

Family caring and children's reading and math skills

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(Received April 2011 Revised August 2011)

Abstract

This paper investigates the influence of “family caring” on children’s reading and mathematics test scores, controlling for the family’s resources. Family caring is the parents’ habits regarding nurturing their children; it is measured by the behavior of parents during the pregnancy and infancy of their child. Three hypotheses are developed and are empirically tested using three generations of data from the British NCDS. Controlling for family resources, family caring as measured here, is found to be strongly correlated with children’s reading and math skills. There is evidence that particularly low levels of family resources or family caring can be compensated for by larger investments of the other. Since the data cover three generations of the same families, the study documents that the cross-generational correlations in family resources and in family caring behaviors are of approximately the same order of magnitude.

Keywords:

Investments in children, inter-generational transmission, longitudinal studies, cognitive skills

Introduction

The influence of family resources on children’s cognitive capabilities has long been documented; it justifies much social policy effort to ameliorate the adverse effects of family economic deprivation on children’s healthy development. This paper emphasizes that families differ not only in their level of resources but also differ in their inclination to use those resources in behalf of their children – called family caring. The nurturance of children begins at the earliest stages of life: behaviors of the mother during the pregnancy influence the healthy development of her child. From birth onward, the family plays a pivotal role in stimulating, nurturing, and facilitating the development of skills, knowledge, and habits that promote cognitive as well as socio-emotional development. While the family’s resources are surely necessary, their sheer availability does not guarantee that they will be deployed in behalf of the child. This paper discusses the nature of “family caring” and frames the issue of its relevance to the

production of skills in children. The concept is distinguished from two other related concepts, one in developmental psychology, “parenting styles,” and one in economics, “interdependent preferences.”

Analytic Framing

A simple framework for thinking about how skills are generated is a production function of the general nature

$$\text{Skill} = f(C, F, S),$$

where C is a vector of the child’s own attributes and actions, F is a vector of family characteristics and behaviors, and S is a vector of school attributes. Various disciplines study effects of elements of S or F on skills but few studies have the data resource to investigate fully the influence of both S and F simultaneously. This paper follows that unfortunate tradition and focuses on the effects of F on children’s skills, controlling for elements of C .

While some skills may be acquired without specific effort or investment, reading and math skills require effort in learning, in practice, and in usage to gain the facility assessed in any reasonable test of these skills. The family has much opportunity to influence these skills long before the child enters formal schooling. I assume that no parent would wish their child not to have the skills necessary for competent social intercourse, and these skills surely include both reading and mathematics. But families may differ in the extent to which they give priority to making the effort and sacrificing their time and resources toward this objective. So while all families are motivated to make investments in their children's skill development, subject to the limitations of their resources, the prices they face, and their understanding of how to enhance these skills, the hypothesis proposed here is that families differ in their inclinations and their behaviors regarding the nurturance of their children.

Family resources

The first set of inputs in the child's skill production that is explored empirically is very conventional: the level of parents' economic and personal resources. These include the family's financial resource, one parent's own reading and math ability, and the parents' levels of schooling. The evidence on the association of parental resources and children's cognitive skills is strong and broad: regarding the role of financial resources see e.g., Huston, et al (1994), Duncan and Brooks-Gunn (1997), Blau (1999), Mayer (2002), McCulloch and Joshi (2002), Aughinbaugh and Gittleman (2003), and Taylor et al (2004), among others. For a good summary reference on the "crucial role that parental cognitive stimulation plays in fostering the intellectual competence of young children" see Saltaris et al (2004); for evidence on the association of parents' education and child's cognitive skills, see e.g., Smith et al (1997), Feinstein (2003), and Michael (2004).

In addition to these three key resources, the structure of the family, its stability over time, and the number of and relationship among adults in the family are often hypothesized as having influence, but the evidence is mixed especially on cognitive attributes of children, see McLanahan (1997), Pierret (2001), DeLeire and Kalil (2002). The age of the

mother at the birth of her child, birth order, and number of siblings also reflect relevant resources. Convincing evidence shows that resources affect the child's skill level through many mechanisms and are acknowledged to be influential in the literatures of many disciplines (illustratively, see Duncan and Brooks-Gunn, 1997, and Kalil and DeLeire, 2004).

Family caring: the concept

While family resources are often shown to influence the child's skills, they are not direct "inputs" in the skill production function. The evidence adduced is typically a reduced form relationship: families that have higher levels of these resources have children who score better on cognitive tests. The evidence usually does not tell us how the mechanism works that produces this association. The often-unstated argument is that a strong and robust statistical association must imply that having more resources means the child is given more. Few studies actually show the connection between the expenditures and the child's achievement; few document the mechanism by which the parent's income or ability or knowledge influences the child's skills. The point of this paper is that families differ in their willingness to expend their resources on their children, and that this difference is influential and is not random. "Family caring" is the term proposed to describe this parental behavior of allocating resources, energy, and attention to their children; it is a latent construct, there is no single measure of it, but there are many behavioral elements that can be identified and measured.

Most economic models assume that given the level of resources and prices, family differences in spending reflect preferences but these preferences are paid little attention because they are assumed to be distributed randomly. On average, families with higher levels of resources expend more on their children which results in more favorable child outcomes, tracked empirically. The contention in this paper is that family caring is a distinct and distinguishable factor and it too influences the resources devoted to the child. One can conceptualize the partial effect on some child outcome of a higher level of resources, holding family caring constant, and similarly, one can think of the partial effect on that outcome of a higher level of

family caring, holding family resources constant. More of either family resources or family caring is likely to result in more "input" into the child's skill production function and thus to generate more measured skill.

Hypothesis #1

The first of three hypotheses tested below is that *family caring differs substantially among families and does so at all levels of family resources*. One piece of evidence about the extent of variation across families in their inclination to expend resources on their children can be found in studies of intra-household allocation of total current consumption expenditures. As an example, Lazear and Michael (1988) estimate the share of household's expenditures made on behalf of the children and report that on average U.S. households spend about \$40 per child per \$100 spent per adult, but the variation across households is considerable: the 10%-90% quantile range among families with children indicates that ten percent of families spend as little as \$17- or-less on each child per \$100 spent on each adult, while another ten percent of families spend \$60-or-more on each child per \$100 spent per adult. Families differ in the use of their money resources in behalf of their children; they surely differ as well in their willingness to spend time with their children, and to focus their daily activities around their children.

In an inquiry that is somewhat related to this paper, Ermisch (2008) uses data from the Millennium Cohort Study to estimate production functions for pre-school child outcomes. He documents that outcomes, both cognitive and behavioral, are strongly linked to family income group. He discusses "what parents do" in terms of educational activities and parenting style. The point here is different. One might expect that parent's education level is a key determinant of both the family's income and the educational activities and parenting style it uses with its children. That common determinant can explain a positive correlation between what parents have and "what they do." But their commitment to their children – family caring – may not be associated with their level of education or their level of resources. While this commitment is not easily or well measured in any data set, this paper uses several measures or indicators of family caring and investigates if it is

distinct from family resources and whether it varies within as well as across family resource groups. If so, that fact may have relevance for policy consideration.

Hypothesis #2

The second hypothesis is that, while controlling for the level of family resources, *family caring is strongly, positively correlated with children's outcomes, measured as test scores in reading and mathematics*. The logic of the argument is that the level of the family input into the child's skill production function depends on both the availability of resources and the family's willingness to expend them on the child. A parent's wealth and own ability does not impact their children's skills automatically, genetics aside; the "inputs" into their children's skill production require the commitment to spend the money, the time, and the energy with their child.

To contrast the notion of family caring in this paper with related concepts in other literatures, consider the developmental psychology literature. There, "parenting" is an important focus and styles of parenting (authoritative or authoritarian, for example) are identified and assessed. Saltaris et al (2004) employ a direct measure of maternal teaching, from an observational study, and conclude that their "findings...suggest that within a high-risk sample, quality of parenting provided to young offspring represents an important predictor of their developing competence." (p.112) Parental "involvement" has been shown to be related to children's academic performance (e.g., Georgiou, 1999, Feinstein and Symons, 1999) and some studies have distinguished the involvement of mothers and fathers (see Peters et al, 2004). Flouri and Buchanan (2004) use the same data set as used in this paper and measure parental involvement at age 7 using some of the dimensions used here to measure family caring. In that literature the emphasis is on the description of the parenting styles. The focus is the parenting process and the associated child outcome. By contrast, I want to establish that there are differences in family's willingness to expend resources, differences in parents' habits of sacrificing their time, their convenience, their money for their children. Here, is it not the style of behavior or the tactic of parenting that is of interest.

"Caring" is a term that has also been used in the economics literature for a very different concept from its use here. In his theory of marriage, Becker (1974, p.328) says "the natural way for an economist to measure 'caring' is through the utility function." In Browning et al (1994), for example, "caring" is the term of choice for describing a utility function in which the adults' utility includes the consumption or utility of the child. There, caring means a degree of altruism, here it means a degree of commitment or willingness to tradeoff some personal benefits in behalf of tending the needs and stimulating the interest of own children.

Hypothesis #3

The third hypothesis explored is that *family caring is a family habit that persists across generations*. The contention is that parents' values regarding family caring are systematically related to their own experiences in childhood and so these values persist within a family from one generation to the next. The experience of the parent when he or she was a child helped form habits and perceptions about how to be a parent, about how to nurture and train a child, and about what level of care-giving and attention and personal sacrifice is appropriate. Families have, and pass along from generation to generation, practices, customs, and behaviors as surely as they pass down recipes and heirlooms. For much the same reason that we see modestly strong correlations across generations in religious affiliation, in political party affiliation, and in occupational choice, the way parents raise children is influenced by the way they were raised. This notion of a habit or a commitment to caring for or investing in children is found in the literature of many social sciences, including economics, i.e., Becker (1991), Becker and Tomes (1986), and Sen (2001), and in psychology, i.e., *Developmental Psychology* (1998), Hauser (1999), Vandell (2000), Belsky (1984), and Chen and Kaplan (2001) among others.

Since the data set used here covers three successive generations, these data permit us to look across the generations of a family to see if there is consistency in the measures of family caring. If so, these family habits constitute the nature, the culture, of that family. In one extreme test of this notion, the test scores of grandchildren are regressed on the

family caring behaviors of the grandparents, controlling for resources but not the behaviors of the intervening generation. A positive association between the grandparent's child caring behaviors and the grandchild's test score would support the hypothesis that these caring behaviors persist across generations.

There are parallel arguments in the literature to the contention that habits of parental behavior – family caring – are passed down from generation to generation. Discussions of "family dynasties" and family culture can be found in economics and in sociology while developmental psychology has often focused on the intergenerational transmission of parenting styles, as sketched in the literature review above. There is discussion, as well, of the heritability of parenting behaviors (e.g., Plomin et al, 1994) and the strategic functionality of parenting behaviors across social classes (Lareau, 2003).

Persistence of parenting styles across generations has been a feature of developmental psychology. As Belsky (1984) noted some years ago, much of the focus on intergenerational transmission of parenting was on abusive or unhealthy styles. Recent efforts focus on more supportive parenting styles. Regarding the transmission of constructive parenting, Chen and Kaplan (2001) describe their evidence from a longitudinal study in Houston as confirming the existence of "modest intergenerational continuity of constructive parenting" (p.27) but characterize the size of the effect they find as "at best moderate." (p.28) More recently, Belsky and colleagues (2005) used data from a longitudinal study of children in 1972-73, with follow-up measures of their parenting behaviors. They focused on what they call "warm-sensitive-stimulating" parenting behaviors. In a recent special section of Developmental Psychology several papers focus on the intergenerational transmission of parenting and in summarizing those papers, Belsky, Conger and Capaldi (2009, p.1203) conclude that two of those "studies provide new evidence of parenting in one generation being repeated in the second generation."

Perhaps the most compelling evidence that the behavior of one generation is closely linked to similar behavior by the mother is found in another species, where the evidence supports the conclusion that "variation in maternal care...is inherited; ...[offspring]

that receive the minimum care from their mothers grow up to return the favor when they have their own offspring." (Robinson 2004, 398) This evidence pertains to the behavior of the Norway rat, studied by Michael Meaney and colleagues (Frances et al 1999) who show that pups raised by a "caring" (measured by specific acts) maternal care-giver produces a different level of the steroid hormone glucocorticoid. That hormone impacts the expression of a particular gene which in turn is closely associated with that same "caring" behavior when that pup becomes a mother. It is, Meaney and his team explain, an epigenetic modification of the gene which is then "stably maintained into adulthood" and affects adult behavior. So Meaney's study concludes that "our findings provide the first evidence that maternal behavior produces stable alterations of DNA methylationproviding a mechanism for the long-term effects of maternal care on gene expression in the offspring." (Weaver et al, 2004, p.852) Moreover, by manipulating these rat-families for scientific study in ways no human subjects review would allow for humans, Meaney's team shows conclusively that it is the "custody" mom, not the "birth" (biological) mom, that determines this outcome. In their study of the Norway rat, there is no polymorphism in the gene, no inherited structural change; there is only an epigenetic modification in the gene, limited to that one generation. Without continued caring, the next generation does not inherit in its DNA a "caring" gene; the environment is the critical component.

We now turn to tests of these three hypotheses that family caring (1) differs among families and does so at high and low levels of family resources; (2) is positively correlated with children's test scores in reading and mathematics and is so when family resources are held constant; and (3) is correlated across generations thus constituting what one might characterize as the culture of the family. If these hypotheses are supported by evidence from the NCDS data set, that evidence should encourage families to engage in family caring in behalf of their children as an important investment in their well-being.

The data and research strategy

The data used in this study are part of the National Child Development Study (NCDS), the longitudinal

study of a British birth cohort of 1958. Two data files are used. The first has information about the parent's resources and behaviors during the pregnancy that resulted in the 1958 birth and during that child's infancy and early childhood. There is a reading and a math test score for each of these children at age 11. With this data file we can study the relationship of the cohort member's test scores at age 11 to family resources and family caring.

The second data file exploits another feature of the NCDS, the "Child of the NCDS." In the 1991 interview, the biological children of a randomly selected one-third of the cohort members were given a series of tests including the PIAT reading recognition and mathematics tests administered to those age 5 and older. These 2,509 children constitute a third generation. The 1991 survey also asked the parent facts about parenting behavior. With this file we can study the relationship of these children's test scores to their family's resources and family caring.

To keep the generations straight, the parents of the child born in 1958 are called G1; the children born in 1958 – the NCDS cohort members – are called G2; and their children tested in 1991 are called G3. The empirical study focuses, separately, on the G1-G2 relationship and the G2-G3 relationship.

A feature of each of these two data files is important to note. The first file, the G1-G2 relationship, includes only those cohort members (G2) surveyed in 1991 who had a child included in the Child of the NCDS data file. Using this subset facilitates comparisons below. Since all these cohort members (G2) had at least one child by age 33, they are disproportionately female and somewhat less well-educated than the cohort overall. In the second file, the G2-G3 relationship, the sample of children in G3 is not a representative sample of British children. Verropoulou and Joshi (2009) discuss the nature of this sample of children as they use a similar subset of the "Child of the NCDS" in their study; also see Michael (2003) for comparisons with U.S. children. Because the second file can include more than one child per family, standard errors of estimated coefficients adjust for this clustering. The empirical investigation is a set of reduced-form OLS regressions that document the relationship of several measures of family resources and family caring to children's test

scores in reading and math. Subsequently linkages between the two files are exploited to address hypothesis #3.

Evidence of family influences: G1 behaviors, G2 test scores.

Considerable descriptive detail about the two data files can be found in Michael (2011); only the "family caring" variables are described here. The G1-G2 data file has 2,564 observations. As these G2 (cohort members) were identically the same age when the two cognitive test scores were administered, these tests have not been normed. The mean of each is about 16; the standard deviation is 9.4 for math and 5.5 for reading; the simple correlation of the two tests is 0.73. Measures of family resources include

parent's SES at the time of the child's birth, home ownership, parents' education and age at the child's birth, and indicators of relative economic deprivation. The notion of family caring is a latent construct, so it is not directly observed; several behaviors are used here as the empirical measure "family caring" by G1 (see Table 1). Four are behaviors reported during the pregnancy: two dummy variables indicating that the mother did not smoke before or during that pregnancy; a dummy indicating that her first prenatal visit occurred within the first 16 weeks of the pregnancy; a dummy indicating that she had at least 16 prenatal medical visits. These four variables reflect the caring behavior by the mother during the fetal period.

Table 1. Family caring descriptive statistics, G1 parents, NCDS (1958-1969)

Variable description	Mean	Std. dev.	Min-max
G1 parent's child-nurturing behaviors: pregnancy (1958)			
G1-mom didn't smoke pre-preg	0.54	0.50	0-1
G1-mom stopped smoking in preg	0.08	0.27	0-1
First prenatal visit < 16 weeks	0.46	0.50	0-1
Frequency of prenatal visit >16	0.25	0.43	0-1
G1 parent's child-nurturing behaviors: post-preg, pre-school age			
G1-mom breastfeed	0.59	0.49	0-1
G1-dad read to child	0.30	0.46	0-1
G1-mom outings w/ child	0.75	0.44	0-1
G1 parent's child-nurturing behaviors: during school years			
G1-mom big interest	0.32	0.47	0-1
G1-dad big interest	0.21	0.41	0-1
G1 parents' high aspirations	0.72	0.45	0-1
G1 parent's child-nurturing behaviors: composites			
G1care-preg	0.00	1.00	-1.77 – +0.81
G1care-post	0.00	1.00	-1.63 – +1.39
G1care-school	0.00	1.00	-2.06 – +1.50
G1-CARE	4.22	2.03	0-9
N=2,564			

The second set of three variables reflects the parents' caring behaviors during the child's pre-school years: a dummy indicating that the mother breastfed the child at least one month; a dummy indicating that the father read to the child frequently; a dummy indicating that the mother took the child "on outings" frequently. These too are behaviors that take time and effort, imply engagement with the child and thus "caring," but do not require a direct expenditure of money.

The third set of variables pertains to the child's early school years. In the data collected at ages 7 and 11 the child's school teachers were interviewed and asked about the involvement by each parent in the child's school life. Two composite indicators are included here that reflect that the teachers said the mother and the father, separately, showed a big interest in the child's school activities. Finally, the parents were asked in 1969 if they hoped their child would continue in schooling beyond the mandatory age of 16 and the final dummy variable indicates an affirmative response.

The measured family caring behaviors are used in three distinct statistical strategies. One strategy includes a set of separate dummy variables in the multivariate regressions on the child's test score. A second strategy uses the sum of nine behaviors as a single covariate. A third strategy performs factor analyses on subsets of the measures, including somewhat greater detail about them, in extracting the latent construct of family caring at different stages in the child's life (pregnancy, pre-school, and early school years), then uses those constructs as covariates in the regression. These factor analyses are described in Michael (2011). All three are defined such that a higher value implies greater family caring.

These several measures of the parent's behaviors with the child reflect family caring. We cannot hope to measure all the behaviors that constitute family caring and those measured serve as proxies for the efforts that distinguish families by their caring behavior. The hypothesis is that family caring is positively associated with the family inputs into the child's skill production function and therefore will be positively related to the child's reading and math test scores.

Table 2 reports OLS regression analyses for the G2 child's reading test score showing the unstandardized

regression coefficients (and t-statistics). One sees the strong influence of the family's resources on the child's test score. Children have higher reading test scores in families with higher socioeconomic status, with parents who remained in school longer, in families that were relatively well-off as measured by their owning their home or by their ineligibility for subsidized school lunches. Children in families with a larger number of children have lower test scores. This regression clearly documents the importance of family resources in influencing the child's cognitive test score in reading. The same pattern of influence is seen for the mathematics test score in Table 3.

Of greater relevance to the key hypothesis in this paper, one also sees that several of the specific parental behaviors that reflect family caring are statistically significantly associated with both reading and math skills. When those specific behaviors are condensed through factor analyses, the three composite variables also show (Model #2) this same positive influence of caring behavior. When the simple composite sum of the "caring" variables is used instead in Model #3, it shows a very strong positive relationship with each of the test scores. Parental behaviors toward their child – caring behaviors – are statistically, strongly, positively associated with the child's reading and mathematics test scores, controlling for the family's level of resources. This evidence supports hypothesis #2.

To explore the implied magnitude of the associations of family resources and family caring on the child's test scores, the predictions from Model #3 are estimated. Holding all else in the regression model constant, as the resources of the family rise from the lowest SES class among those with subsidized housing and school meals, to the highest SES class with home ownership, the predicted test score rises by 5.5 points for reading and about 10 points for math – about one standard deviation in each case. Analogously, holding all else constant, as the parental caring index rises from a low value to its highest value, the reading test score rises by about 4.5 points and the math test score rises by about 7 points, also approaching a standard deviation increment in each case (see Michael 2011 for details). The regression shows that both family resources and parental caring, separately, are strongly related to these two test scores among the G2 children.

Table 2. Regressions on G2-child's reading test score at age 11 (1969)

	Model #1	Model #2	Model #3
Child is female	-0.54 (-2.74)	-0.50 (-2.54)	-0.49 (-2.43)
G1 parents' resources			
SES1 (highest)	1.41 (2.47)	1.62 (2.84)	1.71 (2.96)
SES2	0.82 (2.38)	1.02 (2.99)	0.95 (2.75)
SES4	-0.78 (-2.47)	-0.72 (-2.30)	-0.82 (-2.59)
SES5 (lowest)	-1.49 (-4.22)	-1.46 (-4.14)	-1.64 (-4.58)
Own home (buying)	0.93 (3.83)	0.85 (3.48)	1.03 (4.20)
Rent home	0.43 (1.26)	0.34 (1.00)	0.47 (1.36)
"free school lunch"	-1.14 (-3.76)	-1.05 (-3.45)	-1.24 (-4.03)
G1-mom's age at birth	0.01 (0.40)	0.01 (0.40)	0.02 (0.69)
G1-dad's age at birth	0.04 (1.61)	0.04 (1.53)	0.04 (1.58)
Biological G1-mom	-0.60 (-0.81)	-0.54 (-0.74)	-1.00 (-1.34)
Biological G1-dad	0.02 (0.03)	-0.04 (-0.08)	0.10 (0.22)
G1-mom's age leaving school	0.30 (3.27)	0.33 (3.65)	0.33 (3.55)
G1-dad's age leaving school	0.36 (4.38)	0.33 (3.99)	0.37 (4.48)
English spoken in home	-0.59 (-1.75)	-0.67 (-1.99)	-0.50 (-1.48)
Total number of children	-0.43 (-3.73)	-0.47 (-4.12)	-0.48 (-4.12)
G1 parents' child caring			
G1-mom didn't smoke pre-preg	0.07 (0.34)		
G1-mom stopped smoking in preg	0.12 (0.30)		
First prenat visit < 16 weeks	0.73 (3.61)		
Freq. prenatal visits >16	-0.15 (-0.64)		
G1-mom breastfeed	0.14 (0.64)		
G1-dad read to child	-0.03 (-0.15)		
G1-mom outings w/ child	0.03 (0.11)		
G1-mom big interest	1.50 (5.10)		
G1-dad big interest	1.53 (4.59)		
G1-pars' high aspirations	0.86 (3.35)		
Composites			
G1Care-Preg		0.05 (0.54)	
G1Care-Post		0.24 (2.39)	
G1Care-School		1.31 (12.49)	
G1-CARE			0.55 (10.69)
Intercept	4.76 (2.83)	6.70 (4.00)	3.68 (2.18)
N	2,564	2,564	2,564
R ²	0.20	0.20	0.18

Table 3. Regressions on G2-child's mathematics test score at age 11 (1969)

	Model #1	Model #2	Model #3
Child is female	-0.99 (-2.89)	-0.93 (-2.72)	-0.93 (-2.68)
G1 parents' resources			
SES1 (highest)	2.26 (2.27)	2.56 (2.59)	2.83 (2.82)
SES2	2.63 (4.39)	2.93 (4.92)	2.88 (4.77)
SES4	-0.39 (-0.72)	-0.28 (-0.51)	-0.45 (-0.82)
SES5 (lowest)	-2.50 (-4.07)	-2.41 (-3.92)	-2.72 (-4.37)
Own home (buying)	2.05 (4.87)	1.90 (4.49)	2.28 (5.36)
Rent home	1.03 (1.73)	0.87 (1.46)	1.07 (1.78)
"free school lunch"	-1.73 (-3.27)	-1.58 (-2.98)	-1.86 (-3.47)
G1-mom's age at birth	0.00 (0.04)	0.01 (0.13)	0.02 (0.44)
G1-dad's age at birth	0.06 (1.30)	0.05 (1.23)	0.05 (1.15)
Biological G1-mom	-0.12 (-0.09)	-0.15 (-0.12)	-0.81 (-0.63)
Biological G1-dad	0.23 (0.29)	0.22 (0.27)	0.30 (0.36)
G1-mom's age leaving school	0.24 (1.51)	0.29 (1.84)	0.29 (1.82)
G1-dad's age leaving school	0.56 (3.92)	0.50 (3.51)	0.57 (3.93)
English spoken in home	-0.61 (-1.04)	-0.78 (-1.34)	-0.48 (-0.81)
Total number of children	-0.58 (-2.91)	-0.65 (-3.25)	-0.66 (-3.26)
G1 parents' child caring			
G1-mom didn't smoke pre-preg	0.87 (2.36)		
G1-mom stopped smoking in preg	-0.08 (-0.11)		
First prenat visit < 16 weeks	0.97 (2.75)		
Freq prenatal visits>16	-0.24 (-0.61)		
G1-mom breastfeed	-0.06 (-0.16)		
G1-dad read to child	-0.27 (-0.68)		
G1-mom outings w/ child	-0.32 (-0.70)		
G1-mom big interest	2.80 (5.49)		
G1-dad big interest	1.97 (3.41)		
G1-pars' high aspirations	1.79 (3.99)		
Composites			
G1Care-Preg		0.46 (2.69)	
G1Care-Post		0.14 (0.79)	
G1Care-School		2.18 (11.94)	
G1-CARE			0.87 (9.71)
Intercept	1.19 (0.41)	4.67 (1.61)	-0.15 (-0.05)
N	2,564	2,564	2,564
R ²	0.18	0.18	0.16

Evidence of family influences: G2 behaviors, G3 test scores

A similar analysis of family influences on children’s reading and math is undertaken with these same families a generation later, when the cohort member (G2) has become a parent interviewed at age 33 along with his or her biological children (G3). Here, the children vary in age so their scores on the PIAT-Reading Recognition and PIAT Mathematics tests are normed with mean 100 and standard deviation 15. The intercorrelation of the two tests is 0.57. Table 4 summarizes the information on the measures of family caring on these children who range in age from

5 to 18 (mean 8.7). Compared to the data file used in the previous section, this data file has relatively better information about the family’s resources but less complete information about the family’s caring behaviors. The G2-parent’s reading and math test scores from age 11 (the dependent variables in the section above) measure one of the several resources available to the family in promoting the G3-child’s skills. G2’s education is measured by the level of qualifications earned by the cohort-member-parent, and by the age of school leaving for the partner-parent.

Table 4. Descriptive statistics, G2 parents and G3 children, NCDS (1991)

Variable description	Mean	Std. dev.	Min-max
G2 parents’ child-nurturing behaviors			
Not Smoking (1=yes, didn’t or stopped)	0.62	0.48	0-1
Pregnancy planning status (1=planned)	0.71	0.45	0-1
Prenatal Care in first trimester (1=yes)	0.60	0.49	0-1
Child breastfed (1=yes)	0.62	0.48	0-1
Breastfed 4+ weeks (1=yes)	0.30	0.46	0-1
Family takes holidays together (1=yes)	0.74	0.44	0-1
G2-CARE	3.60	1.42	0-6
N = 2,509			

In this data file family resources are measured by family income, education of each parent, and the reading and math skills of the CM-parent. There are six indicators that measure family caring by the G2 generation. Three pertain to the child’s pregnancy, two that reflect behavior soon after the child’s birth, and one other pre-school indicator; all are dummy variables and summarized in Table 4. In the analysis, the six are used as a set of separate indicators and also as a composite sum of the six. (A factor analysis was not undertaken for these measures of caring because the Cronbach Alpha value for the six is only 0.42.) While these few factors surely do not fully capture the parents’ willingness to expend energy, time, and attention on their children, the contention is that there is signal content in these indicators. They are positively correlated with the degree of commitment to the child, so we expect to see a positive association between these indicators of

family caring and the child’s skills of reading and math.

Table 5 regression models show the strong influence of family resources on the child’s test scores: parent’s own abilities in reading and math, educational achievements of both parents and family’s income level all have strong positive association with the child’s reading and math test scores. (When the income measure is replaced in this regression by the log of annual gross income, its coefficient (and t-statistic) is: 0.89 (2.22).) The evidence here that family income influences these two test scores mirrors the findings reported by Aughinbaugh and Gittleman (2003), using the subset of children of female NCDS members. The family caring measures exhibit a weaker, but generally positive influence on the reading and math test scores in Table 5. The F-tests for this set of six variables are statistically significance and in Models

#2 and #4 when the six separate indicators are replaced by the index G2-CARE, it has a sizable and quite strong association with both test scores, again supporting hypothesis #2.

Considering the implied magnitude of these relationships, holding all other covariates at their means, as the family income index rises from a level of 2 to 7, the reading test score rises four points, or similarly, as the parent's education rises from lower-than-O-level to higher education, the reading test score rises three points. The magnitude of the index of family caring shows a comparable magnitude: a 5-point increase in the family caring index is associated with about a three-and-a-half point rise in the reading test score. So the family caring index has as its range of influence about the same magnitude as the education of the parent. It is well to caution that both the index for income and for caring are scaled arbitrarily as a simple sum of attributes. Within the range found in this sample of children, nonetheless, these magnitudes are substantial. Almost exactly the same magnitude of influence is calculated for the child's math test: as parents education, family income index, and family caring, separately, rises those same amounts, the math test score rises by 3.5 points, 4 points, and 4.5 points, respectively. Both the family's resources and the family's child caring behavior are strongly associated with the child's test scores.

Several qualifications and sensitivity checks have been undertaken and are reported in Michael 2011. Most importantly, to address concern about endogeneity of parent's behavior responding to a child inherently more inclined to be better at reading and math, the family caring composite variable in Models #2 and #4, Table 5, were replaced by one based on only behaviors pre-birth or breastfeeding. It is not credible to think these actions are influenced by the child's later interest in reading or math. This subset performed very similarly to the results shown in Table 5 – e.g., when the breastfeeding variable was included as the only “caring” variable its coefficient was 1.73 ($t=2.71$) for reading and 2.00 ($t=2.98$) for

math. Similarly, when the sum of the four variables (smoking, prenatal medical care in the first trimester, breastfed and breastfed more than 4 weeks) was used, it was strong and statistically significant: 0.68 (2.38) for reading, 0.75 (2.53) for math. The reason for this robust association between the parent's behavior and the child's test scores several years later is not feedback from the child to the parent.

Interactions between resources and caring

One might be concerned that family caring is just another reflection of family resources which could explain why it is positively associated with the child's test scores. But the correlation between resources and caring is not high among either the G1 or the G2 parents: e.g., among the G1 parents, the simple correlation of father's age at leaving schooling and the composite measure of family caring is only 0.14 and among the G2 parents the correlation of family income and the composite measure of G2 family caring is 0.38. Looking at a large array of measures of family resources and measures of caring for each of the two generations (see Michael 2011), while there is a tendency for families with higher levels of resources to also exhibit higher levels of caring, there are substantial numbers of families with high-levels of resource who exhibit low levels of family caring and conversely. Having income or education does not automatically imply a large commitment to expending time and energy caring for the children. This should not be surprising since the attributes that generate income or that are associated with education are not necessarily those that reflect a strong commitment to children. Having sufficient resources to make a large investment does not necessarily imply that it will in fact be made. The relatively modest correlations between family resources and family caring in each generation suggests that the two concepts are not the same phenomenon and do not vary in lockstep. This evidence supports hypothesis #1 that family caring differs at all levels of family resources.

Table 5. Regressions on G3 child's reading and math test scores

	READING TEST SCORE		MATH TEST SCORE	
	Model #1	Model #2	Model #3	Model #4
Child's attributes				
age	0.94 (6.60)	0.93 (6.59)	0.58 (3.86)	0.60 (4.12)
girl	1.75 (3.01)	1.71 (2.94)	-0.94 (-1.63)	-0.93 (-1.62)
white	-2.80 (-1.01)	-2.91 (-1.05)	-3.51 (-1.14)	-3.52 (-1.15)
Parental controls				
mom is Cohort Member(CM)	0.37 (0.52)	0.45 (0.64)	0.53 (0.76)	0.58 (0.84)
age at first birth	0.30 (1.87)	0.32 (2.00)	-0.07 (-0.43)	-0.06 (-0.37)
attend religious serv. often	1.64 (1.91)	1.61 (1.88)	0.32 (0.36)	0.37 (0.42)
married	1.09 (1.61)	1.16 (1.75)	2.13 (3.15)	2.09 (3.12)
number of siblings	-1.21 (-3.43)	-1.15 (-3.28)	-0.74 (-2.09)	-0.72 (-2.01)
Parental resources				
CM's Reading test score	0.33 (4.01)	0.34 (4.06)	0.10 (1.11)	0.11 (1.25)
CM's Math test score	0.16 (3.25)	0.17 (3.27)	0.29 (5.49)	0.29 (5.43)
CM's Educ: No qualifications	0.45 (0.41)	0.50 (0.44)	1.49 (1.34)	1.60 (1.44)
O-level qualifications	2.44 (2.45)	2.45 (2.49)	1.63 (1.71)	1.75 (1.83)
A-level qualifications	2.75 (2.19)	2.75 (2.20)	1.68 (1.32)	1.76 (1.38)
Higher level education	3.02 (2.40)	2.97 (2.37)	3.26 (2.63)	3.44 (2.78)
Spouse's age leaving school	0.37 (2.27)	0.36 (2.25)	0.56 (3.23)	0.57 (3.30)
Income index	0.80 (3.32)	0.77 (3.19)	0.72 (2.92)	0.77 (3.08)
Parental child-caring behaviors				
Not Smoking	0.65 (0.98)		0.84 (1.25)	
Preg planned	1.79 (2.59)		0.60 (0.85)	
Prenat care 1st tri.	0.11 (0.18)		-0.04 (-0.06)	
Breast fed	1.64 (2.28)		1.45 (1.99)	
Breastfed 4+ weeks	0.11 (0.15)		1.19 (1.61)	
Family holidays	-0.11 (-0.15)		1.21 (1.70)	
G2-CARE		0.73 (3.16)		0.90 (3.70)
Intercept	66.60 (11.01)	66.42 (11.06)	77.47 (12.03)	76.16 (12.00)
N	2,509	2,509	2,490	2,490
R ²	0.141	0.138	0.128	0.126
F-Tests on sets of coefficients:				
8 Parental resources	21.26	21.86	19.93	21.58
6 or 1 Parental caring	2.56	10.00	2.80	13.73

Note. Standard errors are adjusted for the clustering of children within a family.

This dispersion in family caring among families at any given level of money resources, or in income among families at a given level of caring, offers an opportunity to re-estimate the basic model on the G2-G3 relationship interacting the levels of family resources and family caring. Table 6 summarizes the

results of doing so. Subsets of families are selected either by family income (Panel A) or by family caring (Panel B). Each of these subsets provides much smaller range over which the other constraint might operate and many fewer observations. The table shows only one coefficient from each regression.

Table 6. Interacting resource and family caring

Panel A: Influence of family caring, controlling for family income

	Family income level		
	0 to 4.5	4.5 to 5.5	5.5 to 7
Reading	1.13 (2.80)	0.90 (1.76)	0.24 (0.70)
N, R ²	772, 0.15	555, 0.17	1182, 0.10
Math	0.97 (2.26)	0.56 (1.12)	0.96 (2.69)
N, R ²	765, 0.13	548, 0.15	1177, 0.09

Panel B: Influence of family resources, controlling for family caring

	Family caring level		
	0 to 2.5	2.5 to 4.5	4.5 to 7
Reading	1.44 (3.49)	0.80 (2.36)	-0.56 (-1.06)
N, R ²	562, 0.15	1231, 0.13	716, 0.10
Math	1.09 (2.28)	0.87 (2.58)	0.27 (2.56)
N, R ²	554, 0.10	1223, 0.11	713, 0.09

Note. Each G2-CARE (Panel A) or INCOME INDEX (Panel B) coefficient is from a separate regression, partitioned by either family income (Panel A) or Family Caring (Panel B). All regressions also include all other child attributes, parental controls, and parental resources from Table 5.

Partitioned by income (Panel A), the caring index exhibits a strong effect at low levels of income for both reading and math, no effect at mid-levels of income, and a significant effect on only the math score at the high level of income. Partitioning by the caring index (Panel B), income has a significant effect on both reading and math at the low level of caring, a smaller but still significant effect at the mid-level of caring, and no relationship with reading but a small, statistically significant relationship for the math score at the high level of caring. A suggested interpretation of this pattern is that at sufficiently high levels of

either caring or income, the variation in the other is less important for the development of the child's skills, particularly in reading. At relatively low levels of either, however, variation in the other has a relatively strong compensatory influence on the child's skills. This point is mirrored in Bynner's (2001, p.287) synthesis essay on childhood risks and protective factors when he concludes "strong parental aspirations and emotional support in the context of sustained encouragement ... may override the worst effects of poverty and disadvantage."

Cross-generational consistency in family resources and family caring

The previous section focused on the correlation between family resources and family caring within each of the two generations. Another important pair of correlations is across the two generations in family resources or in family caring, separately. The third hypothesis is specifically that family caring is correlated from one generation to the next. It is well-known that resources of a family are correlated from one generation to the next and it is so in these data as well. The correlation of high SES in G1 and the attainment of higher education by the cohort member in G2 is 0.15; the correlation of home-ownership by G1 and the Income Index in G2 is 0.18; the correlation of not being impoverished (not "Freelunch") in G1 and Income Index in G2 is 0.20. Modest stability of economic status from one generation to the next is a reality across these two generations. It is more novel to consider the pattern across the two generations in family caring: the correlation of the dummy variable for breastfeeding by G1 and G2 is 0.11; the index of family caring in G1 and in G2 is correlated 0.19, a very similar magnitude to the correlations of family resources. Families that are observed to have relatively high levels of family caring in Generation 1 also tend to do so in Generation 2. That fact supports hypothesis #3. One should note, however, that these cross-generational correlations are not dramatically high – modest stability in both family resources and family caring would seem an apt characterization. This finding is discussed in the concluding section below.

A more stringent test of the notion of carry-over from generation to generation in family caring is performed with these two files by re-estimating the relationships on the G3 children's test scores for reading and math, replacing the G2-parents' own caring behavior by the G1-grandparents' caring behavior. Doing so is not motivated by an argument that the grandparents actually care for the G3 child, although we cannot rule that out and if it occurs with much regularity that would undermine the test of hypothesis #3 reported here. Rather, the argument motivating the regressions reported in Table 7 is that habits of child caring carry over to their offspring, the G2-parent. Thus in these re-estimated regressions, the G1-caring variable is an instrument for the caring behavior of the G2 parent. The results do show a positive association between the G1-caring behavior and the G3 test scores: in terms of the reading test score, the grandparents' (not the parents') caring composite is positively and significantly associated with the child's reading test score. (It is debatable whether the middle-generation's (G2's) own test scores in reading and math should be held constant in this exercise, so both ways are shown here – models #1 and #3 include them while models #2 and #4 exclude them.) For the math test scores of the G3 children, the grandparents' caring variable is only significant when the parent's own test score in math is omitted from the regression. While subject to alternative interpretations, these regressions offer further suggestive evidence that family caring persists from one generation to the next.

Table 7. Regressions on G3 child's test scores, using G1 family caring

	READING TEST		MATH TEST	
	Model #1	Model #2	Model #3	Model #4
Child's attributes				
age	0.90 (6.38)	0.91 (6.42)	0.56 (3.85)	0.58 (3.89)
girl	1.74 (2.99)	1.59 (2.72)	-0.91 (-1.57)	-0.05 (-1.78)
white	-3.43 (-1.23)	-2.07 (-0.79)	-3.92 (-1.26)	-2.61 (-0.87)
Parental controls				
mom is Cohort Member(CM)	0.68 (0.97)	0.69 (0.98)	0.89 (1.29)	0.97 (1.39)
age at first birth	0.34 (2.15)	0.40 (2.48)	-0.02 (-0.14)	0.04 (0.23)
attend religious serv. often	1.81 (2.12)	2.25 (2.58)	0.61 (0.70)	1.01 (1.17)
married	1.24 (1.86)	0.87 (1.28)	2.19 (3.28)	1.95 (2.83)
number of siblings	-1.22 (-3.51)	-1.28 (-3.68)	-0.80 (-2.23)	-0.83 (-2.33)
Parental resources				
CM's Reading test score	0.33 (3.94)	--	0.10 (1.18)	--
CM's Math test score	0.17 (3.35)	--	0.30 (5.60)	--
CM's Educ: No qualifications	0.55 (0.49)	1.64 (1.47)	1.74 (1.57)	2.74 (2.47)
O-level qualifications	2.54 (2.57)	4.96 (5.19)	1.97 (2.06)	4.38 (4.66)
A-level qualifications	2.89 (2.29)	6.45 (5.17)	2.07 (1.63)	5.56 (4.32)
Higher level education	3.11 (2.48)	7.06 (5.98)	3.76 (3.03)	7.65 (6.48)
Spouse's age leaving school	0.43 (2.65)	0.56 (3.38)	0.64 (3.64)	0.79 (4.36)
Income index	0.87 (3.65)	0.99 (3.99)	0.91 (3.59)	0.99 (3.82)
G1 Parental child-caring behaviors				
G1-CARE	0.36 (2.25)	0.56 (3.42)	0.27 (1.61)	0.48 (2.73)
Intercept	66.30 (11.04)	65.87 (10.96)	76.00 (11.90)	73.79 (11.40)
N	2,509	2,509	2,490	2,490
R ²	0.137	0.109	0.122	0.092

Discussion and conclusions

This paper has emphasized that while having the resources to nurture and promote cognitive skills in children is an important family attribute, too often a second and independent attribute is overlooked: the inclination or willingness of families to expend parental energy, resources, and time in nurturing their children, called "family caring." The paper reports findings that support the three hypotheses that family caring: (1) differs among families and is discernibly distinct from having resources, (2) has influence on children's skill acquisition, and (3) exhibits cross-generational correlation of about the same magnitude as family resources since family caring is a habit experienced as a child and later

expressed in adulthood. An additional suggestive finding in the pattern seen in Table 6 is that family caring is compensatory with family income in its relationship to children's cognitive test scores.

We rightly insist on relatively convincing evidence of a true causal connection before claiming to offer guidance to governmental policy makers. Yet, families must make decisions daily about how, and how intensively, to engage with their children. The evidence in this paper, as in other studies some of which have been cited above, show a clear association between engaged parental actions and better child outcomes measured as reading and math skills. While not yet meeting the standard of evidence sufficient to warrant claims of causation, I suggest there is sufficient indication of a connection

to justify advising parents to make efforts to engage with their children, to expend energy and devote attention to their children's interests and activities. Family caring, as measured here, does not "cost money" although it has obvious opportunity costs. Stopping smoking, attending to the pregnancy at an early stage, breastfeeding and going on outings with the children are not, of themselves, expensive efforts, however demanding and restricting they may be.

Doing most of these caring behaviors is within the grasp of nearly all parents! Unlike the observation that the parent's own ability in mathematics can contribute to the child's math skills – a fact that does not easily translate into an action which a parent without that ability can take – parental caring as measured in this paper can be modified relatively inexpensively. Since the evidence is that caring behaviors pays dividends in terms of the children's skills, it may be appropriate to try to persuade parents of the importance of providing that care and attention, especially since most parents have the capacity to act on this information. The human, unlike the Norway rat in the studies by Meaney and colleagues described earlier, may be persuadable by evidence that caring has attractive outcomes, so a mother's behavior might be modified by information, public education, and encouragement.

While the present study and many of the other social scientific studies cited above emphasize that there is a positive cross-generation correlation in parental behaviors toward their children, that correlation is far from the tight association found by Meaney and colleagues for their Norway rats. Indeed, one might as justifiably emphasize the discontinuity in parenting from one generation to the next. As emphasized above, neither family resources nor family caring exhibits an overwhelmingly strong cross-generation correlation. Moreover, even in data as fine as the NCDS, we have only information about the G1 behavior of one of the two sets of grandparents. While positive assortative mating may suggest that there will be positive association in the behaviors of the two sets of grandparents, the linkage is diluted and compromised and we cannot

investigate both sets of G1 caring behaviors here. A similar point about discontinuity is found in Belsky, Conger and Capaldi's recent summary of developmental psychology evidence: "it remains indisputable that the parenting experienced in one generation is by no means inevitably repeated in the next" (2009, p.2102). As discussed above, Chen and Kaplan (2001) also describe the continuity of constructive parenting across generations as "moderate." So while the continuity across generations implies the existence of family culture, it is in the discontinuity that there are grounds for optimism and even activism, as parents can and do change their behavior and the evidence here and elsewhere should help persuade them of the usefulness of family caring.

The limitations of this work include the fact that "family caring" is measured in these data with measurement error and with some arbitrariness in the indicators that are included. Additional research is needed and, fortunately, these NCDS and other data sets capture additional and more detailed information about both what families *have* as resources and what families *do* in terms of their engagements with their children. We can hope to get closer to evidence that clearly indicates a causal relationship using two too seldom used aspects of these longitudinal data sets. One is the dynamics of parental actions and subsequent child outcomes and then subsequent parental actions: the NCDS, for example, has measures of the child's (G2) achievements and behaviors at ages 7, 11, and 16 as well as in adulthood while we also know something about the interactions with parents in these several intervals of time. From the sequencing of parental actions, child outcomes, and subsequent actions and outcomes we should be able to investigate whether there is in fact clear evidence of causal influence. A second underutilized element of these data is the within family, across sibling, comparisons that are feasible with the "Child-NCDS" (G3) data file since all the biological children of these cohort members were tested in 1991.

Acknowledgments

The data used in this study was partially funded by NICHD grant R01-HD27150. The study was supported in part by a grant to the Harris School's Center for Human Potential and Public Policy from the McCormick Tribune Foundation, in part by the Centre for Applied Microeconometrics at the University of Copenhagen, and in part by the Centre for Longitudinal Studies, Institute of Education, London. The author thanks especially John Bynner, and Heather Joshi, and in addition thanks John Hobcraft, Kath Kiernan, Nancy Michael, John Micklewright, and Cybele Raver for helpful suggestions and also thanks participants at university workshops in Aarhus Denmark, Copenhagen, Chicago, IFS-London, Geary Institute-Dublin, and Lund Sweden.

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