

Family Dynamics, Birth Timing, and Child Temperament

A Dynamic Sibling Model Approach

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Abstract

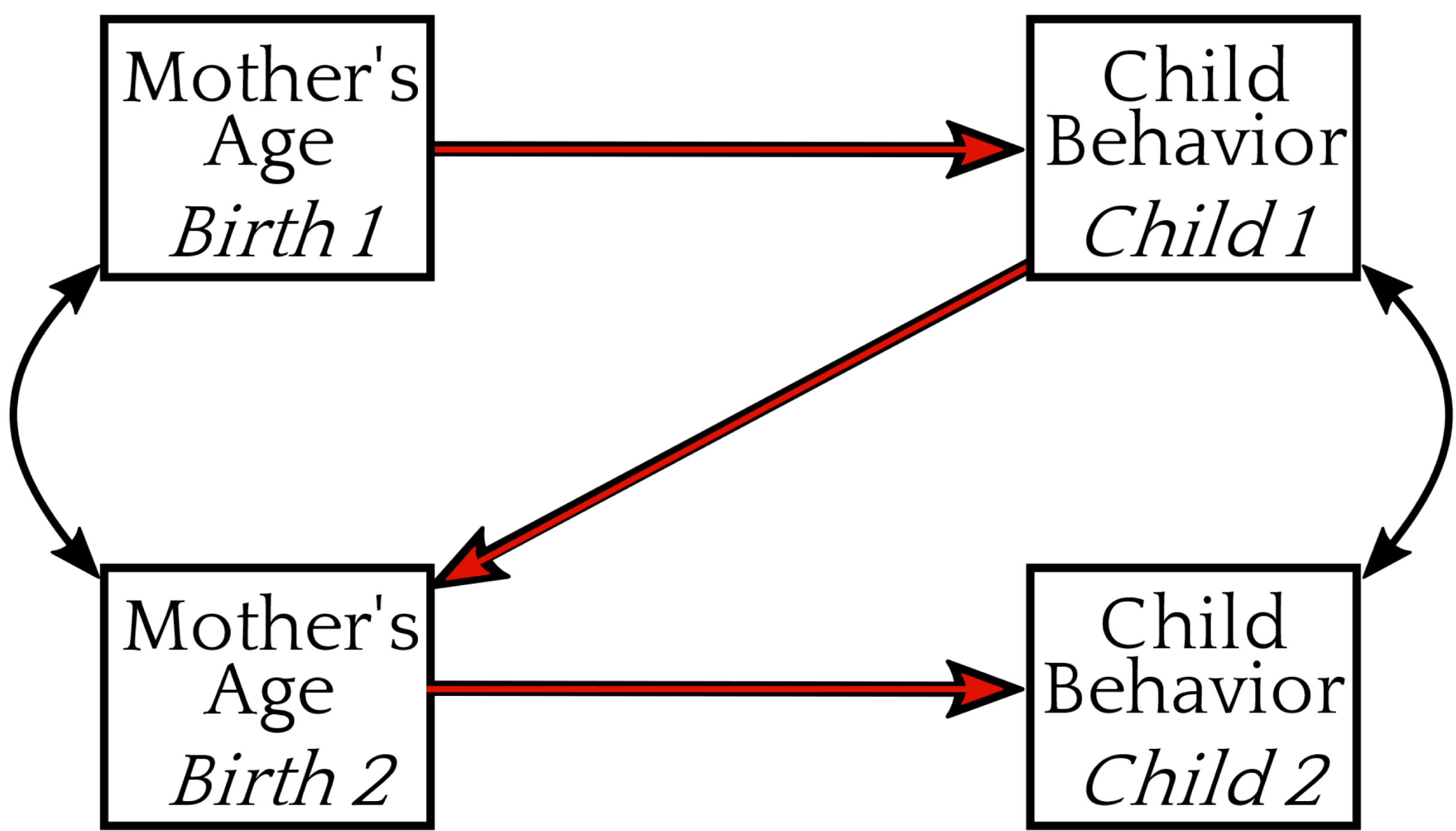
Family conditions and parent characteristics are important determinants of child behavior problems which may be precursors to adult behavior problems and life-course instability. In the past researchers have found it difficult to disentangle early childbearing from parent and mother characteristics associated with young motherhood and child behavior problems. Sibling fixed-effects models offer one approach to remove effects of unobserved time invariant family characteristics on behavior problems. However, if child behavior impacts the parent's subsequent fertility decisions, estimates from sibling models will be biased. We address this with Rosenzweig and Wolpin's (1995) sibling fixed effects instrumental variable model to correct bias introduced by the dynamic relationship between child outcomes and subsequent fertility. Preliminary results reveal older mothers perceive better child behavior, and worse child behavior is associated with earlier subsequent births.

Introduction

Recent research in demography, child development, and economics has focused increasingly on early childhood as a crucial period for the development of self-control and other characteristics relevant to future life outcomes.¹ For example, classic research has found that early child temperament—including persistent crying, difficulty feeding, interrupted sleep, and general colicky behaviors—is correlated with later life course outcomes such as divorce, unemployment, and crime.² Thus, the genesis of temperament has important consequences for later life chances. Research on early child outcomes—such as temperament, birthweight, and behavior problems—suggests that maternal age at birth of a child may be important.³ On the one hand, young mothers may be at their physiological peak, and therefore, be better capable of coping with the challenges of motherhood. On the other hand, older mothers may be more mature and knowledgeable about parenting, which may more than offset any physical shortcoming.

A critical issue in research on maternal age at birth has been addressing the potential confounding effects of socioeconomic status: children of young mothers may show poor child outcomes not because of their mother's age, but rather because they are disproportionately more likely to be drawn from disadvantaged families. Early studies that controlled for observed measures of family socioeconomic status were criticized for failing to control for unobserved family disadvantage. To address this, researchers moved to sibling models. Because siblings share the same family socioeconomic status, comparing child outcomes for siblings born at different ages can isolate the effect of maternal age at birth while controlling for both observed and unobserved family effects. Sibling fixed effects models fail to find negative effects of teen childbearing on child outcomes. In a criticism of Guo and VanWey's⁴ sibling analysis, Phillips argued that we "[s]uppose... that parents are more likely to have a second child if their first child is joyful. If this were the case, temperament differences between siblings would be correlated with differences in the number of siblings they ended up having."⁵ If Phillips is correct, the estimates of maternal age at birth on child outcomes could introduce a correlation between temperament of the first child and maternal age at birth of the second child, resulting in biased estimates of maternal age at birth. This **Theoretical Model** is depicted below, with critical pathways depicted in red.

Theoretical Model



To address this issue we use a structural equation approach to a fixed-effects sibling model that controls for potential correlation between the temperament of the first child and the mother's age at birth of the second child.⁶ This produces a model equivalent to an instrumental variables estimator for the relationship between differences in maternal age at birth and behavior problems using maternal age at first birth as an instrument. This sibling fixed effects instrumental variable model yields estimates of the relationship between mother's age at birth and child difficulty problems, while accounting for the possibility that child behavior problems impact subsequent fertility.

Data

This study uses matched mother-child data from the National Longitudinal Survey of Youth 1979 (NLSY79), a probability sample of 12,686 Americans between the ages of 14 and 21 during 1979. Beginning in 1986, female respondents who had children responded to interviews about their children and parenting behavior and assessments were conducted on the children resulting in their addition to a child and young adult sample of the NLSY79. As of 2012, the child and young adult sample consists of 11,512 children, which is estimated to be some 95% of expected childbirths for original NLSY79 participants; nearly all births to this cohort should be accounted for, avoiding issues with selection on birth timing. Because the focus of this work is the relationship between perceived early-childhood behavior problems and birth timing, analyses are limited to a subsample of mothers with two or more children for which data on infant behavior problems were collected. These perceptions of early child behavior problems were collected from mothers of children between ages 0 and 23 months, beginning in 1986. In this poster, we restrict analyses to 878 (17.8%) mothers with two or more children whose first child was born after data collection began in 1986. Mothers in the analysis subsample were 19 to 40 years of age at birth of first child and 20 to 42 for the second child.

The *Temperament* outcome variables in this analysis are the Difficulty Composite Raw Scores for both siblings which consist of the sum of ordinal (1 to 5) responses to 11 temperament questions capturing a range of child behaviors, such as "How often do you have trouble soothing or calming your infant when he/she is crying or upset?" and "During the average day, how often does your infant get fussy and irritable?" These measures thus capture mother perceptions of child temperament, where higher scores indicate subjectively worse child behavior. This scale has an observed range of 11 to 54 (out of possible 11 to 55) for first observed children and 11 to 52 for second observed children. The key predictors are *Mother's Age* at birth for each child.

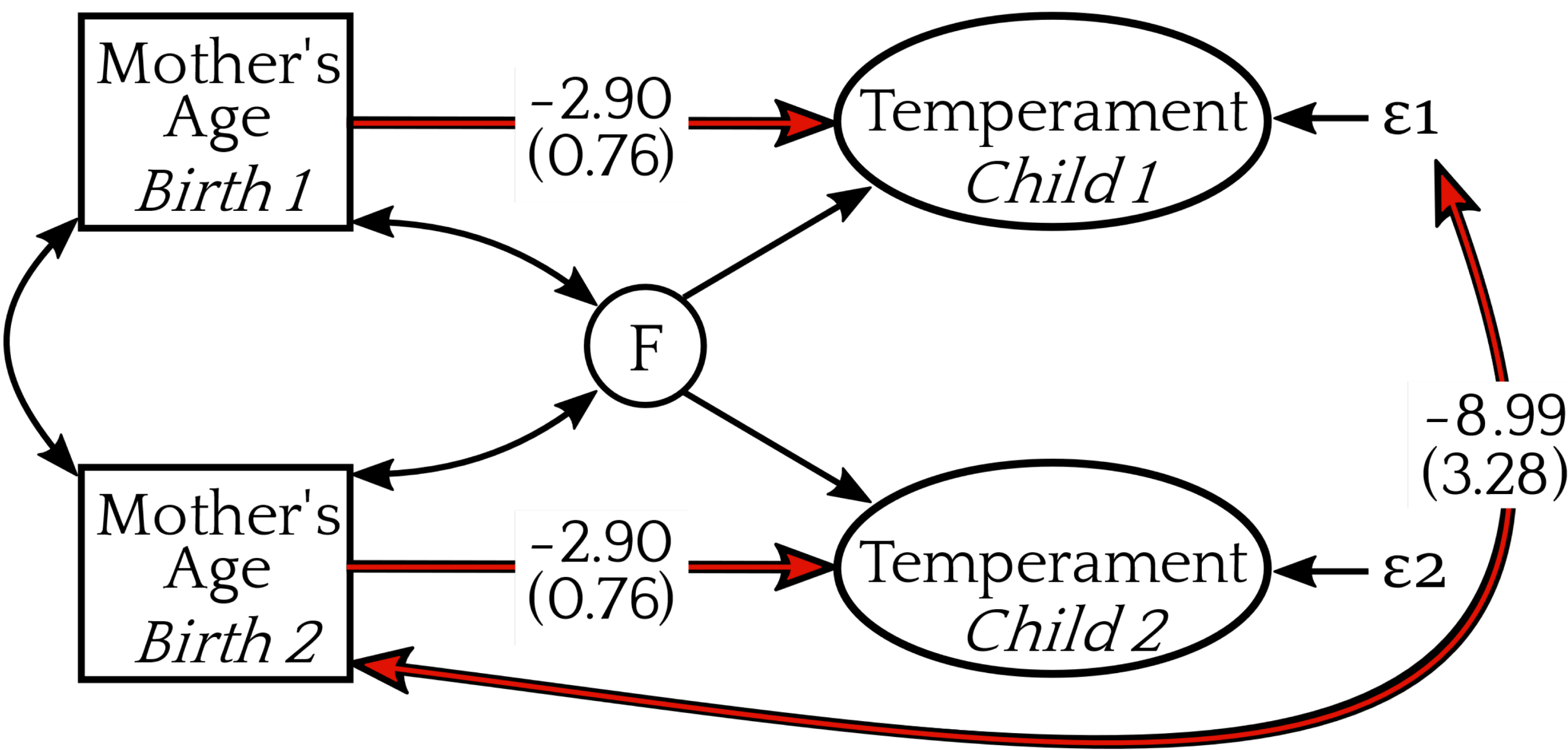
Methods

We use Rosenzweig and Wolpin's sibling fixed effects instrumental variable model⁶ to simultaneously estimate (1) the effects of mother's age on child difficulty and (2) subsequent changes in the timing of the next birth. The **Statistical Model** below depicts our model of mother's age at birth and perceived child difficulty. The *Mother's Age* measures represents maternal ages at birth for each child which are assumed to be correlated with one another and also with unobserved time-invariant family and mother characteristics (*F*). *Mother's Age* predicts *Temperament* measures for each child which are treated as indicators for the shared component (*F*) with loadings constrained to unity, yielding a sibling fixed effects model. The coefficients on *Mother's Age* are constrained to equality for identification. Lastly, we estimate the covariance between the disturbance term for the perceived difficulty of the first child (*ε1*) and *Mother's Age* at second birth. Modeling this covariance accounts for the possibility that child difficulty will impact future fertility decisions and thus timing of future births. We hypothesize that (1) perceived difficulty of the first child is associated with delays in subsequent births and (2) a negative relationship between mother's age and child difficulty will remain in the presence of any feedback effect of difficulty on second births.

Results

The **Statistical Model** below depicts maximum likelihood estimates from the structural equations. A strong negative relationship is observed between mother's age at birth of child and perceived difficulty in early childhood. Net of time-invariant mother and family characteristics, each additional year older at childbirth corresponds to almost three points lower on the difficulty composite ($\beta = -2.90$). Additionally, we see a statistically significant ($t = -2.75$) relationship between the residual of first child difficulty predicted by mother's age at second birth, though this relationship is unexpectedly negative. Greater difficulty in early childhood, net of that associated with maternal age, appears associated with earlier second births. The addition of the instrument appears important as a bias correction, as the relationship between *Mother's Age* and *Temperament* is substantially attenuated ($\beta = -0.85$) when omitting the covariance between *ε1* and *Mother's Age* at second birth.

Statistical Model



Discussion

These results indicate that child behavior problems may influence later fertility, rendering estimates of the effect of maternal age biased in standard sibling models, however the effect of maternal age remains in the presence of this feedback. This draws attention to fertility timing's role as a predictor of child outcomes, which has implications for the intergenerational transmission of disadvantage. Disadvantaged mothers are predisposed to early motherhood which is associated with negative child behaviors which, in turn, predict life-course disadvantage. In addition, it reveals the importance of accounting for dynamic effects in sibling models described by Rosenzweig and Wolpin⁶ and Phillips,⁵ as this dynamic relationship introduces bias into estimates: the relationship between maternal age and child behavior is greatly attenuated without the instrument. Curiously, the feedback effect of child behavior problems appears to be in a direction counter to expectation; positive variation in child difficulty is associated with a shorter interval to second birth. We are presently extending this analysis to include relevant covariates—including education, income, and family composition—which may shed light on this finding. We also are exploring the possibility that this relationship—or its dynamic component—is conditional on mother or family characteristics using group models. Lastly, because model does not account for the possibility that perceived difficulty of the first child could cause mothers to cease having additional children rather than only delaying future births, we are testing hazard models relating child behavior and family characteristics to the probability of subsequent births. Preliminary analyses indicate (1) *Temperament* has little relationship with cessation of fertility, (2) our focal relationships are attenuated by higher socioeconomic status, and (3) the relationship between *Mother's Age* and *Temperament* is most pronounced for first births.

[1] Heckman. 2013. *Giving Kids a Fair Chance*. MIT Press: Cambridge, MA
[2] Caspi, Elder, & Bem. 1987. "Moving Against the World: Life-Course Patterns of Explosive Children." *Developmental Psychology* 23(2).
[3] Geronimus, Korenman, & Hillemeier. 1994. "Does Young Maternal Age Adversely Affect Child Development? Evidence from Cousin Comparisons in the United States." *Population and Development Review* 20(3).

[4] Guo & VanWey. 1999. "Sibship Size and Intellectual Development: Is the Relationship Causal?" *American Sociological Review* 62(2).
[5] Phillips. 1999. "Sibship Size and Academic Achievement: What We Now Know and What We Still Need to Know: Comment on Guo and VanWey." *American Sociological Review* 64(2).
[6] Rosenzweig & Wolpin. 1995. "Sisters, Siblings, and Mothers: The Effect of Teen-Age Childbearing on Birth Outcomes in a Dynamic Family Context." *Econometrica* 63(2).