Parental Time Investments and the Adult Outcomes of their Children[*]

Mette Gørtz[1,2], Sarah Sander[3], and Almudena Sevilla[2,3]

[1]University of Copenhagen

[2]IZA - Institute of Labor Economics

[3]UCL - Institute of Education

November 1, 2019

Very preliminary draft. Please do not cite or circulate.

Abstract

Parental time investments are important inputs in the production of children's skills. Using child specific time investments from the Danish Time Use Survey linked to register data, this article is the first to empirically estimate associations of parental time investments beyond the childhood and adolescent years. In order to account for unobserved factors affecting both parental investments and child outcomes we use within-family variation in the time devoted to siblings of different order to estimate how early parental investments affect the adult outcomes of their children. We find no association of early parental time investments on long-term economic and demographic outcomes of the children.

1 Introduction

It is well documented, that parents of high socioeconomic status are far more likely to have children, who grow up to be high socioeconomic status themselves. Documenting the causal relationship between parents' and children's educational achievement and income level has been an active area of research in the last decade (Black and Devereux, 2011). However, there remains a gap in our understanding of the precise mechanisms behind the documented parent-child correlations in outcomes. In this paper we focus on the role of parental time investments during early childhood and adolescents in shaping children's lives.

In human capital theory, the amount of time parents invest in their children is an important input in the production of child development (Becker, 2009; Francesconi and Heckman, 2016). In a similar vein, developmental theory suggests that children's development is malleable and affected by family influences (Bronfenbrenner and Morris, 1998). Large-scale time-diary surveys administered to representative samples of children coupled with information on child developmental outcomes, such as the Panel Study of Income Dynamics - Child Development Supplement (PSID-CDS) in the United States and Growing Up in Australia: The Longitudinal Study of Australian Children (LSAC), have recently made it possible to directly measure maternal and paternal time inputs in order to empirically document its importance for a children's cognitive and non-cognitive development (Hsin and Felfe, 2014; Del Bono et al., 2016; Del Boca et al., 2017).

In this paper, we link the 1987 Danish Time Use Survey (DTUS) to the Danish administrative registers. This rich information allow us to build entire histories for a particular child, and assess the way parental behavior during childhood influences child's outcomes all the way into adulthood. Importantly, the DTUS allows us to study the effect of parental time investments done with the focal child and as a family. In addition, linking the DTUS to the administrative registers provide us with some advantages. First, it allow us to move beyond cognitive and non-cognitive test and look at a broad range of real life outcomes; earnings, education and family formation. Second, it allow us include birth weight as an observable

proxy for initial endowments in our analysis.

Estimating how parental time affects child development poses important empirical challenges. First, parental investments may be responsive to children's innate abilities, such that disadvantaged children receive more parental attention, even within families. To the extent that this compensating behavior exists (Price and Kalil, 2018), it may lead to a downward bias in the estimates of parental time investments even in models controlling for family fixed effects. Crucially, the linkage of DTUS with register data allow us to control for sibling differences in birth outcomes, which have been shown to be important for later outcomes (Black et al., 2007). Second, there are other variables, such as school characteristics and family environment, which may confound the effects of parental time investments. For example, more educated parents may choose better schools and provide a more stimulating home environment for their children, and also spend more time with their children. Omitting these family characteristics may lead to an upward bias in the coefficient of parental time investments. We address this concern by using family fixed effects models.

Our results indicate that early parental time investments wear off over time. In particular, our results cooperate earlier findings that total parental time may be detrimental for child cognitive development (Milkie et al., 2015), because time spent in unstructured activities, such as watching television, negatively affect child development (Hsin and Felfe, 2014).

This paper contributes to the literature by moving beyond cognitive test scores and simple non-cognitive measures and investigates whether parents' time investments during childhood affects the adult earnings, educational achievement and demographic outcomes of their children. By looking at the long-run effects of parental time investments this paper can inform the design of policy interventions aimed at reducing the persistence of intergenerational inequality.

This paper is organized as follows. In section 2, we review the relevant literature about parental time investments and child outcomes. Section 3 describes the data sources we use in our analysis and outlines our variables of interest. Section 4 presents our empirical strategy,

while section 5 begins by presenting some summary statistics and ends by presenting results of how parental time investments affects long-run outcomes of their children. Finally, section 6 concludes.

2 Background

Despite the theoretical recognition that time parents devote to their children is important, very few studies have tried to empirically estimate the importance for parental time investments (Francesconi and Heckman, 2016). In part because it requires data on parental time use linked to data on children's outcomes, which is not readily available. Some studies have used survey data, asking parents about how often they engage in activities with their children, to investigate how parental time investments relate to child outcomes (Barker et al., 2014). However, these studies may all suffer from recall bias. In order to avoid this recall bias, a small but growing number of studies apply time use data to examine how parental time investments relates to child outcomes.

Studies examining the total amount of parental time with children have founded mixed results (Hsin and Felfe, 2014; Milkie et al., 2015). In contrast, studies dividing the time parents spend with their children in educational or structured activities have found that parental time in these activities are positively related to child development (Fiorini and Keane, 2014; Hsin and Felfe, 2014).

A number of studies use data from the PSID-CDS in order to link parental time investments to child outcomes. Using data from PSID-CDS in a family fixed effect framework, Hsin and Felfe (2014) examine if parental time investments affects child development. They find that the total time parent spend with their children is negatively correlated with cognitive and behavioral development. However, they find that the negative associations are driven by time spend in unstructured activities such as watching television or playing video games, whereas time in educational and structured activities are positively related to child devel-

opment. Raley (2014) find a positive correlation between the time parents spend reading for their preschool children and the children's verbal abilities. Contrary, time spend reading with children of school age are negative related to children's verbal achievement. In addition, she finds a negative correlation between the time parent spend watching television with their preschool children and verbal abilities.

Del Boca et al. (2014) estimate a model of children's cognitive development process and find that both parents' time inputs are important for the cognitive development of their children, particularly when the child is young. Del Boca et al. (2017) find that child's own investments during adolescence matter more than the mother's time investments. With a specific focus on maternal versus parental time investments, Milkie et al. (2015) find that time with mother relates to reductions in delinquency, while time with both parents relates to math score, substance use, externalization problems in addition to delinquent behavior. Fomby and Musick (2018) ask whether children's home environments and the parenting style of the parents moderate the association between parents' total time with children and child outcomes.

Del Bono et al. (2016) use The Millennium Cohort Study (MCS) from the UK to examine if the relationship between maternal time investment and child cognitive and non-cognitive outcomes change over the preschool years applying a value added model. They find that maternal time is positively correlated with child outcomes. They also find evidence that early time is more important for verbal skills.

Fiorini and Keane (2014) use data from the LSAC to investigate how children's own time use in different activities affects their cognitive and non-cognitive development. They find that the time children spend in educational activities, in particular with their parents present, is related to the children's cognitive skills, but not their non-cognitive skills. Using data from the LSAC as well, Cano et al. (2019) examine how the total amount of father–child time relates to children's cognitive development. In line with previous studies focusing on maternal time, they find that paternal total time is only vaguely related to children's outcomes, there

father-child time in educational activities is associated with moderate to large improvements in cognitive development.

Finally, Rasmussen (2009) use data from the 1987 DTUS to examine if parental direct and indirect child care affects children's high school enrollment at age 16. She finds that children's probability of high school enrollment are positively related to mother's child care time on weekdays as well as father's child care time on weekends.

While the existing literature has examined how parental time investments relates to a variety of cognitive and non-cognitive skills, there remains a gap in our knowledge as to whether these investments affect important and tangible adult outcomes, such as love and money.

Heterogeneity in parental investments

Parents can, purposely or unintended, invest differently in their children along a number of different dimensions (see also Almond et al. (2018) for a review of the literature). The rest of this section outlines some dimensions relevant for this study.

Gender of the child

Differences in educational and labor market outcomes between men and women is an active area of research (see e.g. Blau and Kahn (2017); Goldin (2014)). While the literature has devoted most attention to structural factors of the labor market in explaining these difference, Brenøe and Lundberg (2018) examine if gender differences in the childhood family environment affect the adult outcomes of children. As parental time investments are important inputs in child development, differences in parental investments by child gender are a potential origin of long-run gender differences in outcomes. Baker and Milligan (2016), for example, find that parents in Canada, the United States, and the United Kingdom spend more time with girls in teaching activities than with boys.

Birth order and spacing

In a similar vein, Price (2008) shows that, although parents invest almost equal time in each child at a given point in time, higher birth order children receive less time at a certain age than first born children at the same age. In addition, he finds that the birth order difference is much larger when the children are spaced further apart, because parental time investments are decreasing as the children age, particularly as the first child ages. This differential treatment by birth order could be related to the observed differences in adult outcomes by birth order as documented by, for example, Black et al. (2005).

Endowment

Parents may invest differently in children with different endowments. Specifically, parents may try to either reinforce or compensate for endowment differences (Behrman et al., 1982). For example, parents could compensate for learning difficulties of one child by investing more time with that child. Using a sample of siblings from the PSID-CDS, Hsin (2012) shows that lower educated mothers reinforce endowment differences by spending more time with their children of higher birth weight than their children of lower birth weight. In contrast, she finds that higher educated mothers compensate for endowment differences by spending most time with their children of lower birth weight. Datar et al. (2010) show that parent reinforce endowment differences across a broad array of investments.

Parental education

The differential investment behaviour by parental education is also examined by a number of other scholars (Guryan et al., 2008; Ramey and Ramey, 2010; Kalil et al., 2012). As an example, Guryan et al. (2008) find that mothers with a college education or more spend more child care time with their children than mothers with a high school degree or less using data from the American Time Use Survey. Additionally, they show that this pattern holds across countries using time use data from 14 other countries.

Family structure

The emergence on new family structures have sparked a new interest in the allocation of time to children in various family settings (Sayer et al., 2004; Pepin et al., 2018). Kalil et al. (2014) examine how time invested in children vary across six different family structures and find that children living with two biological parents (married or cohabiting) receive the same amount of time as children living with a stepfather and in multi-generational families, because children in two latter family types receive substantial time investments from nonresident biological fathers and grandparents, respectively. Children in single mother households and children living with their mother and her cohabiting boyfriend receive less time investments. Along the same lines, Fallesen and Gähler (2019) show that parents living in cohabiting or married unions spend more time with their children than single parents or parents in reconstituted unions using time use data from Denmark.

3 Data

To assess the way parental behavior influence their children all the way into adulthood we link the 1987 Danish Time Use Survey (DTUS) to administrative registers containing information on children outcomes from adolescence to adulthood.

Our starting point is the 1987 DTUS, a stratified random sample of the Danish population aged 16-74, in which nearly 3600 individuals fill out a 24-hour diary choosing between 39 pre-defined activities for every 15 minutes interval.[1] Respondents fill out the diary on either a weekday or a weekend day (Bonke et al., 2004). A unique feature in the DTUS is that for each time interval the respondent not only fills in the activity but also who was present during the time interval. In particular, the respondents are asked whether the youngest, second youngest or third youngest child was present during each time interval. This feature allow us to distinguish between parental time investments witin a family. From the original

---

[1]Table A1 presents an overview of the 39 activities.

survey we select respondents who have at least one child aged 1-18 living in the household in 1987. In addition, we restrict the sample to include only those children who are alive and resident in Denmark at age 30. This gives us a final sample of 1,791 children.

Long-run child outcomes

In contrast to the existing literature, we investigate if parental time use have lasting effects on economic and demographic outcomes during adulthood by combining time use data and administrative data. Using administrative data as a source for outcome variables provide us with a number of advantages. First, we avoid measurement error and errors stemming from problems of recall or justification bias, because the administrative data is consistent over time and not self-reported. Second, the administrative data allow us to follow individuals over time from 1980 through 2017 without any attrition and across a wide range of outcomes. Third, using information on year of birth of all children in the sample, we can collect a set of age-specific outcomes. Consequently, we are able to examine how parental time investments affects child outcomes at the same age for all the 19 birth cohorts of children in our sample.

The first outcome we are able to examine is high school grade point average (GPA) at age 18-20. This outcome is only available for the part of the sample who attended and completed high school.[2] Our next outcomes of interest are years of completed education at age 25 and 30. By age 30 educational attainment is likely completed (see e.g. Brenøe and Lundberg (2018)). From the tax registers we collect information on gross income at age 25. We use the consumer price index to scale all monetary values to 2019 DKK.

We use the civic and population registers to construct four different demographic outcomes. First, we construct a dummy for whether the children of the 1987 DTUS themselves are parents in 2017. Second, we look at the number of children they have. Third, we construct a dummy for whether they live alone in 2017. Lastly, we construct a dummy for divorce any time before 2017. While economic and educational outcomes often follow a path

---

[2]Rasmussen (2009) use the 1987 DTUS to look at high school attendance.

over the life-cycle, the demographic outcomes we consider are more likely to happen once or more during the life. Consequently, we take stock of the demographic outcomes in 2017.

Parental time investments

Using information from the diary, we are able to distinguish between 39 different activities, as well as who the parent is with while engaged in the activities. Importantly, parents record whether the youngest, second youngest, and/or third youngest child is present for all activities and all episodes. First, this allow us to construct a measure of total time with the parent for the three youngest children in a family. Second, utilizing the 39 activity codes, we are able to distinguish between different types of parental time investments. We use the 39 activity codes to construct five different types of parental time use with children (cf. Table A1). We separately investigate how parental time spent in basic care activities, structured activities, unstructured activities, managing activities, and socializing activities with the focal child present affect the adult outcomes. Distinguishing between e.g. basic care and management activities is crucial as different time inputs may be more important for children's development at different ages. Structured activities include reading, education, doing hobbies and sports. Unstructured activities include housework and leisure time including television watching, management activities include transport of children and school meetings. Socializing activities include meals, having guests and going out.

Covariates

We include a comprehensive set of child and family characteristics as covariates in our analysis. For each child we gather information in the registers on gender, year of birth and spacing to next child. In order to capture endowment differences between children we include a control for birth weight for a sub-sample of children born after 1979. Additionally, the rich administrative data allow us to construct a series of controls for family environment. We include controls for household size, mother's age at the birth of the focal child, aver-

age household income during the child's first five years, parental education and labor force participation.

4   Empirical Strategy

We start our empirical analysis by taking a reduced form approach and estimate child's outcomes during adulthood as a function on parental inputs during childhood in a simple OLS regression.

$$Y_{ij} = \alpha_1 ptime_i + X'_i\theta + \varepsilon_{ij} \tag{1}$$

where Y_{ij} is the adult outcome of child i in family j and $ptime_i$ represent parental time use with child i. $X'_{i,}$ is a vector of controls for child and family characteristics. The included controls for child characteristics are a dummy for gender of the child in addition to sets of dummies for the age of the child, birth order, and spacing to next sibling. In terms of parental characteristics, we control for whether the interviewed parent is the father of the child, whether the interview took place on a weekend day. To account for fathers spending more time with their children on weekends (Rasmussen, 2009), we also include an interaction term between father and weekend. Additionally, we include a dummy for whether the parent is a high school graduate, works part time, or full time at the time of the interview (omitted variable is no work).

While our rich data allow us to control for many individual and family characteristics, estimates from Eq. 1 may still be biased due to unobserved characteristics. Biased estimates will occur, if for example, the time that parents spend with their children depends on unobserved characteristics such as parenting quality and parenting quality simultaneously influence the adult outcomes of children.

Consequently, we proceed our analysis by using within-family variation in the time de-

voted to siblings of different order in a family fixed effect model given by Eq. 2.

$$Y_{ij} = \beta_1 ptime_i + X_i' \gamma + \mu_j + \epsilon_{ij} \tag{2}$$

where μ_j is the family fixed effect and X_i' is vector of child characteristics that vary across siblings. By comparing siblings we take account for all time-constant observed and unobserved characteristics shared with-in the family. As such, equation (2) unpins the casual effect of parental time investments on adult outcomes if no important time-varying variables are omitted (Currie and Almond, 2011). However, Eq. 2 does not account for child specific characteristics affecting both child outcomes and parental time investments such as endowments. We include a control for birth weight of the child in order to capture endowment differences between siblings.

5   Results

Descriptive results

Table 1 shows summary statistics of our outcome variables in column (1) for all children and separately for children aged 0-6, 7-12, and 13-18 at the time of the survey in columns (2), (3) and (4), respectively. We have high school GPA for 844 children in our sample and on average these children have a GPA of 6.8. The GPA is a bit higher for the group of children who are 7-12 at the time of survey and bit lower for the 13-18 age group, which potentially reflects an upward trend in high school GPA. Looking at gross income at age 25, Table 1 reveals no differences across age groups. The children in our sample on average have 12.8 years of education at age 25 and 14.2 at age 30. At age 25 the younger age group have more education than the oldest age group, although differences are small. This could indicate that younger birth cohorts have fewer gap years.

In terms of the demographic outcomes, Table 1 reveals large differences across age groups.

Table 1: Summary statistics of outcome variables

	(1) All	(2) Age 1-6	(3) Age 7-12	(4) Age 13-18
High school GPA, age 18-20	6.750	6.794	6.869	6.509
	(2.381)	(2.319)	(2.377)	(2.473)
Log gross income, age 25	12.19	12.20	12.16	12.21
	(0.574)	(0.592)	(0.564)	(0.566)
Years of education, age 25	12.78	12.95	12.69	12.72
	(1.658)	(1.808)	(1.536)	(1.610)
Years of education, age 30	14.19	14.27	14.35	13.94
	(2.231)	(2.287)	(2.158)	(2.235)
Parent by 2017	0.725	0.547	0.809	0.822
	(0.446)	(0.498)	(0.394)	(0.383)
Number of children by 2017	1.481	0.937	1.683	1.835
	(1.135)	(0.998)	(1.048)	(1.150)
Living alone in 2017	0.211	0.220	0.178	0.238
	(0.408)	(0.414)	(0.383)	(0.426)
Ever divorced by 2017	0.124	0.0433	0.121	0.213
	(0.330)	(0.204)	(0.326)	(0.410)
Observations	1791	601	622	568

 Note— The table shows mean and standard deviation in parenthesis of the outcome variables for the to-tal sample in column (1) and separately for children aged 0-6, 7-12, and 13-18 at the time of the survey in columns (2), (3) and (4), respectively.

These differences are related to the fact that the youngest age group (children aged 0-6 at the time of the survey) are 30-36 in 2017, while the oldest age group are 43-48 in 2017. Consequently, only 55 percent of the youngest age group are a parent by 2017, while 81 percent of the middle age group and 82 percent of the oldest age group are a parent by 2017. On average, the children in our sample have 1.5 children themselves by 2017. As with the dummy variable for parenthood, there exist large differences in the number of children across the age groups. The same pattern across age groups is visible when looking at the fraction of the sample who experience a divorce by 2017. In the youngest age group only 4.3 percent have experienced a divorce, while 21.3 percent of the oldest age group have experienced a divorce by 2017.

Table 2, column (1) shows summary statistics of the parental time investment measures for all children in our sample. On average, the children in our sample spend 37 hours per

Table 2: Summary statistics of parental time investments

	(1) All	(2) Age 1-6	(3) Age 7-12	(4) Age 13-18
Total time	36.86	43.15	36.23	31.48
	(26.01)	(27.67)	(24.38)	(24.80)
Basic care	6.17	10.80	5.05	2.91
	(8.83)	(10.55)	(7.81)	(5.63)
Structured	2.45	1.93	2.94	2.41
	(6.33)	(4.60)	(7.89)	(5.80)
Unstructured	13.65	13.34	13.67	13.92
	(14.77)	(14.61)	(14.45)	(15.29)
Management	2.42	2.76	2.02	1.99
	(6.09)	(4.48)	(4.74)	(8.33)
Socializing	12.36	14.33	12.55	10.25
	(13.12)	(15.16)	(12.90)	(10.71)
Observations	1791	601	622	568

 Note— The table shows mean and standard deviation in parenthesis of the parental time investment measures for the total sample in column (1) and separately for children aged 1-6, 7-12, and 13-18 at the time of the survey in columns (2), (3) and (4), respectively. All time variables are measured in hours per week.

week with their parent. Columns (2)-(4) reveal that parent spend more time younger children than older children. This is especially, true for basic care, where parents on average spend 11 hours per week with children aged 1-6, 5 hours per week with children aged 7-12, and 3 hours per week with children aged 13-18. Parents spend substantially less time with their children in structured activities (2 hours per week) than in unstructured activities (14 hours per week) across all age groups. On average parents spend 2 hours in management activities with their children. Time spend managing is slightly decreasing across age groups, which is not surprising since smaller children are more depend on being transported by their parents than older children. Time spend in socializing activities, such as meals, is on average 12 hours per week.

Table 3 shows summary statistics for background variables of the child. We include children between age 0 and 18 in our sample and the average age of the children is 9.2 years. The average number of children in the households in the sample is just above 2, however, 19 percent of the sample do not have any siblings. As expected around half the sample consists

Table 3: Summary statistics of child and family characteristics

	(1) All	(2) Age 1-6	(3) Age 7-12	(4) Age 13-18
Child's age in years	9.210	3.035	9.593	15.32
	(5.278)	(1.942)	(1.713)	(1.646)
Birth order	1.643	1.784	1.667	1.468
	(0.733)	(0.777)	(0.757)	(0.616)
Number of children in household	2.092	1.985	2.191	2.097
	(0.761)	(0.797)	(0.760)	(0.707)
Only child	0.194	0.265	0.135	0.183
	(0.395)	(0.441)	(0.342)	(0.387)
Boy	0.512	0.522	0.490	0.525
	(0.500)	(0.500)	(0.500)	(0.500)
IP father	0.477	0.469	0.489	0.474
	(0.500)	(0.499)	(0.500)	(0.500)
IP interviewed on weekend	0.365	0.373	0.355	0.366
	(0.481)	(0.484)	(0.479)	(0.482)
IP high school graduate	0.624	0.609	0.653	0.607
	(0.485)	(0.488)	(0.476)	(0.489)
IP part-time work	0.273	0.261	0.281	0.276
	(0.446)	(0.440)	(0.450)	(0.448)
IP full-time work	0.604	0.592	0.622	0.597
Observations	1791	601	622	568

 Note— The table shows mean and standard deviation in parenthesis of child and family characteristics for the total sample in column (1) and separately for children aged 0-6, 7-12, and 13-18 at the time of the survey in columns (2), (3) and (4), respectively. IP is short for interviewed parent.

of boys. In terms of gender of the interviewed parent (IP), 48 percent of the sample is the father of the child. A bit more than a third of the sample fill out the diary on a weekend day. The majority of the interviewed parents have a high school degree or more. The majority (60 percent) of the interviewed parents work full time, while 27 percent is part-time employed.

Regression results

OLS results: Economic and educational outcomes

Table 4 presents OLS estimates of how parental time investments relates to their children's long-run educational and economic outcomes. Column 1 shows how parental time investments

relates to children's high school GPA. Total parental time is negative correlated with high school GPA. The estimate suggests that children who spend 1 hour more per week with their parents get 0.008 point lower GPA when thy graduate in high school. Time spend is basic care is also negatively related to adult outcomes. Children who spend 1 hour more per week with their parent in basic care activities earn 0.4 percent less and have about 3.5 days less education at age 25. Similarly, time spend in unstructured and socializing activities are also negatively related to high school GPA.

Table 4: OLS estimates of parental time investments on educational and economic outcomes

	(1) High school GPA, age 18-20	(2) Log gross income, age 25	(3) Years of educ., age 25	(4) Years of educ., age 30
Total time	-0.00815**	-0.000684	0.000110	-0.00110
	(0.00374)	(0.000590)	(0.00173)	(0.00233)
Basic care	-0.00477	-0.00423**	-0.00980**	0.000126
	(0.00987)	(0.00167)	(0.00487)	(0.00665)
Structured	0.0171	-0.00234	0.00527	0.0126
	(0.00612)	(0.000940)	(0.00275)	(0.00369)
Unstructured	-0.0109*	0.000682	0.00137	-0.00435
	(0.00612)	(0.000940)	(0.00275)	(0.00369)
Management	-0.00706	-0.00206	0.00190	0.00215
	(0.0135)	(0.00215)	(0.00628)	(0.00840)
Socializing	-0.0158**	-0.000307	0.000864	-0.00185
	(0.00696)	(0.00110)	(0.00321)	(0.00433)
Observations	844	1756	1739	1701

Note— $*$ p<0.1, $**$ p<0.05, $***$ p<0.01. Each cell represents a separate regression. All regressions include controls for child age, birth order, number of siblings, gender of the child, gender of the parent, interview on weekend day, education and work of the interviewed parent. High school GPA is only available for those who finish high school.

Family fixed effects: Economic and educational outcomes

We continue the analysis by investigating within family variation in time parents invest in their children. Consequently, we limit the sample to families with two or more children (1290 children in 594 families).

Table 5: FE estimates of parental time investments on educational and economic outcomes

	(1) High school GPA, age 18-20	(2) Log gross income, age 25	(3) Years of educ., age 25	(4) Years of educ., age 30
Total time	-0.00350	-0.00142	-0.00118	-0.000223
	(0.0113)	(0.00155)	(0.00496)	(0.00613)
Basic care	0.00165	-0.00230	-0.0164	-0.00408
	(0.0308)	(0.00444)	(0.0140)	(0.0177)
Structured	0.0732	-0.00210	-0.0281	-0.0572*
	(0.0537)	(0.00789)	(0.0251)	(0.0316)
Unstructured	-0.0186	-0.00175	-0.00384	-0.00132
	(0.0209)	(0.00269)	(0.00876)	(0.0106)
Management	0.0555	0.00164	0.0281	0.0201
	(0.0849)	(0.00765)	(0.0244)	(0.0299)
Socializing	-0.0170	-0.00412	0.0148	0.0149
	(0.0295)	(0.00422)	(0.0134)	(0.0167)
Observations	611	1264	1249	1230

Note— $*$ $p<0.1$, $**$ $p<0.05$, $***$ $p<0.01$. Each cell represents a separate regression. All regressions include child specific controls.

Table 5 shows family fixed effects estimates of parental time investments on educational and economic outcomes of the adult children. Total time with parent appear to be negatively correlate with all four outcomes, but none of the four estimates are statistical significant from zero. Overall, our results confirm previous findings by e.g. Hsin and Felfe (2014); Milkie et al. (2015), who show that total parental time is unrelated to child cognitive development.

OLS results: Demographic outcomes

TBA

Family fixed effects: Demographic outcomes

TBA

Discussion of caveats and limitations

In this paper we study how parental time investments during childhood relates to their children's outcomes in adulthood. Our results suggest that the association between parental time investments and the adult outcomes of their children wear off over time. However, in interpreting our results caution must be made, as there are a number of caveats and limitations in the present study.

First, as the questions and activities in the 1987 DTUS are not targeted towards caching parental behaviour beneficial to child development, we cannot be sure that we capture a meaningful measure of quality time.

Second, the DTUS is only collected on one single day. Thus, in our analysis we assume that the day the parent fills out the dairy is representative for any other day during their children's childhood. Unfortunately, this feature of the data implies that we are not able to capture any dynamics of parental time invest during childhood. It is possible that parents adjust their time investments when gaining information about their child's development.

Third, while our family fixed effects model allow us to take account of time invariant factors affecting both parental time investment and child outcomes shared with-in the family, results may still be biased if parents choose to spend more time with one child over another child in order to compensate for lacking child development. As highlighted by Waldfogel (2016), if children are negatively selected, null results could be biased, because a potentially positive effect of parental time would be offset by the correlation of more time with unobserved factors that are associated with poorer outcomes.

Fourth, as the 1987 DTUS only contains information about the full day for the interviewed parent, we do not observe the time use of the children when they are not with the interviewed parent. Consequently, we are not able to investigate what children do when they are not with their parents. This is an important limitation of our study, because the counterfactual time not spend with parents may be more or less productive in terms of long-run outcomes.

6 Conclusion

This paper combines information on parental time use with the focal child from the Danish Time Use Survey in 1987 with register data from 1980 through 2017, in order to estimate the effect of early parental time investments on children's outcomes during adulthood. We rely on within-family variation in the time devoted to siblings of different birth order to estimate the effect of parental time investments on children's outcomes in adulthood. We find no effect of early parental time investments on long-term economic and demographic outcomes of the children. The many welfare institutions aimed at child development in this specific setting, such as high-quality universal and affordable daycare, free schools and university education, may mediate the effect of parental time use on long-term child outcomes.

References

Almond, D., Currie, J., and Duque, V. (2018). Childhood circumstances and adult outcomes: Act ii. *Journal of Economic Literature*, 56(4):1360–1446.

Baker, M. and Milligan, K. (2016). Boy-girl differences in parental time investments: Evidence from three countries. *Journal of Human Capital*, 10(4):399–441.

Barker, J. E., Semenov, A. D., Michaelson, L., Provan, L. S., Snyder, H. R., and Munakata, Y. (2014). Less-structured time in children's daily lives predicts self-directed executive functioning. *Frontiers in psychology*, 5:593.

Becker, G. S. (2009). *A Treatise on the Family*. Harvard university press.

Behrman, J. R., Pollak, R. A., and Taubman, P. (1982). Parental preferences and provision for progeny. *Journal of Political Economy*, 90(1):52–73.

Black, S. and Devereux, P. (2011). Recent developments in intergenerational mobility. In Ashenfelter, O. and Card, D., editors, *Handbook of Labor Economics*, volume 4B, chapter 16, pages 1487–1541. Elsevier.

Black, S. E., Devereux, P. J., and Salvanes, K. G. (2005). The more the merrier? The effect of family size and birth order on children's education. *The Quarterly Journal of Economics*, 120(2):669–700.

Black, S. E., Devereux, P. J., and Salvanes, K. G. (2007). From the cradle to the labor market? the effect of birth weight on adult outcomes. *The Quarterly Journal of Economics*, 122(1):409–439.

Blau, F. D. and Kahn, L. M. (2017). The gender wage gap: Extent, trends, and explanations. *Journal of Economic Literature*, 55(3):789–865.

Bonke, J., Gupta, N. D., and Smith, N. (2004). The timing and flexibility of housework and men and women's wages. In Hamermesh, D. S. and Pfann, G. A., editors, *The Economics of Time Use*, pages 43–77. Emerald Group Publishing Limited.

Brenøe, A. A. and Lundberg, S. (2018). Gender gaps in the effects of childhood family environment: Do they persist into adulthood? *European Economic Review*, 109:42–62.

Bronfenbrenner, U. and Morris, P. (1998). The ecology of developmental processes. In *Theorectical models of human development*, pages 993–1028. Wiley.

Cano, T., Perales, F., and Baxter, J. (2019). A matter of time: Father involvement and child cognitive outcomes. *Journal of Marriage and Family*, 81(1):164–184.

Currie, J. and Almond, D. (2011). Human capital development before age five. In *Handbook of Labor Economics*, volume 4, chapter 15, pages 1315–1486. Elsevier.

Datar, A., Kilburn, M. R., and Loughran, D. S. (2010). Endowments and parental investments in infancy and early childhood. *Demography*, 47(1):145–162.

Del Boca, D., Flinn, C., and Wiswall, M. (2014). Household choices and child development. *Review of Economic Studies*, 81(1):137–185.

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

Del Bono, E., Francesconi, M., Kelly, Y., and Sacker, A. (2016). Early maternal time investment and early child outcomes. *The Economic Journal*, 126(596):F96–F135.

Fallesen, P. and Gähler, M. (2019). Family type and parents' time with children: Longitudinal evidence for Denmark. *Acta Sociologica*.

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

21

Fomby, P. and Musick, K. (2018). Mothers' time, the parenting package, and links to healthy child development. *Journal of Marriage and Family*, 80(1):166–181.

Francesconi, M. and Heckman, J. J. (2016). Child development and parental investment: Introduction. *The Economic Journal*, 126(596):F1–F27.

Goldin, C. (2014). A grand gender convergence: Its last chapter. *American Economic Review*, 104(4):1091–1119.

Guryan, J., Hurst, E., and Kearney, M. (2008). Parental education and parental time with children. *Journal of Economic Perspectives*, 22(3):23–46.

Hsin, A. (2012). Is biology destiny? Birth weight and differential parental treatment. *Demography*, 49(4):1385–1405.

Hsin, A. and Felfe, C. (2014). When does time matter? Maternal employment, children's time with parents, and child development. *Demography*, 51(5):1867–1894.

Kalil, A., Ryan, R., and Chor, E. (2014). Time investments in children across family structures. *The ANNALS of the American Academy of Political and Social Science*, 654(1):150–168.

Kalil, A., Ryan, R., and Corey, M. (2012). Diverging destinies: Maternal education and the developmental gradient in time with children. *Demography*, 49(4):1361–1383.

Milkie, M. A., Nomaguchi, K. M., and Denny, K. E. (2015). Does the amount of time mothers spend with children or adolescents matter? *Journal of Marriage and Family*, 77(2):355–372.

Pepin, J. R., Sayer, L. C., and Casper, L. M. (2018). Marital status and mothers' time use: Childcare, housework, leisure, and sleep. *Demography*, 55(1):107–133.

Price, J. (2008). Parent-child quality time does birth order matter? *Journal of Human Resources*, 43(1):240–265.

Price, J. and Kalil, A. (2018). The effect of mother–child reading time on children's reading skills: Evidence from natural within-family variation. *Child Development.*

Raley, S. (2014). Time use, inequality, and child well-being. In Ben-Aryeh, A., Casas, F., Frønes, I., and Korbin, J. E., editors, *Handbook of Child Well-Being: Theories, Methods and Policies in Global Perspective*, chapter 34, pages 999–1031. Springer.

Ramey, G. and Ramey, V. A. (2010). The rug rat race. *Brookings Papers on Economic Activity*, 2010(1):129–176.

Rasmussen, A. (2009). Allocation of parental time and the long-term effect on children's education. *University of Aarhus, Aarhus School of Business, Department of Economics, Working Papers.*

Sayer, L. C., Bianchi, S. M., and Robinson, J. P. (2004). Are parents investing less in children? Trends in mothers' and fathers' time with children. *American Journal of Sociology*, 110(1):1–43.

Waldfogel, J. (2016). How important is parental time? It depends: Comment on Milkie, Nomaguchi, and Denny (2015). *Journal of Marriage and Family*, 78(1):266–269.

A   Appendix

Table A1: Parental time use and activity codes

Variable	Activity	Activity number
Basic care activities	Bathing	2
	Child care	8
	Being with child	21
Structured activities	Studying at home	12
	Reading the news paper	13
	Reading	14
	Hobby	15
	Education	29
	Sports	31
	Trip	32
Unstructured activities	Cleaning	6
	Washing and repairing clothes	7
	Gardening	10
	Work from home	11
	Watching television	18
	Listening to radio	19
	Listening to music	20
	Relax	22
	Other at home (talking on the phone)	23
	Work	28
	Grocery shopping etc.	35
	Amusements	38
	Other outside home	39
Management activities	Transport of children	24
	Transport to work	25
	Transport to education	26
	Other transport	27
	Meetings etc.	30
	Visit to public office/GP etc.	36
Socializing activities	Meals	3
	Family visit in home	16
	Visit in home	17
	Visiting family	33
	Visiting other than family	34
	Restaurant	37

Note— We excluded activity 1 (sleep), because no children are recorded present while the parent sleeps.