Quality Time: The Effect of Birth Order

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Abstract

Using data from the American Time Use Survey, we find that a first-born child receives 20-30 more minutes of quality time each day with his or her parent than a second-born child of the same age and from a similar family. Birth order differences also exist for specific activities such as reading or playing together. The magnitude of the birth order difference varies by sibling gender composition, family size, and birth spacing. These results provide a plausible explanation for recent research showing a very significant effect of birth order on educational outcomes.

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The literature linking family size and child outcomes is extensive and consistently reports that children with more siblings have lower levels of educational attainment. Recent research has included the child's birth order in the analysis and found signficant birth order effects, with children of a higher birth order having worse outcomes (Black, Devereux, and Salvanes 2005; Conley and Glauber 2005). In fact, once birth order is controlled for, family size has no effect on the first-born child.

There has been less research in providing a mechanism to explain the link between birth order and educational attainment. This paper examines one possible mechanism: the amount of time that a child spends with his or her parents. Time spent with parents is believed to be an important determinant of a child's educational outcomes. Finding a connection between birth order and time spent with parents provides an important explanation for the link between birth order and child outcomes.

The paper also builds on the economics of time-use by looking at the determinants of parent-child interaction. While most past studies have primarily focused on the amount of time that parents spend with their children, this paper looks at the amount of time each child receives with his or her parent. This change in viewpoint makes it possible to look at differences between siblings in the amount of quality time they receive with their parents.

The key question of this paper is not whether a second-born child receives less quality time than the first-born child at each point in time, but rather if the second-born child receives less quality time at a given age than the first-born child did at the same age. This focus allows us to aggregate these differences at each age across the childhood of

the two siblings. This paper also examines how birth order differences in quality time vary by birth-spacing and sibling gender composition.

The paper proceeds as follows. Section I describes the past literature related to the effects of birth order on child outcomes. Section II describes the American Time Use Survey data used in the analysis. Section III describes the empirical strategy and main results. Section IV addresses the issues of incomplete fertility, sibling gender composition, birth spacing, and alternative measures of parent-child interaction. Section V simulates aggregate birth order differences over the ages four through thirteen. Section VI concludes.

I. Related Research

Early economic studies on the effect of birth order on educational outcomes generally found a small or insignificant effect. Kessler (1991) and Hauser and Sewell (1983) find the effect of birth order to be insignificant, Behrman and Taubman (1986) provide some evidence of a positive effect of being first-born, and Hanushek (1992) finds a U-shaped relationship where the first and last-born have the best outcomes. However, two recent papers find rather large birth order effects. These recent papers provide more convincing evidence due to the size of their sample and their use of instrumental variable methods to handle the endogeneity of family size.

Black, Devereux, and Salvanes (2005) use administrative data for the entire population of Norway over an extended period of time. Using the presence of twins as an instrument for family size, they find that children from larger families have lower levels of educational attainment. However, once they control for the child's birth order, the

effect of family size disappears and is replaced by large birth order effects. In fact, the difference they find between a first and fifth born child is equivalent to the black-white educational gap in the US.

Conley and Glauber (2005) find a similar result using the 1990 PUMS five percent sample. They use the gender mix of siblings as an instrument for family size and find that children in larger families are less likely to attend private school and are more likely to be held back. When they interact the effect of a child's family size with his or her birth order, the effect of family size is insignificant for the first-born child but large and significant for children with a higher birth order.

These two studies provide convincing evidence that educational outcomes do differ by birth order. However, very little empirical work has been done to provide a mechanism to explain the presence of birth order effects. Theories that have been used to explain birth order differences in educational achievement include lifespan resource constraints, parental preferences, optimal stopping models, physiological differences, and the fact that the oldest child gets to be an only child during the early years of his or her life.[1]

A major difficulty in posing a theoretical link between birth order and child outcomes is that the different theories provide countervailing effects, leaving an ambiguous prediction as to the net effect. An alternative approach is to instead look for links between birth order and inputs that have been shown to positively influence child outcomes. One of these inputs is the amount of quality time a child spends interacting with his or her parent.

[1] Behrman and Taubman (1986) and Blake (1989) discuss these theories and their predictions in some detail.

The evidence linking parent-child interaction with educational attainment is not as strong as parents would hope.[2] There are, however, several studies that link educational outcomes to the frequency of certain activities, such as reading, playing or helping with homework. For example, Zick, Bryant, and Osterbacka (2001) find that children whose parents who read or play with them more often have fewer behavioral problems and better grades. Datcher-Loury (1988) finds that, after controlling for the mothers' work status, children whose mother's spend more time at home complete more years of schooling. Finally, Pleck (1997) reviews a number of studies and finds consistent evidence that indicates that higher levels of father involvement affect children in a positive way over a range of outcomes.

There are a few reasons we might expect birth order to affect the amount of active interaction that a child receives with his or her parent. One explanation is that the parent may prefer spending more time with older children because the range of options is greater and includes more of the activities that the parent enjoys doing. Another reason is that the oldest child is always on the developmental edge and so provides a sense of novelty to the parenting experience. Parents may also give extra time to the oldest child, knowing that the oldest child will in turn help in caring for his or her younger siblings. Birth order differences may also result from the child's choices as well. The second-born child has an older sibling to interact with and as a result may demand less attention from his or her parent.

[2] The effect of maternal employment on child outcomes has received considerable attention and maternal employment is often used as a proxy for mother-child time. However, as noted by Blau and Grossberg (1992), mothers who work may compensate for the lack of total time by engaging in more developmental activities. In fact, Bianchi (2000) finds that there is very little change in the amount of quality time that a mother spends with her child before and after entering the workforce.

The contribution of this paper is to analyze the empirical relationship between a child's birth order and the amount of quality time spent with his or her parent. This relationship provides a potential explanation for the link between birth order and child outcomes. The results from this paper also provide insight about factors that influence the amount of parent-child interaction that occurs.

II. Data

The American Time Use Survey (ATUS), administered by the Bureau of Labor Statistics, is the first time that a federal statistical agency in the US has collected data on how people use their time. The survey began in January 2003 and 21,000 individuals completed the survey in 2003 and an additional 14,000 in 2004. The survey will continue into the indefinite future with additional waves of data released each year.[3]

The respondents to the ATUS are sampled from the group of households in the outgoing rotation of the Current Population Survey. For each household, one adult (age 15+) is randomly selected to complete the survey. The respondent is asked to recount the activities of the day immediately prior the day of the survey. For each activity, the respondent reports the starting and ending time, their location, and the members of their household who were present during the activity.

Since the ATUS respondents also participated in the Current Population Survey, we have detailed information about their income, occupation, and education level. The respondent is asked to provide the age, gender, and relationship to the respondent of each person in the household, as well as any children that were not living at home. This

[3] A more detailed description of the ATUS data is found in Hamermesh et al (2005). The data is publicly available at http://www.bls.gov/tus/home.htm.

information makes it possible to construct measures of the child's family size, birth order, birth spacing, and gender composition of siblings.

The ATUS only surveys one parent in the family but the time use of other members of the family is observed as they come in contact with the respondent during the day. As a result, while the ATUS data does not provide information about how children use their time when they are not with their parents, it does give a very accurate measure of the time they spend with the parent participating in the survey and how this time is spent.

The parent's report on which children are present for each activity is used to measure the amount of interaction each child had with his or her parent. This differs from most past studies that have looked at how much time parents spend with their children. Using the child as the unit of analysis makes it possible to look at within-family differences in quality time. Knowing who is present for each activity allows for classification of parent-child time by both the number of siblings and number of parents present during the activity.[4]

The analysis is limited to families with no more than four children in their household. The identification strategy requires that the number of siblings be interacted with the birth order of each child. This is not feasible to do with families with five or more children. The results in this paper, however, are still relevant for the majority of US families.

The analysis is also limited to children ages 4-13 for one and two child families, ages 6-11 for three child families, and ages 8-11 for four child families. This restriction is

[4] No distinction is made between one-on-one time with one's parents and time shared with siblings. In two child families the fraction of quality time a child receives that is not shared with any siblings is 12.9%, the corresponding fractions for three and four child families is 7.1% and 3.1%.

necessary to allow there to be enough first-born children of a certain age with whom to compare the non-first-born children, and vice versa. The children eliminated from the analysis are still used to calculate birth order, birth-spacing, and sibling gender composition of the in-sample children.[5]

Table 1 provides summary statistics of parental characteristics and the time use of the parent. Total time refers to the total amount of time a child was present with the parent, whereas quality time only includes activities in which the child was the primary focus of the activity or in which there would be a reasonable amount of interaction, such as eating together. A complete list of activities that are considered quality time is found in appendix 1. Other parent-child activities included in the table are reading, playing, eating, and watching television together.

Table 2 provides the average quality time that children spend with their mother and father by age, family size, and birth order. This table provides three important patterns. First, the amount of quality time a child spends with his or her parants decreases as the child gets older. Second, the amount of quality time a first-born child receives is greater in families with more children. Third, within nearly every age and family size group, the amount of quality time that a child spends with his or her parent is decreasing in birth order. Each of these patterns will be important in the empirical analysis that follows.

[5] Observations in which the mother would have been less than 14 years or more than 50 years old when the first child in the family was born, children which are born more than 13 years after their next oldest sibling, and families with foster children are also removed from the sample.

III. Empirical Strategy and Results

Ideally, we would like to compare the amount of quality time the first-born child receives when he is five (or any given age) to the amount of quality time the second-born child receives at the same age. The cross-section nature of the data does not allow for this comparison. The strategy of this paper is to compare each child with a child of the same age from a similar family but who has a different birth order. I control for the observable characteristics of the parent and child directly, look within family size groups to control for other unobservable parent characteristics, and use indicators of birth order as the variable of interest.

As a first approach, the amount of quality time that a child spends with his parent is regressed on a set of control variables and relevant birth order indicators, using tobit regression.[6] The following model is used to estimate the parameters of interest for families with 2, 3, or 4 children:

$$T_j = \alpha_j + \delta_j \cdot Z + \beta_j \cdot (\textit{birth order}) + \varepsilon_j \qquad \textit{for } j=2,3, \textit{ and } 4 \qquad (1)$$

where T is a measure of the amount of quality time the child spent with his or her parent. The vector "birth order" includes indicators for birth order, where the number of included indicators depends on the family size, with the omitted group always being the first-born child. The vector Z is the set of control variables including the child's age and gender as well as the parent's age, education, work status, and marital status. The results of this model are shown for two, three, and four child families in table 3.

[6] The tobit estimator corrects for the censored nature of the time children spend with their parents. Of the children in the sample, 12.6% of children with mother's responding to the survey spent no quality time with their mother and 22.6% of the children with father's responding to the survey spent no quality time with their father. Nearly identical results are obtained when using OLS.

The results show that for two child families, the difference in quality time between the first and second-born child is 22 minutes with one's father and 33 minutes with one's mother. The difference in three child families is less and for four child families it becomes insignificant. Significant birth order differences do exist, though, between first and third or first and fourth born children in the three and four child families.

A second approach is to pool the family size groups together and use the interactions of family size and birth order as the variables of interest.

$$T = \alpha + \delta \cdot Z + \beta \cdot (\textit{family size}) \cdot (\textit{birth order}) + \varepsilon \qquad (2)$$

The major difference between this approach and the previous model is that the impact of the explanatory variables no longer vary by family size. Table 4 provides the results of this second model.

The birth order effect is found by taking the difference in the predicted values of each birth order combination within each family size group. The differences for each birth order combination using tobit, mean, and median regression are shown in table 5. The difference in quality time between first and second-born children is about 30-36 minutes for two child families and 20-30 minutes for three child families and insignificant for four child families. The median difference in quality time is slightly smaller but provides the same qualitative results. The insignificant difference between first and second-born children in four child families is likely due to their close birth spacing, an issue addressed in the next section.

The coefficients in table 4 also show the differences in parent-child time by parent education and labor status. Children whose parent's have a college degree spend about 29 more minutes of quality time with their father and 14 more minutes with their mother each day than children of parents who didn't complete high school. Children with parents that work, either full or part-time, spend 25-30 minutes less quality time with their parent than children whose parent does not work.

IV. Specification Issues

Incomplete fertility

One concern is that the model is only controlling for the current family size and not the family size that the child will eventually have. The identification strategy depends on being able to compare children from families of the same size with the idea being that children from families of the same size have parents that are similar in the unobservable ways that influence both their family size and time allocation decisions.

The estimates of the effect of birth order in tables 3 and 4 will be biased upward if children in larger families spend more time with their parents. To make the source of bias more clear, consider two six year olds where one has a ten year old sibling and the other has a two year old sibling. Both have the same current family size but the child with a younger sibling is more likely to be part of a family that will have additional children in the future.

One way to address this issue is to include family fixed effects and adjust the time a child spends with his or her parent by the average amount of quality time spent with one's parents for children of the same age. The empirical model for a two child family is:

$$T - \bar{T}_a = \gamma \cdot \Gamma + \beta \cdot 2^{nd}\, child + \varepsilon$$

where T is the measure of quality time, $\bar{T}_a$ is the average quality time that a child of that age spends with his or her parent and Γ is a set of family fixed effects. The vector γ provides the amount by which each family deviates from the average amount of time spent with children of the same age. This captures the idea that some families have higher levels of parent-child interaction across all of their children. The vector β measures how much the deviation from the age groups average differs by birth order across families. This provides a measure of birth order differences that accounts for the unobservable family characteristics that influence the level of parent-child interaction. The results of this specification run separately by family size are shown in table 6.

The birth order effects continue to be significant but the differences in time spent with one's mother are now about half as large, with a difference of 18 and 12 minutes for two and three child families respectively. The birth order effects are about the same in both the original model and the fixed effect model for fathers, with a difference between the first and second-born child of 29 minutes for two child families and 20 minutes for three child families.

The decrease in the birth order effect for mothers indicates that there are unobservable characteristics in mothers that affect the comparison across families. The original motive for including family fixed effects was the fear that children who are first-born are more likely to have additional siblings born. This decrease in effect suggests than that the unobservable characteristics that make a woman more likely to have more children also cause her to provide more active time to each child, even before the additional children are born.

Sibling characteristics

A second issue is whether birth order differences vary based on important sibling characteristics such as gender composition and birth spacing. This issue is addressed using the subset of families with two children. This group provides a parsimonious way of constructing measures for gender composition and birth spacing that would become overly complex if applied to larger families.

The effect of gender composition of siblings on birth order differences is estimated by interacting the gender of the two children with the birth order of the individual child. The results in table 7 show that the birth order differences in time spent with a particular parent are greatest when the first-born child is the same gender as that parent. For quality time with one's father, the difference is even greater when a first-born boy is followed by a girl. The same case, however, leads to the smallest birth order difference in terms of quality time with one's mother. [7]

Table 8 provides similar results when the birth order of the child is interacted with the amount of birth spacing between siblings. There are no significant birth order differences when the children are 1 or 2 years apart. For children spaced 3-6 years apart, the general pattern is that birth order differences increase with birth spacing.[8]

[7] These results could be driven by the type of paternal preference for sons found by Dahl and Moretti (2005) or a gender specialization within families, where fathers focus on sons while mothers give extra attention to daughters.

[8] The analysis is limited to children who are spaced less than seven years apart and are not twins. The birth spacing restriction affects 8.4% of the sample.

Alternative measures of parent-child interaction

A final issue relates to how sensitive the birth order differences are to the measure of parent-child interaction that is used. Up to this point, the measure of quality time includes all the activities indicated in appendix 1. Table 9 contains three alternative measures of parent-child interaction: total time spent together, time spent reading, and time spent playing. These latter two activities are generally thought to be of the greatest importance in child development and are part of the quality time measure.[9] Time spent watching television and movies together is included as a measure of non-interactive time that is thought to have a negative impact on child outcomes.

Table 9 shows that, for two child families, there are large birth order differences across all four measures of parent-child interaction. The second child gets 7% less total time, 35% less time reading, 61% less time playing, and 31% more time watching television with his or her mother. The corresponding differences for time with one's father are 7% less total time, 55% less reading time, 54% less playing time, and 18% more time watching television.[10] These results provide one explanation for the birth order differences in quality time. The second-born children are getting slightly less total time with their parent and of the time they do receive, quality time is being crowded out by other activities, such as watching television.

The results in table 9 also show that while there are no major differences in total time by parent education level, the nature of parent-child interaction is very different for

[9] One explanation for the birth order differences in section III are that parents become more proficient in caring for their children, so less time is required to provide the same level of care to the second child. This argument does not hold as well for activities such as reading and playing.

[10] The percentage difference is calculated by dividing the difference in predicted values between the first and second child by the predicted value of the first child. The differences for time with one's mother is 27 minutes total time, 1.4 minutes reading, 10.4 minutes playing, and 13.6 minutes watching television. For time with one's father the differences are 19.7, 1.4, 8.4, and 8.6 respectively.

children with college educated parents. Compared to children whose parent have just a high school degree, children of parents with college degrees receive 45% more reading time, 21% more playing time, and 29% less time watching television together. For time with one's father the difference is 90% more reading time, 5% more playing time, and 30% less television time together.[11] The difference between college educated parents and parents who did not complete high school is even greater.

V. Simulation of the Aggregate Amount of Time with Parents

The birth order differences calculated up to this point have controlled for the parent's age. One difference between a first and second-born children is the age of their parents when the child reaches a given age. The estimations have also only examined the amount of time a child spends with a particular parent with no distinction made between when one or both parents are present. This final section addresses these issues by calculating the net effect of a child's birth order using a simulation of the amount of parent-child interaction across ages four through thirteen. The results provide an idea of the magnitude of the birth order difference in quality time over an important period of the child's life.

The sample used in the simulation is restricted to families with two children. This makes it possible to interact birth-order with the child's age, creating a set of 20 indicator variables. Table 10 contains the simulated amount of time that each child spends with his or her parents at each age. The specific case examined in the table is a two child family where the parents are married, college educated, with both parents working full-time.

[11] The difference in time with one's mother by education is 1.2 minutes reading, 2.2 minutes playing, and 16.2 minutes watching television. For time with one's father the differences are 1.0, 0.6, and 17.9 respectively.

Both parents were 29 when the first child was born and they have two boys spaced three years apart.[12]

The third and fourth columns of table 10 show the cumulative time that a child spends with his parents. Between the ages of 4 and 13, the first-born child spends 11,220 hours in quality time with his or her parents and the second-born child spends about 7,600 hours. The difference of 3,610 hours represents about a 47% increase over the time that second child receives and translates into a difference of 59 minutes each day.

The simulation in table 10 combines both father time and mother time. This leads to a double counting of all time in which both parents were present. Past research usually asserts that parents try to maximize the amount of time that at least one of them is with the children, but no research has addressed the relative value of spending time with one parent compared two parents in terms of development. The first-born children in the sample receive 72 minutes of quality time each day with both parents present. The amount for second-born children is 57 minutes. This aggregates across ages 4-13 into 4,380 hours for the first child and 3,470 hours for the second child. Subtracting these from the simulation results shows that the first child spends 6,840 hours of quality time with at least one parent present while the second child spends 4,130 hours. This leads to a birth order difference of 2,700 hours which is a 65% difference and translates into about 44 minutes each day.

Similar simulations can be done to estimate the differences in aggregate time based on the parent's marital status, labor status, age when they first have children, race, birth spacing, or family size. These estimates would be descriptive in nature but could potentially explain part of the disparity in child outcomes that we see between different

[12] The parent age at first birth, marital status, and work status all represent the modal group of the data.

demographic groups. The focus of this paper is the effect of birth order and the simulations serve in this case to provide an illustration of how small differences each day aggregate into large differences over the child's lifetime.

An interesting thing to note in table 10 is that in each year the time allocation to each child is roughly equal. This is shown in the last two columns of table 10 where the 2nd child's time is shifted forward three years to make it easier to compare the amount of quality time they receive the same point in time. At each point in time, the parent is giving roughly equal time to the younger child and may think that he or she is not giving preferential treatment to the oldest child. The large birth order differences only appear when we account for the child's age or aggregate the amount of parent-child interaction over time.

VI. Conclusion

The primary contribution of this paper is that it documents that there exist large birth order differences in the amount of quality time that children spend with their parents. A first-born child in a two or three child family spends about 20-30 more minutes each day engaged in quality time activities with his or her father than the second-born child. The difference in quality time with one's mother for the same group is 30-36 minutes. Birth order differences also exist when comparing second and third born children or other birth order combinations.

This differential treatment likely goes unnoticed by parents because at each point in time they give equal time to each child and often even more time to the younger child. The birth order difference that is the focus of this paper, however, is whether the second

child receives the same amount of time at a certain age as the first child did at the same age. When the quality time received by each child is aggregated over ages 4-13 in a two child family, the difference in the amount of quality time the first and second-born spends with at least one parent present is about 2,700 hours. This large difference in parent-child time provides a plausible explanation for the birth order differences in educational attainment found in recent studies.

The second contribution of this paper is that it provides additional insight into the determinants of parent-child time. While children with college educated parents do not spend anymore total time with their parents, they do spend more time reading and playing and less time watching television together. There are gender effects as well, with sons receiving more time with their fathers and daughters more time with their mothers. As a result the birth order differences in time spent with a particular parent are greatest when the first-born child is the same gender as the parent. This gives some evidence that sibling sex composition may affect child outcomes through differences in quality time and provides a concern for using sex composition as an instrument for family size when the outcome of interest likely is affected by the amount of parent-child interaction.

A final contribution of this paper is that it provides motivation to include birth spacing in the analysis of birth order and child outcomes. Given that family resources generally increase with time, larger birth spacing will create a greater difference in the financial resources available by birth order, favoring the younger child. The results in this paper show that the opposite will be true in terms of time resources. This could allow future work to exploit these opposing forces to test the relative contribution of time and money to child outcomes.

References

Behrman, Jere, and Paul Taubman. “Birth Order, Schooling, and Earnings.” *Journal of Labor Economics*, vol. 84, S121-145, 1986.

Bianchi, Suzanne. "Maternal Employment and Time with Children: Dramatic Change or Surprising Continuity?" *Demography* , vol. 37, no. 4, 139-154, 2000.

Black, Sandra, Paul Devereux, and Kjell Salvanes. “The More the Merrier? The Effect of Family Size and Birth Order on Children’s Education.” *Quarterly Journal of Economics*, vol. 120, no.2, 2005, 669-700.

Blake, Judith. *Family Size and Achievement*, University of California Press: Berkeley and Los Angeles, CA, 1989.

Blau, Francine and Adam Grossberg. "Maternal Labor Supply and Children's Cognitive Development," *The Review of Economics and Statistics*, vol. 74, no. 3, 474-81, 1992

Conley, Dalton. *The Pecking Order*. Pantheon Books, New York, 2004

Conley, Dalton and Rebecca Glauber. “Parental Education Investment and Children’s Academic Risk: Estimates of the Impact of Sibship Size and Birth Order from Exogenous Variation in Fertility.” NBER working paper no. 11302, 2005.

Dutcher-Loury, Linda. “Effect of Mother’s Home Time on Children’s Schooling.” *Review of Economics and Statistics*, vol. 70, 367-373, 1988.

Hamermesh, Daniel, Harley Frazis, and Jay Stewart. “Data Watch: The American Time Use Survey.” *Journal of Economic Perspectives*, vol. 19, no.1, 221-232, 2005.

Hanushek, Eric. “The Trade-off between Child Quantity and Quality,” *Journal of Political Economy*, vol. 100 , 84-117, 1992.

Hauser, Robert and William Sewell. “Birth Order and Educational Attainment in Full Sibships.” *American Educational Research Journal*, vol. 22, 1-23, 1985.

Kessler, Daniel. “Birth Order, Family Size, and Achievement: Family Structure and Wage Determination.” *Journal of Labor Economics*, vol. 9, no. 4, 1991, 413-426.

Pleck, J. H. “Paternal involvement: Levels, origins, and consequences.” In M. E Lamb (Ed.), *The role of the father in child development, 3rd ed.* (pp. 66-103). New York: Wiley, 1997.

Zick, Cathleen D., W. Keith Bryant, and Eva Osterbacka. "Mother's Employment, Parental Involvement, and the Implications for Children's Behavior." *Social Science Research,* vol. 30, 25-49, 2001.

Table 1 Parent characteristics and time use by number of children

	Father Number of Children				Mother Number of Children			
Marital Status	1	2	3	4	1	2	3	4
married	0.756	0.921	0.966	0.952	0.523	0.740	0.751	0.739
partner	0.041	0.015	0.014	0.016	0.046	0.029	0.020	0.020
single	0.203	0.064	0.020	0.032	0.403	0.231	0.229	0.241
Education								
< HS	0.096	0.079	0.121	0.175	0.078	0.080	0.144	0.163
HS grad	0.603	0.534	0.501	0.534	0.624	0.572	0.576	0.567
College grad	0.301	0.387	0.378	0.291	0.298	0.348	0.281	0.269
Employment								
full	0.844	0.895	0.894	0.899	0.600	0.469	0.376	0.339
part	0.041	0.033	0.038	0.048	0.179	0.242	0.238	0.229
spouse_full	0.433	0.413	0.344	0.275	0.469	0.652	0.660	0.604
spouse_part	0.131	0.208	0.235	0.201	0.019	0.025	0.024	0.024
Time-use wkday								
total	193.04	194.72	208.31	194.72	250.95	339.89	408.71	456.49
active	64.11	69.49	77.44	86.11	76.77	128.27	133.63	150.43
reading	1.67	2.16	0.91	1.24	3.30	4.22	3.45	2.65
playing	10.62	10.29	10.50	10.72	7.69	14.90	11.92	10.80
eating	32.21	30.87	30.91	32.84	29.37	36.08	35.49	37.59
television	47.06	37.09	40.62	39.63	44.43	44.98	57.37	49.59
Time-use wkend								
total	359.04	409.69	441.51	485.42	407.44	484.82	518.84	520.32
active	72.93	102.56	102.74	107.94	89.44	126.00	131.46	132.71
reading	1.09	2.43	0.93	2.00	4.00	3.78	2.86	3.25
playing	10.34	17.65	19.77	14.94	10.44	16.41	15.84	20.65
eating	54.85	62.66	57.2	54.32	52.41	58.09	56.05	55.94
television	91.35	76.64	89.89	92.39	63.72	73.88	80.61	69.42
N	758	1,746	761	189	1,278	2,448	1,058	245

Table 2. Mean amount of quality time spent with parent each day by age, family size, and birth order.

Father

Family size	Birth Order	Age 4-5	6-7	8-9	10-11	12-13
1	1st	98.9	70.5	62.6	57.2	48.2
2	1st	125.8	103.8	81.5	74.8	54.3
2	2nd	91.2	72.5	63.7	54.9	45.1
3	1st		124.7	87.2	75.9	64.6
3	2nd		87.2	80.0	72.6	48.9
3	3rd		75.4	58.9	46.0	63.3
4	1st			123.6	105.9	
4	2nd			132.2	82.2	
4	3rd			62.7	64.5	
4	4th			59.9	36.2	
	N	711	1,030	1,156	1,110	972

Mother

Family size	Birth Order	Age 4-5	6-7	8-9	10-11	12-13
1	1st	124.0	96.3	80.6	65.9	54.3
2	1st	188.3	148.0	121.3	94.8	77.5
2	2nd	144.1	108.4	89.5	74.8	56.2
3	1st		183.4	128.5	103.4	82
3	2nd		127.9	104.8	92.4	64.2
3	3rd		106.3	76.5	67.0	69.9
4	1st			132.5	108.0	
4	2nd			118.3	102.2	
4	3rd			112.9	71.8	
4	4th			83.9	50.6	
	N	994	1,451	1,615	1,660	1,470

Note: Each cell in the table is the average quality time spent with a child's father or mother by the child's age, family size, and birth order. The ATUS only surveys one adult in each household, so the fathers and mothers in the sample do not come from the same family.

Table 3. Determinants of quality time, separately by family size

Father

	2 children		3 children		4 children	
	Coef	SE	Coef	SE	Coef	SE
2nd child	**-22.39**	*3.06*	**-17.17**	*4.72*	-1.42	*12.40*
3rd child			**-31.76**	*5.17*	**-46.44**	*11.86*
4th child					**-57.60**	*11.89*
N	2,600		1,342		279	

Mother

	2 children		3 children		4 children	
	Coef	SE	Coef	SE	Coef	SE
2nd child	**-32.67**	*3.02*	**-23.69**	*4.51*	-10.02	*11.19*
3rd child			**-42.78**	*5.12*	**-23.93**	*12.22*
4th child					**-43.65**	*13.76*
N	3,646		1,893		373	

Note: The elements in this table are the average marginal effects following tobit regression. The dependent variable is the amount of quality time the child spends with his or her parent on the day of the survey. The model includes the full set of covariates shown in table 4. The bolded elements indicate a significant difference (5% level) from the first-born child.

Table 4. Determinants of quality time, family size groups pooled together

	Father		Mother	
	Coef.	**SE**	**Coef.**	**SE**
2 child 1st	**16.00**	*3.61*	**36.82**	*3.28*
2 child 2nd	**-6.70**	*3.40*	5.48	*3.07*
3 child 1st	**25.47**	*5.11*	**46.77**	*4.61*
3 child 2nd	8.87	*4.57*	**19.52**	*4.16*
3 child 3rd	-5.62	*4.82*	-1.98	*4.32*
4 child 1st	**58.89**	*11.87*	**46.79**	*9.90*
4 child 2nd	**53.82**	*10.46*	**35.94**	*8.62*
4 child 3rd	5.41	*8.87*	14.57	*8.76*
4 child 4th	-15.06	*10.27*	-10.22	*11.40*
girl	**-6.47**	*2.09*	**3.88**	*1.92*
parent age	**3.93**	*1.20*	2.62	*1.35*
parent age^2	**-0.04**	*0.01*	-0.02	*0.02*
married	**-24.87**	*4.39*	**-30.43**	*2.32*
partner	**-13.35**	*6.10*	**-15.15**	*2.59*
full	7.16	*4.39*	3.40	*3.75*
part	-6.16	*8.79*	**-13.02**	*6.22*
spouse full	2.23	*2.52*	5.84	*3.42*
spouse part	**6.59**	*3.02*	2.18	*7.02*
college	**28.90**	*4.23*	**14.38**	*3.86*
hs grad	**13.97**	*3.78*	4.75	*3.39*
type of day	Yes		Yes	
child's age	Yes		Yes	
N	4,979		7,190	

Note: The elements in this table are the average marginal effects after using tobit regression. The dependent variable is the amount of quality time the child spends with his or her parent on the day of the survey. Type of day includes indicators for weekend, weekday holiday, and weekday during summer months. Bolded elements indicate a significant difference at the 5% level.

Table 5. Tests for birth order differences in quality time spent with parent

		Father			Mother		
Family Size	**Comparison**	**Tobit**	**Mean**	**Median**	**Tobit**	**Mean**	**Median**
2 child	1st vs 2nd	**30.41**	**25.71**	**22.24**	**36.09**	**32.39**	**28.44**
3 child	1st vs 2nd	**20.90**	**15.73**	**17.34**	**30.08**	**27.29**	**20.97**
	1st vs 3rd	**40.41**	**31.60**	**30.35**	**55.06**	**49.69**	**41.80**
	2nd vs 3rd	**19.51**	**15.87**	**13.01**	**24.98**	**22.40**	**20.83**
4 child	1st vs 2nd	5.55	5.92	20.68	11.66	11.75	6.29
	1st vs 3rd	**63.36**	**57.82**	**53.85**	**35.38**	**31.70**	23.06
	1st vs 4th	**92.08**	**75.99**	**66.07**	**64.68**	**55.36**	**44.68**
	2nd vs 3rd	**57.81**	**51.90**	**33.16**	23.72	**19.95**	16.78
	2nd vs 4th	**86.53**	**70.07**	**45.39**	**53.02**	**43.60**	**38.39**
	3rd vs 4th	28.72	**18.16**	12.22	29.30	**23.65**	21.61

Note: The value in each cell is the average difference in predicted values between the two birth-order groups in the quality time spent with the child's parent. The bolded numbers indicate a significant difference between the two groups (5% level).

Table 6. Family Fixed Effects Model

Father

	2 children		3 children		4 children	
	Coef	SE	Coef	SE	Coef	SE
2nd child	**-29.78**	*1.16*	**-20.17**	*2.11*	-10.16	*4.59*
3rd child			**-49.70**	*2.12*	**-30.24**	*4.52*
4th child					**-59.91**	*4.52*
N	3,513		2,132		758	

Mother

	2 children		3 children		4 children	
	Coef	SE	Coef	SE	Coef	SE
2nd child	**-18.30**	*1.33*	**-12.31**	*2.08*	-6.14	*4.02*
3rd child			**-30.60**	*2.08*	**-21.26**	*3.95*
4th child					**-39.82**	*3.95*
N	4,814		2,971		1,051	

Note: The dependent variable is the difference between the quality time a child receives and the average quality time of children the same age. The model includes family fixed effects and an indicator for the child's birth order. Children ages 4-13 are included.

Table 7A. Effect of sibling gender composition and birth order on quality time

	Father		Mother	
	Coef.	**SE**	**Coef.**	**SE**
Boy-boy 1st child	.		.	
Boy-girl 1st child	8.94	*5.75*	0.94	*5.64*
Girl-boy 1st child	-0.67	*5.58*	10.16	*5.82*
Girl-girl 1st child	**-12.41**	*5.50*	8.29	*5.86*
Boy-boy 2nd child	**-22.87**	*5.12*	**-29.59**	*5.57*
Boy-girl 2nd child	**-18.97**	*5.32*	**-25.27**	*5.46*
Girl-boy 2nd child	**-18.35**	*5.27*	**-27.68**	*5.45*
Girl-girl 2nd child	**-29.19**	*5.15*	**-24.82**	*5.60*
N	2,528		3,538	

Note: The coefficients in this table are the average marginal effects of a tobit regression on quality time. The model includes the same set of covariates as table 4 but with the birth order indicators replaced with the interaction of birth order and gender composition of the two children. The sample includes all children age 4-13 in two child families.

Table 7B. Birth order differences in quality time by sibling gender composition

Sex Composition	All Fathers	Married Fathers	All Mothers	Married Mothers	% of sample
Boy-boy	33.21	31.36	25.77	25.75	24.4%
Boy-girl	39.14	37.43	21.34	13.18	26.3%
Girl-boy	25.69	25.22	33.42	34.72	25.9%
Girl-girl	25.36	23.77	39.40	46.09	23.3%
N	2,528	2,314	3,538	2,637	

Note: Each element is the birth order difference between first and second-born children in two-child families based on the difference in predicted values following tobit regression.

Table 8. Birth order differences in quality time by birth spacing

Birth spacing	Father	Mother	% of sample
1 years	13.66	28.76	0.097
2 years	13.27	18.11	0.268
3 years	12.80	**24.95**	0.267
4 years	**37.86**	**37.44**	0.185
5 years	13.51	**42.39**	0.110
6 years	**55.03**	**45.40**	0.073
N	1,142	1,604	

Note: Each element is the birth order difference between first and second-born children in two-child families based on the difference in predicted values following tobit regression. Differences significant at 5% level are bolded. The sample includes all children age 7-11 in two-child families.

Table 9. Alternative measures of parent-child interaction

	Total Time				Reading				Playing				Television			
	father		mother		father		mother		father		mother		father		mother	
2 child 1st	-4.7	*9.8*	**25.6**	*8.2*	**0.39**	*0.18*	0.18	*0.26*	2.51	*1.46*	**5.41**	*1.24*	**-18.8**	*3.5*	**-6.8**	*3.0*
2 child 2nd	**-26.6**	*9.7*	-3.6	*7.9*	-0.10	*0.13*	**-0.80**	*0.20*	**-4.49**	*1.08*	**-2.23**	*0.80*	**-12.7**	*3.7*	1.6	*3.1*
3 child 1st	17.8	*13.3*	**35.5**	*11.1*	0.02	*0.21*	-0.01	*0.36*	**6.45**	*2.64*	**9.83**	*2.44*	**-14.6**	*4.5*	**-8.7**	*3.8*
3 child 2nd	-1.6	*12.4*	19.2	*10.4*	-0.24	*0.13*	**-0.97**	*0.21*	-0.50	*1.67*	2.83	*1.57*	**-13.9**	*4.3*	-3.3	*3.8*
3 child 3rd	-21.0	*13.7*	4.5	*11.4*	**-0.36**	*0.11*	**-1.18**	*0.18*	**-4.46**	*1.26*	**-2.91**	*0.98*	-8.9	*5.1*	2.3	*4.5*
4 child 1st	50.3	*29.0*	39.7	*23.7*	2.18	*1.46*	-0.03	*0.80*	10.55	*6.86*	10.10	*5.33*	**-19.5**	*8.1*	-8.2	*7.9*
4 child 2nd	24.5	*25.4*	31.0	*21.0*	0.58	*0.72*	-0.64	*0.49*	5.78	*5.15*	3.90	*3.63*	**-21.4**	*7.1*	**-16.2**	*6.3*
4 child 3rd	-18.4	*24.0*	-13.2	*21.7*	-0.24	*0.28*	-0.64	*0.48*	-4.07	*2.33*	2.48	*3.44*	**-16.6**	*7.7*	**-15.7**	*6.7*
4 child 4th	-36.8	*30.4*	**-75.6**	*28.8*	0.17	*0.61*	-0.41	*0.78*	-4.87	*2.54*	1.10	*4.41*	-15.6	*10.2*	-16.7	*9.4*
girl	**-30.2**	*5.9*	**25.5**	*5.0*	0.03	*0.08*	0.04	*0.16*	-1.25	*0.81*	0.43	*0.56*	-4.6	*2.5*	1.3	*1.9*
parent age	**10.7**	*3.4*	6.2	*3.5*	0.09	*0.05*	**0.40**	*0.12*	**1.50**	*0.52*	**0.87**	*0.40*	1.8	*1.4*	**-3.7**	*1.3*
parent age^2	**-0.1**	*0.0*	-0.1	*0.0*	0.00	*0.00*	**0.00**	*0.00*	**-0.02**	*0.01*	**-0.01**	*0.01*	0.0	*0.0*	**0.0**	*0.0*
married	**26.3**	*12.4*	**25.6**	*9.8*	-0.61	*0.32*	-0.01	*0.33*	**2.98**	*1.50*	-1.13	*1.21*	**12.9**	*4.5*	1.5	*3.7*
partner	5.1	*25.7*	-30.8	*16.7*	**-0.60**	*0.08*	-0.31	*0.48*	5.70	*5.38*	-0.19	*1.86*	18.3	*12.4*	-4.7	*6.2*
Full	**-83.7**	*12.1*	**-75.6**	*6.1*	-0.18	*0.20*	**-0.68**	*0.20*	**-4.71**	*2.00*	**-4.23**	*0.67*	**-21.5**	*5.4*	**-11.4**	*2.3*
part	**-61.0**	*17.3*	**-46.6**	*6.9*	-0.19	*0.19*	**0.46**	*0.23*	-2.45	*1.91*	**-2.65**	*0.61*	-10.3	*6.5*	**-13.7**	*2.4*
spouse_full	6.0	*7.2*	-7.3	*9.0*	-0.14	*0.10*	0.08	*0.29*	0.98	*1.00*	1.32	*0.98*	1.8	*3.0*	**-8.3**	*3.5*
spouse_part	4.0	*8.4*	-22.1	*18.0*	0.04	*0.12*	0.42	*0.67*	**4.09**	*1.38*	1.07	*2.26*	0.6	*3.5*	**-13.2**	*6.0*
college	6.9	*11.4*	-17.7	*9.9*	**1.28**	*0.46*	**1.96**	*0.52*	**3.72**	*1.80*	**4.43**	*1.40*	**-38.2**	*3.9*	**-31.3**	*3.2*
hs grad	-7.8	*10.6*	-13.6	*8.9*	**0.58**	*0.24*	**0.83**	*0.32*	1.33	*1.52*	1.92	*0.99*	**-26.9**	*4.3*	**-18.0**	*3.4*
N	4,979		7,190		4,979		7,190		4,979		7,190		4,979		7,190	

Note: Total time refers to the amount of time during the day in which the child is present with the parent and does not include anytime while the parent is working or sleeping. Each model also includes indicators for the type of day and the age of the child. In two child families, difference between the first and second child is significant across every measure. For three child families, the difference between the first and second child is significant with regards to playing with both parents and being read to by one's mother.

Table 10. Simulated amount of quality time spent with parents at each age (in 1,000's of hours).

	Total quality time each year		Cumulative quality time		2nd child shifted forward 3 years	
age	1st child	2nd child	1st child	2nd child	1st child	2nd child
4	1.83	1.20	1.83	1.20		
5	1.45	1.21	3.28	2.41		
6	1.30	0.84	4.58	3.25		
7	1.37	0.96	5.95	4.20	1.37	1.20
8	1.14	0.87	7.09	5.07	1.14	1.21
9	0.97	0.59	8.07	5.67	0.97	0.84
10	1.09	0.79	9.15	6.46	1.09	0.96
11	0.86	0.50	10.01	6.96	0.86	0.87
12	0.70	0.40	10.72	7.35	0.70	0.59
13	0.50	0.25	11.22	7.60	0.50	0.79

Note: The number in each cell is the sum of quality time a child spends with both his father and mother each year. The profiles shown are for the specific case of a two child family, where the parents are married, college educated, and both work full-time. Both children are boys and are three years apart. The first two columns are the simulated amount of time that each child receives each year. The third and fourth columns provide the cumulative amount over time. The sixth column is the same as the second column but the 2nd child column is shifted forward three years to provide cross-sectional comparisons. 1,000 hours in one year is equivalent to 164 minutes each day.

Appendix 1. Summary statistics of specific types of parent-child interaction

Activity description	Fraction of children with time>0	Mean of those with time>0	Total time across sample	Mean across sample	Included in quality time
reading to/with	7.3%	31.6	28,148	2.31	1
playing, not sports	11.1%	98.4	132,729	10.91	1
helping with homework	10.6%	56.9	73,407	6.03	1
talking with/listening	8.0%	33.5	32,791	2.69	1
helping/teaching	1.9%	38.5	8,889	0.73	1
arts and crafts with	0.2%	54.1	1,623	0.13	1
eating and drinking	72.1%	55.8	489,617	40.23	1
physical care for	44.5%	48.6	262,909	21.60	1
playing sports with	1.2%	65.0	9,494	0.78	1
attending performing arts	0.4%	104.9	5,245	0.43	1
attending museums	0.3%	164.7	5,434	0.45	1
participating in religious practices	1.7%	31.1	6,274	0.52	1
homeschooling of children	0.3%	175.6	5,619	0.46	1
looking after (as primary activity)	6.5%	64.3	50,629	4.16	1
organizing and planning for	2.1%	21.6	5,562	0.46	0
attending events	3.3%	111.4	45,132	3.71	0
picking up/dropping off	22.3%	11.5	31,157	2.56	0
meetings and school conferences	0.4%	48.2	2,508	0.21	0
travel related to caring for	28.5%	22.3	77,469	6.37	0
attending religious services	6.5%	111.8	88,470	7.27	0
watching television	39.9%	134.5	652,933	53.66	0

Note: The unit of analysis above is the individual child, but each measure refers to the amount of time the child spent engaged in the activity with their parent. Sample size is 12,169.