Maternal labor supply effect of lowering school entry age: the Case of Korea

1. Introduction

One of the major challenges in South Korea is women's low labor force participation. Similar to the western world, women's participation increased dramatically in the second half of the 20th century despite the Confucian culture that maintained strict 'separate spheres'. The lack of female work force participation is associated with other features of the labor market. First, the gender wage gap is the highest rate among all OECD countries, much greater than the OECD average. Second, women's labor force participation across ages follows an age-specific pattern; the prevalent work interruptions illustrate how difficult it is for women to combine work and family responsibilities. Third, deeply rooted labor market dualism often places female workers as outsiders of the labor market. Despite the rise in the level of education, many women are hired as non-regular workers and thus excluded from the benefits of the internal labor market (i.e. higher wages, social protection, and job security).

Recently, the South Korean government has begun to pay attention on building strategies to increase women's labor force participation, especially by bringing homemakers back into the workforce. One policy that has been proposed is lowering the school enrollment age. The government's rationale are threefold: 1) Public education serves dual purpose by providing children with valuable skills and childcare for parents. Therefore, mothers who have more time at hand would return to the workforce. 2) It will reduce the costs of education parents spend in kindergarten[1] and private tutoring. 3) The combined effects will help to increase the fertility rate.

The purpose of this paper is to examine whether lowering school entering age by one year can increase mother's labor supply. If women are sequencing motherhood and working, then relieving the mothering responsibilities by sending kids to school earlier may result in increased labor supply. I exploit a unique feature of the existing school entry law, which allows for adopting a regression discontinuity design to estimate the causal effect on mothers' labor supply. The study will have policy implications on whether the proposed legislation has an effect on maternal employment – whether lowering the school entry age by one year would affect working mothers' labor supply. In addition, the paper will shed light on who might respond to the legislation.

2. Theoretical framework

Economic theories on married women's employment are centered on two key concepts. The first is a woman's opportunity cost of her time and effort, which in competitive labor market will be equal to the market wage given her level of education, experience, and skills. The second component is a woman's unearned income, which refers to husband's earnings and family assets. Increase in this type of income exerts income effect on women's work; the rise in her husband's earnings can depress her market work.

Combining the two components together, the woman will make a decision to whether not to enter the labor force. The theory predicts that the higher the opportunity cost of staying home, the

[1] Kindergarten is not free in South Korea and is often expensive.

more likely the woman will work outside the home. Economists later made some adjustment to the theory of women's labor supply by adding quality of childcare to women's utility function. This implies that women's decision to work hinges on the cost of childcare along with their opportunity costs. Sending kids to school one year early saves costs on childcare since school basically serves as a free day care, so mothers would increase labor supply.

However, the economic theory of labor supply does not address contextual barriers of re-entry at all. Sociologists have criticized economists for overlooking contextual constraints. While economists claim that in a perfectly competitive market, difference in wages reflect individual differences in human capital, sociologist argue that: 1) the labor market is far from perfectively competitive; 2) there exists important differences on the demand side and wages are not completely explained by individual workers' characteristics. They place much of the emphasis is placed on the structural constraints.

The labor market in Korea is highly segmented. Having such a highly segmented market means that it is difficult to crossover between the primary and secondary labor markets. Such dualism also implies that firm- or primary market-specific skills are highly rewarded than occupation-specific skills and once workers leave the firm or primary market for a long time to raise children for example, it becomes hard to re-enter since they lose their investment in firm-specific skills as soon as they leave. In contrast, workers who remain in the same firm are disproportionately rewarded. Career interruption is not a preferred profile by employers in the primary market, so women can only expect to enter the secondary sector. Moreover, the dominance of family-owned conglomerates has led to the diffusion of highly formalized workplace culture especially in the primary market, which gives little schedule flexibility for working mothers. Therefore, the theories predict that mothers who return to workplace as their children start school are more likely to work as irregular workers.

3. Research design

a) Current school entry law and RDD

Using the South Korean Census data[2][3], I plan to use a regression discontinuity design taking advantage of the current school entry law. In South Korea, an academic year starts in March. Children who are born from March through December are of age 8 at the time of entry, whereas those who are born in either January or February start public education at age 7. In terms of age in months, children enter school when they are from 73 (born in February in year t+1) to 84 (born in March in year t) months old.

This school entry law, established in 1955, lends itself to a sharp regression discontinuity design. The treatment in this case is a child entering school. A child who is of 63-72 months would enter elementary school one year later than a child who is 73-74 months old although they are both 7 in a

[2] The data is similar to 1% Public Use Microdata Sample and is collected every 5 years.

[3] There are two ways I could organize the data from Census: single cross-section and panel. With the first data structure, statistical power may be a challenge if there are not enough observations around the threshold birth month. If this were the case, I would pool cross sections from different years to ensure that the sample size is enough. And I would include year fixed effect in the regressions to account for year effects on women's labor supply attributable to their child's school entry.

given year, so children who barely missed or received the treatment can be viewed as the control and treatment group, respectively.

For example, a child born in February 2001 entered school in March 2007 and another child born in March 2001 started public education in March 2008. This generates an exogenous cutoff that determines selection into the treatment; the assignments are not random, but an investigator fully observes the measure of underlying assignment (i.e. selection on observables). And there is a discontinuity in the level of treatment around the threshold. A child's birth month and the school entry law have been determined independently of each other; in general, parents' timing of birth does not depend on the entry law and parents cannot control the assignment process in the neighborhood of the threshold – parents cannot manipulate time to change their children's age.

b) Empirical model

Formally, the regression discontinuity framework can be written as:

$T_i = 1\{\text{Age of the youngest child} \geq 73 \text{ months}\}$
$\text{Labor supply}_i = b_0 + b_1 * T_i + b_{2*}(\text{A vector of covariates}) + E_i$

Ti is the treatment and b1 is the average treatment effect of sending a 7 year old to school on maternal labor supply. This estimate may be causal.

c) Variables

Outcome variables

- Labor supply measures in the given year: Number of weeks worked in the year her child entered school, hours worked per week, a binary indicator whether the person is in labor force, type of work contract (regular, part-time, self-employed)

Treatment: whether the child actually entered the school

Assignment variable: Birth year and month of the mother's youngest child

Covariates: In a sharp R-D, covariates are not needed to identify the causal effect of the treatment. But I need them to conduct placebo tests and including covariates can improve precision.

- Skills and education: Schooling (years), college graduate, numbers of years in the labor market since graduating from secondary schooling
- Income and household assets: income if worked before, spousal income, household asset, husband's level of education, welfare receipts, husband in the labor force
- Other information: age, region of residence (provinces and Special Cities), age of other children, costs on child's private education

d) Procedures

Once the data is collected for analysis, here are the steps I would take:

1. Graph the data since graphical presentation provides useful information at the outset. Graph the child's age (months) against the outcome variables, covariates, and the density of the observations. Whereas I would like to see a jump in the outcome around the cutoff age, in the second graph should not covariates should not show discontinuity. In the first graph, if I don't see a jump in the measures of maternal labor supply, this probably means that the size of treatment effect is zero or very small. In the second graph, if I see discontinuities in the covariates, this means there might be selection bias and covariates are not balanced across birth months; internal validity is compromised. I can also test for the balance by conducting t-tests on mean differences between the treatment and control group. The third graph tests whether there has been manipulation in the assignment process, which is not plausible since it is unlikely that parents changed birth records to avoid being assigned to either the treatment or control.

2. Choose a bandwidth (in days or months) around the school entering age. Graphically, one wants a bin width that is narrow enough so that the jump at the threshold is visible, but that is also wide enough so that noise does not overpower its signal – a wider bin width can include a larger set of observations, thereby increasing statistical precision. There are also formal tests to choose optimal bandwidths; the idea is that if a bandwidth were too wide, then choosing a smaller bin size would provide a better fit to the data (F-test). The goal is to find the widest bandwidth that does not over-fit the data.

3. Run linear regressions (regular OLS, polynomial or non-parametric) with and without covariates. Adding covariates should not affect the point estimate very much and serves as a robustness check.

4. Check for robustness using various values of the bandwidth. If my results depend only a particular bandwidth, they are less credible. I can also employ various specification checks to formally test for discontinuities discussed in the first step.