Is Biology Destiny? Birth Weight and Differential Parental Treatment

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Abstract

Time diaries and sibling fixed effects models are used to examine whether parental time investments in children compensate for or reinforce birth weight differences among siblings (i.e. 666 sibling pairs, age 0-12). The findings demonstrate that the direction and degree of differential treatment varies by SES. Lower income and less educated parents reinforce differences by spending more time with normal weight children (≥ 2500g). Advantaged parents compensate by spending more time with low weight children. First, the findings show that the lasting effects of low birth weight may not be entirely due to biology; biosocial interactions both compensate for and reinforce early-life disadvantages. Second, sibling correlation studies may underestimate the influence of family background in determining status attainment because disadvantaged families act in ways that decrease sibling resemblance over time. In these cases, family background exerts its influence in unexpected ways: producing diverging rather than converging destinies.

Now Israel loved Joseph more than any of his other sons, because he had been born to him in his old age; and he made a richly ornamented [a] robe for him. When his brothers saw that their father loved him more than any of them, they hated him and could not speak a kind word to him. (Genesis 37:3-4)

Parental favoritism and differential treatment has been a source of familial conflict dating as far back as biblical times. In modern times, psychologists and family sociologists have also been concerned with the consequences of differential treatment for sibling conflict (Brody et al., 1987, 1992; McHale & Gamble, 1989; Stocker, Dunn, & Plomin, 1989) and children's self-esteem (McHale et al., 2000). From a stratification standpoint, the issue of differential parental treatment may also be important if human capital investments are differentially allocated among children according to attributes—cognitive ability, temperament and health, for example—that determine later socioeconomic outcomes. Additionally, the degree of inequality within families may vary by socioeconomic status if the degree and direction of unequal treatment also differs across family background. For example, if disadvantaged parents are more likely to reinforce endowment differences among children, we may see lower sibling resemblance in status attainment among children who come from lower SES households.

In this study, I ask the following questions. Are parental time investments in their children used to compensate for or reinforce birth endowment differences among children? Does the degree and direction of differential treatment—in terms of how parental time with children is allocated among children—vary across family socioeconomic status? In order to address these questions, I use children's time diary data from the Panel Study of Income Dynamics-Child Development Supplement to examine how total quantity of parental time, as well as type of parental time, is distributed among children. I use children's birth weight to measure birth endowments and early childhood health conditions. I compare differences in parental time investment between siblings in order to compare children who are raised in the same family environment and subject to the same environmental factors.

The findings of this study show that parental time investments—both with respect to the total quantity devoted to children and the amount of time devoted to activities aimed at specifically enhancing human capital development—is responsive to endowment differences among siblings. But whether investments are used to compensate for or reinforce endowment differences depends on parent's socioeconomic standing. Parents from socioeconomically disadvantaged households are more likely to direct their resources—both total time and time in developmentally oriented activities—towards normal weight children (≥ 2500g). Those from more advantaged households are more likely to compensate for endowment differences among their children by diverting parental time towards low birth weight children (<2500g).

The findings of this paper extend the literature in several ways. First, they have important implications for a long tradition of research using sibling correlations to estimate the influence of family background on status attainment (Hauser & Mossel, 1985; Hauser & Sewell, 1986; Hauser & Wong, 1989; Solon et al., 1991; Teachman, 1995; Warren, Hauser & Sheridan, 2002). This line of research relies on the assumption that shared family background implies shared family experiences and therefore, strong sibling resemblance in attainment outcomes should imply that family background exerts a strong influence on social mobility. Likewise, low sibling correlation would imply that family background is not important for status attainment. The finding of this paper calls into question the validity of these assumptions. Specifically, the paper shows that in socioeconomically disadvantaged families, human capital investments may be used to reinforce birth endowment differences among siblings, potentially increasing attainment differences and lowering sibling resemblance over time. In this case, sibling correlation studies underestimate the influence of family background in lower SES families. The findings suggest that family background not only determines later life outcomes but also the

degree of inequality experienced within the family. Specifically, maternal time in lower SES families may be invested in ways that increase inequalities among siblings whereas in higher SES time is invested in ways that attempt to equalize endowment differences among siblings.

Second, several studies have established birth weight as an important predictor of later status attainment (Conley and Bennett, 2000; Berhman and Rosenzweig, 2004; Currie & Moretti 2005; Black et al., 2007). But these studies can only speculate as to the mechanisms that relate birth weight to later health and socioeconomic outcomes. In particular, to what extent are the processes driving these relationships biological or sociological in nature? The findings suggest that there are important social dynamics occurring within the family that both compensate for and reinforce early life disadvantages.

Third, this article improves upon previous studies aimed at testing economic models of parental resource allocation set forth by Becker and Tomes (1976) and Behrman et al. (1982, 1989). Empirical tests of these theories have been constrained by limited information on child endowments and parental investments. To date, studies have used adult outcomes such as adult IQ or earnings to capture an individual's birth endowment and educational attainment as a proxy for parental investments in children (Giriliches 1979; Behrman, Rosenzweig, and Taubman, 1994; Miller, Mulvey, and Martin, 1995; Ashenfelter and Rouse, 1998). This method confounds early-life conditions with later life transitions that leave past findings difficult to interpret. Using better available data, I obtain more direct measures of both birth endowments (e.g. birth weight) and parental investments (e.g. time with children).

LITERATURE REVIEW

DIFFERENTIAL PARENTAL TREATMENT: THEORY AND EVIDENCE

Economic models of parental resource allocation argue that parents use a combination of human capital investments and inter-vivos transfers (i.e. lump sum and bequests) to maximize the wealth and/or earnings of their offspring (Becker & Tomes, 1976; Behrman, Pollak & Taubman, 1982). Allocation decisions are based on parental preferences for equity within the household, resource constraints and the characteristics of children. The prediction of these models—with respect to whether investments are compensating or reinforcing—is highly sensitive to assumptions about parental preferences for equity within the family. One variation of this theory proposes that parents use investments in human capital to reinforce endowment differences among their offspring by concentrating investments on children with more promising labor market prospects (Becker & Tomes, 1976; Becker 1991). Another variation holds that parental investments are allocated in ways to help equalize earning potentials among their offspring. In this case, investments are diverted to aid children with fewer labor market prospects (Behrman, Pollak, and Taubman, 1982).

Studies that have sought to empirically test these theories provide mixed results. Several studies have found that parental investments in children's schooling compensate rather than reinforce ability differences among children (Giriliches 1979; Behrman, Pollak, and Taubman, 1982; Ashenfelter and Rouse, 1998). Other studies find the opposite; human capital investments favor more able children (Behrman, Rosenzweig, and Taubman, 1994; Miller, Mulvey, and Martin, 1995). None of these studies have explicitly considered whether investment strategies vary over the economic conditions of the family.

One major limitation these studies is that they do not use direct measures of child birth endowments or parental investments[1]. First, all of the cited studies use completed years of

[1] One exception is Datar et al. 2006. They use data from the National Longitudinal Survey of Youth-Child (NLSY-C) to examine the effect of birth weight differences among on the distribution of parental health/human capital

education to proxy for parental investments in children. This approach must assume that an individuals' educational attainment is the sole result of parental investments human capital. It is unlikely, however, that educational attainment only reflects the sum of parental investments and not also captures the preferences and behaviors of children, themselves, along with a host of social and environmental factors affecting children's educational transitions that are unrelated to parents' investments in children. Second, all previous studies use proxies of child endowments that are measured much later in life (e.g. adult earnings or adult IQ) rather than ones that are measured during childhood. This approach implicitly assumes children are born with certain abilities that do not change over time and are not malleable to environmental influences. Substantial research, however, in the biological and social sciences demonstrate that cognitive skills are not static traits and that cognitive development, especially during the early years, are highly responsive to familial and environment stimuli (Shore, 1997; Danziger and Waldfogel, 2000).

The allocation of parental resources among children may not simply be driven by assessments of children's long-term earnings potential. They may also be influenced by more immediate childcare concerns, particularly if their child has special health or developmental needs. Additionally, positive parenting behavior and a parents' capacity to equitably distribute time and attention among his or her offspring may be dependent on access to economic and social resources.

First, studies generally show that parents use their time to compensate for health and developmental disabilities among children. In this case, the allocation of resources generally center on meeting the immediate needs of physically or developmentally challenged children.

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inputs among their offspring (i.e. breastfeeding, well-baby visits, immunizations, and preschool attendance). They find that normal birth weight children were more likely to be breastfed, taken to well-baby visits, receive vaccinations, and attend preschool programs compared to their lower birth weight siblings.

For example, mothers spent more time in play and mealtime activities with younger, chronically ill children than their older healthy siblings (Quittner & Opipari, 1994). Likewise, older children with a physical or mental disability spent more time playing with mothers than did older children with nondisabled siblings (McHale & Pawletko, 1992).

Second, socioeconomic circumstance may affect parenting behavior and the distribution of parental time, affection and support among their offspring. Economic hardship lowers an individual's capacity to provide consistent and responsive care. For example, fathers who experienced heavy economic loss during the Great Depression were more irritable and explosive, and were more likely to use violent and arbitrary punishment towards children (Elder 1999; Elder, Nguyen & Caspi, 1985). Likewise, studies using a nationally representative sample of children and families from the NLSY show that poor mothers are less affectionate and used more physical discipline than non-poor mothers (Bradley et al., 2001). In the same vein, the economic stress associated with socioeconomic disadvantage may make parents less equitable and more driven by preferences or child characteristics.

As a result, whereas parental resources may be used to compensate for the particular needs of less developmentally able children, there may also be important heterogeneity in how parents respond to endowment differences among their children. If parental time, patience and attention for children is a finite resource and economic stress lowers an individual's capacity to provide effective parenting, we might expect to see socioeconomically disadvantaged parents devoting more time and attention to children who are better endowed and "easier" to care for—those who are more cognitively able, less behaviorally problematic, and in better health. On the other hand, parents who are not economically stressed may be more capable of providing more equitable treatment to their children or even divert more care and attention to children with

special health or developmental needs. In sum, this theory would predict that more advantaged parents will be more likely to compensate for ability differences whereas less advantaged parents will be more likely to reinforce differences.

LOW BIRTH WEIGHT AS A MEASURE FOR CHILD BIRTH ENDOWMENTS

Birth weight is a particularly good indicator of birth endowments for several reasons. First, birth weight truly captures birth endowments because it is a literal measure of characteristics that are assigned to children at birth through no influence of their own. Second, low birth weight (<2,500 grams) is an important predictor of multiple indicators of an individuals' short and longer-term physical, social and cognitive development, making birth weight a particularly meaningful method to study how early childhood conditions influence the status attainment process.

Low birth weight children suffer from multiple dimensions of health and cognitive impairments throughout childhood. They score lower on a host of neuropsychological assessments ranging from assessments of cognitive development such as problem solving and language skills to more basic assessments of physical functioning such as fine and gross motor skills and spatial perceptions (for detailed review see Hack, Klein and Taylor, 1995; Aram et al., 1991; Boardman et al. 2002; Almond et al. 2005). Additionally, they tend to exhibit more behavioral problems. At infancy, preterm and low birth weight children are more prone to crying and changes in behavioral states (Johnston et al., 1993). In school age, they display more classroom behavioral problems—lower attention span and higher rates of hyperactivity—than normal weight children (Klebanov, Brooks-Gunn, & McCormick, 1994). Taken together, these studies suggest that caring for low birth weight children requires additional emotional and physical effort on the part of parents. Moreover, it may be particularly demanding for parents

who are also socio-economically stressed and lack the resources to cope with the additional responsibilities associated with caring for a special needs child. As a result, we might expect to see socioeconomically disadvantaged parents responding more negatively to low birth weight children either by spending less time or having less positive interactions with them.

Recent studies have demonstrated that the early health and developmental conditions linked with low birth weight have lasting consequences that may stretch into adulthood. Analyzing sibling data from the PSID, Conley and Bennett find that low birth weight children are less likely to graduate from high school (2000). Several other studies using either sibling or twin data find that adults who were born low birth weight have significantly lower IQ, height and earnings than their normal birth weight counterparts (Sorensen et al., 1997; Black, Devereux & Salvanes, 2006). These studies, however, can only speculate as to whether the link between the early childhood conditions associated with birth weight and later status attainment outcomes are due to purely biological reasons or to biosocial interactions between children's birth endowment and socio-economic environment. One study looks at the interactive effects of birth weight and parental resources on status attainment in order to examine whether socioeconomic status acts as a buffer for low birth weight children (Conley & Bennett, 2001). The results suggest that the relationship between low birth weight and later outcomes may differ by income (i.e. the negative effects of low birth weight on high school graduation is moderated by parental income) but these findings do not hold up in models using sibling fixed effects[2]. Conley and Bennett call for further investigation into the processes that link maternal poverty to poor birth outcomes and, in

[2] Conley and Bennett (2001) use logistic regressions to examine the effect of low birth weight on high school graduation, first, by comparing all children and then by comparing outcomes only among siblings. In ordinary least square regressions, they find that being born low birth weight is negatively associated with high school graduation but that the effects are less severe for children from non-poor households. In sibling fixed effect models, however, interactions between low birth weight and parental income become statistically insignificant. They note that since their fixed effect models only captures income differences within the family (e.g. differences in income during one child's early childhood versus the next sibling) rather than across families, they cannot rule out the possibility that childhood income plays buffers the effect of low birth weight on education attainment across families.

turn, to worse outcomes in later life. Specifically, they suggest differential treatment of offspring as a potential mechanism (i.e. social stigma associated with low birth weight children being labeled as "the weak one" among his/her siblings).

DATA AND METHODS

SAMPLE

I use sibling time use data from the Child Development Supplement of the Panel Study of Income Dynamics (PSID-CDS) to examine the influence of child birth endowments on the distribution of maternal time investments among siblings. This data set is the only national representative survey that collects children's time diaries for up to two children within the same family. The data set provides a unique opportunity to estimate sibling fixed effects off of time diary data, which is a procedure rarely performed on time diary data. Starting in 1997, the PSID conducted the Child Development Supplement (CDS), which collected children's time diaries for up to two randomly selected children within a family, for approximately 3,600 children between the ages of 0 and 12. This resulted in 765 pairs of siblings who both completed time diaries. In addition to the time use module, the PSID-CDS[3] collected comprehensive assessments of children's health and cognitive development, including children's birth weight.

Estimation Strategy

The goal of this paper is to use new and improved data to determine (1) whether parental investments either reinforce or compensate endowment differences among children and (2) if investment strategies vary by socioeconomic status. First, I conduct cross-sectional analysis on the full sample of children using ordinary least square (OLS) estimation to examine the influence of being low birth weight on the amount of maternal time received. Next, I employ sibling fixed

[3] A more detailed description of the PSID-CDS study can be found in Hsin (2005), Folbre et al. (2005) and Yeung et al. (2001).

effect models to eliminate potentially biasing factors (observable and unobservable). For example, it may not be socioeconomic status, per se, that makes certain parents more or less likely to spend time with children but unobserved characteristics of caregivers who tend to come from more advantaged or disadvantaged households. By comparing siblings who share the same caregiver, I can purge estimates of unobserved characteristics that are shared among siblings. These characteristics may include maternal personality traits, shared home environment, and shared genetic endowments. This method is commonly used in the literature as a way to correct for potentially biasing unobserved factors (Conley and Bennett, 2000; Conley and Bennett, 2001; Behrman and Rosenzweig, 2004).

It is important to note, however, that unobserved characteristics that are not shared among siblings cannot be eliminated by sibling comparisons. For example, it may be the case that LBW children, as a response to enduring health problems during of early childhood, develop more introverted, shy and cautious personalities than their normal birth weight sibling. Parents may respond to these observed personality differences by either spending more time with introverted children or by giving them more space. I cannot distinguish between the direct effects of low birth weight (e.g. health and cognitive problems associated with low birth weight) and more *indirect* effects (e.g. the behavioral or psychological adjustments children may make in response to their health status) on parental time use. As such, I follow previous studies in using birth weight status not as a measure of any single indicator of early childhood conditions but as a heuristic tool to capture a variety of health, cognitive and behavioral conditions associated with low birth weight status.

DEPENDENT VARIABLES

Time diaries record not only the types of activities each child performs over the course of the day, but they also record information on the amount of time each child spends with their caregivers, namely the mother[4]. Therefore, children's time diary data can be used to obtain the amount of time children spend with mothers as well as the types of activities that are performed together. In addition to examining total time mothers devote to their children, I also distinguish between types of activities that are performed together. Specifically, I distinguish between activities that may more directly foster children's cognitive achievement (i.e. playing together, reading, doing homework, and having meals together) and those types of activities that may be less likely to foster cognitive achievement (i.e. watching television, child is passive recipient of personal care, performing housework or running errands, unstructured time together).

One random weekday and random weekend time diary was collected. I use both weekday and weekend diaries to construct a representative week by multiplying weekday time use by 5 and weekend time use by 2. Both total shared time and share time in developmental activities are measured as total number of hours spent with children per week. Table 1 presents that descriptive statistics for total and developmental time together.

Time diaries are child specific, allowing for analysis of variation in the amount of maternal care each sibling receives. Appendix A and B show histograms of sibling variation in time use for total and developmental time, respectively (controlling for age). These figures show that there is substantial variation in the amount of maternal time received among siblings.

CHILD ENDOWMENTS

[4] The preliminary analysis only examines children's time with mothers, although information on children's time with fathers and other relatives can be obtained. The majority of time diaries were completed with mothers alone or mothers and children together. Therefore, the data quality for children's time with mothers is the most reliable. In future work, I hope to include fathers' time with children among intact families.

Birth endowments are captured using a dummy variable for low-birth-weight status. Following medical conventions, low birth weight is defined as children born weighing less than 2,500 grams or 5 pounds 8 ounces. Table 2 shows that among the 765 sibling pairs in the sample, 8.5% of the sample (65 siblings pairs) falls in the category of having one siblings being normal weight and another low-birth weight.

MOTHERS' SOCIOECONOMIC STATUS

Both mothers' education and family income are used to measure the socioeconomic resources available to parents. Mother's education is measured as a continuous variable for years of schooling. Log of household income (in 1996) is also included to control for family resources. Both mothers' education and income are included in OLS estimates as well as interactions between education and income, on one hand, and low birth weight, on the other. The main effect of education and income drop out of the analysis in fixed effect models because they are common characteristics that are shared among siblings. Interactions with birth weight status, however, do not. This interaction serves to identify if the relationship between birth weight and parental time investments vary by parents' socioeconomic status. Summary statistics for mothers' education and family income are presented in Table 1.

CHILD CHARACTERISTICS

Children's age is measured as a continuous variable, ranging from age 1 to 12. Age squared is introduced to capture potential nonlinearities. A dummy variable is included to indicate if child is male. The respondent's sex is included because of sex differences in physical development and in terms of childrearing behavior. First, research shows that females are at greater risk for being born at low weight relative to males. Second, boys have a greater risk of exhibiting developmental disabilities than girls (Rutter et al., 2004; Volkmar et al., 2005).

Finally, some evidence suggests that mothers may spend more time and be more encouraging of daughters versus sons (Leaper et al., 1998; Tucker et al. 2003).

A dummy variable indicates whether child is first born. From a biological prospective, evidence suggests that first borns have a higher risk of being born low birth weight (Miller 1994). From a social prospective, evidence also suggests that first born children tend to receive more maternal time relative to later born children (Price 2006).

In OLS estimations , I also control for some characteristics of children and mothers, including child's race and mothers. Child's race is measured using dummy variables for African American and Latino (omitted category is White). I also account for maternal work hours in 1997 using dummy variables to measure fulltime and part-time work. A dummy variable is included to account for female headship.

RESULTS

First, using an ordinary least square approach, I examine the relationship between birth weight and maternal time investments in children. The strategy employed in Table 3 is to examine the influence of birth weight and maternal socioeconomic status on the total time and the total developmental time that is devoted to children, controlling for observable characteristics of mothers and children that could potentially confound this relationship. The control variables include child's age and age squared, child's sex and birth order, number of siblings, race, maternal employment in 1997 and female headship.

Net of these factors, the results show that low birth weight is negatively correlated with total maternal time in Column 1 and positively correlated with developmental time in Column 2, although these relationships are not statistically significant. Column 2 and 5 introduce interactions between birth weight and mother's years of schooling. The results suggest that

better educated mothers may devote less total time to low birth weight children, although these results are, again, not statistically significant. Column 3 and 6 introduce interaction between birth weight and logged household income. These results, while not statistically significant, also suggest that mothers with more socioeconomic resources devote less time to their low birth weight children.

In Table 4, I re-examine these relationships using a fixed effect framework. Sibling comparisons are necessary in order to address the issue that families may differ along dimensions that cannot be measured. To the extent that these unobserved factors are correlated with variables that are included in the model, ordinary least squared estimates are biased. Examples include characteristics of mothers that make them more likely to have low birth weight children and engage in differential treatment. Mothers who engage in prenatal behaviors that increase the likelihood of having a low birth weight child, such as smoking and drinking alcohol during pregnancy, may also be more likely to devote unequal treatment towards their children. Sibling comparisons can purge estimates of these unobserved factors to the extent that they are constant across siblings.

Using this framework, I compare sibling pairs who are raised by the same mother in Table 4. The results contrast ordinary least square estimates in that they indicated that time investments are differentially allocated according to birth weight differences among siblings. Columns 1 and 4 both indicate that, on average, low birth weight is not significantly related to total time and time in developmental activities, respectively. Columns 2 and 5 indicate that the direction and degree of differential treatment varies significantly by mothers' socio-economic circumstance.

Figures 1 and 2 graphically represent the predicted values for total time and developmental time, respectively, (all control variables are evaluated at the sample mean). Both figures suggest that lower educated mothers reinforce birth endowment differences (i.e. devote more time to normal birth weight children) and better-educated mothers compensate for endowment differences (i.e. devote more time to low birth weight children). Figure 1 shows that mothers with 10 years of schooling spend approximately 5 hours more per week with her normal weight offspring compared to her low birth weight offspring. The gap in total hours declines with mothers' schooling and reverse in favor of low birth weight children as mothers receive more post-secondary education. Among college graduates (16 years of schooling), mothers devote nearly 7 more hours per week with their low birth weight children. Figure 2 demonstrates that the same patterns are evident in the allocation of developmentally oriented time. Lower educated mothers devote approximately 4 hours more developmental time to normal birth weight children than to their low birth weight children. Better-educated mothers spend approximate 4 more hours with their low birth weight children compared to their normal birth weight children.

Column 3 and 6 examine interactions between low birth weight and another indicator of maternal socioeconomic status, family income. The estimates suggest the same pattern of time allocation by income, although the relationships are not statistically significant. Low-income mothers spend more total time and developmental time with normal weight children whereas higher income mothers adopt a compensating strategy by spending more time with their low birth weight children than with their normal weight children. While the relationship is not statistically significant, the point estimates for birth weight and interactions between birth weight and income in Column 3 are near identical to the point estimates for birth weight and interactions between birth weight and maternal education in Column 2. One reason for this finding may be

that measures of family income are measured more imprecisely than mothers' education and, therefore, the estimate for income is more noisy.

DISCUSSION AND CONCLUSION

This study uses time diary data from the PSID-CDS to examine the influence of child birth endowments, as measured by low birth weight status, on the distribution of human capital investment among children, as represented by the total time and developmental time mothers devote to children. I investigate whether investments in human capital are responsive to endowment differences among children and whether the patterns of time investments vary by socioeconomic status. Sibling fixed effects are used to account for sibling-invariant characteristics that may bias ordinary least square estimates. The paper provides evidence that suggests that investment strategies vary by socioeconomic status. In particular, sibling fixed effect models show that lower educated mothers direct more time towards normal birth weight children whereas better-educated mothers direct more time towards low birth weight children relative to their normal weight children. In other words, parents with fewer resources tend to reinforce birth endowment differences whereas parents with more resources are more likely to compensate for endowment differences among their offspring. Similar patterns were found when considering variation across family income, although these results are not statistically significant. One reason may be that measurements of income are more prone to measurement error than maternal education.

This paper contributes to the literature in several ways. First, it speaks to a tradition of studies using sibling correlations to estimate the influence of family background on status attainment (Hauser & Mossel, 1985; Solon et al., 1991; Warren et al., 2002). These studies argue that strong sibling resemblance in attainment outcomes implies that status attainment is

highly dependent on family background. Low sibling correlations imply family background matters less. This paper shows that these studies underestimate the influence of a disadvantaged family background because, in low SES families, social origin decrease, rather than increase, sibling resemblance over time. In this case, family background exerts its influence in unexpected ways: producing diverging rather than converging destinies among siblings from lower SES families

Second, studies have established low birth weight as an important predictor of later attainment (Conley & Bennett, 2000; Black et al., 2007). But previous studies were only able to speculate about the mechanisms that relate birth weight to later outcomes. This study shows that the lasting effects of low birth weight are not purely due to biological destiny but to biosocial interactions occurring at the family level, which both compensate for and reinforce early-life disadvantages. Third, this article extends previous tests of economic models of parental resource allocation. Previous studies were constrained by data limitations and produced mixed results. Adult outcomes such as earnings captured birth endowments and educational attainment proxied for parental investments, whereas I obtain more reliable estimates by using direct measures of birth endowments and parental investments.

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Table 4.1. Descriptive Statistics

	Mean	**SD**
Total shared time w/ mom (hrs/wk)	44.41	20.26
Shared time in developmental activities (hrs/	24.77	14.61
Low birth weight (=1 if <=2,500 gr)	8%	0.27
Mom's education (yrs)	12.85	2.86
Log income	10.7	0.92
Child's age	5.88	3.34

Table 4.2. Within Family Variation in Birth Weight

	# of sibling pairs	% of families
Neither is low birth weight	668	87,3
One sibling	65	8,5
Both siblings	32	4,2
N	765	100

Table 4.3. Regression of Total Shared Time and Developmental Time on Low Birth Weight (LBW), Maternal Socioeconomic Status and Independent Variables: Ordinary Least Square (with standard errors robust to clustering by mother's ID)

	Total Shared Time			Developmental Time		
	(1)	(2)	(3)	(4)	(5)	(6)
LBW	-0,221	1,145	5,728	0,41	0,387	1,634
	(1,40)	(7,71)	(11,48)	(1,05)	(5,59)	(8,31)
Mom's ed (yrs)	0,445	0,451	0,438	0,496	0,495	0,494
	(0.207)**	(0.211)**	(0.208)**	(0.143)***	(0.145)***	(0.143)***
Log income	-1,086	-1,088	-0,996	-0,702	-0,702	-0,683
	(0.647)*	(0.647)*	(0,69)	(0,43)	(0,43)	(0,47)
LBW x Mom's ed		-0,107			0,002	
		(0,61)			(0,45)	
LBW x log income			-0,574			-0,118
			(1,09)			(0,80)
Child's age (1997)	-3,935	-3,937	-3,929	-3,299	-3,299	-3,298
	(0.429)***	(0.429)***	(0.429)***	(0.329)***	(0.328)***	(0.329)***
Child's age sq	0,138	0,138	0,137	0,127	0,127	0,126
	(0.033)***	(0.033)***	(0.033)***	(0.025)***	(0.025)***	(0.025)***
Male child (=1)	-1,012	-1,011	-1,02	0,523	0,523	0,521
	(0,77)	(0,77)	(0,77)	(0,54)	(0,54)	(0,54)
Birth order	-1,003	-1,004	-1,002	-0,795	-0,795	-0,795
	(0.575)*	(0.575)*	(0.575)*	(0.404)**	(0.405)**	(0.404)**
# siblings	-0,73	-0,726	-0,733	0,19	0,19	0,189
	(0,53)	(0,53)	(0,53)	(0,37)	(0,37)	(0,37)
Constant	79,617	79,557	78,729	46,967	46,968	46,785
	(7.008)***	(7.031)***	(7.432)***	(4.748)***	(4.765)***	(5.074)***
Obs.	2139	2139	2139	2139	2139	2139
R-squared	0,258	0,258	0,258	0,302	0,302	0,302

Robust standard errors in parentheses; ** significant at 5%; *** significant at 1%.
Regressions include dummy variables for female headship, Black, Latino, full-time and part-time maternal employment.

Table 4.4. Total Maternal Time and Developmental Time as Predicted by Low Birth Weight (LBW), Maternal Socioeconomic Status: Sibling Fixed Effect Models

	Total Shared Time			Developmental Activities		
	(1)	(2)	(3)	(4)	(5)	(6)
LBW	0,048	-27,572	-21,757	-0,385	-18,565	-14,306
	(2,03)	(14.023)**	(24,79)	(1,41)	(9.969)*	(15,16)
LBW x Mom's ed		2,113			1,391	
		(1.061)**			(0.763)*	
LBW x log income			2,113			1,347
			(2,39)			(1,48)
Child's age (1997)	-3,647	-3,63	-3,646	-2,796	-2,784	-2,794
	(0.614)***	(0.613)***	(0.614)***	(0.461)***	(0.461)***	(0.462)***
Child's age sq.	0,133	0,133	0,133	0,126	0,126	0,127
	(0.042)***	(0.042)***	(0.042)***	(0.031)***	(0.031)***	(0.031)***
Male child (=1)	-0,255	-0,321	-0,255	0,035	-0,008	0,039
	(0,87)	(0,88)	(0,88)	(0,62)	(0,62)	(0,62)
Birth order	0,934	0,981	0,959	1,013	1,044	1,032
	(0,95)	(0,95)	(0,95)	(0,70)	(0,70)	(0,70)
Constant	59,029	58,91	59,001	34,222	34,144	34,189
	(3.656)***	(3.650)***	(3.663)***	(2.789)***	(2.779)***	(2.797)***
Observations	1332	1332	1330	1332	1332	1330
R-squared	0,234	0,237	0,235	0,219	0,222	0,219
# clusters	666	666	665	666	666	665

Robust standard errors in parentheses

** significant at 5%; *** significant at 1%

Figure 4.1. Predicted Values from Sibling Fixed Effect Models of Mothers' Total Time with Children by Years of Education and Children's Birth Weight

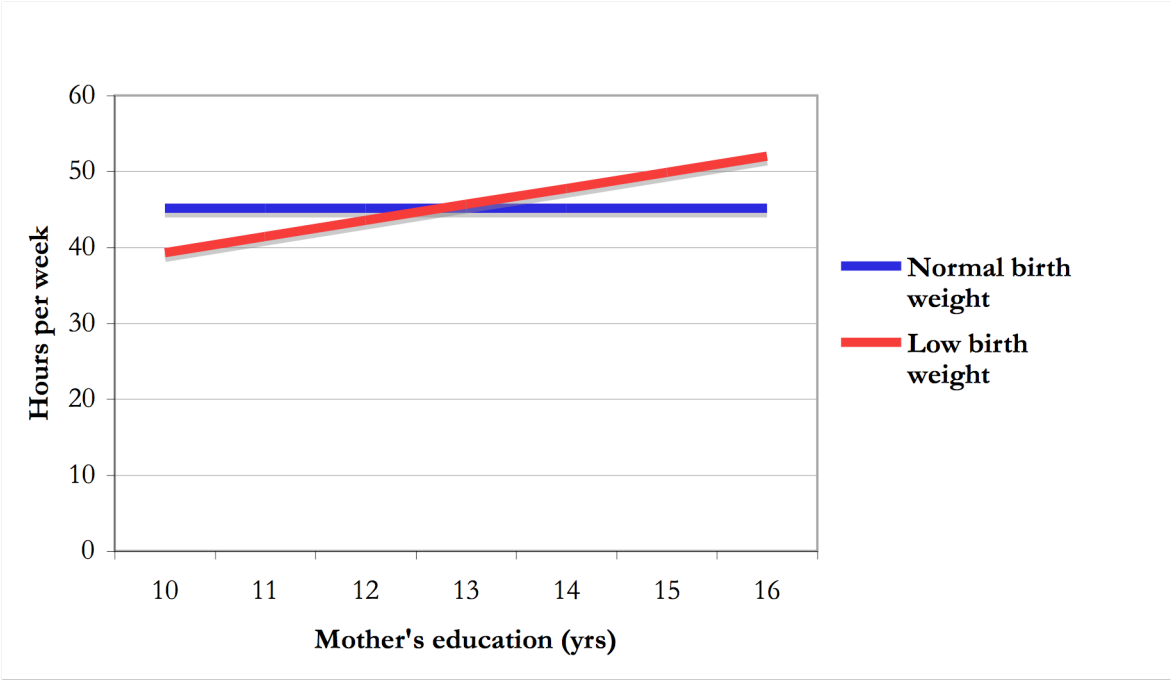

Figure 4.2. Predicted Values from Sibling Fixed Effect Models of Mothers' Time with Children by Years of Education and Children's Birth Weight

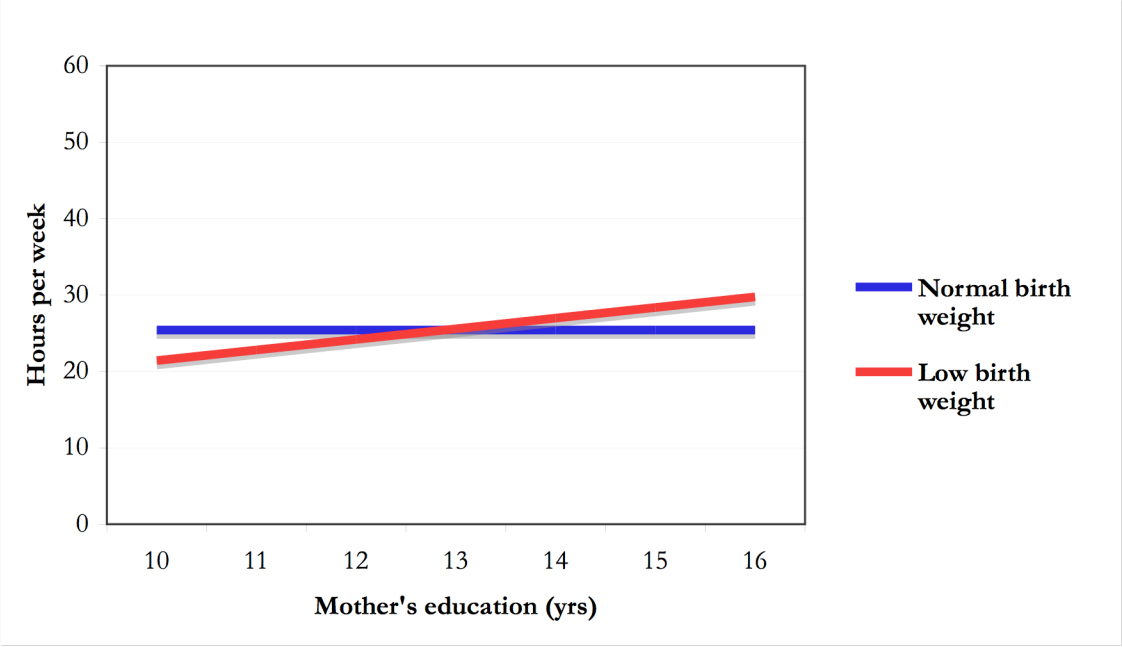

Figure 4.3.A. Histogram of Within-Sibling Difference in Total Hours per Week Spent with Mothers

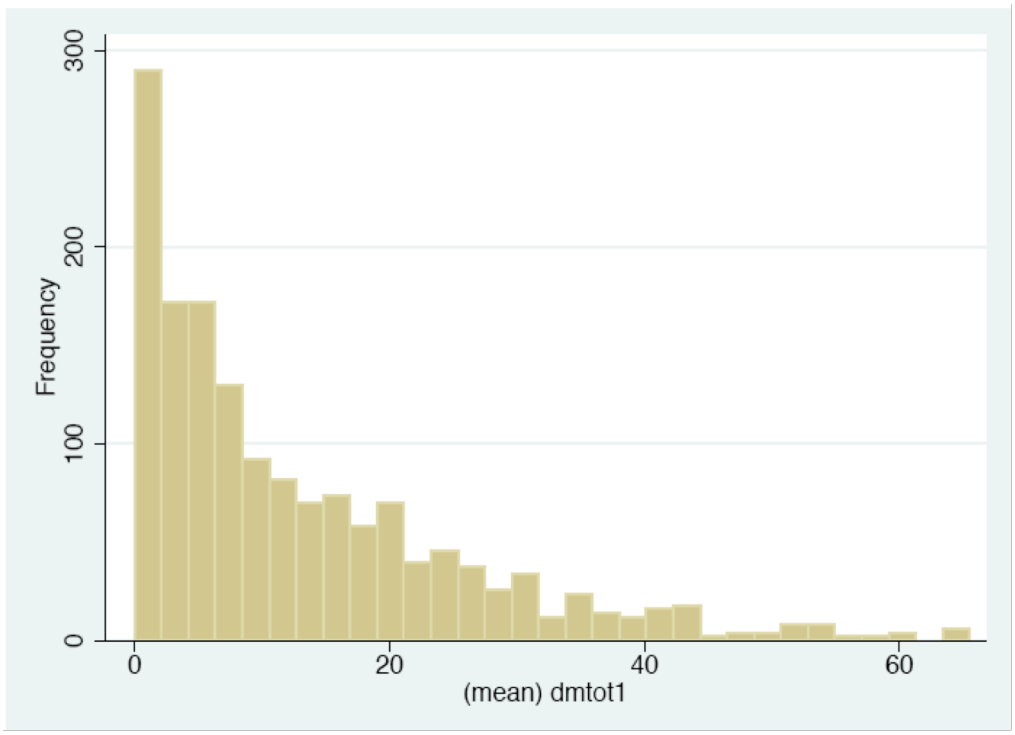

Figure 4.4.B. Histogram of Within-Sibling Difference in Hours per Week Spent in Developmental Activities with Mothers