Family Size, Birth Order, and Child IQ*

by

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Abstract

It is clear that birth order affects children's outcomes along a number of dimensions, including education and earnings, although recent evidence from the psychology literature provides mixed evidence of the effects of birth order on IQ. The evidence on the effect of family size in the economics literature is even more mixed, with inconclusive results on all outcomes. This paper uses a large dataset on the population of Norway and focuses on the effect of birth order and family size on IQ, an outcome not previously available in datasets of this magnitude. Because of the endogeneity of family size, we instrument for family size using twin births. Importantly, we find a strong and significant effect of both birth order and family size on IQ. Our results suggest that earlier born children have higher IQs, and this effect becomes slightly larger when controls for birth characteristics are included, suggesting that it is unlikely that biological explanations for birth order effects play much role. In addition, we find that family size has a negative effect on IQ, suggesting that random shocks to family size have a negative effect on existing children.

Birth order and family size have long been of interest to researchers across a variety of disciplines. Because of data limitations, however, it is only recently that researchers can estimate the effects of these variables on children's outcomes in a convincing way. While the evidence is strong that there are birth order effects in terms of educational attainment and earnings (See Black, Devereux, and Salvanes 2005), some question remains in terms of the effect of birth order on IQ.

Credible estimates of family size effects have also been elusive until recent years, largely due to data limitations and the inability to identify the causal relationship between family size and children's outcomes. Recent research has used instrumental variables approaches to identify the effect of family size on outcomes such as educational attainment and earnings and has come up with mixed results. (See Black, Devereux, and Salvanes 2005 and Angrist, Lavy and Schlosser 2005.)

This paper uses a large dataset on the population of Norway and focuses on the effect of birth order and family size on IQ, an outcome not previously available in datasets of this magnitude. Because of the endogeneity of family size, we instrument for family size using twin births, arguing that the birth of twins provides exogenous variation in family size.

When using the twin instrument, we restrict the sample to families with at least n births and study the outcomes of children born before the nth birth. In practice, we estimate the specification for values of n between 2 and 4. By restricting the sample to families with at least n births, we make sure that, on average, preferences over family size are the same in the families with twins at the nth birth and those with singleton births. Also, by restricting the sample to children born before birth n, we avoid selection

problems that arise because families who choose to have another child after a twin birth may differ from families who choose to have another child after a singleton birth.

Our methodology avoids two possible pitfalls that can arise when twins are used as instruments. First, by focusing on whether a twin birth occurs for the nth birth, we avoid the problem that families that have more births are more likely to have at least one twin birth. Second, by only using children born before a possible twin birth, we are able to avoid the problem that a twin birth both increases family size and shifts downwards the birth order of children born after the twins. For example, if a twin birth occurs at the second birth, the next child born is now the fourth born-child rather than the third. Thus, any estimates using children born subsequent to a twin birth will confound family size effects with birth order effects.

In contrast to previous research, we find strong birth order effects on IQ that are present both in cross-sectional and within-family analysis. Later-born children have lower IQ on average and the differences are quite large. The birth order effects become slightly larger when controls are included for birth characteristics. Thus suggesting that it is unlikely that biological explanations for birth order effects play much of a role.

Our family size results are more mixed. OLS estimates suggest that there is no strong relationship between family size and IQ. Our IV estimates using twins imply that family size has a negative effect on IQ. These findings are consistent if it is the case that higher IQ parents are more likely to have large families (consistent with the fact that average father IQ scores are higher for 4 child families than for 1 or 2 child families), or if parents choose to have larger families when they know that they are in a position to provide the relevant investments for their children. Unexpected random shocks to family

size, such as induced by twins, lead to poorer IQ outcomes for children. These results are rather different from the tiny statistically insignificant IV family size effects we found for education in our 2005 paper. The differences appear largely due to different cohorts.

Finally, we address the recent critique of twin studies by Rosenzweig and Zhang. We show that their suggested methodology for addressing differential investments is flawed and indeed there is no way of tackling this issue with conventional data sources. However, if the Rosenzweig-Zhang hypothesis of re-enforcing investments by parents is correct, this would suggest that, if anything, our twins estimates understate the deleterious effects of increased family size on child IQ.

References

Angrist, Joshua D., Victor Lavy, and Analia Schlosser, "New Evidence on the Causal Link between the Quantity and Quality of Children", NBER Working Paper #11835. 2005.

Black, Sandra E., Paul Devereux, and Kjell Salvanes, "The More the Merrier? The Effect of Family Size and Birth Order on Adult Outcomes", Quarterly Journal of Economics, May 2005.

Rosenzweig Mark R., and Junsen Zhang, "Do Population Control Policies Induce more Human Capital Investment? Twins, Birthweight, and China's 'One Child' Policy" IZA Working Paper 2082. April 2006.