

THE INTERACTION OF BIRTH WEIGHT, GESTATION, AND PARENTAL INVESTMENT IN THE PRODUCTION OF COGNITIVE DEVELOPMENT

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Abstract

Low birthweight is correlated with a variety of poor physical health and cognitive outcomes later in life [e.g., Harvey et al. 1982, Eberstein, et al. 1990, McCormick, et al. 1992]. Much of the research on how low birthweight affects later life outcomes, however, does not account for the strong likelihood that low birthweight is the outcome of genetic and environmental influences that themselves are highly correlated with later life outcomes. A number of recent studies using data on identical twins makes this point convincingly. An intriguing aspect of this twin research is that OLS estimates of the effects of birthweight on early life outcomes appear to be biased upward while OLS estimates of the effects of birthweight on later life outcomes appears to be biased downward. Almond, Chay, and Lee (2002), for example, find that OLS estimates of the effect of birthweight on infant mortality are upwardly biased substantially, while Behrman and Rosenzweig (2002) report that OLS estimates of the long-run effects of low birthweight on schooling and earnings are biased downward by as much as 50 percent.

One interpretation of the findings reported in these twin studies is that OLS estimates of the effects of low birthweight on later outcomes are potentially contaminated by two types of bias. The first bias is a pure endowment bias. Low birthweight is correlated with low genetic endowments that themselves are correlated with a host of later outcomes. A second bias is introduced by the interaction of unobserved parental investments and genetic endowments. The sign of this second bias, which we will call an interaction bias, depends on whether parental investments compensate or exacerbate initial endowments. Imagine a parent with two children, one is low birthweight and the other is not. This parent may compensate for the poor endowment of the low birthweight child by allocating to that child more resources than the normal birthweight child. For example, parents may spend more time with their low birthweight children or send them to special schools. In this case, the interaction bias will lead OLS estimates to be downwardly biased. On the other hand, if parents choose to allocate resources disproportionately to the child with the highest endowments, then the interaction bias will lead to upwardly biased OLS estimates.

That Behrman and Rosenzweig (2002) and others [e.g., Alderman, et al. 2001; Glewwe and King 2001] have found evidence that OLS estimates of the effects of early child health on later life outcomes are downwardly biased suggest that parents may act to compensate for the low endowments of low birthweight children. In this research, we seek direct evidence that parents behave in this manner using data from the National Longitudinal Survey of Youth (NLSY) Child Survey. The NLSY collects data on test scores of children ages 5-14 in each survey wave allowing us to examine how birthweight affects test scores over time while controlling for family level endowments.¹ Our research pays careful attention to the source of variation in birthweight and outcomes across sibling pairs and considers how family income and other common environmental influences affect the relationship between birthweight and later

¹ Boardman, et al. (2002) use a similar approach with NLSY data, but employ a random-effects as opposed to a fixed-effects estimation strategy. Random-effects will not account for correlation between family-level endowments and birthweight.

outcomes. In addition, we experiment with a variety of measures of low birthweight including categorical and continuous measures and indices combining birthweight and prematurity. Of key interest is whether the test scores of low and normal birthweight siblings converge over time and how results vary by whether we compare children of a similar age or similar grade level.

Parental investment is notoriously difficult to measure, but, in this research, we take advantage of a highly relevant and easily quantifiable parental investment: delayed kindergarten entry and grade retention. Delaying kindergarten entrance for low birthweight children or having them repeat grades may allow these children to meet grade-level performance standards more quickly than they otherwise would. At the same time, delaying kindergarten entry or retaining children has real costs for parents in terms of childcare and, possibly, social stigma. Using state-level variation in kindergarten entrance cut-off dates to identify exogenous variation, we test whether delaying kindergarten entry is one means by which low birthweight children succeed in catching up with their peers. We also examine how the effect of grade progression on later outcomes varies between low and normal birthweight children.

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