Universal Preschool and Mothers' Employment

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Abstract

I provide empirical evidence of mothers' responsiveness to changes in compulsory education laws that target young children in a developing country setting. I use the case of Mexico where universal preschool was implemented through a phased-in scheme from 2004 to 2008. A subsequent increase in preschool enrollment was observed and I hypothesize that higher preschool enrollment positively impacted mothers' employment. Through a difference-in-difference analysis, I exploit geographic variation across time in preschool enrollment. I compare the labor outcomes of mothers of preschool-age children to outcomes of mothers of younger children, mothers of older children and non-mothers. Individual level data come from the Mexican Income and Expenditure Household Survey and aggregate data come from the Mexican Ministry of Education. Results indicate that higher preschool enrollment significantly increased the employment of mothers of 3– and 4–year old children. In adjusted models where treatment is subject to a child's actual preschool enrollment, effects remained positive and statistically significant. When predicted (instead of observed) enrollment by state and year is used, estimates were consistent in sign and larger in magnitude. Effects on weekly hours worked of women already working were mixed, but mostly negative.

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I Introduction

For women with young children, labor participation and child care are jointly determined (Berlinski and Galiani 2007). During 2002 a change in the Mexican law included preschool as part of compulsory education. The constitutional change stated, "No child would be able to enroll in primary school without having 3 years of preschool education." The policy's goal was to improve children's cognitive development outcomes by exposing them to more years of education. Prior to the policy change, preschool education was optional and available at private and public institutions, but enrollment rates were low. [1] After this policy change, significant increases in preschool enrollment were observed. The effect of this policy change on preschool enrollment remains unexplored. Under the assumption that the policy had a positive impact on preschool enrollment, I hypothesize that sharp increases in preschool enrollment also positively impacted the employment of women with preschool age children. In Mexico, 58% of working women in Mexico have at least one child. Thus, a policy change that affects a child's enrollment represents an ideal opportunity to test mothers' responsiveness in the labor market. This study contributes to the growing empirical literature on child care and maternal employment.

First, I estimate the effect of the policy on a child's probability of preschool enrollment. I found a progressively significant increase in predicted preschool enrollment each year after the education laws changed. Then, I estimate the effect of increased preschool enrollment on maternal employment measured as the probability of employment and weekly hours worked. I found significant and positive effects on the probability of employment of mothers of preschoolers of 3- and 4- years of age in comparison to mothers of younger and older children, and to non-mothers. Effects varied depending on the comparison group. Effects on weekly hours worked of mothers who were already working were negative for both mothers of 3- and 4-year olds. Although the effect of preschool enrollment on the employment of mothers of 5-year old preschoolers was also positive and significant after adjustments in the specification of the treatment were made, an additional policy change

[1] Average rates of preschool enrollment at the national level were as low as 15% for the first grade of preschool (usually for children of three years of age).

that affected this group of mothers complicates the analysis. For this reason, the case of mothers of 5-year old preschoolers is analyzed separately in the appendix. This paper is organized as follows: section II presents the main findings of previous literature; section III provides an overview of the policy changes in Mexico; section IV outlines data and methods; section V describes results; limitations are found in section VI; section VII has a discussion of results and section VIII concludes.

II Prior Research

In countries in Latin America with low female labor force participation, the expansion of preschool education serves a dual goal: improve a child's cognitive development and incentivize mothers' employment. The main rationale is that expanding preschool education provides an implicit child care subsidy and thus could potentially improve child outcomes while providing positive work incentives to mothers (Blau and Currie 2006; Berlinski, Galiani, and Ewan 2011). Moreover, public preschools provide a price subsidy for childcare on the employment margin, encouraging mothers to enter paid work (Cascio, 2009). For mothers who would otherwise work more hours than in the school day, the price subsidy for childcare is inframarginal. The effect of public school eligibility on labor supply is therefore neither a price elasticity nor an income elasticity of employment, but rather a combination of the two (Gelbach, 2002).

There is a large body of literature that has explored the effects of child care and prekindergarten subsidies, changes in preschool laws, and increases in the supply of schools on maternal employment (Barua 2014; Bauernschuster and Schlotter 2015; Berlinski and Galiani 2007; Berlinski, Galiani, and Ewan 2011; Blau and Tekin 2007; Brewer et al. 2014; Cascio 2009; Fitzpatrick 2010; Fitzpatrick 2012; Gelbach 2002). The care available is targeted at children of different ages, and the countries and periods of study differ in terms of average female labor market participation and alternative childcare provision (Brewer et al., 2014). In some developed countries reforms that increased the availability or affordability of public child care has shown positive effects but in other

countries there are only effects on children's enrollment but zero effects on maternal employment (Bauernschuster and Schlotter, 2015). Thus, evidence in this topic is inconclusive.

Positive Effects on Mothers' Employment

There is extensive research that has found positive evidence that childcare subsidies increases maternal employment in developed countries. Schlosser (2011) found that in Israel, a gradual implementation of compulsory pre-kindergarten laws for children 3 and 4 years old in Arab towns increased maternal employment. The observed effect was larger among more educated mothers. Using children's quarter of birth as an instrument, Gelbach (2002) found that in the United States (U.S.), access to a child care subsidy in 1980 increased the employment probability of single and married mothers whose youngest child was 5 years old by 6-24%. In similar a fashion, Cascio (2009) found that in the U.S. an increase in kindergarten funding in 1960s and 1970s increased employment of single mothers with 5-year olds with no younger children by 12%. Barua (2014) used school entrance age cut-offs of children [2] as an exogenous variation to study the changes in the intertemporal labor supply of married women. Using US Census data and National Longitudinal Survey of Youth (NLSY), this study tested the effect of a one year delay in school attendance on long run maternal labor supply. Results suggested that for married women having a 5 year old enrolled in school increased labor supply, measured in hours and weeks worked by 16% to 17%.

Baker, Gruber, and Milligan (2008) studied the effect of subsidized childcare for children under 5 years old in Quebec, Canada. Their results showed a positive effect of this subsidy on maternal employment for married mothers in the magnitude of 8 percentage points (pp). Lefebvre and Merrigan (2008) also found an increase in hours and weeks worked in the Canadian case. In the United Kingdom Brewer et al. (2014) used geographical variation in the roll-out of free places implied by an expansion of a free entitlement, [3] which increased the proportion of children in England who could access free part-time

[2] Most states in 1979 had fourth quarter of birth entry cutoffs, fourteen states had September cutoffs while five states had January first cutoffs. In states with fourth quarter of birth entry cutoffs, children were allowed to enter kindergarten before their fifth birthday.

[3] In 1997, the UK government announced a policy of universal, free, part-time early education for all

early education by around 50 pp between 2000 and 2008. This study found positive effects on the employment of mothers whose youngest child was 3 years old of around 3 pp. Nollenberger and Rodriguez Planas (2011) exploited the timing and age-targeting of a child-care expansion in Spain. [4] Authors showed that this policy led to a significant increase in employment (8%), and hours worked (9%) of mothers with age-eligible children (3-year-olds), and that effects remained over the long term.

In Argentina, Berlinski and Galiani (2007) explored the effect of increasing the supply of preschools on female employment. Through a difference-in-difference analysis, these researchers found that this policy did have a statistically significant effect on mothers' employment between 7 to 14 pp. Also in Argentina, Berlinski, Galiani, and Ewan (2011) tried a different specification of the instrument (quarter of birth) and found that mothers were 19.1 pp more likely to work for more than 20 hours a week (i.e., more time than their children spend in school. This study also found that mothers worked, on average, 7.8 more hours per week when their youngest child attended preschool. No effects were found on maternal labor outcomes when the youngest in the household attended preschool. More recently, Bauernschuster and Schlotter (2015) analyzed the introduction of a legal claim to a place in kindergarten in Germany, based on cut offs determined by a child's day of birth. Using individual level data and a difference-in-difference methodology this study found that a marked increase in kindergarten attendance of three-year olds had positive effects on maternal employment. This study found that a 10 pp increase in public child care attendance rates increased mothers' employment by 3.7 pp.

Null Effects on Mothers' Employment

In Norway, Havnes and Mogstad (2011) found that a staged expansion of subsidized child care had a large correlation but a small causal effect on maternal employment. Using quarter of birth as an instrument to replicate the setting of Gelbach (2002) [5]

3 and 4 year olds in England, which became effective for 4 year olds from 2001 and for 3 year olds from 2005.

[4]The policy provided subsidized child care for all 3-year olds. Prior to this reform, universal preschool had only been offered to children 4- and 5-years old and the available child care for 3-year-old children was mainly informal or provided privately.

[5]The rules imply children born in April are generally eligible for public kindergarten when they are five while children born in December generally have to wait until the following year.

Fitzpatrick (2012) took advantage of the enrollment rules and timing of birth. This study found null effects on the employment of single mothers and positive effects on the employment of married mothers. Lastly, subsidies for universal preschool in Georgia (1993) and Oklahoma (1998), in the U.S. resulted in an increase in enrollment but had no effect on maternal labor supply (Fitzpatrick, 2010). The main hypothesis behind these findings were that recent cohorts of women had changed their preferences and female labor supply were less responsive than it had used to be some decades ago (Blau and Kahn 2007; Heim 2007). Blau and Kahn (2007) found that in the 1990s, women's own elasticity decreased in 50-56%, while their cross-wage elasticity fell by 38-47%. This theory predicts that only those women that work less than the number of hours of care provided by the programs would indeed increase their labor supply (Fitzpatrick, 2010). In summary, differences in results across countries and settings reflect the initial level of female labor supply, lifecycle event patterns, and the childcare policy environment (Fitzpatrick, 2012). Using a state year-variation I provide empirical evidence of a mother's responsiveness to changes in compulsory education laws of young children in developing countries, focusing in the case of Mexico.

III Policy Change and Preschool Enrollment

On November 2002, the Mexican government modified the compulsory education laws to include the completion of preschool education. Prior to the policy change, the "basic" compulsory education laws in Mexico included six years of primary education and three years of middle school. The new legislation phased in universal preschool across the whole country. The first phase, required all 5 year-olds to be enroll in the 3rd grade of preschool by the academic year 2004-2005. Subsequently, during the second phase, the compulsory law reached the 4 and 5 year olds eligible for the second and third grades of preschool by the academic year 2004-2005. The third phase mandated all eligible children to enroll in the first and all the consecutive grades of preschool by academic year 2008-2009. The policy change was approved at the Federal level but the responsibility of implementation

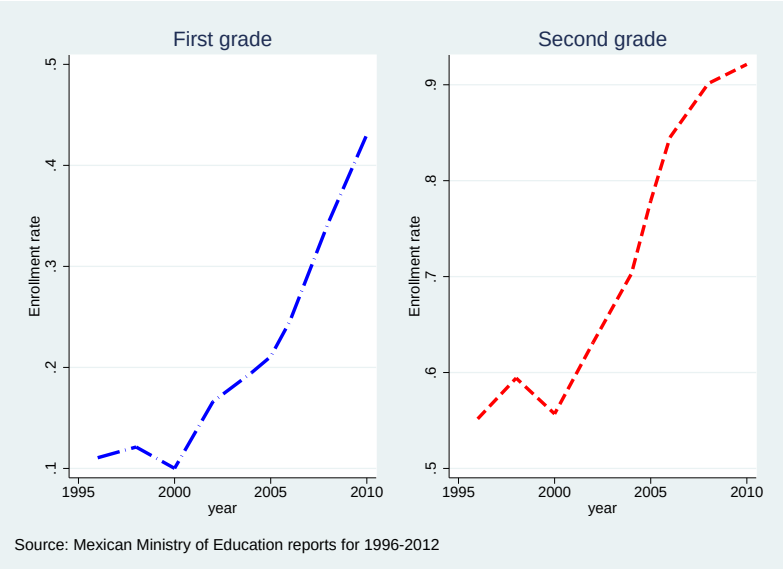
was deemed a local task. The timing of implementation varied considerably across states and over years.

The year the reform was passed (2002), national enrollment rates were, on average, 19%, 61% and 81% for the first, second and third grades of preschool, respectively. After the initial year of the reform, gradual changes occurred between 2004 and 2008, but not all the parents were able or willing to enroll their children in preschool. Given the low levels of preschool enrollment prior to the reform, by 2008, it was evident that the roll out was not successful (see Figure 1 in the appendix), thus the government relaxed the policy and required children to have at least one year of preschool in order to enroll in elementary school.

In 2006 another policy change that affected preschool enrollment of older children took place. Starting academic year 2006-2007, the minimum entry age for first grade of elementary school changed from 6 years old by September (when the academic year starts) to 6 years old by December of the corresponding academic year. This change would allow 5-year old children to be enrolled in the first year of primary school four months prior to their 6th birthday. This complicates the analysis of the employment outcomes of mothers of 5-year old preschoolers, because after 2006, a 5-year old child could either be enrolled in preschool or in primary school. For this reason, the impact of universal preschool on the employment of mothers of 5-year olds was analyzed separately from the outcomes of mothers with 3- and 4-year olds.

As shown in Figure 6 in the Appendix, there was wide state variation in preschool enrollment in Mexico and I exploit this geographic variation across time to identify the causal effect of universal preschool on maternal labor supply. From the figure below it is noticeable that the trend of preschool enrollment per grade spiked for the first and second graders in the 2000s. These differences are further discussed in the following sections.

Figure 1: Observed Preschool Enrollment Rates by Year and Grade



IV Data and Methods

Data

Cross section data come from the *Mexican Income and Expenditure Household Survey* (ENIGH). This survey provides a rich set of labor market indicators and information on socioeconomic and demographic characteristics, and it is representative of the urban and rural population. These data has been collected since 1984, although information on marital status has only been included since 1996. This database also includes information on individual school enrollment for all the people of 6 years of age or older for all survey years. However, individual information of preschool enrollment (for children younger than 6 years of age) has only been collected after 2004. Thus, I can only include observations from 2004-2012 in the estimation of the probability of preschool enrollment. In order to ensure comparability across the different models, I also restricted my sample to include observations from 2004 to 2012 in the estimation of female labor force participation.

In addition, I appended a file with enrollment rates by year, state, and age of the children using yearly reports from the Ministry of Education for the corresponding years. I also added data on ruling party at the state level collected by the Research Center for Development (CIDAC) that is publicly available.

Empirical Strategy

In order to test the effect of the policy change on preschool enrollment, I calculated the probability of enrollment for each of the three grades of preschool. To contrast the effect of the two policies that affected mothers of 5-year old children after 2006, I also calculated the probability of enrollment in the first grade of primary school for 5-year old children. The probabilistic models have the following functional form:

$$P_{ijt} = \alpha_0 + \alpha_1 X_{ijt} + \beta_{1-4} Year_t + \lambda_j + \delta_a + \epsilon_{ijta} \tag{1}$$

$$E_{ijt} = \alpha_0 + \alpha_1 X_{ijt} + \beta_{1-4} Year_t + \lambda_j + \epsilon_{ijt} \tag{2}$$

Where i indexes the individuals; j indexes state of residence in Mexico (1-32), a indexes child's age, and t indexes year. In model (1), the probability of preschool enrollment (P_{ijt}) is calculated for children 3 - 6 years of age. This model includes age-of-the-child fixed effects. In model (2), the probability of primary school enrollment (E_{ijt}) is calculated only for 5-year old children. Both models include controls for number of male working adults in the house (as a proxy for level of wealth), number of elderly (proxy for family caregivers), and state fixed effects. In these models, I include five year dummies from 2005-2012 (2005 being the omitted category) to show the impact of the policy change on the probability of enrollment. After the estimation of this model, I calculate the average predicted probability in preschool enrollment per year and grade to show the effect of the policy on individual enrollment. As Bertrand, Duflo, and Mullainathan (2004) have noted, conventional standard errors often understate the standard deviation of the estimators. Thus, errors in these two models were clustered at the state level.

Once I establish that the universal preschool policy had a significant effect on preschool enrollment, I estimate the effect of changes in preschool enrollment on maternal employment through a difference-in-difference (DD) model that takes advantage of the continuous state-year variation in preschool enrollment. The specification of the probabilistic

model (or ordinary least square model) was the following:

$$L_{ijt} = \alpha_0 + \alpha_1 X_{ijt} + \alpha_2 Z_{jt} + \beta_1 ENROL_{jt} + \beta_2 TREAT_i$$
$$+\beta_3 ENROL * TREAT_{ijt} + \nu_j + \lambda_t + \delta_m + \epsilon_{ijtm} \quad (3)$$

Where L_{ijt} represents a dichotomous variable of employment status or weekly hours worked (above 0) for the i-th woman, in j state (1-32), in period t (2005-2012). The enrollment rate$_{jt}$ is a continuous variable that takes advantage of the state-year variation in the rate of enrollment for each of the distinct preschool grades. First, the enrollment rates of all preschool grades are analyzed together then separately. Coefficient β_1 captures the effect of changes of aggregate preschool enrollment by year and state on maternal employment.

Mothers with a preschool age child were potential beneficiaries of changes in preschool enrollment. Thus, the treatment variable indicates that a woman of 20-40 years of age had a child of preschool age (3-5 years of age). The "treatment" status was based solely on the age of the child, and thus these should be considered intend-to-treat estimates (ITT). Since there is no random assignment of the treatment, there is no perfect comparison group. In light of this, three comparison groups of women of a fertile age (20-40 years old) are included. C1: women with *younger* children (0-2 years of age), C2: women with *older* children (7-9 years of age) and C3: women with *no children*. The threshold for comparison group two was chosen such that these mothers had similar employment outcomes and characteristics to mothers of preschoolers, to achieve better comparability. Mothers of 6 year old children were not included in this group because there was a non-negligible overlap of 6 year olds enrolled in preschool.

In this analysis, the difference-in-difference estimate was given by β_3 and this represents the coefficient of interest. I hypothesize that in absence of universal preschool and the consequent sharp increase in preschool enrollment, the employment trajectories of mothers of preschoolers would have been the same as those of mothers of children of different ages (and those of non-mothers). Since I use the age of the child to determine

the treatment status and not actual preschool enrollment, β_3 represents ITT estimates. Thus, β_3 captures the effect of an increased preschool enrollment on maternal employment for potential beneficiaries (mothers of preschoolers) when compared to women that should have not been affected from increases in preschool enrollment in states where preschool enrollment increased sharply. Traditional DD analyses usually use a dummy of pre- post-policy to test the effect of a policy change. In this analysis, I used enrollment rate, which is a continuous variable and captures more subtle changes of the policy across years.

The vector Z_{ijt} includes controls for *education* (less-than-primary education, primary education and some secondary education, and complete secondary education and beyond), *marital status* (married or cohabitating, single and divorced, separated or widowed), *region* (urban and rural), *family status* (i.e. whether the woman is head of the household), *number of women, number of men*, and *number of additional workers in the household*.

During the legislative discussion of the change in compulsory education laws, there were party differences in budget allocation and disbursement. To control for these differences I include dummy variables for each of the three ruling parties across states in Mexico (*Partido de la Revolucion Institucional*-PRI, *Partido Accion Nacional* -PAN and *Partido de la Revolucion Democratica* -PRD). In order to account for pre- and post-trends in state preschool investment I also added a variable for when the state and federal party coincided.

This model includes a state fixed-effect u_j that remove fixed differences in maternal employment across states, a year fixed-effect λ_t that absorbs variation for common shocks to maternal employment, an age-of-the-mother fixed effect δ_m that controls heterogeneity of labor decisions across different ages, and ϵ_{ijtm} is an individual error assumed to be distributed independently across states and independently from u_j, δ_m and λ_t.

In order to estimate the treatment-on-the-treated (TOT) effects of the policy change, I use a different specification of the treatment. The model used to measure the TOT is analogous to model (3), which estimates the ITT, but differs in that the treatment is not subject to a child's age, but it is subject to a child's actual preschool enrollment.

Model (4) has the following functional form with the same control specifications and fixed effects.

$$L_{ijt} = \alpha_0 + \alpha_1 X_{ijt} + \alpha_2 Z_{jt} + \gamma_1 ENROL_{jt} + \gamma_2 TREAT_i + \gamma_3 ENROL * TREAT_{ijt} + \nu_j + \lambda_t + \delta_m + \epsilon_{ijtm} \quad (4)$$

In this case, γ_3 is the coefficient of interest and provides the TOT effect of preschool enrollment on maternal employment. In model (4) I allow the age of the child to vary because there is a certain degree of age variation in each grade of preschool. Ages range from 3 to 7 years of age in 99.8% of the cases, thus this is the range that I use for the analysis. In the case of the comparison group, I only change the age threshold of the comparison group of mothers with older children in order to avoid an overlap, thus mothers of older children only include children of 8 and 9 years of age. The period also includes years 2005-2012.

V Results

Descriptive characteristics of women among 20-40 years of age of treatment and comparison groups are found in Table 1. Average labor force participation rate (LFPR) of mothers of preschool-age children was 44%. Both mothers of older children and non-mothers had higher LFPRs at 51% and 62%, respectively. Mothers of younger children had a lower LFPR at 35%. The age composition of mothers of preschoolers was very different from the three comparison groups, among the former 16% were 20-25 years old, and 22% were 36-40 years old.

Women with younger children and non-mothers were in comparison younger, 31-32% were 25 years old or younger and 13-14% were 36 years of age or older. It is interesting to note that women of older children represented a significantly older cohort, 42% were 36 years of age or older and only 4% were in the youngest age group. The composition of marital status was similar among mothers. In general 3-4% of all mothers were single, 88-94% was married, and 3-8% were divorced or widowed. The composition differed greatly

Table 1: Descriptive characteristics of women 20-40 years of age for the period 1996 to 2012

Mothers grouped by child's age	Child 3-5	Child 0-2	Child 7-9	No child
Labor force participation rate	0.444	0.349	0.514	0.624
Age groups 20-25	0.167	0.306	0.043	0.322
26-30	0.310	0.327	0.176	0.227
31-35	0.300	0.233	0.366	0.155
36-40	0.223	0.134	0.415	0.142
Marital status				
Single	0.036	0.028	0.043	0.377
Married	0.907	0.940	0.882	0.548
Divorced/separated/widowed	0.057	0.032	0.076	0.076
Education				
Less than primary school	0.170	0.177	0.160	0.119
Primary / some secondary	0.246	0.247	0.246	0.167
Secondary school and +	0.584	0.576	0.594	0.714
Number of children				
One	0.218	0.215	0.164	n/a
Two	0.348	0.336	0.399	n/a
Three or +	0.434	0.448	0.437	n/a
Household composition				
Head of household	0.124	0.087	0.155	0.207
Additional workers	1.552	1.492	1.963	1.423
Number of women	2.350	2.409	2.400	1.755
Number of men	2.260	2.323	2.244	1.038
Urban residence	0.775	0.748	0.761	0.857
Observations	21.5	25.9	6.1	13.3

Note: 1. Data come from ENIGH for the years 1996-2012 2. Observations are weighted and expressed in millions.

for non-mothers, whom in general presented a significantly lower marriage rate (55%) and as a complement a much higher percentage of non-married women (45%). Education levels between mothers of preschoolers and mothers of young children were very similar: 17% had less-than primary education, 24% had primary or some secondary education 58% had a secondary diploma and beyond. Women with older children were slightly less educated than other mothers, but showed a similar education distribution. Women with no children had the highest level of education level; 71% had secondary diploma or greater. Among mothers, the majority (54- 57%) had one or two children. There were a lower percentage of women with young and preschool children who were the head of the household (9-12%). For mothers of older children and childless women these percentages were 16% and 21%, respectively.

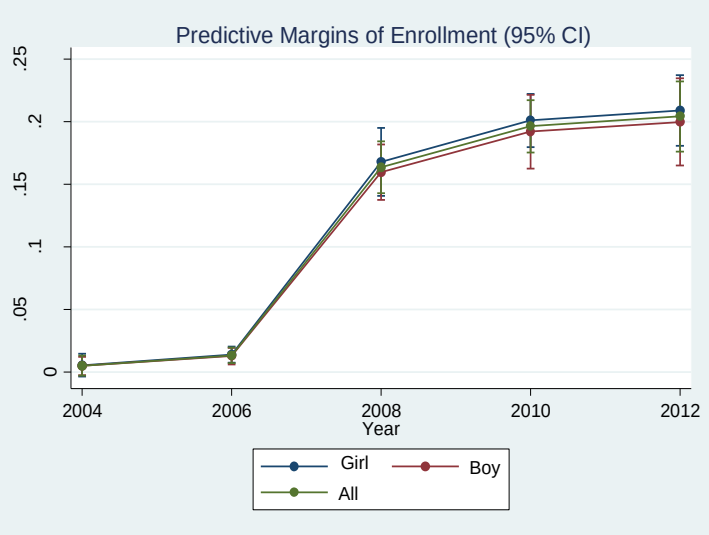
Lastly, the distribution of party ruling at the state level was the following: 28% for

PAN, 15% for PRD and 57% for PRI. In the period analyzed there was a party transition. From 1996 to 2000 PRI ruled the country, and from 2000 to 2012 the PAN ruled. On average, in 32% of the states the federal and state parties coincided at some point.

Effect on Preschool Enrollment

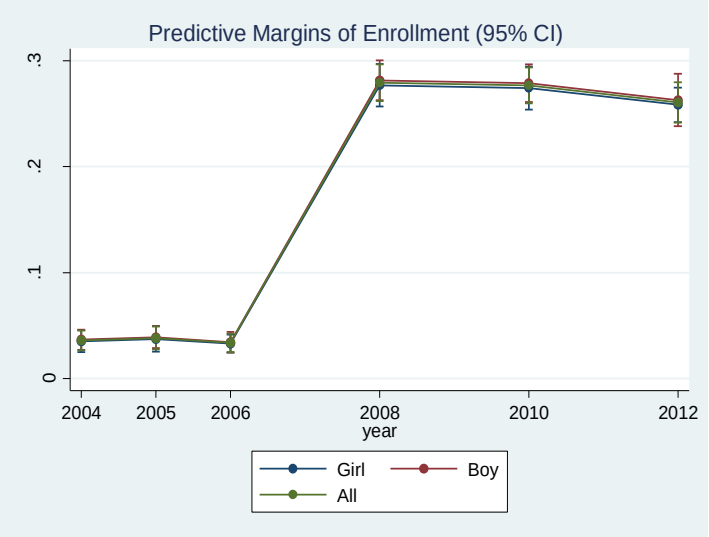
Results from model 1 indicate that preschool reform had a significant effect on increasing a child's probability of enrollment on the first and second levels of preschool after 2006. After calculating the probit models for all preschool years, I estimate the changes in the marginal probabilities of enrollment. Table 7 in the appendix shows these marginal probabilities. In figures 2 and 3 below I plotted the marginal probabilities by children's gender. Results show that, in 2008, a child's probability of being enrolled in the first year of preschool increased by 16 pp compared to the previous year and this probability increased by 19 pp in 2010 and 2012. The probability of preschool enrollment for second graders increased around 22 to 24 pp across 2008-2012. No statistically significant changes in preschool enrollment were observed between years 2006 and 2004 for either first or second levels of preschool.

Figure 2: Predicted Enrollment in 1st Year of Preschool



The case for children in the third year of preschool (usually 5-year olds) showed a different trajectory (see figure 4). The probability of being enrolled in the third year of preschool increased 3 pp in 2008, and 4 pp in 2010, and in 2012 this probability decreased

Figure 3: Predicted Enrollment in 2nd Year of Preschool



roughly 3 pp. As previously discussed, in 2006 the minimum entry age for primary school was modified to allow 5-year children to be enrolled in primary school four months prior to their 6th birthday. This effect is reflected on model 2 that shows the probability of a 5-year old to be enrolled in primary school. This probability increased gradually over the years (see figure 5). The probability of a 5-year-old to be enrolled in elementary school increased 5 pp in 2006, 9 pp in 2008, 10 pp in 2010, and 11 pp in 2012. These contrasting results for 5-year olds show that when a mother of a 5-year old was presented with the alternative of enrolling her child in either primary school or preschool, on average, mothers chose to enroll their child in primary school. The implication of these results on the employment outcomes of mothers of 5-year olds and preschoolers on the third grade of preschool is further discussed in the appendix.

Figure 4: Predicted Enrollment in 3rd Year of Preschool

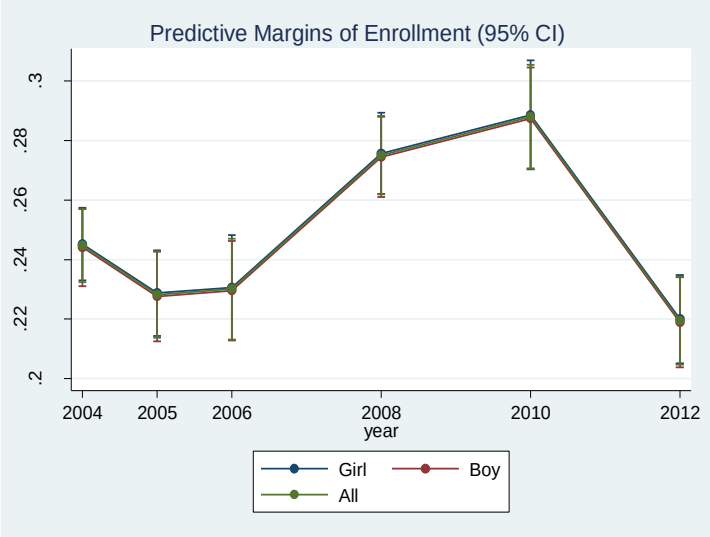
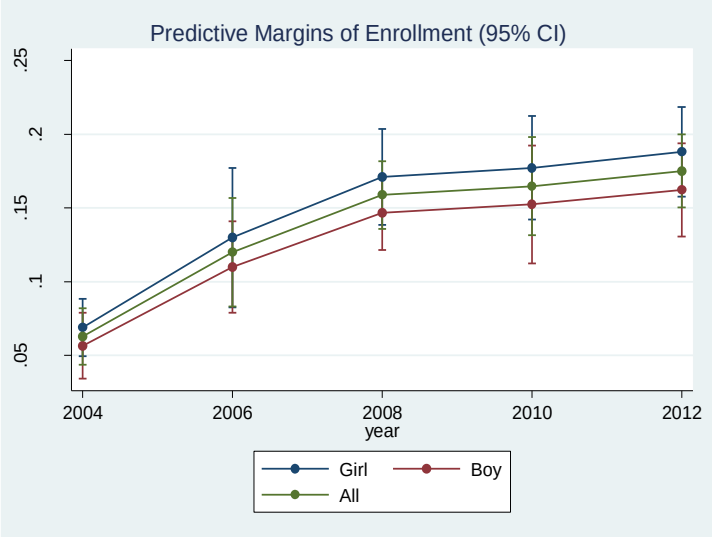


Figure 5: Predicted Enrollment in 1st Year of Elementary School for 5-year olds



ITT Estimates of Preschool Enrollment on Maternal Employment

Table 2 shows the results of model (3) that includes preschool enrollment for the three preschool grades combined and additionally shows results for mothers of 3- and 4-year olds. As previously described, only observations from 2004-2012 were included. Analyses including prior years were run separately and results remain consistent. When all potential beneficiaries of the policy were combined, the effect was not indistinguishable from zero, except when mothers of preschool-age children were compared to mothers of younger children. These results could portray the significant weight of mothers of 5-year

old preschoolers whom were influenced by an additional change in minimum entry age to elementary school in addition to universal preschool.

When model (3) is disaggregated by preschool level, the effects of a rise in preschool enrollment after the policy change,[6] were positive and significant for mothers of 3- and 4-year olds. DD results suggest that higher preschool enrollment causally increased the probability that a mother with a preschool-aged child was employed by 8 to 16 pp, in comparison to mothers of younger children. For mothers of 3-year olds, higher preschool enrollment increased a mother's probability of employment by 6.5 to 8 pp when compared to mothers of older or younger children, respectively. The analogous effect for mothers of 4-year olds was higher in comparison, and ranged from 14 to 19 pp. Since DD estimates assume a one-unit change in both t_i and $enrollment\ rate_{jt}$ this means that estimates are measured per 100 pp increase. Thus, I divide coefficients by 10 to get them expressed in a more conservative 10 pp increase in enrollment. Assuming linearity, this means that a 10 pp increase in preschool enrollment of three and four year olds increased the employment of mothers whose youngest child is three or four years of age by 0.8 to 1.9 pp.

Table 2: Marginal probability of mothers' employment (ITT estimates)

	(1)	(2)	(3)
	Younger child	**Older child**	**No child**
ITT estimate (mother of a 3-, 4- or 5-year old)	0.1591+	0.0981	0.2096
	(0.089)	(0.124)	(0.135)
ITT estimate (mother of a 3-year old)	0.0797***	0.0648***	0.1787***
	(0.001)	(0.001)	(0.001)
ITT estimate (mother of a 4-year old)	0.1855***	0. 1360***	0. 1505***
	(0.001)	(0.001)	(0.001)
State fixed effects	yes	yes	yes
Year fixed effects	yes	yes	yes
Age-of-the-mother fixed effects	yes	yes	yes
N1	89,588	52,040	166,794
N2	20,875	12,823	39,312
N3	20,320	12,268	38,757

Note: 1. Household composition, education, marital status, family status, and political environment controls are included. 2. Robust standard errors in parentheses. 3. Significance levels: ***p<0.001, **p<0.01, *p<0.05, +p<0.10. 4. Sample is restricted to years 2004-2012 to assure comparability with TOT estimates. 5. Sample sizes correspond to models that include as a treatment group mothers with children of 3-, 4-, and 5-year olds (N1), a treatment group that included mothers of 3-year olds (N2) and a treatment group that included mothers of 4-year olds (N3).

[6]Between the years 2004 and 2012, preschool enrollment increased 24 pp for the first level and 35 pp for the second level.

TOT Estimates of Preschool Enrollment on Maternal Employment

Under the second specification of the treatment that measures the effect of takers of the policy, and using individual preschool enrollment, effects were statistically significant for the pooled group of all-age preschoolers (see Table 3). Effects were stronger across all comparison groups for mothers of first grade preschoolers. In the case of second grade preschoolers, effects were consistently smaller in magnitude but the effect remained positive and statistically significant. The TOT estimate ranged from 12 to 26 pp for mothers of first grade preschoolers and for second grade preschoolers the effects ranged from 3 to 11 pp. This suggests that for mothers whose youngest child was enrolled in the first or second level of preschool, a 10 pp increase in preschool attendance increased their employment by 0.3 to 2.6 pp.

Table 3: Marginal probability of mothers' employment (TOT estimates)

	(1)	(2)	(3)
	Younger child	**Older child**	**No child**
TOT estimate (all preschool grades)	0. 0132***	0.0045*	0.2078***
	(0.001)	(0.001)	(0.002)
TOT estimate (child enrolled in first-year)	0.1223***	0.1219***	0.2629***
	(0.002)	(0.002)	(0.002)
TOT estimate (child enrolled in second-year)	0.0455***	0.0289***	0.1056***
	(0.002)	(0.002)	(0.002)
State fixed effects	yes	yes	yes
Year fixed effects	yes	yes	yes
Age-of-the-mother fixed effects	yes	yes	yes
N1	88,720	88,720	88,720
N2	16,884	6,312	8,391
N3	17,839	7,716	9,795

Note: 1. Household composition, education, marital status, family status, and political environment controls are included. 2. Robust standard errors in parentheses. 3. Significance levels: ***p<0.001, **p<0.01, *p<0.05, +p<0.10. 4. Sample is restricted to years 2004-2012 to assure comparability with TOT estimates. 5. Sample sizes correspond to models that include as a treatment group mothers with children of 3-, 4-, and 5-year olds (N1), a treatment group that included mothers of 3-year olds (N2) and a treatment group that included mothers of 4-year olds (N3).

Instrumental Variable-Type Model

A mother's decision to enroll her child in preschool could be endogenous. Mothers could decide to enroll their children in preschool based on employment preferences. In order to address the possible effect of endogeneity in a mother's decision to enroll her child in preschool, I used the results from predicted preschool enrollment (model 1) per

state and year *in lieu* of the observed enrollment rate per grade. I then estimated the effect of predicted enrollment on the employment of mothers who had a preschool-age child. These models also included state, year, and age-of-the-mother fixed effects. Across all comparison groups, the effect of predicted preschool enrollment on the employment of mothers of 3- and 4-year olds was positive and significant (see Table 4). For mothers of 3-year olds, these estimates were significantly higher than ITT or TOT estimates that used the observed enrollment rate. For mothers of 4-year olds the estimates that used predicted enrollment are on average smaller than ITT or TOT estimates that used the observed enrollment rate. These results reinforce the hypothesis that sharper increases in preschool enrollment affected positively the employment of mothers. This evidence suggests that a 10 pp rise in preschool attendance after the policy change increased the employment of mothers whose youngest child was 3 years of age by 1.2 to 4.3 pp. The effect of a 10 pp increase in enrollment was a rise of 0.1 to 1.3 pp on mothers of 4-year olds.

Table 4: Marginal probability of mothers' employment using *predicted* enrollment by state and year

	(1)	(2)	(3)
	Younger child	**Older child**	**No child**
Estimate for mothers of child of 3-years of age	0.3068 ***	0.1239***	0.4276***
	(0.001)	(0.002)	(0.002)
Estimate for mothers of child of 4-years of age	0.0126***	0.0104***	0.1276***
	(0.001)	(0.001)	(0.001)
State fixed effects	yes	yes	yes
Year fixed effects	yes	yes	yes
Age-of-the-mother fixed effects	yes	yes	yes
N1	14,339	6,197	19,761
N2	16,977	7,211	24,260

Note: 1. Household composition, education, marital status, family status, and political environment controls are included. 2. Robust standard errors in parentheses. 3. Significance levels: ***p<0.001, **p<0.01, *p<0.05, +p<0.10. 4. Sample is restricted to years 2004-2012 to assure comparability with TOT estimates. 5. Sample sizes correspond to models that include as a treatment group mothers with children of 3-, 4-, and 5-year olds (N1), a treatment group that included mothers of 3-year olds (N2) and a treatment group that included mothers of 4-year olds (N3).

Preschool Enrollment and Hours worked

Previous literature has shown that universal preschool or school subsidies tend to have an effect on hours worked only of women working part-time. In the case of Mexico, results from Table 5 on hours worked are mixed but mostly negative, depending on the

comparison group. In the case of full-time workers, the negative impact is larger than the impact on part-time workers. These results suggest that women working less than the length of a preschool day were less affected by work-related incentives in comparison to women working longer hours who might have already had daycare/school arrangements. There is evidence of a growing perception that the early life period for child development is important and investments at this early stage could reflect short and medium-term gains. Thus, decreases in working hours might reflect mothers' preference for early childhood investments that lead them to switch their children from informal arrangements to formal child care spaces.

Table 5: Intent to treat estimates of predicted preschool enrollment on weekly hours worked

	(1) **Younger child**	(2) **Older child**	(3) **No child**
Estimate for mothers of child of 3-years of age	-10.31***	-5.952***	-13.44***
	(0.107)	(0.160)	(0.0993)
Estimate for mothers of child of 4-years of age	-4.054***	2.195***	-15.57***
	(0.0558)	(0.0784)	(0.0620)
State fixed effects	yes	Yes	yes
Year fixed effects	yes	Yes	yes
Age-of-the-mother fixed effects	yes	Yes	yes

Note: 1. Household composition, education, marital status, family status, and political environment controls are included. 2. Robust standard errors in parentheses. 3. Significance levels: ***p<0.001, **p<0.01, *p<0.05, +p<0.10. 4. Sample is restricted to years 2004-2012 to assure comparability with TOT estimates. 5. Sample sizes correspond to models that include as a treatment group mothers with children of 3-, 4-, and 5-year olds (N1), a treatment group that included mothers of 3-year olds (N2) and a treatment group that included mothers of 4-year olds (N3).

VI Limitations

One important limitation of this study is the lack of data availability. There are no available datasets on the construction/supply of preschools by state and year. The publicly available data is for existing elementary schools at the national level or disaggregated data for a couple of states. Had these data been available at the state-year level, this analysis would have been included the constructions of schools as an instrument to more precisely measure the effect of universal preschool on maternal employment. Another data limitation was found in the information of individual preschool enrollment that was

only available from 2005 and after. A richer data set with this information unfortunately did not exist. Thus, to the best of my ability I constructed variables on individual enrollment only for the 2005-2012 periods.

VII Discussion

Preschool enrollment increased sharply after compulsory education laws changed in Mexico. At the same time, minimum entry age for elementary school was modified and mothers of 5-year old children were able to enroll their children in elementary school prior to their 6th birthday. Both laws positively affected enrollment of young children, and consequently had a positive effect on a mother's probability of being employed. A geographical variation in the roll-out of free preschool places, which increased preschool enrollment by around 25 to 35 pp between 2004 and 2012, led to a rise in the employment rate of mothers whose youngest child is 3 years old of around 8 pp and an increase of 19 pp in the employment of mothers of 4 year olds. The effect of a higher preschool enrollment on a mother's probability of work was also positive and significant when mothers of 3- and 4-year olds were compared to mothers of older children and non-mothers. Those effects ranged from 6 to 18 pp increases in employment, depending on the comparison group. When the specification of the treatment depended on a child's actual preschool enrollment (and not on the age of the child) the effect of an increased preschool enrollment became stronger for women of children enrolled in the first year of preschool and remained statistically and substantially significant for women with children enrolled in second year of preschool. However, because of possible endogeneity in the decision of sending a child to preschool, these estimates might be biased. To control for that possible bias, I use predicted enrollment by state and year, instead of the observed enrollment rate. These estimates were consistent for both mothers of 3- and 4-year olds. Following these last set of results, on average, a 10 pp increase in preschool enrollment led to an increase of 1.2 to 4.3 pp in mothers' employment with a 4-year old. In order to interpret these findings in a manner that clarifies their magnitude I use the size of the labor force in Mexico.

The number of female employees in 2004 was roughly 15 million, each percentage point increase in employment is equivalent to 15 thousand additional female employees. Under these assumptions, changes in the employment of mothers of 4-year olds were equivalent to about 180,000 to 646,522 more mothers at work. In the case of mothers of a 3-year old, changes were smaller at around 0.1 to 1.2 pp, equivalent to about 15,000 to 180,000 more mothers at work. Taken as a proportion of the labor force population, these changes were economically significant.

Overall, results suggest that on average mothers of a child enrolled in preschool ("takers") had a higher probability of being employed in comparison to mothers of a preschool-aged child (potential beneficiaries of universal preschool).These differences in effects of "takers" v. potential beneficiaries were consistent across all the comparison groups for mothers of first grade preschoolers and larger than the equivalent difference for mothers of second grade preschoolers. One possible explanation is that once mothers enrolled their children in the first year of preschool, they were more likely to keep their child in school, thus having a more steady employment path and less job interruptions. Since the preschool provision required that, to be enrolled in primary school, a child needed a minimum of one year of preschool, 3-, 4- and 5-year olds could be enrolled in only one year of preschool. However, the older the child grew without being enrolled in preschool, the lower the probability that the mother could return to the labor market. Longer absences from the labor market also imply larger losses of job experience. Another plausible explanation is that 4-year olds might already be in other form of child care (i.e. private childcare or some type of family care). If this is the case, mothers of those children should have been less responsive to changes in compulsory education laws. However, these differences in results might also be explained by the potential endogeneity in the decision to enroll a child in preschool. For this reason more conservative results that follow an ITT strategy using predicted enrollment should be the most reliable.

Results were mixed in the case of weekly hours worked, with small positive effects of around 1 hour/week to a decreases of around 7 hours/week, depending on the comparison group. This evidence could suggest that mothers who were already working decided had

strong preferences for early childhood education and switched their children from informal arrangements to formal child care spaces which offered shorter hours.

VIII Policy Implications

High-quality formal childcare tends to improve outcomes for children, and it constitutes a policy equalizer when it targets children from low socioeconomic backgrounds Blanden et al. (2014). Government support for childcare is thought to have a dual goal by both promoting children's development and encouraging maternal employment. In Mexico, time and monetary constraints have restricted mothers' potential to invest in human capital to fully develop professional long-lasting careers or to simply incorporate into the labor market. Over the past decades several policies have improved mother's incentives for work, and women have responded positively to those incentives. As a consequence, the labor force participation of Mexican women overall has increased sharply over the past years. As established in this study, a positive contributor to this trend in employment was the sharp increase in preschool enrollment derived from universal preschool. The changes in preschool enrollment may have had positive effects also on wages, household income, income mobility, and child well-being among other outcomes. These changes remain unexplored and represent an area of opportunity for an extension of this work.

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A Appendix

Analysis for mothers of 3rd year preschoolers / 5-year old children

As previously outlined, in 2006 a second law change that affected mothers of 5-year old children occurred. The minimum entry age for first grade elementary school was lowered so that some 5-year olds could be enrolled four months earlier. In order to control for this change, model (3) was modified to include the number of 5 and 6 year olds enrolled in the first grade of elementary school. Once this control was included, the DD estimate of an increase in preschool enrollment on mothers' employment was negative when mothers of 5-year olds were compared to mothers of younger and older children (see table 6 below). The effect of a sharper preschool enrollment was only positive when mothers of 5-year olds were compared to non-mothers. These effects could reflect the choices of mothers that preferred to enroll their 5-year old children in elementary school rather than in preschool.

The TOT estimates showed that a sharp increase in preschool enrollment had no effect on a mother of a 5-year old enrolled in preschool, when compared to mothers of younger children. However, when mothers of enrolled 5-year olds were compared to mothers of older children and to non-mothers the effect of preschool enrollment was positive and significant. Preschool enrollment increased the employment of mothers of enrolled 5-year olds in 3 to 8pp.

Table 6: Marginal probability of employment of mothers of 5 year olds/ 3rd grade preschoolers

	(1)	(2)	(3)
	Younger child	**Older child**	**No child**
ITT estimate (unadjusted)	-0.0275***	-0.1606***	-0.1806***
	(0.002)	(0.002)	(0.002)
ITT estimate (adjusted)	-0.0295***	-0.0385***	0.0434***
	(0.002)	(0.002)	(0.002)
TOT estimate	-0.0002	0.0265***	0.0834***
	(0.002)	(0.002)	(0.002)
State, age of mother, and year fixed effects	yes	yes	yes
N1	24,618	14,379	45,773
N2	19,665	11,613	10,723
N3	19,557	10,197	12,276

Notes: 1. Adjustment included for 5-6 year olds enrolled in primary school. 2. Robust standard errors in parentheses. 3. Significance levels: ***p<0.001, **p<0.01, *p<0.05, +p<0.10. 4. Household composition, education and political environment controls are included. 5. Sample sizes correspond to models that unadjusted models (N1), adjusted models (N2) and TOT model (N3).

Figure 6: State Variation on Average Preschool Enrollment for Academic Year 2008-2009

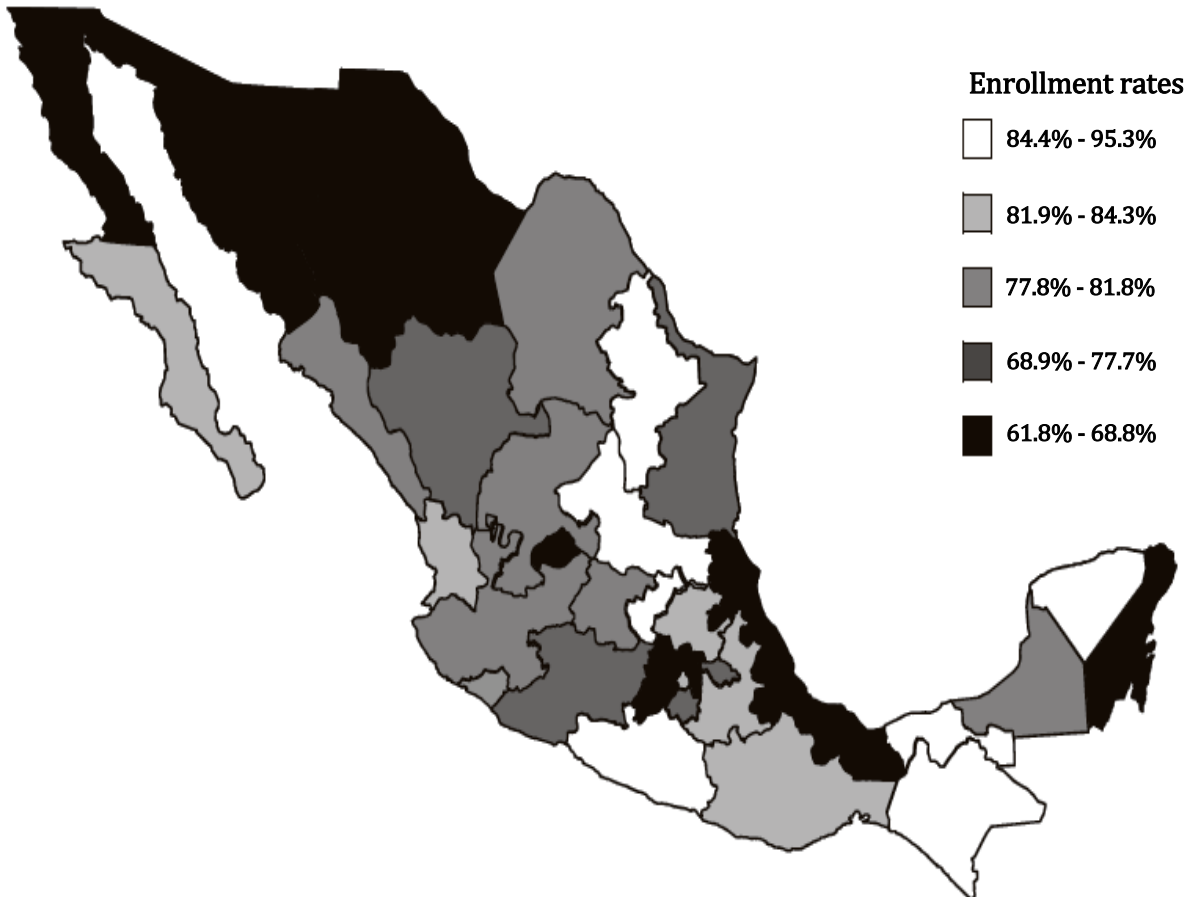

Table 7: Average marginal effect on preschool enrollment and first grade elementary enrollment

	Preschool			Elementary school
	(1)	(2)	(3)	(4)
Year	**First grade**	**Second grade**	**Third grade**	**First grade (only 5-year-olds)**
2006	0.0081	-0.0023	-0.0146	0.0572*
	(0.0063)	(0.0067)	(0.0118)	(0.0248)
2008	0.1587***	0.2430***	0.0304**	0.0961***
	(0.0091)	(0.0119)	(0.0113)	(0.0184)
2010	0.1913***	0.2404***	0.0433***	0.1021***
	(0.0136)	(0.0121)	(0.0122)	(0.0161)
2012	0.1992***	0.2245***	-0.0252*	0.1124***
	(0.0173)	(0.0131)	(0.0126)	(0.0191)
N	17,962	24,168	27,841	6,608

Note: 1. Data includes years 2005-2012 (where there is available information on individual enrollment for children of 5 years of age and younger) 2. Robust standard errors clustered at the state level. 3. Significance levels: ***p<0.001, **p<0.01, *p<0.05, +p<0.10. 4. Models 1-3 include children of 3-6 of age; model 4 includes only 5-year olds. 5. Controls include child's gender, urban residence, presence of elderly in the household and number of working adults within the household.