

Family Size, Children's Cognitive Test Scores and Familial Interaction: US, 1997-2002

One of the most robust findings related to the influence of family structure on children's academic success in the status attainment literature is that children from larger families do less well than children from smaller families. The reason why has been the subject of intense debate for a long time. One prominent hypothesis, labeled the 'confluence model' is that the presence of younger siblings in household reduces the age-appropriate intellectual stimulation a child is exposed to (Zajonc and Markus 1975). Another, competing hypothesis, labeled 'resource dilution', is that parental resources available to any particular child are diluted when additional children are in the family (Blake 1986).

What the empirical debate has for the most part previously not addressed adequately is that a critical element to both hypotheses forwarded above is the amount of time children spend in activities others. Both the confluence and resource dilution hypotheses are in large part at their core, interactional. The first suggests that children will do less well to the degree that they interact with younger siblings in activities that are age appropriate to those younger children, but less developmentally appropriate for themselves. The second implies that with more children in the household, parents have less of all resources – but, for intellectual development most importantly less time and attention - to allocate to any particular child (Downey 1995). A unique element of this research is the precise measurement of parental resources and family context through children's time use in interaction with parents and siblings.

The analyses presented in this paper use data from the Panel Study of Income Dynamics Child Development Supplement (PSID-CDS I and CDS II). The sample is restricted to children aged 8-17 years old in 2002 from two parent families where the

child was the biological or adopted son or daughter of the head in 1997 and the primary and secondary caregivers of the child were both their parents. In the first part of the analysis presented here we test whether simple bivariate analyses reveal associations between a) age standardized scores from the Woodcock-Johnson Revised Letter-Word Identification test (hereafter LW) b) children's time with parents and c) children's time with siblings and sibship size. We then move to a multivariate analysis of these standardized test scores using the same data to evaluate relative degrees of support for the confluence and resource dilution models cross-sectionally. A nested modeling strategy is employed to assess the relative goodness of fit of a variety of models. After a baseline model including only the number of children in the family 18 years of age and younger and appropriate controls (age and sex of the child, birth order, race, mothers' education and age and family income), the first of these is a conventional specification of the confluence model, including a measure of the difference between sample children's age and the mean age of other children in the household. This is then compared to an ameliorated confluence specification with measures of time spent in interaction and in the presence of siblings as main effects and in interaction with the age difference measure from the conventional specification. The conventional resource dilution model is specified by adding to the baseline model measures of household resources, including the number of books in the household, the number of shared family meals and interviewer's assessment of the safety of the household. This model is used as a reference for an ameliorated confluence model which adds to the prior specification measures of time children spend engaged in activities with parents and simply in their presence. The final

model estimates a specification of measures relevant to both the confluence and resource dilution models simultaneously.

Though cross-sectional tests such as those performed in the first part of the multivariate analysis are conventional in the literature, it has long been suggested that such identified relationships between family size and achievement may be at least partially spurious, due to unobserved heterogeneity on the family level (either through genetic or environmental factors; Rodgers et. al 2000). Recent empirical evidence using statistical models controlling for unobserved heterogeneity has lent rather dramatic support to this contention (Guo and VanWey 1999).

For this reason, in the third part of the analysis we replicate tests of the above specifications of the confluence and resource dilution models using fixed effects models for change in standardized LW test scores between 1997 and 2002. These models, in comparison to those of the cross-sectional analysis allow us to evaluate whether unobserved heterogeneity on the family or individual level is responsible for any association between sibship size and the standardized test scores identified in the first part of the analysis.

Preliminary results suggest that a significant negative association between family size and LW test scores exists in the baseline model in the cross-sectional data from 2002. This association is not diminished by either specification of the confluence model or the conventional resource dilution model but is by the specification of the ameliorated resource dilution model, including measures of children's time spent with parents. In this model, the magnitude of the coefficient associated with sibship size was reduced by 14% compared to the baseline model and was no longer statistically significant. The most

important component of time with parents relative to the sibship size effect appears to be time parents are accessible to them but not directly engaged in activities with children, which had a significant positive association with LW scores. This suggests that an important mechanism through which family size contributes to difference in cognitive development occurs through the dilution of parental time with children. A caveat to this is that the results of the fixed effects regressions suggest as in previous longitudinal research on similar test results (Guo and VanWey 1999) that once sources of time constant unobserved heterogeneity are controlled for, there is no statistically significant effect of family size on the LW scores, and in fact the direction of the association is *positive*. In conclusion, possible methodological and substantive possible reasons for the differences between the OLS and fixed effects regressions are discussed, and placed in the context of broader research concerning family size and achievement outside the realm of cognitive test scores.

References

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