**Example of Fixed Effects Models**

**From Lopoo (2004): *"The Effect of Maternal Employment on Teenage Childbearing"***

**Theories of Maternal Employment and Childbirth (p. 4)**

*There are several reasons to believe that maternal employment might affect teenage childbearing.*

***First****, maternal employment may inhibit parental monitoring which may lead to the early onset of sexual activity or an increase in the frequency of intercourse (Haveman and Wolfe 1994, 1995; McLanahan 1988; McLanahan and Sandefur 1994). Hogan and Kitagawa (1985) found, using a sample of young, African American women in Chicago, that parental monitoring of dating behavior is negatively related to the likelihood of a pregnancy. If working mothers have less time to supervise their children, maternal employment may increase the likelihood of teenage childbearing*

***Second****, although maternal employment may reduce the time mothers spend with their children, it also probably implies that they have more resources to invest in their children, all else equal. Thus, maternal employment may negatively influence teenage childbearing through an income effect.*

***Third,*** *maternal employment could operate through a mechanism sometimes called role modeling (Haveman and Wolfe 1994, 1995; Morris et al. 2001). Because children frequently model their behaviors after their parents or other adults who are important to them, a mother’s employment should increase the likelihood that her daughter will work, ceteris paribus. If bearing a child at a young age reduces a woman’s future net wage (gross wage rate less childcare costs), then she may be less likely to bear a child.*

**Data (p. 7)**

*I use the National Education Longitudinal Study of 1988 (NELS) for this analysis. The NELS is a Department of Education survey that includes a sample of eighth graders in 1988 that attended a random sample of 1,000 schools.8 The students were interviewed in 1988, 1990, 1992, and 1994... The NELS sample consists of 6,210 teenagers of whom 1,057 or 18.8 percent (17 percent of the unweighted sample) had a birth before their final survey in the spring of 1994 (when most of the teens were twenty).*

*One limitation of the NELS data is that the teen is asked about her mother’s employment in 1988 only. If this measure is not a good indication of maternal employment throughout the daughter’s teenage years, any estimates of the effect of maternal employment may suffer from* ***measurement error****. To address this potential problem, I used the Panel Study of Income Dynamics (PSID) to select a sample of teenagers born between 1973 and 1975. Figure 1 shows the correlation between an indicator of employment for these teenagers’ mothers in 1988 and separate indicators for maternal employment from 1989-1994. The correlation between maternal employment in 1988 and maternal employment in subsequent years declines in the PSID each year until 1994 when the correlation is 0.36. If accurate, this figure suggests that, although the 1988 measure is not perfect, it is fairly highly correlated to maternal employment over the young woman’s teenage years, particularly through 1992.*



**Modeling the Data (pp 9-10):**

*Estimates of β may be biased by omitted factors correlated both to maternal employment and teenage childbearing. To tackle this endogeneity problem, I use two approaches. First, the NELS contains a rich set of measures that allows me to control for many characteristics that are related to both. Without explicit controls for these measures, their effects will load onto the maternal employment measure producing biased results. Second, I use a school fixed effects model to remove the endogeneous characteristics common to students from the same school. If parents who send their children to the same schools have similar characteristics, then these common factors, which may be correlated to maternal employment, can be removed from the error term.*

*One might believe that nonworking mothers are more likely to live in poor areas where teenage childbearing is disproportionately prevalent, perhaps due to a contagion effect (Crane 1991; Brooks-Gunn et al. 1993). Working mothers, on the other hand, may be more likely to live in more affluent areas where teenage childbearing is relatively rare. A model that uses variation between these areas to estimate the relationship between maternal employment and teenage childbearing might show a negative coefficient for maternal employment. To attribute this effect to maternal employment rather than the contagion effect would be incorrect. This school fixed effects model may provide more solid evidence than the LPM because characteristics common to the community, including those correlated to maternal employment, are removed from the analysis even when they are not observed.*

**Results (p.16)**



*Collectively, these results point to the importance of the unobserved factors within school districts that are correlated to both maternal employment and teenage childbearing. However, even after controlling for a fairly complete set of covariates and school fixed effects, these results suggest that the teenage daughters of working mothers are 2.2 percentage points less likely to bear a child than the teenage daughters of non-working mothers.*