent to the 3-4% contribution of digital media time use that we find in our main analysis. This tells us that organised out-of-school educational activities

and cognitive leisure are potential substitutes and replacing digital media time use with either of these activities will potentially help reduce the SES gap. When cognitive leisure time is the reference category, as shown in Figure A5, we confirm this finding. The contribution of time spent on digital media to the literacy SES gap and numeracy SES gap is about 4% relative to time spent on cognitive leisure activities. These results also allow us to infer the relative productivity benefits of other activities, such as physical activity and social activities, that are often considered more beneficial to human capital development than digital media time. The small and insignificant coefficient estimates for these activities when digital media time is used as the reference category (see Appendix Table A9) suggest that swapping time spent with digital media for more physical or social activities would do little to improve the SES gap in cognitive skills or indeed socio-emotional wellbeing.

In our main OB analysis we control for whether time use was recorded on a school day or not and whether it was the parent or the child reporting time use using dummy variables included as main effects. In a robustness check, we fully interact our models with these two dummy variables to account for potential important differences across how time use is reported and present the time use contributions to the SES gap of our outcome variables in Figure A6. The results are similar to our main results based on the more parsimonious model estimates presented in Figure 4, with the fully interacted based approach yielding slightly larger and more precisely estimated results.

In order to understand the relative importance of the time use estimates we consider the contribution of factors other than time use from our decomposition results. To this end we provide an extended OB decomposition in Table A14, which includes all lags of time varying controls. A number of conclusions are apparent. First, it is clear that across our many control variables there is no single silver bullet that explains the SES gap in human capital. Many variables have small impacts with varying levels of precision surrounding these estimates. Second, the contribution of contemporaneous time allocated to digital media is relatively large in terms of explaining the SES gap for literacy, numeracy and internalising problems compared to many other inputs. Third, there are no other time varying inputs that contribute as much as (or more than) time spent with digital media that are also estimated with precision. Differences in digital

media use explain more than other factors that may a priori be deemed important in explaining the gap. For example, differences in digital media time use explains 5 to 8 times more of the gap compared with differences in the proportion of parents with English as a first language. Lastly, our estimates of the contribution of time use consider only the contemporaneous contributions of time use. However, the model predicts a degree of persistence in the outcome score as captured by the coefficient on the lagged outcome (see Table 2), which means past time use investments continue to have an impact on current outcomes, but at a depreciated rate. By only considering the contemporaneous impacts of time use, we are potentially providing estimates that underestimate the true impact, especially if time use patterns are equalised across SES groups throughout the whole of childhood.

To account for the potential cumulative impact of time use investments throughout childhood we include the depreciated impact of previous time use investments, β_3 from Equation 2 shown in Table 2, which is approximately equal to 0.5. We find no supportive evidence that this depreciation rate varies by time use input (as the coefficients on the lagged time use inputs are all insignificant and small as shown in Appendix Table A11). This in turn suggests the depreciation given by the coefficient on the lagged score in Table 2 is the relevant rate. In Figure 5 we illustrate the impact on the numeracy SES gap under a scenario where time spent on organised out-of-school educational (or cognitive leisure) activities and digital media were equalised across the SES groups over eight years (from age 6 to 14). Under this scenario, the low SES group would spend on average 35 minutes more per day on educational (or cognitive leisure) activities rather than digital media over the eight year period. The grey bars indicate the impact on numeracy skills if only the contemporaneous effects of time use (4%) were considered. If we additionally include the cumulative effects of this equalisation in time spent on organised out-of-school educational activities, the impact on numeracy skills is shown by the blue bars. By age 14 the contribution of this time use equalisation to the SES gap is almost double, nearly 8%. Altogether this suggests that given the cumulative effect of skill development, children's time invested in organised out-of-school educational activities or cognitive leisure could be a more important factor in determining the SES gap than the contemporaneous results suggest.

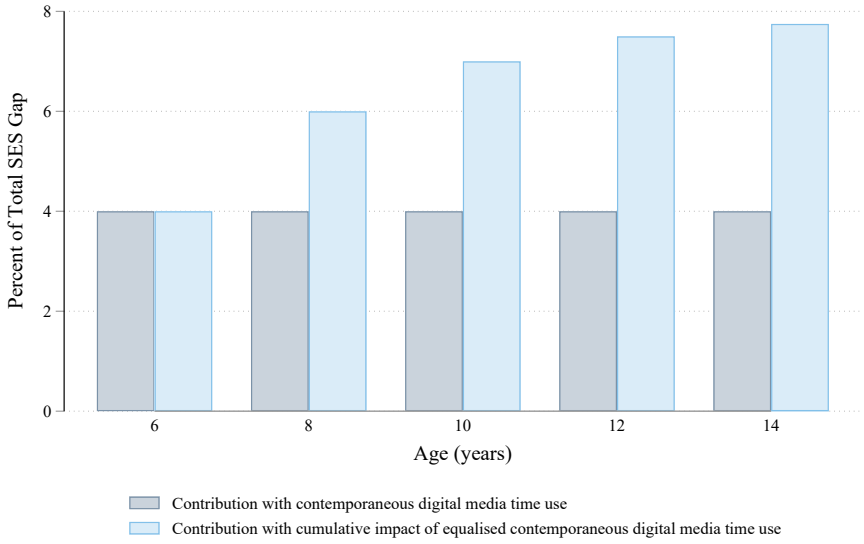


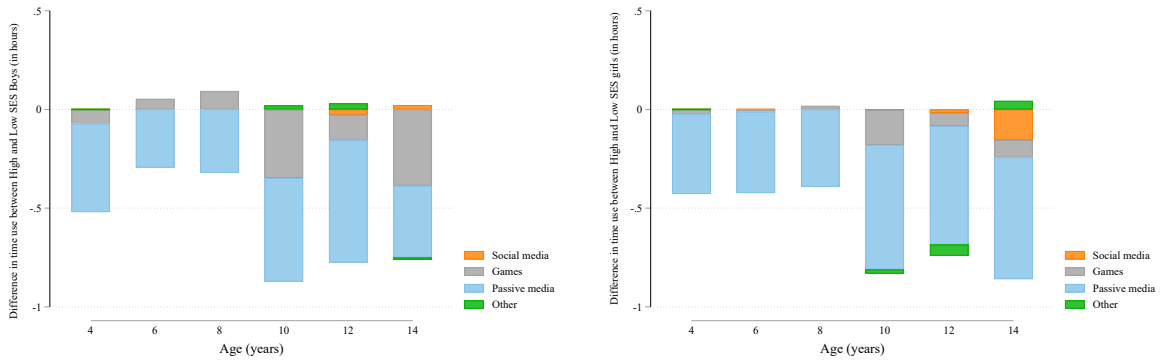
Figure 5: Numeracy SES Gap: Impact of Time Use Equalisation under Different Assumptions

Notes: This figure presents the SES gap in numeracy scores by age of the child under two scenarios. The initial gap is represented by the zero line where current time use patterns are maintained. This gap is then modified by first equalising child time spent on educational activities across SES groups by increasing time spent on organised out-of-school education activities by 35 minutes per day and reducing time spent with digital media by 35 minutes per day, accounting only for contemporaneous effects. The gap is then further modified by accounting for the depreciated cumulative impact of equalised past time use investments for the full 8 years, using the rate of depreciation of 0.5, as suggested by the coefficient on the lagged outcome score (numeracy) from Table 2.

5.5 Heterogeneity Analysis

We first consider gender differences in the contribution of each digital media time use component to the SES gaps in cognitive skills. Figure 6 shows that there are substantive differences by gender in the distribution of time use differences by SES. On average, both low SES boys and girls spend more time on passive media, and this difference grows with age. In terms of specific gender differences, low SES boys spend more time on digital games, and this pattern also grows with age. Specifically, at age 14, low SES boys spend 20 minutes more per day on digital games than high SES boys. On the other hand, low SES girls spend more time on social media, with an approximate difference of around 10 minutes at the age of 14.

The overall SES gap by gender is presented in Table 4. We focus on cognitive skills and digital media time use as this is where we found economically meaningful contributions in our main results. Boys observe larger SES gaps across both numeracy and literacy, and this further motivates separate analysis by gender.



(a) Boys (b) Girls

Figure 6: SES Gaps in Digital Media Time Use by Age and Gender

Notes: This figure presents mean differences in digital media time use (hours) by low and high SES children by age of the child and gender. Positive difference in time use, means more time spent on an activity by the high SES group, and vice versa for negative.

The detailed OB decomposition results split by gender are shown in Table 4, Panel C.[22] The results suggest that time not allocated to educational activities and instead allocated to digital media, passive media in particular, amongst the low SES explains 5% of the numeracy skills SES gap amongst boys and not at all for numeracy amongst girls. The gender split results also show an important contribution of digital games for boys (1%) in explaining the numeracy gap. The difference across the genders appear to be driven by a greater return to organised out-of-school educational activities amongst boys than girls, and not so much by differences in digital media time use patterns. The notable difference in social media time use by SES for females does not appear to contribute to the SES gap in cognitive skills, and this is because social media does not appear to negatively influence cognitive skill development relative to organised out-of-school educational activites.

[22]Tables A15 and A16 in the Appendix present the coefficient estimates from the VA+ model, on cognitive skills and socioemotional difficulties by gender. Additionally, in Figure A7 we provide the full detailed decomposition results for all our time use categories and the results show no economically meaningful gender differences across the non digital media time use categories.

Table 4: SES Gap and Contributions by Gender

	Literacy				Numeracy			
	Girls		Boys		Girls		Boys	
Panel A								
Mean Difference	-0.633***		-0.654***		-0.627***		-0.767***	
	(0.031)		(0.033)		(0.038)		(0.040)	
Panel B								
Decomposition								
Explained	-0.436***		-0.496***		-0.589***		-0.618***	
	(0.043)		(0.045)		(0.052)		(0.051)	
Unexplained	-0.197***		-0.159***		-0.037		-0.150***	
	(0.046)		(0.049)		(0.053)		(0.052)	
% Explained	68.88		75.84		93.94		80.57	
Panel C	Coeff.	Contribution (%)	Coeff.	Contribution (%)	Coeff.	Contribution (%)	Coeff.	Contribution (%)
Decomposition - Media								
Digital media	-0.015	2.743*	-0.030***	4.790***	-0.014	2.149	-0.037***	5.096***
(overall)	(0.010)	(1.563)	(0.010)	(1.504)	(0.013)	(2.041)	(0.013)	(1.725)
Types								
Social media	-0.000	0.048	0.000	-0.028	-0.003	0.460	-0.000	0.015
	(0.001)	(0.169)	(0.001)	(0.145)	(0.002)	(0.287)	(0.001)	(0.119)
Media-Games	0.001	-0.237	-0.007*	0.994*	-0.002	0.265	-0.010**	1.338*
	(0.002)	(0.347)	(0.003)	(0.520)	(0.003)	(0.532)	(0.005)	(0.687)
Media-Passive	-0.019**	2.931**	-0.025***	3.804***	-0.009	1.447	-0.029***	3.739***
	(0.008)	(1.288)	(0.008)	(1.168)	(0.010)	(1.581)	(0.010)	(1.262)
Media-Other	-0.000	0.000	-0.000	0.019	0.000	-0.023	-0.000	0.004
	(0.000)	(0.019)	(0.000)	(0.073)	(0.001)	(0.108)	(0.000)	(0.028)
Observations	3,337		3,522		2,413		2,527	

Notes: Robust standard errors in parenthesis, clustered at individual level. *** p<0.01, ** p<0.05, * p<0.1. Contribution refers to the percentage of the total SES gap that is explained by each of the digital media variables.

Our second heterogeneity analysis considers the SES gap of just the older children, aged 10 through to 14 years as this is where differences in digital media use become much more apparent and also more detailed information is provided.[23] Age has been suggested to be an important moderator in affecting the returns to human capital investments (Cunha & Heckman 2007). This analysis also can be seen as a sensitivity check of our main analysis which combines self-reported cognitive skill measures at younger ages with NAPLAN test scores from age 10 onwards, where this discontinuity in testing regime at age 10 could be affecting our results. Results for ages 10-14 only are shown in Table 5. Comparing our results for the older age groups in Table 5 with the results for the whole sample in Figure 4 we see that digital media explains less of the literacy SES gap (2% vs 4%) and more of the numeracy SES gap (nearly 7% vs nearly 4%) for the older children versus estimates for the whole sample respectively. The dominant category within digital media is still passive media for the older age group. We also see that there is a contribution from digital gaming for numeracy. Despite increasing use of social media among older children, we find no clear supportive evidence that it helps explain the SES gaps in cognitive skills. Overall, this suggests that our main finding of contemporaneous digital media time use explaining 4% of the numeracy skills gap at any given age is potentially a downward estimate of the contribution of time use patterns for older ages.

6 Discussion and Conclusion

Our results show the existence of a substantial SES gap among Australian children in both cognitive skills and socio-emotional difficulties at age 4 that is maintained throughout childhood confirming a general pattern observed internationally (Cunha et al. 2006*a*, Feinstein 2003, Jerrim & Vignoles 2013). Compared to high SES children, we find that low SES children spend 35 minutes more per day with digital media at the expense of organised out-of-school educational activities (such as homework and tutoring/music lessons) or cognitive leisure activities (such as playing board games, reading or playing a musical instrument for leisure) as recorded in detailed time use diaries. The greater allocation of time spent with digital media is apparent

[23] We see that the contributions from the other time use variables do not substantively vary from the main analysis, see Figure A8 in the Appendix. Digital media remains the most important time use factor in explaining the SES gap in cognitive skills.

Table 5: Overall SES Gap and Contributions for Older Children (Aged 10 - 14 Years)

	Literacy		Numeracy	
Panel A				
Mean Difference	-0.803***		-0.811***	
	(0.034)		(0.036)	
Panel B				
Decomposition				
Explained	-0.675***		-0.732***	
	(0.044)		(0.047)	
Unexplained	-0.127***		-0.078*	
	(0.044)		(0.046)	
% Explained	84.06		90.26	
Panel C	Coeff.	Contribution (%)	Coeff.	Contribution (%)
Decomposition - Media				
Digital media	-0.026**	3.573**	-0.052***	6.657***
(overall)	(0.011)	(1.446)	(0.013)	(1.628)
Types				
Social media	-0.002	0.219	-0.003	0.337
	(0.001)	(0.157)	(0.002)	(0.213)
Media-Games	-0.004	0.523	-0.017***	2.084***
	(0.004)	(0.516)	(0.006)	(0.700)
Media-Passive	-0.023***	2.838***	-0.035***	4.257***
	(0.008)	(0.990)	(0.009)	(1.106)
Media-Other	0.000	-0.006	0.000	-0.021
	(0.000)	(0.048)	(0.001)	(0.109)
Observations	2,895		2,845	

Notes: Robust standard errors in parenthesis, clustered at individual level. *** p<0.01, ** p<0.05, * p<0.1. Contribution refers to the percentage of the total SES gap that is explained by each of the digital media variables.

from age 4 and grows as children age. This may be due to a lack of ability to afford more stimulating extra-curricular activities, or the additional cognitive load that economic disadvantage places on parents, leaving them with fewer cognitive resources to make more optimal parenting decisions (Mani et al. 2013, Cobb-Clark, Salamanca & Zhu 2019). It should be noted that high SES children do spend a fairly large proportion of their time with digital media, on average about three and a half hours per day by age 14. It is just that low SES children spend on average 35 minutes per day *more* with digital media.

We show that this difference in contemporaneous digital media time use explains about 4% of the SES gap in numeracy skills at any given age, indicating that if children from low SES backgrounds invested 35 minutes more per day on organised out-of-school educational activities or cognitive leisure instead of on digital media, then the numeracy SES gap would be 4% smaller at any given age. Furthermore, we show that of time use spent with digital media,

the differences by SES are driven by passive media (such as watching TV), although for boys and older children, we see an increasing contribution from digital games. Digital media is also found to be the most important time use category in explaining the SES gap in literacy skills and internalising problems, explaining roughly 3% of the gap, although these results are not as robustly estimated. Importantly, our estimates should be viewed as an accounting exercise where we find that the 35 minutes per day extra low SES children spend with digital media is crowding out on average 35 minutes per day of organised out-of-school educational or cognitive leisure activities that the high SES children are spending their time on. The results do not support swapping out digital media use for physical exercise, chores or social activities if the SES gap is to be narrowed, despite wide recognition that these activities offer developmental benefits. We show that these alternative activities are no more productive than digital media activities at improving cognitive skills or mental health, and there is no meaningful SES gap in time spent on these activities. We find that the contribution of time use spent on organised out-of-school educational activities is larger for boys and older ages in explaining the numeracy SES gap, because of greater returns to time use spent on these activities for boys and older age children, and also because there is a larger SES time use gap for older age children.

Our finding that the 35 minutes less per day spent on organised out-of-school educational and cognitive leisure by the low SES children explains at best 4% of the numeracy skills SES gap could be viewed as a small contribution to the overall SES gap. However, this needs to be viewed in context, and relative to the impact of other important determining factors. The first thing to note is that our main results are potentially conservative as they only account for the contemporaneous impact of time use on contemporaneous human capital, and ignore the cumulative impact that can potentially be achieved if time use gaps are narrowed and this is sustained throughout childhood. Our estimates show that accounting for the cumulative impact of a permanent whole of childhood equalisation of time use by SES groups could potentially double the contribution estimate. Second, the relative importance of time use appears to be important compared to other inputs. For example, within our own model we found that few covariates had a contribution of similar magnitude to time use. More broadly, the wider literature on the SES gap has not found a single silver bullet to reducing the SES gap. For example studies

have shown that pre-school can explain some of the SES gap (Gormley & Gayer 2005, Cascio & Schanzenbach 2013, Weiland & Yoshikawa 2013). Cascio & Schanzenbach (2013) find a roughly 0.06 student-level standard deviation improvement in national tests in eighth grade from high quality pre-school amongst children eligible for free meals, and find smaller or zero effects for children in more advantaged families. Decisions beyond the early childhood years also appear to matter; Crawford, Macmillan & Vignoles (2017) show that sorting into schools potentially explains part of the SES cognitive skills gap. Other studies have found the SES gap in academic achievement to be associated with attitudes and behaviours of students and their parents (Gregg & Washbrook 2011, Chowdry, Crawford & Goodman 2011). There is also some suggestive evidence that parenting styles explain between 3% and 4% of the SES cognitive skills gap at age five (Dearden, Sibieta & Sylva 2011). Even specific fixed traits have only found to have small contributory effects, for example Jerrim et al. (2015) found that for three important genes related to reading comprehension, they can explain at best 2% of the SES gap in reading test scores. It therefore appears that many factors affect the SES gap rather than one or two important factors. Differences in time use are important in explaining the SES skills gap, but are only one of many factors that can potentially help reduce the gap.

We have supported the internal validity of our findings by way of a number of robustness and sensitivity tests and argue that there is potentially meaningful external validity to the results of this Australian based research to other developed countries that observe similar SES gaps and time use patterns. Altogether, the results of this paper are important as they suggest that the SES gap in numeracy skills can be narrowed by investments beyond the early years. Whilst the evidence of the efficacy of early year investments is well researched (Almond, Currie & Duque 2018), less is known about investments affecting children at older ages, the 'middle' period. Our research adds to this relatively under-researched period of child development.

Our results show that children's own time use allocations are potentially important in determining the SES gap in numeracy skills. However, our results do not speak to *how* children's own time use allocations can be altered in a way that would reduce SES gaps. This requires further research on precise barriers to increasing time spent on cognitively stimulating activities and what incentives work to switch activities among low SES families. The benefit of our analysis

is the long follow-up of our study, observing children throughout childhood and into adolescence. Yet, this comes at a cost of having to use broad categories of time use to allow common investments across ages. This means we are unable to identify specific educational and cognitive leisure activities that could be promoted. However, given we find similar effects across cognitive leisure activities and organised out-of-school educational activities, any activity that is cognitively stimulating will likely have a similar effect.

There is also the potential for measurement error to affect our results. Although our cognitive measures are externally validated (NAPLAN scores are given by external examiners, cognitive skills tests at younger ages are administered by trained interviewers/evaluators), and socio-emotional outcomes are captured using a validated emotional and behavioural instrument which is consistently measured each survey wave, there is still room for scores to measure skills and mental health with some error. While TUDs are more accurate than survey questions that ask respondents to estimate their time spent in certain activities (Raley 2014), the data may still be affected by recall bias and measurement error.

To conclude, a substantial SES gap in cognitive skills and socio-emotional difficulties amongst children is observed in Australia that is sustained into adolescence mirroring findings found in other Western countries. Digital media use that replaces organised out-of-school educational activities and cognitive leisure time explains a small but meaningful part of the cognitive skill gap, more so for boys and older children. Policies aimed at changing how children from low SES families spend their time out of school, increasing the time spent on cognitively stimulating activities, either organised or as leisure, are likely to reduce the size of the SES gap.

References

Almond, Douglas, Janet Currie, and Valentina Duque. 2018. "Childhood circumstances and adult outcomes: Act II." *Journal of Economic Literature*, 56(4): 1360–1446.

Arnup, Jessica L, Nicole Black, and David W Johnston. 2021. "Changes in children's time use during periods of financial hardship." *Journal of Population Economics*, 1–30.

Attanasio, Orazio, Sarah Cattan, Emla Fitzsimons, Costas Meghir, and Marta Rubio-Codina. 2020. "Estimating the production function for human capital: Results from a randomized controlled trial in Colombia." *American Economic Review*, 110(1): 48–85.

Barsky, Robert, John Bound, Kerwin Ko' Charles, and Joseph P Lupton. 2002. "Accounting for the black–white wealth gap: A nonparametric approach." *Journal of the American statistical Association*, 97(459): 663–673.

Becker, Gary. 1964. *Human Capital: A Theoretical and Empirical Analysis with Special Reference to Education, First Edition.* National Bureau of Economic Research, Inc.

Becker, Gary S. 1962. "Investment in human capital: A theoretical analysis." *Journal of Political Economy*, 70(5, Part 2): 9–49.

Ben-Porath, Yoram. 1967. "The production of human capital and the life cycle of earnings." *Journal of Political Economy*, 75(4, Part 1): 352–365.

Beres, Kristee A., Alan S. Kaufman, and Mitchel D. Perlman. 2000. "Chapter 4 - Assessment of Child Intelligence." In *Handbook of Psychological Assessment (Third Edition)*. . Third edition ed., , ed. Gerald Goldstein and Michel Hersen, 65–96. Amsterdam:Pergamon.

Bianchi, Suzanne M, and John Robinson. 1997. "What did you do today? Children's use of time, family composition, and the acquisition of social capital." *Journal of Marriage and the Family*, 332–344.

Björklund, Anders, Markus Jäntti, and Matthew J Lindquist. 2009. "Family background and income during the rise of the welfare state: Brother correlations in income for Swedish men born 1932–1968." *Journal of Public Economics*, 93(5-6): 671–680.

Blakemore, Tamara, Lyndall Strazdins, and Justine Gibbings. 2009. "Measuring family socioeconomic position." *Australian Social Policy*, , (8): 121–168.

Blanden, Jo, and Stephen Machin. 2007. *Recent changes in intergenerational mobility in Britain.* Sutton Trust London.

Blinder, Alan S. 1973. "Wage discrimination: Reduced form and structural estimates." *Journal of Human Resources*, 436–455.

Bratberg, Espen, Jonathan Davis, Bhashkar Mazumder, Martin Nybom, Daniel D Schnitzlein, and Kjell Vaage. 2017. "A comparison of intergenerational mobility curves in Germany, Norway, Sweden, and the US." *The Scandinavian Journal of Economics*, 119(1): 72–101.

Caetano, Carolina. 2015. "A test of exogeneity without instrumental variables in models with bunching." *Econometrica*, 83(4): 1581–1600.

Caetano, Carolina, Gregorio Caetano, Hao Fe, and Eric Reed Nielsen. 2021. "A dummy test of identification in models with bunching."

Caetano, Gregorio, and Vikram Maheshri. 2018. "Identifying dynamic spillovers of crime with a causal approach to model selection." *Quantitative Economics*, 9(1): 343–394.

Caetano, Gregorio, Josh Kinsler, and Hao Teng. 2019. "Towards causal estimates of children's time allocation on skill development." *Journal of Applied Econometrics*, 34(4): 588–605.

Cascio, Elizabeth U, and Diana Whitmore Schanzenbach. 2013. "The impacts of expanding access to high-quality preschool education." *Brookings Papers on Economic Activity*, , (2): 1–54.

Chevalier, Arnaud, Kevin Denny, and Dorren McMahon. 2009. "A multi-country study of inter-generational educational mobility." In *Education and Inequality across Europe*. 260–281. Edward Elgar Publishing.

Chowdry, Haroon, Claire Crawford, and Alissa Goodman. 2011. "The role of attitudes and behaviours in explaining socio-economic differences in attainment at age 16." *Longitudinal and Life Course Studies*, 2(1): 59–76.

Cobb-Clark, Deborah A, Nicolas Salamanca, and Anna Zhu. 2019. "Parenting style as an investment in human development." *Journal of Population Economics*, 32: 1315–1352.

Conti, Gabriella, Giacomo Mason, and Stavros Poupakis. 2019. "Developmental Origins of Health Inequality." In *Oxford Research Encyclopedia of Economics and Finance*.

Crawford, Claire, Lindsey Macmillan, and Anna Vignoles. 2014. "Progress made by high-attaining children from disadvantaged backgrounds."

Crawford, Claire, Lindsey Macmillan, and Anna Vignoles. 2017. "When and why do initially high-achieving poor children fall behind?" *Oxford Review of Education*, 43(1): 88–108.

Cunha, Flavio, and James Heckman. 2007. "The technology of skill formation." *American Economic Review*, 97(2): 31–47.

Cunha, Flavio, and James J Heckman. 2008. "Formulating, identifying and estimating the technology of cognitive and noncognitive skill formation." *Journal of Human Resources*, 43(4): 738–782.

Cunha, Flavio, James J Heckman, Lance Lochner, and Dimitriy V Masterov. 2006*a*. "Interpreting the evidence on life cycle skill formation." *Handbook of the Economics of Education*, 1: 697–812.

Cunha, Flavio, James J. Heckman, Lance Lochner, and Dimitriy V. Masterov. 2006*b*. "Interpreting the Evidence on Life Cycle Skill Formation." In . Vol. 1 of *Handbook of the Economics of Education*, , ed. E. Hanushek and F. Welch, 697–812. Elsevier.

Daraganova, Galina, Ben. Edwards, and Mark Sipthorp. 2013. "Using National Assessment Program— Literacy and Numeracy (NAPLAN) data in the Longitudinal Study of Australian Children (LSAC)." *Growing Up in Australia: The Longitudinal Study of Australian Children (LSAC) - LSAC Technical Paper No. 8*.

Dearden, Lorraine, Luke Sibieta, and Kathy Sylva. 2011. "The socio-economic gradient in early child outcomes: Evidence from the Millennium Cohort Study." *Longitudinal and Life Course Studies*, 2(1): 19–40.

Del Boca, Daniela, Chiara Monfardini, and Cheti Nicoletti. 2017. "Parental and child time investments and the cognitive development of adolescents." *Journal of Labor Economics*, 35(2): 565–608.

Dunn, L. M., and L. M. Dunn. 1997. "Examiner's manual for the PPVT-III Peabody Picture Vocabulary Test: Form IIIA and Form IIIB." *Minnesota: American Guidance Service*.

Feinstein, Leon. 2003. "Inequality in the early cognitive development of British children in the 1970 cohort." *Economica*, 70(277): 73–97.

Ferreira, Daniel, Miguel A Ferreira, and Beatriz Mariano. 2018. "Creditor control rights and board independence." *The Journal of Finance*, 73(5): 2385–2423.

Fiorini, Mario, and Michael P Keane. 2014. "How the allocation of children's time affects cognitive and noncognitive development." *Journal of Labor Economics*, 32(4): 787–836.

Fortin, Nicole, Thomas Lemieux, and Sergio Firpo. 2011. "Decomposition methods in Economics." In *Handbook of Labor Economics*. Vol. 4, 1–102. Elsevier.

Goodman, Anna, Donna L Lamping, and George B Ploubidis. 2010. "When to use broader internalising and externalising subscales instead of the hypothesised five subscales on the Strengths and Difficulties Questionnaire (SDQ): Data from British parents, teachers and children." *Journal of Abnormal Child Psychology*, 38: 1179–1191.

Goodman, Robert. 2001. "Psychometric properties of the strengths and difficulties questionnaire." *Journal of the American Academy of Child & Adolescent Psychiatry*, 40(11): 1337–1345.

Goodman, Robert, Tamsin Ford, Helen Simmons, Rebecca Gatward, and Howart Meltzer. 2000. "Using the Strengths and Difficulties Questionnaire (SDQ) to screen for child psychiatric disorders in a community sample." *The British Journal of Psychiatry*, 177(6): 534–539.

Gormley, William T, and Ted Gayer. 2005. "Promoting school readiness in Oklahoma an evaluation of Tulsa's pre-k program." *Journal of Human Resources*, 40(3): 533–558.

Gregg, Paul, and Elizabeth Washbrook. 2011. "The role of attitudes and behaviours in explaining socio-economic differences in attainment at age 11." *Longitudinal and Life Course Studies*, 2(1): 41–58.

Grossman, Michael. 1972. "On the concept of health capital and the demand for health." *Journal of Political Economy*, 80(2): 223–255.

Grossman, Michael. 2000. "The human capital model." In *Handbook of Health Economics*. Vol. 1. 1 ed., , ed. A. J. Culyer and J. P. Newhouse, Chapter 07, 347–408. Elsevier.

Heckman, James J. 2007. "The economics, technology, and neuroscience of human capability formation." *Proceedings of the National Academy of Sciences*, 104(33): 13250–13255.

Heckman, James J. 2012. "The developmental origins of health." *Health Economics*, 21(1): 24.

Heckman, James J, and Stefano Mosso. 2014. "The economics of human development and social mobility." *Annual Review of Economics*, 6(1): 689–733.

Hertz, Tom, Tamara Jayasundera, Patrizio Piraino, Sibel Selcuk, Nicole Smith, and Alina Verashchagina. 2008. "The inheritance of educational inequality: International comparisons and fifty-year trends." *The BE Journal of Economic Analysis & Policy*, 7(2).

Hutton, John S, Jonathan Dudley, Tzipi Horowitz-Kraus, Tom DeWitt, and Scott K Holland. 2020. "Associations between screen-based media use and brain white matter integrity in preschool-aged children." *JAMA Pediatrics*, 174(1): e193869–e193869.

Jann, Ben. 2008. "The Blinder–Oaxaca decomposition for linear regression models." *The Stata Journal*, 8(4): 453–479.

Jerrim, John, and Anna Vignoles. 2013. "Social mobility, regression to the mean and the cognitive development of high ability children from disadvantaged homes." *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, 176(4): 887–906.

Jerrim, John, Anna Vignoles, Raghu Lingam, and Angela Friend. 2015. "The socio-economic gradient in children's reading skills and the role of genetics." *British Educational Research Journal*, 41(1): 6–29.

Jürges, Hendrik, and Rasheda Khanam. 2021. "Adolescents' time allocation and skill production." *Economics of Education Review*, 85: 102178.

Kalb, Guyonne, and Jan C Van Ours. 2014. "Reading to young children: A head-start in life?" *Economics of Education Review*, 40: 1–24.

Kaufman, Alan S, Dawn P Flanagan, Vincent C Alfonso, and Jennifer T Mascolo. 2006. "Test review: Wechsler intelligence scale for children, (WISC-IV)." *Journal of Psychoeducational Assessment*, 24(3): 278–295.

Krieger, Nancy, David R Williams, and Nancy E Moss. 1997. "Measuring social class in US public health research: Concepts, methodologies, and guidelines." *Annual Review of Public Health*, 18(1): 341–378.

Loewen, Olivia K, Katerina Maximova, John P Ekwaru, Erin L Faught, Mark Asbridge, Arto Ohinmaa, and Paul J Veugelers. 2019. "Lifestyle behavior and mental health in early adolescence." *Pediatrics*, 143(5).

Lundborg, Petter, Dan-Olof Rooth, and Jesper Alex-Petersen. 2022. "Long-term effects of childhood nutrition: Evidence from a school lunch reform." *The Review of Economic Studies*, 89(2): 876–908.

Macmillan, Lindsey, and Emma Tominey. 2022. "Parental inputs and socio-economic gaps in early child development." *Journal of Population Economics*, 1–31.

Madden, David. 2022. "The socio-economic gradient of cognitive test scores: Evidence from two cohorts of Irish children." *Fiscal Studies*, 43(3): 265–290.

Mani, Anandi, Sendhil Mullainathan, Eldar Shafir, and Jiaying Zhao. 2013. "Poverty impedes cognitive function." *Science*, 341(6149): 976–980.

Marks, Gary N. 2017. "Is SES really that important for educational outcomes in Australia? A review and some recent evidence." *The Australian Educational Researcher*, 44(2): 191–211.

McDool, Emily, Philip Powell, Jennifer Roberts, and Karl Taylor. 2020. "The internet and children's psychological wellbeing." *Journal of Health Economics*, 69: 102274.

Nguyen, Ha Trong, Luke B Connelly, Huong Thu Le, Francis Mitrou, Catherine L Taylor, and Stephen R Zubrick. 2020. "Ethnicity differentials in academic achievements: The role of time investments." *Journal of Population Economics*, 33: 1381–1418.

Nguyen, Ha Trong, Sally Brinkman, Huong Thu Le, Stephen R Zubrick, and Francis Mitrou. 2022. "Gender differences in time allocation contribute to differences in developmental outcomes in children and adolescents." *Economics of Education Review*, 89: 102270.

Oaxaca, Ronald. 1973. "Male-female wage differentials in urban labor markets." *International Economic Review*, 693–709.

Pekkarinen, Tuomas, Kjell G Salvanes, and Matti Sarvimäki. 2017. "The evolution of social mobility: Norway during the twentieth century." *The Scandinavian Journal of Economics*, 119(1): 5–33.

Raley, Sara. 2014. "Time Use, Inequality, and Child Well-Being." *Handbook of Child Well-Being: Theories, Methods and Policies in Global Perspective*, , ed. Asher Ben-Arieh, Ferran Casas, Ivar Frønes and Jill E. Korbin, 999–1031. Dordrecht:Springer Netherlands.

Rokicki, Slawa, and Mark E McGovern. 2020. "Heterogeneity in early life investments: A longitudinal analysis of children's time use." *Review of Income and Wealth*, 66(3): 647–676.

Soloff, Carol, David Lawrence, and Robert Johnstone. 2005. *Sample design.* LSAC Technical Paper No. 1. Australian Institute of Family Studies Melbourne.

Suziedelyte, Agne. 2015. "Media and human capital development: Can video game playing make you smarter?" *Economic Inquiry*, 53(2): 1140–1155.

Tepper, Deanna L, Tiffani J Howell, and Pauleen C Bennett. 2022. "Executive functions and household chores: Does engagement in chores predict children's cognition?" *Australian Occupational Therapy Journal*, 69(5): 585–598.

Todd, Petra E, and Kenneth I Wolpin. 2003. "On the specification and estimation of the production function for cognitive achievement." *The Economic Journal*, 113(485): F3–F33.

Todd, Petra E, and Kenneth I Wolpin. 2007. "The production of cognitive achievement in children: Home, school, and racial test score gaps." *Journal of Human Capital*, 1(1): 91–136.

van Poortvliet, Matthew. 2021. "Inequality in skills for learning: do gaps in children's socio-emotional development widen over time according to family background?" *Oxford Review of Education*, 47(4): 455–474.

Walsh, Jeremy J, Joel D Barnes, Jameason D Cameron, Gary S Goldfield, Jean-Philippe Chaput, Katie E Gunnell, Andrée-Anne Ledoux, Roger L Zemek, and Mark S Tremblay. 2018. "Associations between 24 hour movement behaviours and global cognition in US children: A cross-sectional observational study." *The Lancet Child & Adolescent Health*, 2(11): 783–791.

Weiland, Christina, and Hirokazu Yoshikawa. 2013. "Impacts of a prekindergarten program on children's mathematics, language, literacy, executive function, and emotional skills." *Child Development*, 84(6): 2112–2130.

Online Appendix

Table A1: Attrition Estimates - Literacy Score

	Age 6/7	Age 8/9	Age 10/11	Age 12/13	Age 14/15
Child characteristics					
Male	0.060***	0.010	0.005	0.002	0.012
	(0.019)	(0.016)	(0.010)	(0.007)	(0.007)
Age (in months)	0.131	0.121	0.121**	0.087**	0.042
	(0.105)	(0.088)	(0.057)	(0.035)	(0.037)
Age2	-0.001	-0.001	-0.001**	-0.001***	-0.000
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
Low birthweight	-0.048	0.003	-0.037**	0.006	-0.004
	(0.035)	(0.030)	(0.018)	(0.015)	(0.015)
WAI score	0.029***	0.032***	-0.005	-0.003	0.004
	(0.010)	(0.008)	(0.005)	(0.004)	(0.004)
Household characteristics					
Single parent HH	-0.069**	-0.021	-0.016	0.024*	-0.011
	(0.028)	(0.026)	(0.014)	(0.012)	(0.011)
No of older siblings	-0.026***	-0.033***	-0.016***	-0.002	-0.002
	(0.010)	(0.008)	(0.005)	(0.004)	(0.004)
No of younger siblings	-0.014	0.003	0.001	0.003	0.001
	(0.015)	(0.013)	(0.008)	(0.006)	(0.006)
Neighbourhood disadvantage	0.023	0.020	0.022***	0.011*	0.005
	(0.016)	(0.013)	(0.008)	(0.006)	(0.006)
HH real income (ln)	0.022	0.036**	0.015**	0.010*	0.007
	(0.015)	(0.014)	(0.007)	(0.005)	(0.005)
Parent characteristics					
Male	-0.076	0.020	-0.008	-0.001	0.031
	(0.049)	(0.045)	(0.027)	(0.021)	(0.023)
Age	0.054***	0.060***	0.020**	0.010*	0.015***
	(0.014)	(0.012)	(0.008)	(0.005)	(0.005)
Age2	-0.001***	-0.001***	-0.000*	-0.000	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Main language English	0.080***	0.062***	0.001	-0.016	-0.002
	(0.029)	(0.024)	(0.016)	(0.012)	(0.012)
Birth country	0.052**	0.037*	0.019	0.020**	0.004
	(0.026)	(0.021)	(0.014)	(0.010)	(0.010)
Education	0.033	0.059***	0.013	0.024***	0.009
	(0.022)	(0.018)	(0.011)	(0.008)	(0.008)
Cohort dummy				-0.016**	-0.048***
(=1 if from cohort K)				(0.008)	(0.007)
Constant	-4.480	-4.442*	-3.409**	-2.282**	-1.134
	(3.026)	(2.513)	(1.655)	(1.024)	(1.069)
Observations	5,309	5,252	5,162	8,370	7,702
R-squared	0.050	0.054	0.027	0.016	0.018

Notes: Estimates from a linear probability model where the dependent variable equals one if the child is in our estimation sample for literacy score at each age and zero otherwise. All covariates are measured at age 4. Robust standard errors in parenthesis, clustered at individual level. *** p<0.01, ** p<0.05, * p<0.1.

Table A2: Attrition Estimates - Internalising Problems

	Age 6/7	Age 8/9	Age 10/11	Age 12/13	Age 14/15
Child characteristics					
Male	0.056***	0.012	0.002	-0.005	0.003
	(0.020)	(0.015)	(0.011)	(0.009)	(0.009)
Age (in months)	0.018	0.160*	0.074	-0.022	0.009
	(0.116)	(0.088)	(0.066)	(0.050)	(0.050)
Age2	-0.000	-0.001*	-0.001	0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
Low birthweight	-0.035	0.007	-0.024	0.013	0.002
	(0.036)	(0.029)	(0.019)	(0.018)	(0.019)
WAI score	0.014	0.030***	0.016***	0.009*	0.011**
	(0.011)	(0.008)	(0.006)	(0.005)	(0.005)
Household characteristics					
Single parent HH	-0.095***	-0.024	-0.028	0.026*	0.004
	(0.029)	(0.026)	(0.017)	(0.015)	(0.016)
No of older siblings	-0.035***	-0.033***	-0.020***	0.002	-0.003
	(0.010)	(0.008)	(0.006)	(0.005)	(0.005)
No of younger siblings	-0.026*	0.003	0.000	0.001	0.003
	(0.016)	(0.013)	(0.009)	(0.007)	(0.008)
Neighbourhood disadvantage	0.026	0.016	0.005	0.004	0.002
	(0.017)	(0.013)	(0.009)	(0.008)	(0.008)
HH real income (ln)	0.008	0.038***	0.016	0.009	0.011*
	(0.016)	(0.014)	(0.011)	(0.007)	(0.007)
Parent characteristics					
Male	-0.058	0.030	0.028	0.009	0.049*
	(0.051)	(0.044)	(0.029)	(0.027)	(0.027)
Age	0.057***	0.060***	0.023**	0.015*	0.016**
	(0.014)	(0.012)	(0.009)	(0.008)	(0.007)
Age2	-0.001***	-0.001***	-0.000*	-0.000*	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Main language English	0.105***	0.073***	0.019	-0.005	0.012
	(0.030)	(0.024)	(0.016)	(0.015)	(0.015)
Birth country	0.058**	0.043**	0.015	0.021*	-0.006
	(0.026)	(0.021)	(0.014)	(0.012)	(0.013)
Education	0.055**	0.069***	0.031**	0.018*	0.015
	(0.023)	(0.018)	(0.012)	(0.010)	(0.010)
Cohort dummy				-0.025***	-0.030***
(=1 if from cohort K)				(0.009)	(0.009)
Constant	-1.348	-5.566**	-2.419	0.601	-0.330
	(3.328)	(2.530)	(1.879)	(1.428)	(1.439)
Observations	5,309	5,252	5,162	8,370	7,702
R-squared	0.052	0.055	0.017	0.005	0.006

Notes: Estimates from a linear probability model where the dependent variable equals one if the child is in our estimation sample for internalising problems at each age and zero otherwise. All covariates are measured at age 4. Robust standard errors in parenthesis, clustered at individual level. *** p<0.01, ** p<0.05, * p<0.1.

Table A3: Time Use Diaries in LSAC

Panel A1	**K cohort**					
	Parent reported 96 15-minute time slots Up to two entries					
	Wave 1 2004 4-5 yrs		Wave 2 2006 6-7 yrs		Wave 3 2008 8-9 yrs	
	No.	%	No.	%	No.	%
Survey data	4,983	100.0	4,464	89.6	4,331	86.9
Time use diaries	3,728	74.8	3,385	67.9	2,911	58.4
Diaries that add up to 24 hrs	3,504	70.3	3,182	63.9	2,771	55.6
Diaries after dropping missing day	3,504	70.3	3,177	63.8	2,770	55.6

Panel A2	**K cohort**					
	Child reported Activity episode Only one TUD					
	Wave 4 2010 10-11 yrs		Wave 5 2012 12-13 yrs		Wave 6 2014 14-15 yrs	
	No.	%	No.	%	No.	%
Survey data	4,169	83.7	3,956	79.4	3,537	71.0
Time use diaries	3,953	79.3	3,570	71.6	2,925	58.7
Diaries that add up to 24 hrs	3953	79.3	3567	71.6	2925	58.7
Diaries after dropping missing day	3953	79.3	3567	71.6	2925	58.7

Panel B	**B cohort**					
	Child reported Activity episode Only one TUD					
	Wave 6 2014 10-11 yrs		Wave 7 2016 12-13 yrs		Wave 8 2018 14-15 yrs	
	No.	%	No.	%	No.	%
Survey data	3,764	73.7	3,381	66.2	3,127	61.2
Time use diaries	3,390	66.4	2,951	57.8	2,626	51.4
Diaries that add up to 24 hrs	3,390	66.4	2,951	57.8	2,625	51.4
Diaries after dropping missing day	3,390	66.4	2,951	57.8	2,625	51.4

Notes: Percentages are calculated as a proportion of the original sample in Wave 1, which is 4,983 and 5,107 children for Cohort K and B respectively.

Table A4: Time Use Categories

Category	Items	Parent completed diary			Child completed diary					
		4-5K	6-7K	8-9K	10-11K	12-13K	14-15K	10-11B	12-13B	14-15B
Bed/Sleeping	Sleeping/napping	x	x	x						
	Awake in bed	x	x	x						
	Napping				x	x	x	x	x	x
	Time between sleep and wake up				x	x	x	x	x	x
School	Responses 'Day care centre/playgroup to the question 'where was the child'	x	x	x						
	School lessons				x	x	x	x	x	x
Education	Read a story, talk, sing	x	x	x						
	Reading looking at book by self		x	x						
	Drawing/colouring	x								
	Organised lessons/activity	x	x	x						
	Educational game	x								
	Being taught to do chores, read etc	x								
	Use computer/computer games (if this is done for or as part of homework)	x	x	x						
	Private music lessons/practice, academic tutoring				x	x	x	x	x	x
	Doing homework (not via electronic device)				x	x	x	x	x	x
	Doing homework (electronic device)				x	x	x	x	x	x
	Attend courses (excluding school/university)						x	x	x	x
	Clubs/religious groups						x	x	x	x
	Non Active club activities (e.g. chess)				x	x	x			
	Scouts, girl guides				x					
Physical activity	Active free play (running, ball game)		x	x						
	Walking (for travel or fun)	x								
	Ride bicycle, trike (travel or fun)	x								
	Other exercise - swim/dance/run about	x								
	Organised sport/physical activity (swim/dance Auslick etc)		x	x						
	Active activities				x					
	Active activities nec					x	x	x	x	x
	Organised team sports and training				x	x				
	Organised individual sport (swimming)				x	x				
	Ball games, riding a bike, scooter, skater and other free activities				x					
	Taking pet for a walk/playing				x	x				
	Archery/shooting sports						x	x	x	x
	Athletics/Gymnastics						x	x	x	x
	Fitness/Gym/Exercise						x	x	x	x
	Ball sports						x	x	x	x

Category	Items	Parent completed diary			Child completed diary					
		4-5K	6-7K	8-9K	10-11K	12-13K	14-15K	10-11B	12-13B	14-15B
	Martial arts / Dancing						x	x	x	x
	Motor Sports / Roller Sports / Cycling						x	x	x	x
	Water/Ice/Snow Sports						x	x	x	x
	Organised team sports and training other						x	x	x	x
	Archery / Shooting sports (individual)						x	x	x	x
	Athletics / Gymnastics (individual)						x	x	x	x
	Fitness / Gym / Exercise (individual)						x	x	x	x
	Martial arts / Dancing (individual)						x	x	x	x
	Motor Sports / Roller Sports / Cycling (individual)						x	x	x	x
	Ball Sports (individual)						x	x	x	x
	Water/Ice/Snow Sports (individual)						x	x	x	x
	Organised individual sport and training other						x	x	x	x
	Archery / Shooting sports (unstructured)						x	x	x	x
	Athletics / Gymnastics (unstructured)						x	x	x	x
	Fitness / Gym / Exercise (unstructured)						x	x	x	x
	Ball Sports (unstructured)						x	x	x	x
	Martial arts / Dancing (unstructured)						x	x	x	x
	Motor Sports / Roller Sports / Cycling (unstructured)						x	x	x	x
	Water/Ice/Snow Sports (unstructured)						x	x	x	x
	Unstructured active play Other					x	x	x	x	x
	Walking pets/playing with pets						x	x	x	x
	Active club activities					x	x	x	x	x
	[Travel] By foot				x	x	x	x	x	x
	[Travel] By bike, scooter, skateboard etc				x	x	x	x	x	x
General care and travel	Eating, drinking, being fed	x	x	x	x	x	x	x	x	x
	Bathe, dress, hair care, healthcare	x	x	x	x					
	Do nothing, bored, restless	x	x	x	x	x	x	x	x	x
	Crying, upset	x	x	x						
	Arguing, fighting, destroying things	x	x	x						
	Held, cuddled	x	x	x						
	Being reprimanded, corrected	x	x	x						
	Non-verbal interaction (cuddles)					x	x	x	x	x
	Cleaning teeth					x	x	x	x	x
	Showering/bathing					x	x	x	x	x
	Getting dressed / getting ready				x	x	x	x	x	x
	Personal care nec.					x	x	x	x	x
	Doctor				x	x	x	x	x	x
	Dentist				x	x	x	x	x	x
	Physiotherapist / Chiropractor				x	x	x	x	x	x
	Medical/Health care				x		x	x	x	x
	Medical/Health care nec.					x	x	x	x	x
	Travel in pusher or on bicycle seat	x								

Category	Items	Parent completed diary			Child completed diary					
		4-5K	6-7K	8-9K	10-11K	12-13K	14-15K	10-11B	12-13B	14-15B
	Travel in a car	x	x	x	x	x	x	x	x	x
	Travel on public transport	x	x	x	x	x	x	x	x	x
	Travel nec				x	x	x	x	x	x
Chores	Helping with chores/jobs		x	x						
	Retailing					x	x	x	x	x
	Hospitality						x	x	x	x
	Clerical/office						x	x	x	x
	Labourers and related workers						x	x	x	x
	Gardening/lawn mowing					x	x	x	x	x
	Baby sitting					x	x	x	x	x
	Apprenticeships/trades persons						x	x	x	x
	Woking in a family business or farm					x	x	x	x	x
	Work other					x	x	x	x	x
	Pamphlet delivering					x				
	Umpiring (work)					x	x	x	x	x
	Car washing (work)					x	x	x	x	x
	Animal care (work)					x	x	x	x	x
	Volunteering (work)					x	x	x	x	x
	Cleaning/tidying					x	x	x	x	x
	Laundry/clothes care					x	x	x	x	x
	Clothes making						x	x	x	x
	Food/drink preparation					x	x	x	x	x
	Food/drink clean up					x	x	x	x	x
	Gardening/lawn mowing					x	x	x	x	x
	Cleaning grounds/ garage/shed/outside of house						x	x	x	x
	Pool care						x	x	x	x
	Animal care					x	x	x	x	x
	Home maintenance					x	x	x	x	x
	Design/home improvement						x	x	x	x
	Heat/water/power upkeep						x	x	x	x
	Car/boat/bike care						x	x	x	x
	Selling/disposing of household assets						x	x	x	x
	Rubbish/recycling						x	x	x	x
	Packing						x	x	x	x
	Household management other						x	x	x	x
	Taking care of siblings				x	x	x	x	x	x
	Chores nec				x	x	x	x	x	x
	Making own bed/tidying own room				x					
	Cleaning, tidying other rooms				x					
	Making preparing own food				x					
	Cooking, meal preparation, making lunch				x					
	Washing dishes, stacking and emptying dishwasher				x					

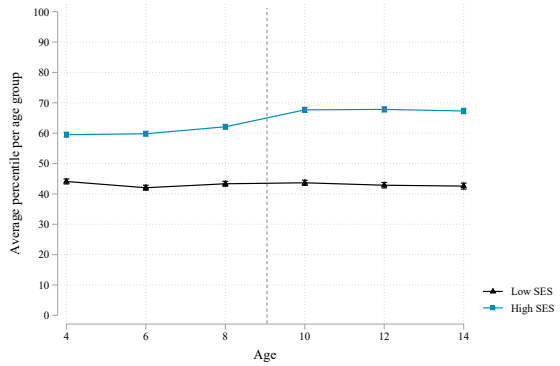
Category	Items	Parent completed diary			Child completed diary					
		4-5K	6-7K	8-9K	10-11K	12-13K	14-15K	10-11B	12-13B	14-15B
	Gardening, putting out the bin				x					
	Taking care of pets				x					
	Shopping,				x	x	x	x	x	x
	Purchasing consumer good, durable goods				x	x	x	x	x	x
	Window shopping						x	x	x	x
	Purchasing repair services						x	x	x	x
	Purchasing administrative services						x	x	x	x
	Purchasing personal care services						x	x	x	x
	Purchasing other services						x	x	x	x
Social activities	Visiting people, special event, party	x	x	x						
	Taken places with adult (shopping)	x	x	x						
	Attendance at movies, cinema, concert, theatre, museum, exhibition, art gallery, zoo, park, botanic garden				x	x	x	x	x	x
	Other mass events				x	x	x	x	x	x
	Going out nec				x	x	x	x	x	x
	Religious practice				x	x	x	x	x	x
	Weddings, funerals, rites of passage				x	x	x	x	x	x
	Religious activities, ritual ceremonies nec				x	x	x	x	x	x
	Attending live sporting events				x	x	x	x	x	x
	Talking face to face				x	x	x	x	x	x
	Talking on a landline phone, mobile phone				x	x	x	x	x	x
	Negative face to face communication				x	x	x	x	x	x
	Skype or Webcam/ video chatting				x	x	x	x	x	x
	Communication nec				x	x	x	x	x	x
Cognitive leisure	Quiet free play		x	x						
	Other play, other activities	x								
	Playing musical instruments or singing for leisure					x	x	x	x	x
	Chess, card, paper and board games/crosswords, toys						x	x	x	x
	Games of chance, gambling						x	x	x	x
	Hobbies, collections						x	x	x	x
	Reading or being read to for leisure				x	x	x	x	x	x
	Handworks crafts						x	x	x	x
	Arts						x	x	x	x
	Non-active activities nec				x	x	x	x	x	x
	Unstructured non-active play					x	x	x	x	x
Social media	Spent time on social networking sites					x	x	x	x	x
	Texting, email, social networking such as FB Twitter				x					
	Texting/email					x	x	x	x	x
	Online chatting/instant messaging					x	x	x	x	x

Category	Items	Parent completed diary			Child completed diary					
		4-5K	6-7K	8-9K	10-11K	12-13K	14-15K	10-11B	12-13B	14-15B
Media - Games	Using computer/computer game	x	x	x						
	Electronic media, games, computer use				x	x				
	Playing games (electronic device)					x	x	x	x	x
	Computer games - internet				x					
	Computer games not internet				x					
	Xbox, PlayStation, Nintendo, Wii				x					
Media - Passive	Watching TV, a video, or a DVD	x	x	x	x	x	x	x	x	x
	Listening to tapes, CDs, radio music, music	x	x	x	x	x	x	x	x	x
Media - Other	General application use (Microsoft office)					x	x	x	x	x
	Downloading/posting media					x	x	x	x	x
	Internet shopping					x	x	x	x	x
	General internet browsing					x	x	x	x	x
	Creating/maintaining websites					x	x	x	x	x
	Other internet/electronic device use					x	x	x	x	x
	Internet not covered elsewhere				x					
Other/Unknown	Not sure what child was doing	x	x	x						
	Other				x	x	x	x	x	x
	Uncodable activity					x	x	x	x	x
	Filling out the diary					x	x	x	x	x

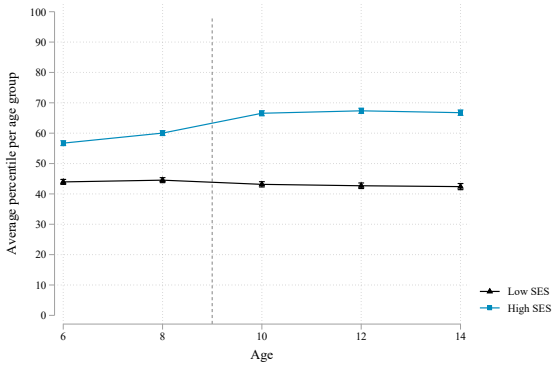
Table A5: Exogeneity Test Results

	Literacy				Numeracy				Internalising Problems				Externalising Problems			
	Low SES		High SES		Low SES		High SES		Low SES		High SES		Low SES		High SES	
	F-stat	p-value	F-stat	p-value	F-stat	p-value	F-stat	p-value	F-stat	p-value	F-stat	p-value	F-stat	p-value	F-stat	p-value
Panel A - VA+ Model																
No controls	4.050	0.000	9.330	0.000	2.420	0.003	4.100	0.000	6.200	0.000	2.090	0.012	11.180	0.000	5.930	0.000
Time and State FE	3.630	0.000	6.800	0.000	1.990	0.018	2.970	0.000	5.560	0.000	1.700	0.055	8.960	0.000	5.240	0.000
Lagged outcome	2.680	0.001	3.370	0.000	2.330	0.005	1.900	0.026	1.950	0.021	0.640	0.825	2.460	0.003	2.130	0.010
Lagged time use	2.060	0.014	1.650	0.066	1.210	0.264	1.440	0.134	0.770	0.693	1.010	0.442	1.310	0.201	1.840	0.033
Child controls	1.970	0.020	1.570	0.088	1.280	0.218	1.610	0.076	0.820	0.642	1.050	0.395	1.160	0.302	1.960	0.020
Household controls	2.050	0.015	1.530	0.101	1.300	0.208	1.550	0.094	0.840	0.615	1.010	0.439	1.170	0.297	1.990	0.018
Parent controls	2.080	0.013	1.470	0.121	1.180	0.289	1.500	0.109	0.790	0.669	0.980	0.474	1.180	0.287	2.060	0.014
Parenting styles	2.170	0.009	1.460	0.126	1.140	0.323	1.530	0.101	0.810	0.650	0.920	0.535	1.220	0.257	1.810	0.036
Life events	2.080	0.013	1.410	0.145	1.300	0.204	1.500	0.108	0.850	0.607	0.930	0.518	1.190	0.281	1.840	0.032
Panel B - OLS with only contemporaneous inputs																
No controls	4.050	0.000	9.330	0.000	2.420	0.003	4.100	0.000	6.200	0.000	2.090	0.012	11.180	0.000	5.930	0.000
Time and State FE	3.630	0.000	6.800	0.000	1.990	0.018	2.970	0.000	5.560	0.000	1.700	0.055	8.960	0.000	5.240	0.000
Child controls	2.890	0.000	5.820	0.000	1.650	0.066	2.020	0.016	4.860	0.000	1.560	0.088	6.270	0.000	3.770	0.000
Household controls	2.820	0.001	5.550	0.000	1.580	0.084	1.900	0.026	4.660	0.000	1.420	0.143	6.070	0.000	3.640	0.000
Parent controls	2.740	0.001	4.950	0.000	1.590	0.079	1.500	0.111	4.450	0.000	1.300	0.206	5.710	0.000	3.490	0.000
Parenting styles	2.610	0.001	4.840	0.000	1.490	0.113	1.480	0.118	4.040	0.000	1.220	0.261	5.260	0.000	3.030	0.000
Life events	2.610	0.001	4.870	0.000	1.510	0.108	1.480	0.116	4.140	0.000	1.210	0.263	5.540	0.000	3.090	0.000
Panel C - VA Model (Contemporaneous + lagged outcome)																
Lagged outcome	2.380	0.004	2.480	0.002	2.040	0.015	1.380	0.162	1.690	0.057	0.540	0.903	1.770	0.042	2.100	0.012
Panel D - Child FE Model																
No controls	4.050	0.000	9.330	0.000	2.420	0.003	4.100	0.000	6.200	0.000	2.090	0.012	11.180	0.000	5.930	0.000
Time and State FE	3.630	0.000	6.800	0.000	1.990	0.018	2.970	0.000	5.560	0.000	1.700	0.055	8.960	0.000	5.240	0.000
Child Fixed-effects	1.910	0.025	1.410	0.145	1.030	0.419	1.900	0.026	0.930	0.520	1.150	0.307	2.360	0.004	1.220	0.261
Child controls	1.970	0.020	1.470	0.121	1.060	0.388	1.900	0.026	0.960	0.494	1.140	0.316	2.430	0.003	1.210	0.266
Household controls	1.950	0.022	1.490	0.114	1.040	0.406	1.930	0.023	0.990	0.454	1.110	0.345	2.410	0.003	1.220	0.260
Parent controls	1.900	0.026	1.480	0.116	1.100	0.350	1.870	0.029	1.010	0.437	1.130	0.331	2.340	0.004	1.280	0.218
Parenting styles	1.810	0.036	1.500	0.109	1.100	0.352	1.880	0.028	1.010	0.442	1.130	0.330	2.370	0.004	1.250	0.238
Life events	1.840	0.033	1.550	0.091	1.060	0.386	1.910	0.025	1.000	0.446	1.110	0.348	2.510	0.002	1.360	0.173

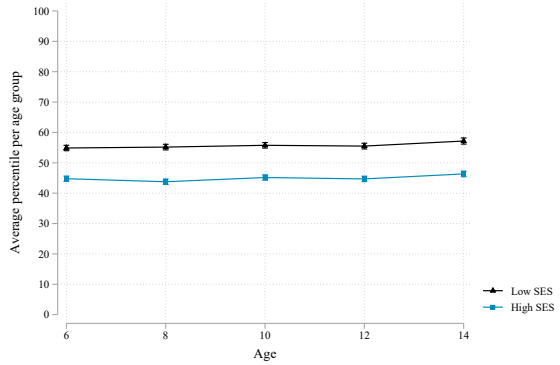
Figure A1: SES Gap by Average Percentile Rank



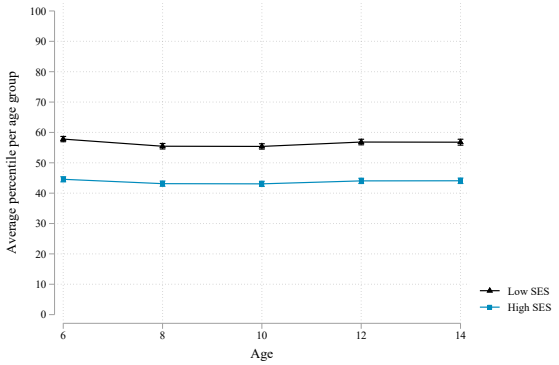
(a) Literacy Score



(b) Numeracy Score



(c) Internalising problems



(d) Externalising Problems

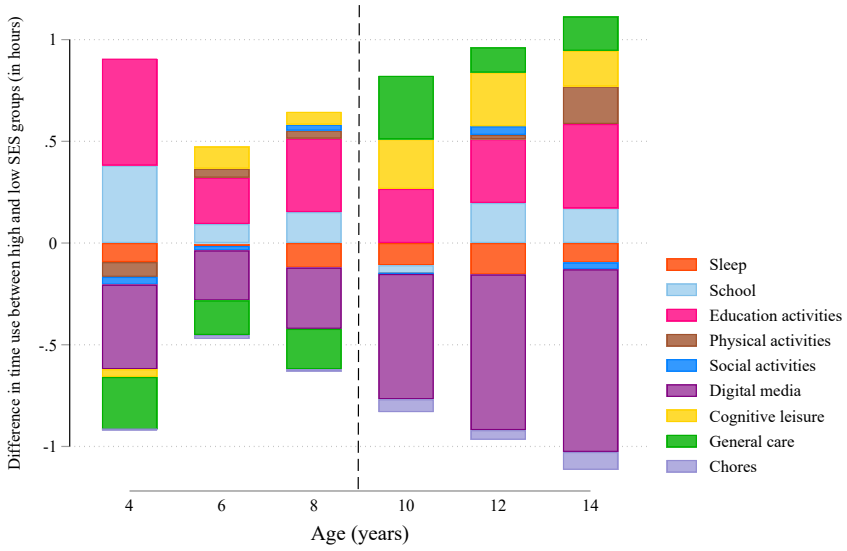
Notes: These figures present the average percentile rank of each score, by age and SES group.

Table A6: Mean Differences in Time Use by SES - Full Sample

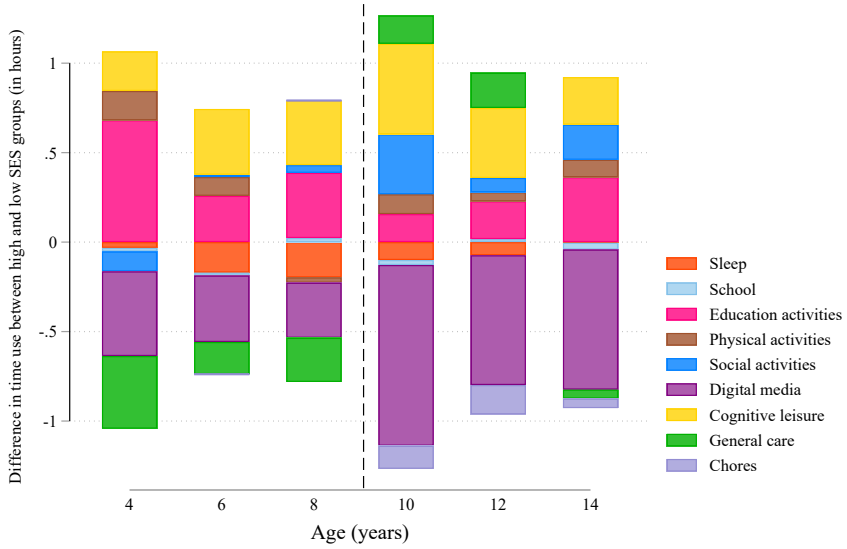
Age (in years)		**4**			**6**			**8**			**10**			**12**			**14**	
	Low	High	Diff	Low	High	Diff	Low	High	Diff	Low	High	Diff	Low	High	Diff	Low	High	Diff
Sleep	11.64	11.58	-0.06	11.24	11.14	-0.108**	11.06	10.9	-0.166***	10.21	10.1	-0.109***	9.74	9.62	-0.113***	9.33	9.31	-0.015
	[0.04]	[0.03]	[0.049]	[0.04]	[0.03]	[0.044]	[0.04]	[0.03]	[0.050]	[0.03]	[0.02]	[0.035]	[0.03]	[0.03]	[0.043]	[0.04]	[0.03]	[0.053]
School	1.52	1.84	0.317***	2.89	3.01	0.116	2.80	2.87	0.071	2.26	2.27	0.019	2.56	2.65	0.092	2.40	2.33	-0.07
	[0.07]	[0.07]	[0.102]	[0.09]	[0.08]	[0.120]	[0.10]	[0.09]	[0.131]	[0.05]	[0.05]	[0.069]	[0.06]	[0.05]	[0.079]	[0.06]	[0.06]	[0.086]
Education activities	1.85	2.44	0.592***	0.50	0.75	0.245***	0.44	0.80	0.363***	0.28	0.49	0.215***	0.39	0.65	0.265***	0.45	0.83	0.379***
	[0.05]	[0.06]	[0.079]	[0.02]	[0.02]	[0.029]	[0.02]	[0.03]	[0.037]	[0.01]	[0.02]	[0.022]	[0.02]	[0.02]	[0.029]	[0.02]	[0.03]	[0.041]
Physical activities	1.00	1.06	0.062	1.79	1.85	0.058	1.79	1.79	0.00	1.99	2.04	0.048	1.57	1.61	0.037	1.23	1.38	0.146***
	[0.04]	[0.03]	[0.047]	[0.05]	[0.04]	[0.062]	[0.06]	[0.04]	[0.070]	[0.03]	[0.03]	[0.048]	[0.04]	[0.03]	[0.049]	[0.04]	[0.03]	[0.050]
General Care	4.27	3.86	-0.410***	3.91	3.72	-0.190***	3.91	3.68	-0.226***	3.75	3.98	0.233***	3.75	3.91	0.157***	3.15	3.20	0.049
	[0.05]	[0.04]	[0.068]	[0.05]	[0.04]	[0.059]	[0.06]	[0.04]	[0.066]	[0.04]	[0.04]	[0.056]	[0.04]	[0.04]	[0.059]	[0.05]	[0.05]	[0.070]
Chores	0.00	0.00	0.00	0.28	0.27	-0.012	0.34	0.33	-0.004	0.80	0.70	-0.104***	0.84	0.75	-0.098***	1.07	1.03	-0.048
	[0.00]	[0.00]	[0.000]	[0.01]	[0.01]	[0.019]	[0.02]	[0.01]	[0.022]	[0.02]	[0.02]	[0.031]	[0.03]	[0.02]	[0.036]	[0.04]	[0.03]	[0.049]
Social activities	0.93	0.81	-0.120**	0.93	0.92	-0.017	0.99	1.03	0.039	0.68	0.84	0.162***	0.98	1.04	0.061	1.59	1.68	0.095
	[0.04]	[0.03]	[0.050]	[0.04]	[0.04]	[0.056]	[0.05]	[0.04]	[0.068]	[0.02]	[0.03]	[0.039]	[0.03]	[0.03]	[0.048]	[0.05]	[0.05]	[0.067]
Cognitive leisure	1.12	1.23	0.110**	0.69	0.94	0.247***	0.57	0.81	0.239***	0.69	1.06	0.368***	0.52	0.85	0.325***	0.44	0.67	0.232***
	[0.04]	[0.03]	[0.052]	[0.03]	[0.03]	[0.040]	[0.03]	[0.03]	[0.041]	[0.02]	[0.03]	[0.035]	[0.02]	[0.03]	[0.035]	[0.02]	[0.03]	[0.037]
Digital media	1.59	1.12	-0.478***	1.72	1.38	-0.332***	2.06	1.76	-0.304***	3.29	2.45	-0.837***	3.61	2.87	-0.737***	4.31	3.54	-0.772***
	[0.04]	[0.03]	[0.043]	[0.04]	[0.03]	[0.050]	[0.05]	[0.04]	[0.062]	[0.05]	[0.04]	[0.066]	[0.06]	[0.05]	[0.076]	[0.07]	[0.06]	[0.096]
Unknown	0.07	0.06	-0.014	0.04	0.03	-0.005	0.04	0.03	-0.011	0.06	0.07	0.005	0.04	0.05	0.011	0.02	0.02	0.003
	[0.01]	[0.01]	[0.020]	[0.01]	[0.01]	[0.014]	[0.01]	[0.01]	[0.015]	[0.01]	[0.01]	[0.010]	[0.01]	[0.01]	[0.008]	[0.00]	[0.00]	[0.005]
N	1437	1689	3126	1451	1888	3339	1197	1660	2857	2382	2429	4811	1994	2253	4247	1610	2014	3624

Notes: 'Diff' denotes the difference of means between the high SES and low SES children for each of the time use variables measured in hours per day. ***p<0.01, ** p<0.05, * p<0.1.

Figure A2: Time Use SES Gaps by Age



(a) School Day Responders



(b) Non-School Day Responders

Notes: This figure presents mean differences in time use (hours) by low and high SES children by age of the child. Positive difference in time use, means more time spent on an activity by the high SES group, and vice versa for negative. A school day is defined as a weekday with positive school hours, and a non-school day refers to either a weekday with no school hours or a weekend day. The dashed vertical line illustrates the break in reporting: before age 10 parents report time use, from 10 years of age children report their own time use.

Table A7: Mean Differences in Time Use by SES - School Day

Age (in years)		**4**			**6**			**8**			**10**			**12**			**14**	
	Low	High	Diff	Low	High	Diff	Low	High	Diff	Low	High	Diff	Low	High	Diff	Low	High	Diff
Sleep	11.51	11.41	-0.09	10.97	10.95	-0.01	10.79	10.66	-0.121**	10.04	9.93	-0.109***	9.27	9.12	-0.155***	8.72	8.62	-0.096*
	[0.07]	[0.05]	[0.078]	[0.04]	[0.03]	[0.052]	[0.04]	[0.04]	[0.058]	[0.03]	[0.03]	[0.039]	[0.03]	[0.03]	[0.043]	[0.04]	[0.03]	[0.055]
School	5.24	5.63	0.381**	6.73	6.83	0.094*	6.77	6.92	0.152**	4.51	4.47	-0.04	4.77	4.96	0.197***	4.87	5.04	0.171***
	[0.11]	[0.11]	[0.159]	[0.04]	[0.04]	[0.057]	[0.05]	[0.04]	[0.067]	[0.03]	[0.03]	[0.045]	[0.03]	[0.03]	[0.045]	[0.04]	[0.04]	[0.052]
Education activities	1.16	1.68	0.526***	0.49	0.72	0.228***	0.41	0.77	0.361***	0.40	0.66	0.266***	0.51	0.82	0.314***	0.60	1.01	0.414***
	[0.07]	[0.07]	[0.101]	[0.02]	[0.02]	[0.029]	[0.03]	[0.03]	[0.041]	[0.02]	[0.03]	[0.033]	[0.03]	[0.03]	[0.039]	[0.04]	[0.04]	[0.055]
Physical activities	0.55	0.48	-0.07	0.85	0.90	0.04	0.87	0.91	0.04	1.80	1.79	0.00	1.34	1.36	0.02	1.07	1.26	0.184***
	[0.04]	[0.03]	[0.048]	[0.03]	[0.03]	[0.043]	[0.04]	[0.04]	[0.054]	[0.04]	[0.04]	[0.052]	[0.04]	[0.04]	[0.054]	[0.04]	[0.04]	[0.060]
General Care	3.34	3.09	-0.259***	3.23	3.06	-0.170***	3.28	3.08	-0.198***	3.61	3.92	0.312***	3.78	3.90	0.124*	3.19	3.36	0.168*
	[0.08]	[0.06]	[0.094]	[0.05]	[0.04]	[0.061]	[0.06]	[0.04]	[0.068]	[0.05]	[0.05]	[0.068]	[0.05]	[0.05]	[0.074]	[0.07]	[0.06]	[0.094]
Chores	0.00	0.00	0.00	0.14	0.13	-0.02	0.19	0.18	-0.01	0.44	0.37	-0.064**	0.45	0.40	-0.047*	0.66	0.57	-0.088**
	[0.00]	[0.00]	[0.000]	[0.01]	[0.01]	[0.014]	[0.01]	[0.01]	[0.020]	[0.02]	[0.02]	[0.026]	[0.02]	[0.02]	[0.028]	[0.03]	[0.03]	[0.044]
Social activities	0.35	0.31	-0.04	0.23	0.21	-0.02	0.22	0.25	0.03	0.57	0.57	0.00	0.88	0.92	0.04	1.50	1.46	-0.03
	[0.04]	[0.03]	[0.048]	[0.03]	[0.02]	[0.038]	[0.03]	[0.03]	[0.043]	[0.03]	[0.03]	[0.042]	[0.04]	[0.04]	[0.052]	[0.06]	[0.05]	[0.077]
Cognitive leisure	0.63	0.60	-0.04	0.33	0.44	0.109***	0.25	0.31	0.063**	0.47	0.71	0.244***	0.34	0.60	0.264***	0.28	0.46	0.175***
	[0.05]	[0.04]	[0.060]	[0.02]	[0.02]	[0.031]	[0.02]	[0.02]	[0.030]	[0.02]	[0.03]	[0.034]	[0.02]	[0.02]	[0.033]	[0.03]	[0.03]	[0.038]
Digital media	1.18	0.77	-0.416***	1.00	0.76	-0.246***	1.20	0.90	-0.301***	2.13	1.51	-0.616***	2.63	1.86	-0.765***	3.09	2.19	-0.898***
	[0.05]	[0.03]	[0.059]	[0.03]	[0.03]	[0.043]	[0.04]	[0.03]	[0.054]	[0.05]	[0.04]	[0.060]	[0.06]	[0.05]	[0.071]	[0.08]	[0.06]	[0.098]
Unknown	0.03	0.04	0.01	0.01	0.01	0.00	0.02	0.00	-0.01	0.05	0.06	0.01	0.04	0.04	0.01	0.03	0.03	0.00
	[0.02]	[0.02]	[0.027]	[0.01]	[0.00]	[0.007]	[0.01]	[0.00]	[0.008]	[0.01]	[0.01]	[0.011]	[0.01]	[0.01]	[0.008]	[0.01]	[0.01]	[0.008]
N	407	546	953	614	823	1437	492	681	1173	1183	1235	2418	1067	1196	2263	787	931	1718

Notes: 'Diff' denotes the difference of means between the high SES and low SES children for each of the time use variables measured in hours per day. ***p<0.01, ** p<0.05, * p<0.1.

Table A8: Mean Differences in Time Use by SES - Non-School Day

Age (in years)		**4**			**6**			**8**			**10**			**12**			**14**	
	Low	High	Diff	Low	High	Diff	Low	High	Diff	Low	High	Diff	Low	High	Diff	Low	High	Diff
Sleep	11.70	11.67	-0.03	11.45	11.28	-0.170***	11.25	11.06	-0.197***	10.38	10.28	-0.100*	10.27	10.19	-0.07	9.91	9.90	0.00
	[0.05]	[0.04]	[0.061]	[0.05]	[0.04]	[0.065]	[0.06]	[0.05]	[0.073]	[0.04]	[0.04]	[0.058]	[0.05]	[0.04]	[0.070]	[0.06]	[0.05]	[0.079]
School	0.05	0.02	-0.02	0.08	0.06	-0.02	0.03	0.05	0.02	0.03	0.00	-0.028***	0.02	0.04	0.02	0.04	0.00	-0.038***
	[0.01]	[0.01]	[0.015]	[0.02]	[0.02]	[0.026]	[0.01]	[0.01]	[0.020]	[0.01]	[0.00]	[0.010]	[0.01]	[0.01]	[0.017]	[0.02]	[0.00]	[0.014]
Education activities	2.13	2.81	0.681***	0.51	0.77	0.259***	0.46	0.83	0.364***	0.16	0.31	0.156***	0.25	0.46	0.211***	0.32	0.68	0.363***
	[0.07]	[0.07]	[0.102]	[0.03]	[0.03]	[0.047]	[0.03]	[0.04]	[0.056]	[0.02]	[0.02]	[0.029]	[0.03]	[0.03]	[0.042]	[0.03]	[0.05]	[0.060]
Physical activities	1.18	1.34	0.164***	2.49	2.59	0.11	2.44	2.41	-0.03	2.18	2.29	0.11	1.84	1.89	0.05	1.39	1.48	0.10
	[0.05]	[0.04]	[0.062]	[0.07]	[0.06]	[0.090]	[0.08]	[0.06]	[0.102]	[0.06]	[0.06]	[0.080]	[0.06]	[0.06]	[0.084]	[0.06]	[0.05]	[0.078]
General Care	4.64	4.24	-0.406***	4.40	4.22	-0.179**	4.35	4.10	-0.247**	3.89	4.05	0.158*	3.71	3.91	0.196**	3.12	3.07	-0.05
	[0.06]	[0.06]	[0.084]	[0.07]	[0.05]	[0.086]	[0.08]	[0.06]	[0.097]	[0.06]	[0.06]	[0.088]	[0.07]	[0.07]	[0.094]	[0.08]	[0.06]	[0.102]
Chores	0.00	0.00	0.00	0.39	0.38	0.00	0.44	0.44	0.00	1.16	1.03	-0.129**	1.30	1.13	-0.164**	1.47	1.42	-0.05
	[0.00]	[0.00]	[0.000]	[0.02]	[0.02]	[0.031]	[0.03]	[0.02]	[0.034]	[0.04]	[0.04]	[0.052]	[0.05]	[0.04]	[0.065]	[0.06]	[0.05]	[0.081]
Social activities	1.16	1.05	-0.111*	1.44	1.46	0.01	1.52	1.57	0.04	0.79	1.12	0.335***	1.09	1.17	0.08	1.68	1.87	0.196*
	[0.05]	[0.04]	[0.066]	[0.07]	[0.06]	[0.087]	[0.09]	[0.06]	[0.103]	[0.04]	[0.05]	[0.065]	[0.06]	[0.06]	[0.084]	[0.08]	[0.07]	[0.106]
Cognitive leisure	1.31	1.53	0.221***	0.95	1.32	0.367***	0.79	1.15	0.360***	0.91	1.42	0.506***	0.73	1.12	0.391***	0.59	0.86	0.265***
	[0.05]	[0.05]	[0.067]	[0.05]	[0.04]	[0.061]	[0.04]	[0.04]	[0.063]	[0.04]	[0.05]	[0.059]	[0.04]	[0.05]	[0.063]	[0.04]	[0.04]	[0.062]
Digital media	1.76	1.28	-0.473***	2.24	1.87	-0.371***	2.66	2.35	-0.308***	4.43	3.42	-1.010***	4.75	4.02	-0.725***	5.48	4.70	-0.783***
	[0.05]	[0.03]	[0.055]	[0.06]	[0.05]	[0.072]	[0.07]	[0.05]	[0.087]	[0.08]	[0.07]	[0.102]	[0.10]	[0.08]	[0.123]	[0.11]	[0.09]	[0.141]
Unknown	0.08	0.06	-0.02	0.05	0.05	-0.01	0.06	0.05	-0.01	0.08	0.08	0.00	0.04	0.06	0.02	0.01	0.02	0.01
	[0.02]	[0.02]	[0.026]	[0.02]	[0.02]	[0.024]	[0.02]	[0.02]	[0.025]	[0.01]	[0.01]	[0.016]	[0.01]	[0.01]	[0.013]	[0.00]	[0.00]	[0.006]
N	1030	1143	2173	837	1065	1902	705	979	1684	1199	1194	2393	927	1057	1984	823	1083	1906

Notes: 'Diff' denotes the difference of means between the high SES and low SES children for each of the time use variables measured in hours per day. ***p<0.01, ** p<0.05, * p<0.1.

Table A9: Effects of Children's Time Allocation on Human Capital - With Digital Media as the Omitted Category

	Literacy		Numeracy		Internalising Problems		Externalising Problems	
	Low SES	High SES	Low SES	High SES	Low SES	High SES	Low SES	High SES
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ref: Digital Media								
Sleep	-0.041***	-0.006	-0.024*	-0.034**	-0.015	-0.013*	-0.007	0.004
	(0.013)	(0.012)	(0.014)	(0.014)	(0.010)	(0.007)	(0.008)	(0.007)
Education activities	0.048***	0.039***	0.059**	0.025*	-0.014	-0.012	-0.022*	0.000
	(0.018)	(0.014)	(0.023)	(0.015)	(0.015)	(0.008)	(0.011)	(0.007)
School	0.003	-0.007	0.011	-0.031*	0.007	-0.004	0.010	0.001
	(0.018)	(0.015)	(0.020)	(0.018)	(0.014)	(0.010)	(0.012)	(0.009)
Physical activities	-0.014	-0.001	0.014	0.013	-0.019**	-0.019***	0.000	-0.005
	(0.011)	(0.009)	(0.013)	(0.011)	(0.008)	(0.006)	(0.007)	(0.006)
General care	0.001	0.001	0.017	-0.012	-0.009	-0.010*	0.001	0.005
	(0.010)	(0.009)	(0.011)	(0.010)	(0.007)	(0.005)	(0.006)	(0.005)
Chores	0.011	0.039**	0.021	-0.005	0.001	-0.013	0.003	-0.004
	(0.018)	(0.016)	(0.019)	(0.016)	(0.011)	(0.009)	(0.010)	(0.008)
Social activities	-0.000	0.001	0.023*	-0.002	-0.015*	-0.009	-0.008	0.006
	(0.010)	(0.009)	(0.012)	(0.011)	(0.008)	(0.006)	(0.007)	(0.005)
Cognitive leisure	0.037**	0.050***	0.039**	0.029**	-0.013	-0.006	-0.010	-0.010
	(0.015)	(0.012)	(0.017)	(0.013)	(0.011)	(0.008)	(0.011)	(0.007)
Unknown	0.036	0.013	0.032	0.046	0.049	-0.020	0.003	0.011
	(0.041)	(0.039)	(0.046)	(0.083)	(0.038)	(0.020)	(0.021)	(0.013)
Observations	2,742	4,117	1,977	2,963	3,847	5,407	3,847	5,408
R-squared	0.360	0.358	0.448	0.424	0.603	0.641	0.714	0.712

Notes: Robust standard errors in parenthesis, clustered at individual level. *** p<0.01, ** p<0.05, * p<0.1. Each activity refers to the amount of time spent on that activity measured in hours per day. All models include diary and time FE, child controls, household controls, parent controls, parenting styles, life events and state FE.

Table A10: Effects of Children's Time Allocation on Human Capital - With Cognitive Leisure as the Omitted Category

	Literacy		Numeracy		Internalising Problems		Externalising Problems	
	Low SES	High SES	Low SES	High SES	Low SES	High SES	Low SES	High SES
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ref: Cognitive leisure								
Sleep	-0.078***	-0.056***	-0.063***	-0.063***	-0.002	-0.007	0.004	0.013
	(0.018)	(0.014)	(0.019)	(0.016)	(0.013)	(0.009)	(0.012)	(0.008)
Education activities	0.010	-0.011	0.021	-0.003	-0.001	-0.006	-0.011	0.010
	(0.022)	(0.017)	(0.026)	(0.017)	(0.018)	(0.009)	(0.015)	(0.008)
School	-0.034*	-0.057***	-0.027	-0.059***	0.020	0.003	0.021	0.011
	(0.021)	(0.016)	(0.023)	(0.020)	(0.016)	(0.011)	(0.014)	(0.010)
Physical activities	-0.052***	-0.051***	-0.024	-0.016	-0.006	-0.013	0.011	0.004
	(0.016)	(0.012)	(0.017)	(0.014)	(0.012)	(0.008)	(0.011)	(0.007)
General care	-0.037**	-0.049***	-0.022	-0.041***	0.004	-0.004	0.011	0.015**
	(0.017)	(0.012)	(0.017)	(0.013)	(0.012)	(0.008)	(0.011)	(0.007)
Chores	-0.027	-0.012	-0.017	-0.033*	0.014	-0.007	0.013	0.005
	(0.022)	(0.018)	(0.023)	(0.019)	(0.015)	(0.011)	(0.014)	(0.009)
Social activities	-0.038**	-0.050***	-0.016	-0.031**	-0.002	-0.003	0.002	0.015**
	(0.016)	(0.012)	(0.017)	(0.014)	(0.011)	(0.008)	(0.011)	(0.007)
Digital media	-0.037**	-0.050***	-0.039**	-0.029**	0.013	0.006	0.010	0.010
	(0.015)	(0.012)	(0.017)	(0.013)	(0.011)	(0.008)	(0.011)	(0.007)
Unknown	-0.001	-0.037	-0.007	0.018	0.061	-0.014	0.013	0.020
	(0.043)	(0.040)	(0.048)	(0.084)	(0.039)	(0.020)	(0.023)	(0.014)
Observations	2,742	4,117	1,977	2,963	3,847	5,407	3,847	5,408
R-squared	0.360	0.358	0.448	0.424	0.603	0.641	0.714	0.712

Notes: Robust standard errors in parenthesis, clustered at individual level. *** p<0.01, ** p<0.05, * p<0.1. Each activity refers to the amount of time spent on that activity measured in hours per day. All models include diary and time FE, child controls, household controls, parent controls, parenting styles, life events and state FE.

Table A11: Effects of Children's Time Allocation on Human Capital - Full Table

	Cognitive Skills				Socioemotional Difficulties			
	(1) Literacy score		(2) Numeracy score		(3) Internalising problems		(4) Externalising problems	
	Low SES	High SES	Low SES	High SES	Low SES	High SES	Low SES	High SES
Ref: Education activities								
Sleep	-0.088***	-0.045***	-0.083***	-0.060***	-0.001	-0.001	0.015	0.004
	(0.020)	(0.015)	(0.026)	(0.018)	(0.017)	(0.009)	(0.013)	(0.008)
School	-0.044*	-0.046**	-0.048*	-0.056**	0.021	0.009	0.032**	0.001
	(0.024)	(0.018)	(0.029)	(0.022)	(0.019)	(0.011)	(0.015)	(0.010)
Physical activities	-0.062***	-0.040***	-0.045*	-0.013	-0.005	-0.007	0.022*	-0.006
	(0.019)	(0.014)	(0.025)	(0.016)	(0.015)	(0.008)	(0.012)	(0.007)
Care	-0.047**	-0.038***	-0.042*	-0.037**	0.005	0.002	0.022*	0.005
	(0.019)	(0.014)	(0.025)	(0.015)	(0.016)	(0.008)	(0.012)	(0.007)
Chores	-0.037	-0.000	-0.038	-0.030	0.015	-0.001	0.024*	-0.005
	(0.024)	(0.018)	(0.027)	(0.020)	(0.017)	(0.010)	(0.014)	(0.009)
Social activities	-0.048**	-0.038***	-0.036	-0.027*	-0.001	0.003	0.013	0.005
	(0.019)	(0.015)	(0.024)	(0.016)	(0.016)	(0.008)	(0.012)	(0.007)
Cognitive leisure	-0.010	0.011	-0.021	0.003	0.001	0.006	0.011	-0.010
	(0.022)	(0.017)	(0.026)	(0.017)	(0.018)	(0.009)	(0.015)	(0.008)
Digital media	-0.048***	-0.039***	-0.059**	-0.025*	0.014	0.012	0.022*	-0.000
	(0.018)	(0.014)	(0.023)	(0.015)	(0.015)	(0.008)	(0.011)	(0.007)
Unknown	-0.012	-0.026	-0.027	0.021	0.062	-0.008	0.024	0.011
	(0.044)	(0.041)	(0.050)	(0.084)	(0.041)	(0.020)	(0.024)	(0.014)
Lagged outcome	0.465***	0.493***	0.512***	0.512***	0.725***	0.762***	0.790***	0.808***
	(0.022)	(0.019)	(0.024)	(0.020)	(0.016)	(0.013)	(0.013)	(0.011)
Lagged time use								
Sleep	-0.022	-0.021	-0.020	-0.044**	-0.009	-0.033***	0.000	-0.004
	(0.017)	(0.014)	(0.028)	(0.021)	(0.012)	(0.010)	(0.011)	(0.008)
School	-0.011	-0.015	0.011	0.001	-0.015	-0.026**	0.003	0.002
	(0.020)	(0.013)	(0.031)	(0.020)	(0.014)	(0.010)	(0.012)	(0.008)
Physical activities	-0.036**	-0.012	-0.026	-0.018	-0.014	-0.021***	-0.008	0.007
	(0.015)	(0.011)	(0.027)	(0.016)	(0.011)	(0.008)	(0.010)	(0.007)
Care	-0.016	-0.017	-0.020	-0.015	-0.003	-0.020***	0.000	-0.006
	(0.015)	(0.011)	(0.027)	(0.017)	(0.010)	(0.007)	(0.009)	(0.006)
Chores	-0.051**	0.005	-0.040	-0.017	-0.021	-0.005	-0.012	-0.003
	(0.022)	(0.019)	(0.032)	(0.021)	(0.016)	(0.012)	(0.014)	(0.012)
Social activities	-0.025	-0.016	-0.018	-0.019	-0.011	-0.016*	0.005	0.000
	(0.016)	(0.012)	(0.028)	(0.017)	(0.012)	(0.008)	(0.010)	(0.007)
Cognitive leisure	-0.009	-0.001	0.013	-0.018	-0.017	-0.011	-0.007	0.002
	(0.017)	(0.013)	(0.032)	(0.019)	(0.013)	(0.009)	(0.011)	(0.007)
Digital media	-0.033**	0.003	-0.021	-0.024	-0.008	-0.020**	-0.011	-0.007
	(0.015)	(0.011)	(0.027)	(0.017)	(0.011)	(0.008)	(0.010)	(0.007)
Unknown	-0.052	-0.002	-0.002	-0.071*	0.002	0.020	0.005	0.025
	(0.035)	(0.022)	(0.048)	(0.041)	(0.024)	(0.037)	(0.023)	(0.015)
Contemporaneous controls								
Child's Gender	0.071**	0.081***	0.146***	0.237***	-0.097***	-0.037**	0.034*	0.058***
	(0.036)	(0.029)	(0.041)	(0.036)	(0.024)	(0.017)	(0.020)	(0.015)
Child's Age (in months)	0.014	0.029	0.082**	-0.010	0.005	0.005	-0.006	0.017*
	(0.024)	(0.020)	(0.036)	(0.026)	(0.016)	(0.011)	(0.013)	(0.010)
Child's Age2	-0.000	-0.000*	-0.000**	-0.000	-0.000	-0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Government school	-0.026	0.032	0.001	0.089***	0.016	0.020	-0.002	0.011
	(0.035)	(0.028)	(0.040)	(0.034)	(0.024)	(0.017)	(0.019)	(0.014)
Single parent HH	-0.033	-0.058	-0.132***	-0.007	0.074**	0.058	0.047*	0.032
	(0.046)	(0.060)	(0.050)	(0.063)	(0.034)	(0.038)	(0.027)	(0.026)
No. of older siblings	-0.054***	-0.030	-0.017	-0.009	-0.045***	-0.020*	-0.004	-0.014
	(0.019)	(0.019)	(0.023)	(0.022)	(0.013)	(0.012)	(0.012)	(0.009)
No. of younger siblings	-0.012	0.034*	0.003	0.023	-0.014	0.005	-0.004	-0.012
	(0.019)	(0.020)	(0.030)	(0.022)	(0.014)	(0.011)	(0.012)	(0.010)
Neighbourhood Disadvantage	-0.029	0.061**	-0.020	0.048	0.010	-0.004	-0.002	-0.004
	(0.029)	(0.027)	(0.031)	(0.034)	(0.020)	(0.014)	(0.017)	(0.013)
Baseline controls								
Low birthweight	-0.009	-0.065	-0.016	0.063	-0.038	-0.010	0.016	0.077**
	(0.062)	(0.062)	(0.079)	(0.066)	(0.046)	(0.036)	(0.036)	(0.034)
WAI score at age 4	0.131***	0.132***	0.185***	0.218***	-0.067***	-0.014	-0.042***	-0.017**
	(0.021)	(0.017)	(0.026)	(0.022)	(0.015)	(0.010)	(0.012)	(0.008)

HH real income (ln)	0.003	0.045	0.088***	0.095***	-0.007	-0.004	-0.018	-0.011
	(0.031)	(0.030)	(0.027)	(0.036)	(0.018)	(0.017)	(0.015)	(0.015)
Hardship	-0.036	-0.013	-0.026	-0.125**	0.013	0.045	-0.005	0.039
	(0.037)	(0.046)	(0.043)	(0.061)	(0.025)	(0.029)	(0.021)	(0.024)
Parent 1 - Male	-0.109	-0.036	-0.104	0.075	-0.092	0.001	0.026	-0.041
	(0.105)	(0.062)	(0.085)	(0.086)	(0.070)	(0.039)	(0.049)	(0.035)
Parent 1 - Age	-0.010	0.003	0.013	0.015	-0.010	0.003	-0.015	-0.006
	(0.019)	(0.028)	(0.027)	(0.040)	(0.017)	(0.018)	(0.014)	(0.017)
Parent 1 - Age2	0.000	0.000	-0.000	-0.000	0.000	-0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Parent 1 - Main language English	0.036	-0.046	-0.110	-0.084*	-0.070*	-0.003	-0.030	-0.001
	(0.060)	(0.041)	(0.074)	(0.050)	(0.043)	(0.023)	(0.039)	(0.022)
Parent 1 - Birth country	-0.096*	0.003	-0.025	-0.002	0.028	0.035*	0.005	-0.005
	(0.053)	(0.037)	(0.058)	(0.044)	(0.034)	(0.019)	(0.033)	(0.017)
Parent 1 - Education	0.038	0.056*	0.267*	0.052	0.020	-0.010	-0.115	0.018
	(0.148)	(0.033)	(0.151)	(0.040)	(0.082)	(0.019)	(0.072)	(0.016)
Parent 1 - Employment status	0.048	-0.076*	0.052	0.043	-0.005	-0.020	0.013	-0.001
	(0.049)	(0.042)	(0.057)	(0.050)	(0.035)	(0.024)	(0.030)	(0.019)
Parent 1 - Work hours	-0.003*	0.002	-0.002	-0.003**	-0.000	0.000	-0.000	0.001
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Cold parenting	0.022	0.017	-0.143*	0.010	-0.033	0.081*	0.103*	0.109***
	(0.081)	(0.072)	(0.086)	(0.097)	(0.065)	(0.048)	(0.053)	(0.042)
Angry parenting	-0.034	-0.021	-0.042	-0.032	0.083**	0.053*	0.092***	0.025
	(0.051)	(0.041)	(0.057)	(0.054)	(0.040)	(0.029)	(0.031)	(0.024)
Inconsistent parenting	-0.103**	0.037	-0.081	-0.008	0.076**	0.008	0.030	-0.016
	(0.051)	(0.068)	(0.053)	(0.077)	(0.036)	(0.037)	(0.032)	(0.033)
Illogical parenting	0.050	-0.116	0.105	0.002	-0.032	0.007	-0.003	-0.005
	(0.057)	(0.071)	(0.069)	(0.088)	(0.041)	(0.037)	(0.032)	(0.035)
Major illness	-0.049	-0.032	-0.038	-0.130**	0.043	-0.019	0.042	-0.025
	(0.058)	(0.060)	(0.067)	(0.063)	(0.038)	(0.030)	(0.031)	(0.026)
Major illness - relative	-0.036	0.047	-0.067	0.017	0.060*	0.062**	0.018	0.030
	(0.050)	(0.043)	(0.051)	(0.047)	(0.034)	(0.027)	(0.027)	(0.022)
Death - family	0.076	-0.092	-0.109	-0.062	-0.055	-0.030	0.005	-0.044*
	(0.079)	(0.058)	(0.086)	(0.071)	(0.048)	(0.032)	(0.042)	(0.026)
Death - close relative	-0.042	0.070*	-0.018	0.023	0.014	0.020	0.005	0.007
	(0.039)	(0.038)	(0.042)	(0.043)	(0.027)	(0.021)	(0.024)	(0.019)
Problems with friends	-0.041	0.011	-0.050	0.001	0.088**	0.086***	-0.018	0.083***
	(0.050)	(0.053)	(0.063)	(0.052)	(0.038)	(0.031)	(0.032)	(0.024)
Problems with work	0.045	-0.025	-0.003	0.004	0.044	0.022	0.025	0.037*
	(0.043)	(0.037)	(0.047)	(0.044)	(0.029)	(0.023)	(0.024)	(0.022)
Relationship separation	0.065	0.067	-0.033	0.174*	0.020	0.044	0.029	-0.089*
	(0.078)	(0.096)	(0.087)	(0.097)	(0.056)	(0.062)	(0.047)	(0.050)
Financial crisi2	-0.011	-0.048	-0.016	-0.065	0.052	0.055	0.038	0.036
	(0.063)	(0.067)	(0.071)	(0.070)	(0.050)	(0.048)	(0.039)	(0.036)
Legal problems	-0.107	0.027	0.039	0.071	0.140*	0.174*	0.113**	-0.029
	(0.097)	(0.139)	(0.129)	(0.150)	(0.084)	(0.094)	(0.057)	(0.072)
Theft	-0.107	0.005	0.157*	-0.233***	-0.010	0.005	0.019	-0.027
	(0.081)	(0.083)	(0.092)	(0.080)	(0.052)	(0.043)	(0.051)	(0.035)
Drugs and alcohol problems	0.086	-0.104	-0.123	-0.166	0.083	-0.032	0.135**	0.094*
	(0.081)	(0.104)	(0.112)	(0.107)	(0.076)	(0.060)	(0.056)	(0.056)
Time and Diary FE								
School day	-0.162	0.194**	-0.103	0.071	-0.044	0.030	-0.108	-0.030
	(0.112)	(0.096)	(0.128)	(0.117)	(0.093)	(0.067)	(0.076)	(0.056)
Diary type	0.567	-0.451	0.629	-0.841**	-0.305	0.551	0.298	0.328
	(0.586)	(0.431)	(0.459)	(0.361)	(0.559)	(0.363)	(0.458)	(0.325)
Weekday	0.006	-0.066*	-0.084*	0.007	-0.011	0.002	-0.029	-0.014
	(0.044)	(0.036)	(0.051)	(0.043)	(0.031)	(0.022)	(0.027)	(0.019)
Constant	1.182	-0.709	-5.543*	2.597	0.516	-0.562	0.016	-1.164
	(2.108)	(1.651)	(2.852)	(2.186)	(1.370)	(0.987)	(1.155)	(0.867)
Observations	2,742	4,117	1,977	2,963	3,847	5,407	3,847	5,408
R-squared	0.360	0.358	0.448	0.424	0.603	0.641	0.714	0.712

Notes: Robust standard errors in parenthesis, clustered at individual level. *** p<0.01, ** p<0.05, * p<0.1. Each activity refers to the amount of time spent on that activity measured in hours per day. All models include year, month and state FE.

Table A12: Effects of Children's Time Allocation on Cognitive Skills

	Literacy				Numeracy			
	Model 1		Model 2		Model 1		Model 2	
	Low SES	High SES	Low SES	High SES	Low SES	High SES	Low SES	High SES
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ref: Education activities								
Sleep	-0.088***	-0.044***	-0.088***	-0.045***	-0.085***	-0.058***	-0.083***	-0.060***
	(0.020)	(0.015)	(0.020)	(0.015)	(0.026)	(0.018)	(0.026)	(0.018)
School	-0.045*	-0.044**	-0.044*	-0.046**	-0.052*	-0.054**	-0.048*	-0.056**
	(0.023)	(0.018)	(0.024)	(0.018)	(0.029)	(0.022)	(0.029)	(0.022)
Physical activities	-0.060***	-0.039***	-0.062***	-0.040***	-0.047*	-0.010	-0.045*	-0.013
	(0.019)	(0.014)	(0.019)	(0.014)	(0.025)	(0.016)	(0.025)	(0.016)
General care	-0.046**	-0.037***	-0.047**	-0.038***	-0.049**	-0.036**	-0.042*	-0.037**
	(0.019)	(0.014)	(0.019)	(0.014)	(0.024)	(0.015)	(0.025)	(0.015)
Chores	-0.036	0.001	-0.037	-0.000	-0.040	-0.028	-0.038	-0.030
	(0.024)	(0.018)	(0.024)	(0.018)	(0.027)	(0.020)	(0.027)	(0.020)
Social activities	-0.048***	-0.038***	-0.048**	-0.038***	-0.039	-0.028*	-0.036	-0.027*
	(0.018)	(0.014)	(0.019)	(0.015)	(0.024)	(0.016)	(0.024)	(0.016)
Cognitive leisure	-0.007	0.013	-0.010	0.011	-0.020	0.004	-0.021	0.003
	(0.022)	(0.017)	(0.022)	(0.017)	(0.026)	(0.017)	(0.026)	(0.017)
Digital media	-0.046**	-0.037***	-0.048***	-0.039***	-0.063***	-0.023	-0.059**	-0.025*
	(0.018)	(0.013)	(0.018)	(0.014)	(0.023)	(0.015)	(0.023)	(0.015)
Lagged outcome and time use	Yes		Yes		Yes		Yes	
Diary, time and state FE	Yes		Yes		Yes		Yes	
Child, Household & Parent controls	Yes		Yes		Yes		Yes	
Parenting Styles	No		Yes		No		Yes	
Life events	No		Yes		No		Yes	
Observations	2,742	4,117	2,742	4,117	1,977	2,963	1,977	2,963
R-squared	0.356	0.354	0.360	0.358	0.440	0.416	0.448	0.424
Coefficient stability	Low SES		High SES		Low SES		High SES	
Chi2	6.22		3.37		6.58		8.44	
P-value	0.7179		0.9477		0.6804		0.491	

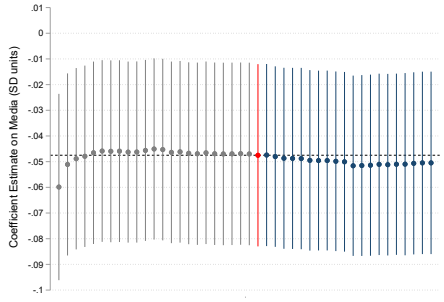
Notes: Robust standard errors in parenthesis, clustered at individual level. *** p<0.01, ** p<0.05, * p<0.1. Each activity refers to the amount of time spent on that activity measured in hours per day.

Table A13: Effects of Children's Time Allocation on Socio-Emotional Difficulties

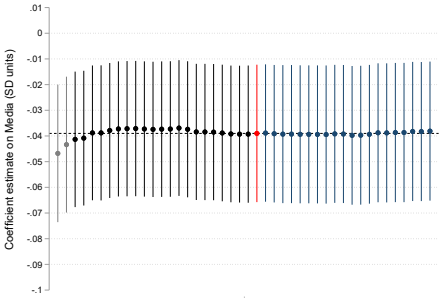
	Internalising Problems				Externalising Problems			
	Model 1		Model 2		Model 1		Model 2	
	Low SES	High SES	Low SES	High SES	Low SES	High SES	Low SES	High SES
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ref: Education activities								
Sleep	-0.002	-0.003	-0.001	-0.001	0.015	0.004	0.015	0.004
	(0.017)	(0.009)	(0.017)	(0.009)	(0.014)	(0.008)	(0.013)	(0.008)
School	0.020	0.010	0.021	0.009	0.031**	0.002	0.032**	0.001
	(0.019)	(0.011)	(0.019)	(0.011)	(0.015)	(0.010)	(0.015)	(0.010)
Physical activities	-0.003	-0.008	-0.005	-0.007	0.024**	-0.007	0.022*	-0.006
	(0.016)	(0.008)	(0.015)	(0.008)	(0.012)	(0.007)	(0.012)	(0.007)
General care	0.008	0.002	0.005	0.002	0.025**	0.005	0.022*	0.005
	(0.016)	(0.008)	(0.016)	(0.008)	(0.012)	(0.007)	(0.012)	(0.007)
Chores	0.016	-0.001	0.015	-0.001	0.026*	-0.004	0.024*	-0.005
	(0.017)	(0.010)	(0.017)	(0.010)	(0.014)	(0.009)	(0.014)	(0.009)
Social activities	0.000	0.002	-0.001	0.003	0.015	0.005	0.013	0.005
	(0.016)	(0.008)	(0.016)	(0.008)	(0.012)	(0.007)	(0.012)	(0.007)
Cognitive leisure	-0.000	0.006	0.001	0.006	0.012	-0.009	0.011	-0.010
	(0.018)	(0.009)	(0.018)	(0.009)	(0.015)	(0.008)	(0.015)	(0.008)
Digital media	0.016	0.013*	0.014	0.012	0.024**	-0.000	0.022*	-0.000
	(0.015)	(0.008)	(0.015)	(0.008)	(0.011)	(0.007)	(0.011)	(0.007)
Lagged outcome and time use	Yes		Yes		Yes		Yes	
Diary, time and state FE	Yes		Yes		Yes		Yes	
Child, Household & Parent controls	Yes		Yes		Yes		Yes	
Parenting Styles	No		Yes		No		Yes	
Life events	No		Yes		No		Yes	
Observations	3,847	5,407	3,847	5,407	3,847	5,408	3,847	5,408
R-squared	0.596	0.637	0.603	0.641	0.710	0.709	0.714	0.712
Coefficient Stability	Low SES		High SES		Low SES		High SES	
Chi2	12.75		8.95		9.94		9.39	
P-value	0.174		0.442		0.355		0.402	

Notes: Robust standard errors in parenthesis, clustered at individual level. *** p<0.01, ** p<0.05, * p<0.1. Each activity refers to the amount of time spent on that activity measured in hours per day.

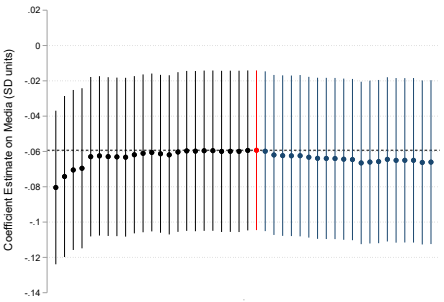
Figure A3: Coefficient Stability Plots - Digital Media Time Use



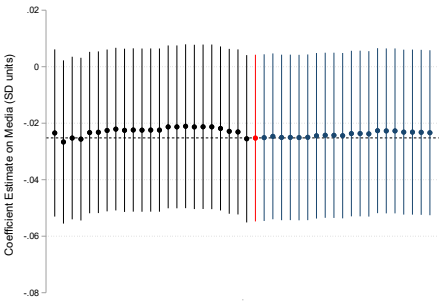
(a) Literacy - Low SES



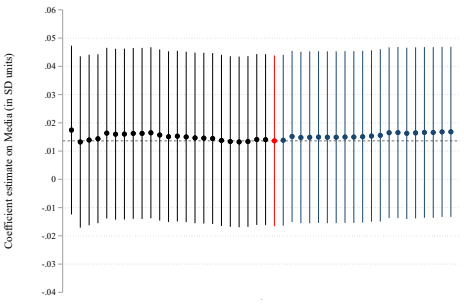
(b) Literacy - High SES



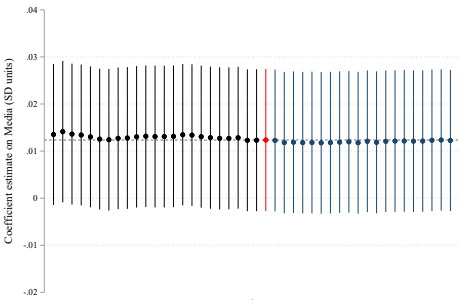
(c) Numeracy - Low SES



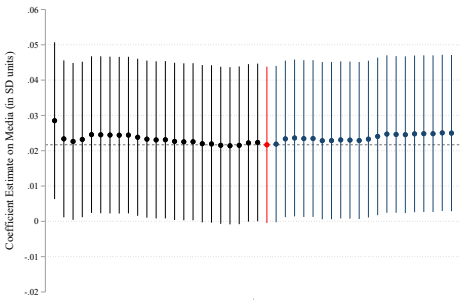
(d) Numeracy - High SES



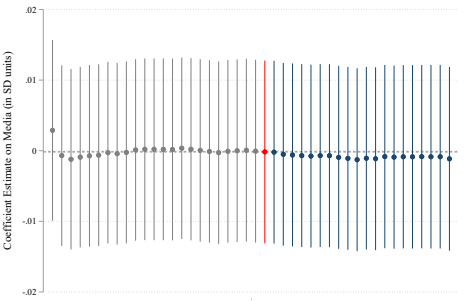
(e) Internalising Problems - Low SES



(f) Internalising Problems - High SES



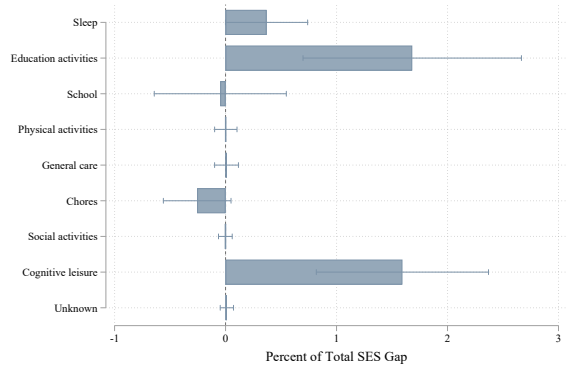
(g) Externalising Problems - Low SES



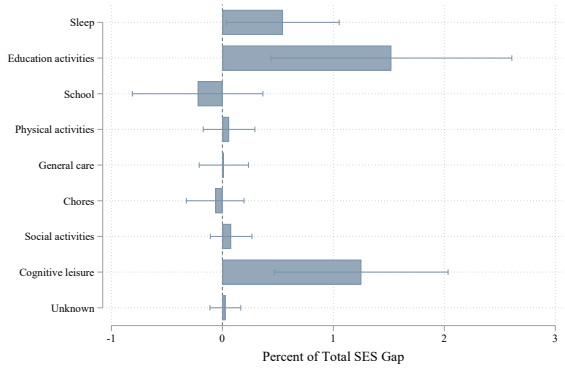
(h) Externalising Problems - High SES

Notes: Each dot represents the coefficient estimate on digital media, with controls added sequentially. Gray dots represent the models for which the exogeneity test does not pass, while black dots represent the models for which the exogeneity test passes. The red dot denotes the estimate from our preferred specification. The blue dots represent the model estimates with interaction terms. This includes interacting Parent's age with household controls and parenting styles, as well as interacting child's WAI score with household controls and parenting styles.

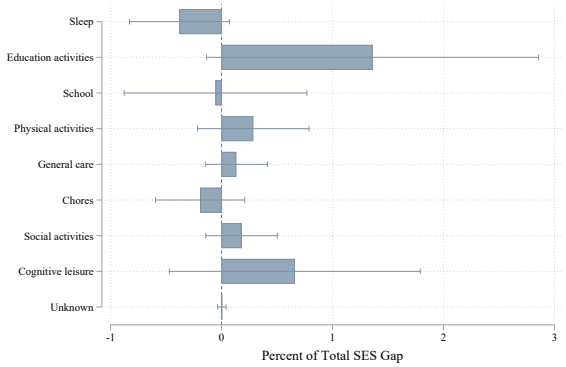
Figure A4: Oaxaca Decomposition Contributions of Time Use on Human Capital SES Gap - With Digital Media as the Omitted Category



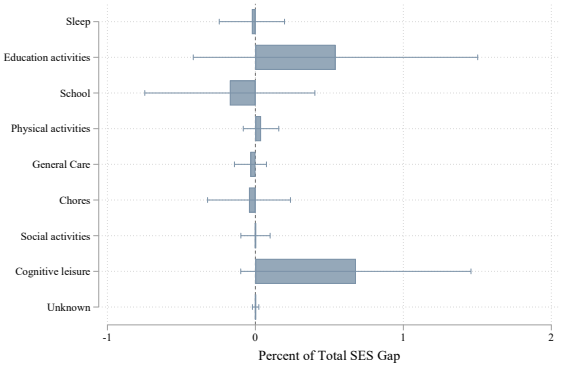
(a) Literacy Gap



(b) Numeracy Gap



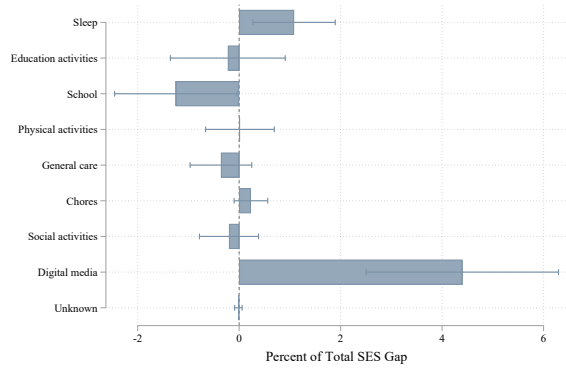
(c) Gap in Internalising Problems



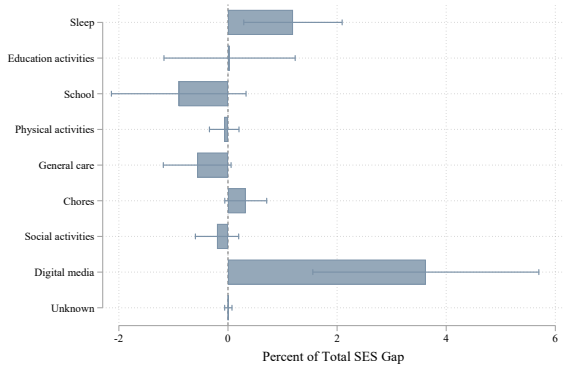
(d) Gap in Externalising Problems

Notes: Each figure presents the % contribution of a time use category to the overall SES standardised score gap, with 95% confidence intervals depicted as spikes on top of the bars.

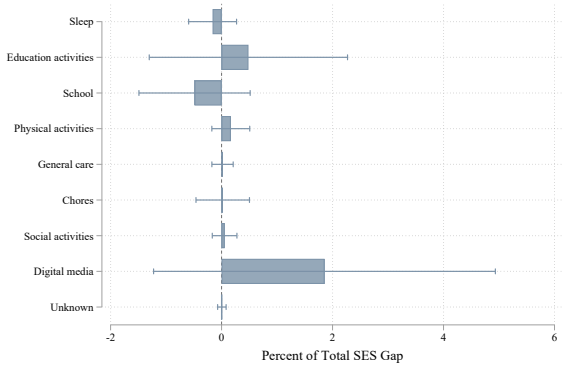
Figure A5: Oaxaca Decomposition Contributions of Time Use on Human Capital SES Gap - With Cognitive Leisure as the Omitted Category



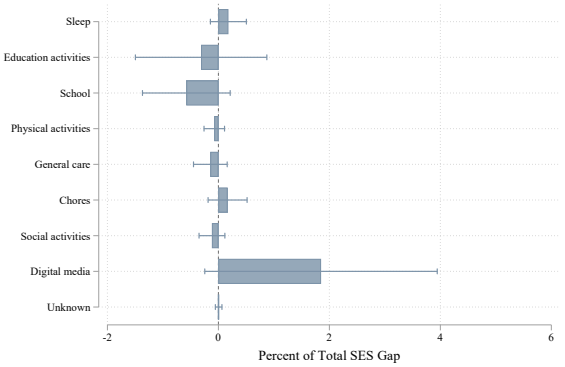
(a) Literacy Gap



(b) Numeracy Gap



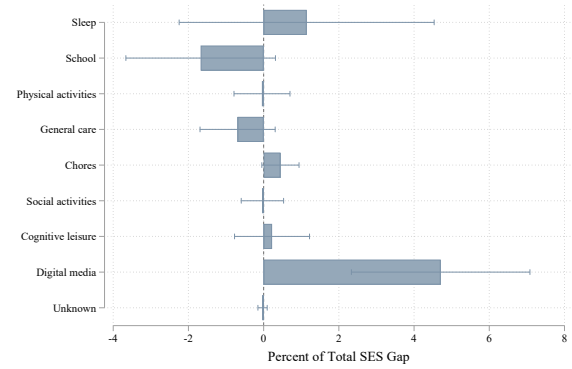
(c) Gap in Internalising Problems



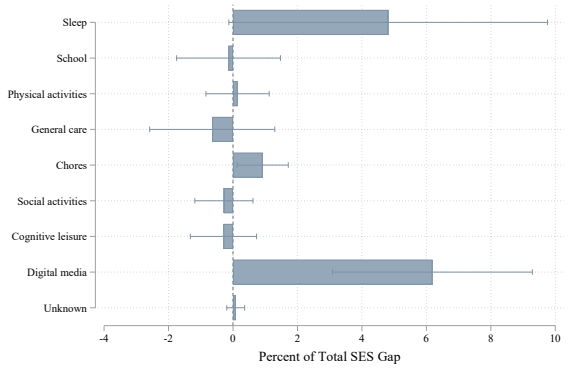
(d) Gap in Externalising Problems

Notes: Each figure presents the % contribution of a time use category to the overall SES standardised score gap, with 95% confidence intervals depicted as spikes on top of the bars.

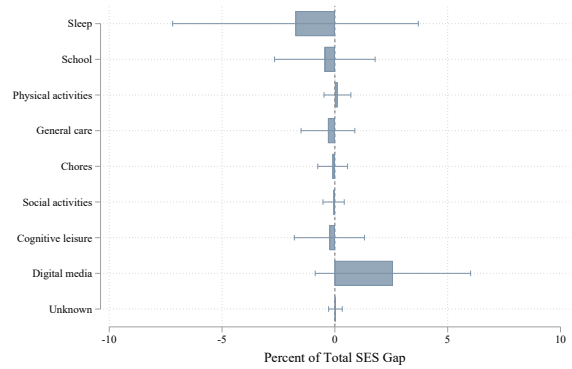
Figure A6: Oaxaca Decomposition Contributions of Time Use on Human Capital SES Gap - With Interaction Terms



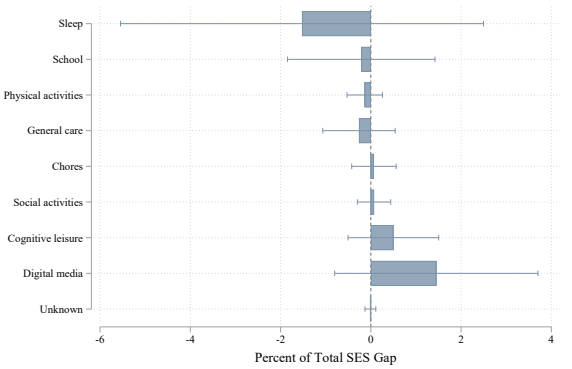
(a) Literacy Gap



(b) Numeracy Gap



(c) Gap in Internalising Problems



(d) Gap in Externalising Problems

Notes: Each figure presents the % contribution of a time use category to the overall SES standardised score gap, with 95% confidence intervals depicted as spikes on top of the bars.

Table A14: Detailed Decomposition Estimates

	Cognitive Skills				Socio-emotional difficulties			
	Literacy		Numeracy		Internalising Problems		Externalising Problems	
	Gap	Explained	Gap	Explained	Gap	Explained	Gap	Explained
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Low SES	-0.254***		-0.254***		0.119***		0.149***	
	(0.018)		(0.021)		(0.017)		(0.017)	
High SES	0.391***		0.445***		-0.167***		-0.214***	
	(0.014)		(0.018)		(0.013)		(0.012)	
Difference	-0.644***		-0.699***		0.287***		0.363***	
	(0.023)		(0.028)		(0.021)		(0.021)	
Explained	-0.492***		-0.565***		0.275***		0.321***	
	(0.029)		(0.034)		(0.023)		(0.023)	
Unexplained	-0.153***		-0.134***		0.012		0.042**	
	(0.031)		(0.035)		(0.020)		(0.018)	
Time use variables								
Sleep		-0.006**		-0.008**		-0.000		0.001
		(0.003)		(0.003)		(0.001)		(0.001)
School		0.007*		0.006		-0.002		-0.002
		(0.004)		(0.004)		(0.002)		(0.001)
Physical activities		-0.000		0.000		0.000		-0.000
		(0.002)		(0.001)		(0.000)		(0.000)
General care		0.002		0.004*		-0.000		-0.000
		(0.002)		(0.002)		(0.000)		(0.000)
Chores		-0.001		-0.002		0.001		0.001
		(0.001)		(0.001)		(0.001)		(0.001)
Social activities		0.001		0.001		-0.000		-0.000
		(0.002)		(0.001)		(0.000)		(0.000)
Cognitive leisure		-0.001		-0.000		-0.002		0.001
		(0.003)		(0.004)		(0.002)		(0.002)
Digital media		-0.023***		-0.023***		0.008*		0.004
		(0.007)		(0.009)		(0.005)		(0.004)
Unknown		0.000		-0.000		0.000		0.000
		(0.000)		(0.000)		(0.000)		(0.000)
Lagged time use								
Sleep		-0.001		-0.003		-0.001		-0.000
		(0.001)		(0.002)		(0.001)		(0.000)
School		0.002		-0.000		0.003*		-0.000
		(0.002)		(0.002)		(0.002)		(0.001)
Physical activities		0.000		-0.000		0.000		-0.000
		(0.001)		(0.001)		(0.001)		(0.000)
General care		-0.002		-0.000		-0.001		-0.000
		(0.001)		(0.001)		(0.001)		(0.000)
Chores		-0.000		-0.001		-0.001		-0.000
		(0.000)		(0.001)		(0.001)		(0.001)
Social activities		0.000		0.001		0.000		-0.000
		(0.001)		(0.001)		(0.001)		(0.000)
Cognitive leisure		0.001		0.002		0.004**		0.000
		(0.002)		(0.004)		(0.002)		(0.001)
Digital media		-0.007		-0.011		-0.009**		-0.004
		(0.005)		(0.007)		(0.004)		(0.003)
Unknown		0.000		-0.000		0.000		0.000
		(0.000)		(0.000)		(0.000)		(0.000)
Lagged outcome		-0.286***		-0.297***		0.218***		0.278***
		(0.013)		(0.016)		(0.016)		(0.016)
School day		-0.001		0.000		-0.000		0.001
		(0.002)		(0.001)		(0.001)		(0.001)
Early		0.000		0.000		0.000		-0.017
		(0.000)		(0.000)		(0.016)		(0.013)
Weekday		0.000		0.000		0.000		0.000
		(0.001)		(0.000)		(0.000)		(0.000)
Fixed at birth or age 4								
Low birthweight		-0.000		0.000		-0.000		0.000
		(0.001)		(0.001)		(0.000)		(0.000)
WAI score at age 4		-0.047***		-0.077***		0.013***		0.011***
		(0.005)		(0.008)		(0.003)		(0.002)

	Cognitive Skills				Socio-emotional difficulties			
	Literacy		Numeracy		Internalising Problems		Externalising Problems	
	Gap	Explained	Gap	Explained	Gap	Explained	Gap	Explained
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Parent 1 age		-0.014***		-0.014**		-0.001		0.000
		(0.005)		(0.006)		(0.004)		(0.003)
P1 - Main language English		-0.002		-0.005**		-0.001		0.001
		(0.002)		(0.002)		(0.001)		(0.001)
P1 - Birth country		-0.002		-0.000		0.004**		-0.000
		(0.003)		(0.003)		(0.002)		(0.002)
Child controls								
Male		0.000		-0.000		-0.001		0.001
		(0.001)		(0.003)		(0.001)		(0.001)
Age (in months)		0.026		0.030		0.017		0.020
		(0.027)		(0.033)		(0.022)		(0.020)
Age2		-0.022		-0.025		-0.010		-0.012
		(0.023)		(0.030)		(0.020)		(0.017)
Government school		0.012**		0.006		-0.004		-0.001
		(0.006)		(0.008)		(0.004)		(0.004)
Household controls								
Single parent HH		-0.003		-0.014**		0.006		0.008*
		(0.007)		(0.007)		(0.005)		(0.004)
No of older siblings		-0.004		-0.001		-0.006*		-0.001
		(0.005)		(0.005)		(0.003)		(0.003)
No of younger siblings		-0.000		0.006		0.000		0.000
		(0.002)		(0.004)		(0.000)		(0.000)
Neighbourhood disadvantage		-0.008		-0.034		0.001		0.004
		(0.018)		(0.028)		(0.011)		(0.009)
HH real income (ln)		-0.014		0.011		0.006		0.001
		(0.011)		(0.016)		(0.009)		(0.006)
Hardship		-0.002		-0.010		0.007*		0.002
		(0.005)		(0.006)		(0.004)		(0.004)
Parent controls								
Male		0.001		0.000		0.000		-0.000
		(0.001)		(0.000)		(0.000)		(0.000)
Education		-0.006		0.040		0.020		0.065**
		(0.042)		(0.051)		(0.036)		(0.028)
Employment status		0.002		0.005		-0.007**		0.001
		(0.005)		(0.006)		(0.003)		(0.003)
Work hours		0.004		0.004		0.007*		-0.001
		(0.005)		(0.006)		(0.004)		(0.003)
Parenting styles								
Cold parenting		0.000		0.001		0.001*		0.003***
		(0.001)		(0.001)		(0.001)		(0.001)
Angry parenting		0.000		0.000		-0.000		-0.001
		(0.000)		(0.000)		(0.001)		(0.002)
Inconsistent parenting		0.001		-0.002		0.005***		0.007***
		(0.002)		(0.002)		(0.002)		(0.002)
Illogical parenting		0.002*		0.004**		-0.003***		-0.005***
		(0.001)		(0.002)		(0.001)		(0.001)
Life events								
Major illness		-0.002		-0.003		0.001		0.000
		(0.001)		(0.002)		(0.001)		(0.001)
Major illness - relative		0.000		-0.000		0.001*		0.000
		(0.000)		(0.001)		(0.001)		(0.000)
Death - family		0.000		0.000		0.000		0.000
		(0.000)		(0.001)		(0.000)		(0.000)
Death - close relative		0.002		0.000		0.001		0.001
		(0.002)		(0.002)		(0.001)		(0.001)
Problems with friends		-0.000		-0.000		0.002**		0.001*
		(0.001)		(0.001)		(0.001)		(0.000)
Problems with work		0.000		0.000		0.001		0.001
		(0.001)		(0.001)		(0.001)		(0.001)
Relationship separation		0.002		0.002		0.001		-0.001
		(0.002)		(0.002)		(0.001)		(0.001)

	Cognitive Skills				Socio-emotional difficulties			
	Literacy		Numeracy		Internalising Problems		Externalising Problems	
	Gap	Explained	Gap	Explained	Gap	Explained	Gap	Explained
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Financial crisis		-0.001		-0.001		0.002		0.001
		(0.002)		(0.002)		(0.002)		(0.001)
Legal problems		0.000		0.001		0.002**		0.000
		(0.001)		(0.001)		(0.001)		(0.001)
Theft		-0.001		-0.001		-0.000		-0.000
		(0.001)		(0.001)		(0.000)		(0.000)
Drugs and alcohol problems		-0.000		-0.003**		0.001		0.002***
		(0.001)		(0.002)		(0.001)		(0.001)
Observations	6,859	6,859	4,940	4,940	9,254	9,254	9,255	9,255

Notes: Robust standard errors in parenthesis, clustered at individual level. *** p<0.01, ** p<0.05, * p<0.1. Each activity refers to the amount of time spent on that activity measured in hours per day. All models include time and state FE.

Table A15: Effects of Children's Time Allocation on Cognitive Skills by Gender

	Literacy				Numeracy			
	Girls		Boys		Girls		Boys	
	Low SES	High SES	Low SES	High SES	Low SES	High SES	Low SES	High SES
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ref: Education activities								
Sleep	-0.083***	-0.010	-0.085***	-0.088***	-0.123***	-0.015	-0.039	-0.112***
	(0.029)	(0.020)	(0.030)	(0.022)	(0.035)	(0.026)	(0.042)	(0.027)
School	-0.089***	-0.022	0.023	-0.087***	-0.065*	-0.006	-0.019	-0.107***
	(0.031)	(0.024)	(0.035)	(0.027)	(0.038)	(0.028)	(0.048)	(0.034)
Physical activities	-0.058**	-0.014	-0.059**	-0.072***	-0.042	-0.003	-0.035	-0.029
	(0.029)	(0.018)	(0.026)	(0.022)	(0.032)	(0.022)	(0.041)	(0.025)
General care	-0.034	-0.015	-0.053**	-0.075***	-0.040	-0.001	-0.036	-0.078***
	(0.029)	(0.017)	(0.027)	(0.021)	(0.032)	(0.021)	(0.041)	(0.023)
Chores	-0.028	0.033	-0.048	-0.056*	-0.045	-0.027	-0.020	-0.025
	(0.032)	(0.023)	(0.035)	(0.029)	(0.036)	(0.027)	(0.043)	(0.029)
Social activities	-0.061**	-0.018	-0.032	-0.071***	-0.046	0.009	-0.019	-0.067***
	(0.027)	(0.017)	(0.026)	(0.023)	(0.032)	(0.021)	(0.039)	(0.025)
Cognitive leisure	-0.014	0.032	-0.001	-0.021	0.005	0.034	-0.040	-0.034
	(0.030)	(0.020)	(0.034)	(0.027)	(0.034)	(0.024)	(0.044)	(0.027)
Digital media	-0.047*	-0.018	-0.038	-0.068***	-0.058*	-0.005	-0.058	-0.053**
	(0.027)	(0.018)	(0.025)	(0.020)	(0.031)	(0.020)	(0.038)	(0.024)
Unknown	-0.016	0.035	-0.014	-0.107***	0.015	0.201***	-0.043	-0.180*
	(0.061)	(0.061)	(0.056)	(0.030)	(0.073)	(0.071)	(0.054)	(0.092)
Observations	1,327	2,010	1,415	2,107	966	1,447	1,011	1,516
R-squared	0.391	0.357	0.388	0.403	0.495	0.434	0.466	0.470

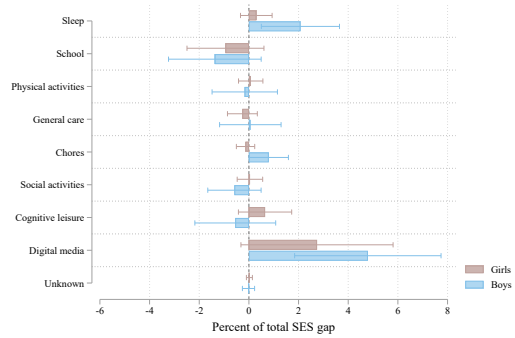
Notes: Robust standard errors in parenthesis, clustered at individual level. *** p<0.01, ** p<0.05, * p<0.1. Each activity refers to the amount of time spent on that activity measured in hours per day. All models include diary and time FE, child controls, household controls, parent controls, parenting styles, life events and state FE.

Table A16: Effects of Children's Time Allocation on Socio-emotional Difficulties by Gender

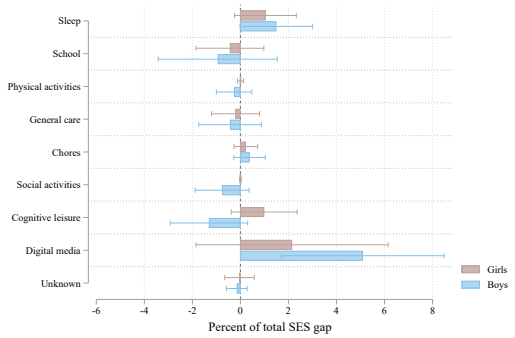
	Internalising Problems				Externalising Problems			
	Girls		Boys		Girls		Boys	
	Low SES	High SES	Low SES	High SES	Low SES	High SES	Low SES	High SES
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ref: Education activities								
Sleep	-0.018	0.005	0.009	-0.017	0.041**	-0.001	-0.015	0.000
	(0.025)	(0.012)	(0.024)	(0.014)	(0.020)	(0.011)	(0.020)	(0.012)
School	0.028	0.015	0.012	-0.001	0.053**	0.002	0.006	-0.010
	(0.028)	(0.016)	(0.027)	(0.015)	(0.022)	(0.013)	(0.022)	(0.015)
Physical activities	-0.010	0.004	-0.005	-0.026**	0.038**	0.011	0.001	-0.028***
	(0.022)	(0.011)	(0.022)	(0.011)	(0.017)	(0.009)	(0.018)	(0.010)
General care	0.006	0.012	-0.001	-0.015	0.039**	0.013	0.000	-0.011
	(0.023)	(0.011)	(0.023)	(0.011)	(0.017)	(0.009)	(0.018)	(0.010)
Chores	0.010	0.006	0.016	-0.015	0.036*	0.013	0.007	-0.030**
	(0.024)	(0.014)	(0.024)	(0.015)	(0.020)	(0.013)	(0.020)	(0.013)
Social activities	0.003	0.020*	-0.010	-0.023*	0.038**	0.015	-0.014	-0.013
	(0.023)	(0.011)	(0.023)	(0.012)	(0.017)	(0.009)	(0.018)	(0.011)
Cognitive leisure	0.004	0.011	-0.002	-0.009	0.041**	0.005	-0.029	-0.035***
	(0.024)	(0.012)	(0.029)	(0.014)	(0.019)	(0.011)	(0.026)	(0.012)
Digital media	0.013	0.018*	0.013	0.001	0.041**	0.010	0.000	-0.018*
	(0.021)	(0.011)	(0.022)	(0.012)	(0.016)	(0.009)	(0.017)	(0.009)
Unknown	0.042	-0.006	0.087	-0.011	0.032	0.015	0.012	0.000
	(0.043)	(0.028)	(0.073)	(0.027)	(0.034)	(0.018)	(0.032)	(0.023)
Observations	1,889	2,706	1,958	2,701	1,889	2,706	1,958	2,702
R-squared	0.591	0.634	0.634	0.665	0.695	0.676	0.720	0.732

Notes: Robust standard errors in parenthesis, clustered at individual level. *** p<0.01, ** p<0.05, * p<0.1. Each activity refers to the amount of time spent on that activity measured in hours per day. All models include diary and time FE, child controls, household controls, parent controls, parenting styles, life events and state FE.

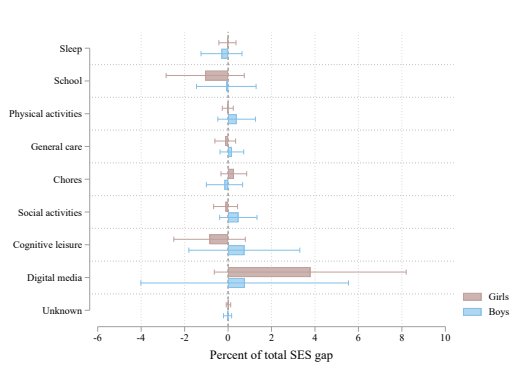
Figure A7: Oaxaca Decomposition Contributions of Time Use on Human Capital SES Gap by Gender



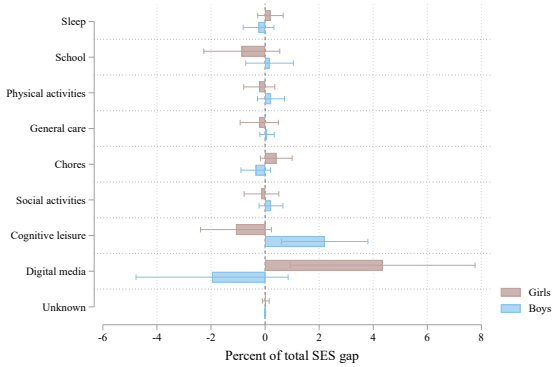
(a) Time Use; Literacy



(b) Time Use; Numeracy



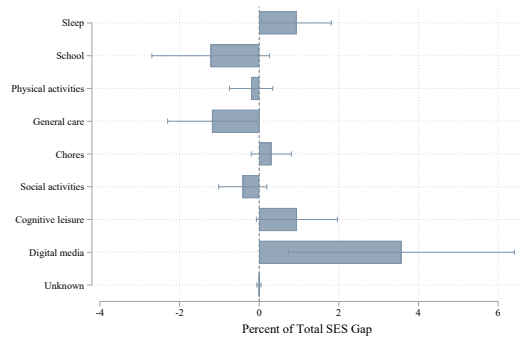
(c) Time Use; Internalising Problems



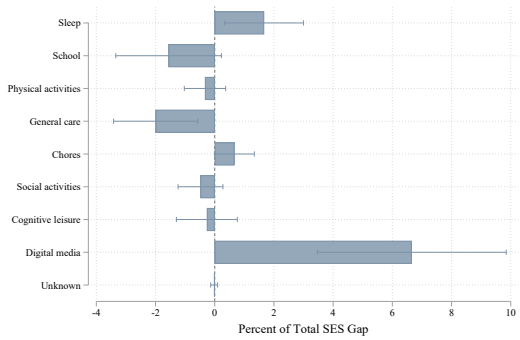
(d) Time Use; Externalising Problems

Notes: Each figure presents the % contribution of a time use category to the overall SES standardised score gap split by gender, with 95% confidence intervals depicted as spikes on top of the bars.

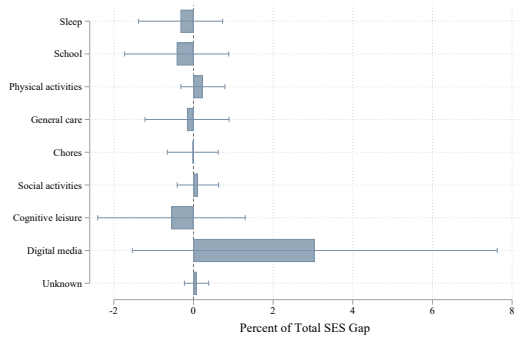
Figure A8: Oaxaca Decomposition Contributions of Time Use on Human Capital SES Gap - Older Children Aged 10 - 14 Years



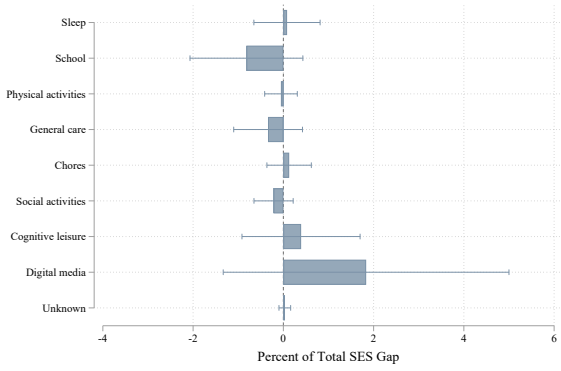
(a) Time Use; Literacy



(b) Time Use; Numeracy



(c) Time Use; Internalising Problems



(d) Time Use; Externalising Problems

Notes: Each figure presents the % contribution of a time use category to the overall SES standardised score gap for older children, with 95% confidence intervals depicted as spikes on top of the bars.