Intertemporal substitution in maternal labor supply: Evidence using state school entrance age laws [☆],[☆☆]

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HIGHLIGHTS

- I study the dynamic relation between school entry age and maternal labor supply.
- Married mothers' labor supply increases by 16–17% if her 5 year old is in school.
- Further results point towards long run intertemporal substitution in labor supply.
- Rough calculations yield an uncompensated wage elasticity of 0.37.
- The intertemporal elasticity of substitution is derived to be 0.73.

ARTICLE INFO

ABSTRACT

Using exogenous variation in maternal net earning opportunities, generated through school entrance age of children, I study intertemporal labor supply behavior among married mothers. Employing data from the 1980 US Census and the NLSY, I estimate the effect of a one year delay in school attendance on long run maternal labor supply. IV estimates imply that having a 5 year old enrolled in school increases labor supply for married women. Further, using a sample of 7 to 10 year olds from the NLSY, I investigate persistence in employment outcomes for a married mother whose child delayed school entry. Results point towards long run intertemporal substitution in labor supply. Rough calculations yield an uncompensated wage elasticity of 0.37 and an intertemporal elasticity of substitution equal to 0.73.

1. Introduction

The intertemporal labor supply hypothesis states that leisure is easily substitutable across periods. Hence, small and temporary movements in the perceived real wage induce individuals to allocate their time such that periods of high labor supply coincide with periods of high transitory wages. The standard measure of this effect is the intertemporal elasticity of substitution which is predicted to be positive.

The main issue in the empirical analysis of the intertemporal labor supply elasticities is the endogeneity of intertemporal wage changes since labor supply today depends on past and expected future wages.

In this paper, I use exogenous variation in maternal net earning opportunities, generated through school entrance age of children, to study intertemporal labor supply among married women. Changes in maternal labor supply, over time, are determined by the process of substitution between market and household work associated with raising children. In the absence of informal child care, most parents have to incur child care costs in order to be able to work. One of the main sources of child care subsidies is the availability of schools. Delaying entry to school may impose an additional year of child care for the mother and consequently a year less in the labor market. The main aim of this paper is to measure the extent to which mothers respond to this additional year of child care costs by substituting future work for current work. The identification strategy relies on comparing labor supply responses over time for married women whose 5 year olds were enrolled in kindergarten and those whose children delayed kindergarten enrollment to age 6.

Uncovering the causal relation between age at enrollment and maternal labor supply is problematic because unobserved characteristics

of parents and children are correlated with school entrance age. To deal with the endogeneity of school entrance age, I use an instrumental variable (IV) strategy. Regulations regarding kindergarten entrance age vary throughout the United States and children born just before the state cut-off are almost a year younger, when they enter kindergarten, relative to children born after the cut-off. I exploit this exogenous variation in child month of birth and state kindergarten entrance age laws to instrument for actual age at enrollment.

Using data from the 1980 US Census, I find that married women increase their labor supply by up to 17% if their five year old is enrolled in school. Further, using a sample of 7 to 10 years old children from the NLSY, I find evidence of intertemporal substitution in labor supply. In particular, the labor supplied by a mother whose child went to school at age 5 is lower than that of a mother whose child delayed entry to age 6. This decrease can be attributed to a pure wealth effect. Rough calculations yield an uncompensated labor supply elasticity of 0.37, an intertemporal elasticity of substitution of 0.73 and a wealth elasticity of −0.36.

The structural interpretation of the empirical results requires the key identification assumption that school starting age of the child affects maternal labor supply only through wages. I perform a simple test to check the validity of this assumption. Children born in the first two quarters are never constrained by law in any state and hence their mothers receive the implicit wage subsidy at the same point in time, i.e. in the year the child turns 5. I show that for these children, age at entry has no effect on maternal labor supply.

The remainder of the paper is organized as follows. Section 2 discusses the theoretical relation between school entrance age and maternal labor supply in a life-cycle setting. In Section 3, I address identification issues and the empirical model. Section 4 describes the data and presents summary statistics. The main findings and results are shown in Section 5. This section also explores some alternative interpretations of the results. Finally, I conclude in Section 6.

2. School entrance age and intertemporal maternal labor supply: theoretical background

A key concern in estimating labor supply elasticities is that it is difficult to find temporary and exogenous movements in real wages that can identify effects on labor supply. Most studies treat wages as exogenous or use age and education related variables as instruments for life cycle wage changes (Altonji, 1986). However, these instruments may fail to satisfy the exclusion restriction as they are most likely correlated to changes in tastes. Moreover, Mroz (1987) shows that the resulting labor supply elasticities are often sensitive to the choice of instruments.

Several studies estimate intertemporal labor supply by exploiting certain life cycle events or policy changes that generate exogenous and anticipated wage changes. Mulligan (1999) uses the termination of Aid to Families with Dependent Children (AFDC) as a life cycle event that causes an anticipated wage shock to study labor supplied over time. However, Looney and Singhal (2004) argue that the estimates obtained in this study can be explained by mean reversion rather than intertemporal substitution. Several studies have used differences-in-differences estimates to measure the effect of tax reforms on labor supply of married women (For example, Eissa, 1995; Eissa and Liebman, 1996; Blundell et al., 1998; Bosch and Van der Klaauw, 2012). Most of these studies assume that an individuals' labor supply responds to the income of his or her spouse as it would respond to unearned income. Gelber (2014) shows that this simplification produces income effects that are wrong-signed and the estimated elasticities are biased.

Unlike earlier studies, I abstract from wage considerations and directly infer the intertemporal substitution effect from the relation between wages and labor supply. A child care subsidy in the form of free or subsidized schooling increases a mother's effective wage at the employment margin. However, there is substantial variation in the age at which children start school. I exploit this variation to study intertemporal labor

supply behavior among married mothers.[1] In addition, the empirical strategy allows me to isolate substitution effects from wealth effects. Before explaining the empirical strategy, it is worthwhile to understand how school entrance age affects maternal labor supply within a multiperiod context.

Gelbach (1999) shows that for mothers who would otherwise have not worked, free public school enrollment provides a 100% price subsidy for child care at the margin. This increases her effective wage at the employment margin increasing the price of leisure relative to the price of consumption and makes her substitute towards work and away from leisure. For women who choose to work more hours than the length of the school day, school enrollment is like an income transfer equal to the number of hours spent in school times the hourly price of child care. Therefore, the budget set has a kink at the point that represents the length of the school day. Women located at the kink receive both a price and an income subsidy.[2]

Not all women receive this subsidy at the same time. In the United States, laws require a child to be five by the state cut-off date to be eligible to attend kindergarten in the beginning of the academic year, usually, in September. As a consequence, children born just before the state cut-off are almost a year younger, when they enter kindergarten, relative to children born after the cut-off. For example in California, where the cut-off was December 2nd in 2000, the youngest child in a class (born on December 1st) would be allowed to enter kindergarten in September when he is just four years and nine months old compared to the oldest child who would be a year older. This difference in chronological age between the youngest and the oldest kindergartner also generates variation in the time period at which mothers receive the child care subsidy.

Fig. 1 illustrates the wage profiles of two mothers who are identical in observable characteristics but differ in the age at which their 5 year old starts school. To simplify the analysis, the figure is drawn assuming that a mother increases the intensity of labor force attachment when her child becomes eligible to start school. Thus the labor supply response corresponds to hours of work.

The 'constrained' woman refers to the mother whose child begins kindergarten at age 6 while the 'unconstrained' refers to a mother who sends her child to school at age 5. Assuming no loss of human capital accumulation, the life cycle wage profiles of the two women are identical except at time period t that corresponds to age 5 for the child. At time t, the unconstrained mother receives a child care subsidy in the form of free or subsidized schooling that increases her effective wage causing her wage profile to shift upwards (the curve ABCD). The constrained mother receives this subsidy in period $t + 1$ corresponding to the year the child turns 6, and her wage profile shifts up by the same amount (the curve AEFD). Given the wage profiles of the two women, how would their labor supply differ over the life cycle assuming an environment of perfect certainty?

To study life-cycle labor supply, I assume that mothers are forward-looking and plan out their lifetime labor supply, given expected lifetime economic environment. Consider the following log-linear approximation of the conventional intertemporal labor supply function:

$$\ln h_{it} = A_t + \sigma \ln w_{it} + \delta \ln(\lambda_{it}). \tag{1}$$

The equation shows the relation between optimal hours (h), wages (w) and marginal utility of wealth (λ) for mother i, where $i = c$