Reexamining State Pre-K Programs: Enrollment and Mothers' Labor Supply

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Abstract

Funding for public Pre-K, i.e. schooling for 4-year-old children, has increased in many states over the last decade including the introduction of universal voluntary half-day Pre-K in three states. Leveraging large samples from annual American Communities Survey (ACS) data shows that increased enrollment in state Pre-K has led to small increases in school attendance among Pre-K aged children, with changes most apparent for children with married parents. However, Universal Pre-K legislation appears to have caused a decrease in labor hours among married mothers contrary to claims that such programs help mothers return to work. These changes cannot be explained by state-level economic changes as decreases in labor hours are only found for mothers with children aged 4-5, and only during the school year. Although labor supply decreases may be due to income effects for some women, some mothers may also reduce hours to better manage caring for and transporting their children in the presence of free but half-day schooling.

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1 Introduction

Increased financial support for public preschool (Pre-K) has been championed by many, including President Obama who stated during his 2013 State of the Union Address, "I propose working with states to make high-quality preschool available to every single child in America."[1] Although text of the three most recent Universal Pre-K (UPK) initiatives indicate that the primary focus of public schooling for 4-year-olds is increased kindergarten readiness, some also argue that it allows poor mothers to return to work. For example, The Center for American Progress argues "these programs provide important benefits to working parents, especially working mothers ... often left to choose between the lesser of two evils: low-quality care or forgoing needed pay to stay at home and care for a child themselves."[2,3] This paper provides evidence that although recent half day UPK programs are associated with small increases in school attendance, they appear to have decreased the labor supply of mothers with eligible children.

The NIEER defines preschool (Pre-K) as programs for pre-kindergarten age children with primary focus of child (not parent) education, with group learning experience for children two or more days per week, and not primarily designed to serve children with disabilities (NIEER, 2003). Public Pre-K exists in all but ten states,[4] but eligibility and hours differ greatly from state to state. This paper will examine the effect of changes in Pre-K availability on child school attendance and mothers' labor force outcomes, with focus on recent Pre-K expansion in Iowa, Florida, and Vermont. Each of these states has increased Pre-K enrollment by more than 50% of state 4-year-olds since 2002 and offers primarily half-day schooling (about 3 hours per day). Although previous research has focused on full day Pre-K programs, these

[1] https://www.whitehouse.gov/the-press-office/2013/02/12/remarks-president-state-union-address

[2] www.americanprogress.org/issues/education/report/2013/05/08/62519/the-importance-of-preschool-and-child-care-for-working-mothers

[3] Many shared similar sentiments in regards to recent Pre-K expansion efforts in NYC. For instance, Congresswoman Yvette Clarke stated, "These programs will assist parents who want to work but had been unable to afford the high cost of child care" http://www1.nyc.gov/office-of-the-mayor/news/174-15/pre-k-all-22-000-families-apply-pre-k-first-day#/0

[4] HI, ID, IN, MS, MT, ND, NH, SD, UT, and WY

programs are only available in 2 of the 8 states enrolling at least 50% of state 4-year-olds[5] and only 2 of the 8 states that have increased enrollment by at least 25% of state 4-year-olds since 2002.[6] Some states have expanded by gradually adding classrooms at the town and district level, but seven have grown through statewide UPK initiatives guaranteeing funding for all Pre-K aged children.[7] These UPK initiatives cause a sudden surge in school enrollment by eligible children with little change in the school attendance of other children or work behavior of their parents. Variation caused by the introduction of UPK in Florida, Iowa, and Vermont will be used to investigate the effects of Pre-K enrollment in this paper.

Unsurprisingly, I find that UPK initiatives appear associated with increases in school attendance by eligible children. However, there appears to be no effect on school attendance for children of unmarried mothers. This result may be explained by their eligibility for pre-existing income-based programs (like Head Start and targeted state Pre-K programs). I also find that mothers' work hours decrease with the adoption of UPK. Married mothers work about one hour less per week on average after states introduce UPK initiatives. This reduction in hours appears mostly due to decreases in full and near-full time employment. No similar changes are witnessed for mothers with children that are not of Pre-K age, and effects are much stronger during the school year (not summer months) which suggests that observed changes in mother's work hours cannot be attributed to regional or state-level economics changes.

Decreases in mothers' labor supply with Pre-K entitlement can be explained by a static labor supply model, introducing fixed costs for both labor force entry and the purchase of a uniform childcare commodity. To use childcare services mothers must find suitable childcare, evaluate its quality, and then arrange daily transportation. After receiving half day Pre-K, high wage mothers find it optimal to arrange half-day childcare to supplement half-day Pre-K and continue working full time. Women with lower wages, however, may reduce their work

[5]Full day Pre-K being 6 hours or more. Pre-k in Georgia is uniformly full-day while Oklahoma offers a mixture of full-day and half-day by district.

[6]AR and LA

[7]FL, GA, IA, NY, OK, VT, and WV

to occur only during Pre-K hours to avoid arranging and paying for supplementary childcare. Accordingly some mothers may decrease work hours after introduction of universal half day pre-k. Examination of data from the Survey of Income and Program Participation (SIPP) Childcare Supplement confirms that women are more likely to care for their own children after Pre-K enlargement, and are less likely to use other forms of childcare. This suggests that the observed reduction in labor hours may be due to incentive for some women to care for children themselves rather than find supplementary childcare after the introduction of universal half day pre-k.

2 Related Literature

There is substantial research on the effects of early childhood education. Two of the most studied interventions include the Carolina Abecedarian Project and the Perry Preschool Project, based on evidence using randomized controlled trials. The Perry Preschool program, taking place in Michigan in the 1960s, has been linked to a myriad of long term benefits including increased educational attainment as well as earnings, and decreases in welfare receipt and criminal activity. Heckman (2011) suggests that the long run rate of return for preschool investment may be as high as 10%. Conversely, the 1972 Abecedarian participants have higher educational attainment but show no changes in either income or criminal activity (Campbell, 2012). More recent programs allow for analysis of larger-scale interventions. For instance, Currie's survey (2001) finds Head Start participants better prepared for later schooling, leading to less special education and grade repetition. Deming (2009) finds that Head Start also increases the adult educational outcomes. Research on UPK, more specifically, has shown that it may increase kindergarten readiness, especially for children of disadvantaged backgrounds (e.g. Gormley et al 2005, Wong et al 2008). Fitzpatrick (2008), however, suggests that these effects do not persist; Georgia's UPK program improved 4th grade test scores only for disadvantaged youths in rural areas, while other populations saw

no long term improvements after gaining public Pre-K eligibility.

Other work investigates the effects of school expansion for young children on mothers' labor supply. Gelbach (2002) show that female labor supply increased after the introduction of state kindergarten programs, with mothers increasing labor supply by at least 6%. Cascio (2009) finds that single mothers are 6.9% more likely to work after the introduction of public Kindergarten. Subsidized Pre-k in Quebec was found to significantly increase mothers' labor supply by around 8% (Lefebvre and Merrigan 2005, Baker et. al 2009). Similarly, Bauernschustera and Schlotterd (2015) show that German public childcare is associated with higher mothers' labor supply. Other papers have examined such topics as the political economy of state Pre-K expansion (Kahn and Barron 2015) and childcare market implications of state Pre-K (Bassok et al. 2014).

The two papers most related to what follows are Fitzpatrick (2010) and Sall (2014), both examining specifically the effects of public Pre-K on mothers' labor supply. Most importantly, the expansions studied in Fitzpatrick and Sall have included mostly states / counties offering full day pre-k. The labor force effects of Pre-K expansion may differ greatly for half-day programs due to childcare fixed costs, as explained in the next section. Both papers also examine the results from Pre-K expansion at an earlier time period and the effects of more recent Pre-K expansion efforts may differ for many reasons. For instance, changes in alternative childcare options, women's labor force behavior, and other cultural changes may cause the effects of modern Pre-K expansions to differ from what was found in the earlier reforms analyzed by Fitzpatrick and Sall. This paper also investigates the effect of Pre-K programs using alternate estimation technique.

Fitzpatrick (2010) uses regression discontinuity (RD) methods to show that although UPK eligibility increases preschool enrollment by about 14% in Georgia and Oklahoma, there is little effect on female labor supply. Fitzpatrick (2010) relies on RD methods for identification which, despite intuitive appeal, may provide biased results. Children are eligible for Pre-K only if they are 4-years old before their states' cutoff date, typically a day

in August or September. Although some children eligible for Pre-K each year are born 1 week (or less) earlier than others which are not yet eligible, sufficient sample size requires comparisons across a much wider window. Fitzpatrick (2010) expands the treatment group to those born up to 100 days before eligible date, and compares them to those born up to 100 days too late - effectively using a sort of birth quartile instrument. Recent work (Buckles and Hungerman, 2013) shows that quarter-of-birth are likely related to mothers' labor outcomes. Children born in winter months are more likely to have mothers that are teenagers, unmarried, and have not received a high school diploma. Although these differences may be mitigated via differencing by state, these birth quartile effects may vary between states.

Sall (2014) showed state Pre-K programs associated with large increases in mothers' labor supply using difference-in-difference by county. Sall measures Pre-K expansion via percentage of schools offering Pre-K (rather than actual Pre-K enrollment or eligibility). Although number of schools offering Pre-K within a county may be correlated with attendance this introduces measurement error. Endogeneity of Pre-K may also be troublesome in Sall (2014) because county Pre-K funding is likely influenced by local economic conditions (with more prosperous towns likely to introduce Pre-K classrooms). I address this by focusing on the effect of statewide UPK reforms that are explicitly educational in focus.

3 Static Labor Supply With Pre-K and Fixed Costs

Consider the following model demonstrating two possible effects of free Pre-K given labor supply with childcare with fixed costs. Start with a standard static labor supply model (e.g. Pencavel 1986). I add fixed costs to labor force entry, for which empirical support abounds starting with Cogan (1981); these fixed costs are due to necessary non-marginal costs of work including job search, transit, negotiation, training, etc. Unlike Cogan's work, I also add a fixed cost of childcare due to obstacles such as childcare search and transit. The existence of childcare fixed costs is consistent with higher estimated labor fixed costs for women with

children. I will also assume decreasing marginal cost of childcare, because childcare cost surveys suggest that hourly costs of childcare decrease in weekly hours.[8]

Assume mothers have 16 awake hours to allocate every day to leisure (L), or childcare (E), or work (H) at wage W_i. To allow nonzero work hours, mothers must purchase D hours of childcare from the market for $f(D)$ and/or partake in free Pre-K (K) if available. Mothers' then maximize utility

$$U(C, L) = \frac{C^{1-\gamma} L^{1-\delta}}{(1-\gamma)(1-\delta)} \tag{1}$$

s.t.

$$C + f(D) < R + W * H - a_1 * I(H > 0) \tag{2}$$

$$E + H + L = 16 \tag{3}$$

$$E + D + K = 8 \tag{4}$$

where C is consumption, a_1 is fixed cost of work due to transportation etc., δ and γ determine elasticity of consumption versus leisure, and (2)-(4) are income, hours, and childcare constraint respectively.

Maximization yields first order conditions: $W = f'(D)$, and $W = C/L = MU_L/MU_C$. Although transfers with high cash value may cause changes in work hours via income effects, I will assume no significant changes in the marginal utility of consumption versus leisure with state Pre-K eligibility. This is due to both the low average value of state Pre-K entitlement, as well as the lack of income effects found in full day Pre-K programs which are far more generous. Note, however, that $W_i * H - a_1 > f(D)$ is a necessary condition for work. To make clear distinctions between not working, part time employment, and full time employment assume that after realizing individual wages mothers can choose to work either 0, 4, or 8 hours daily i.e. $H \in \{0, 4, 8\}$. Also, for simplicity, assume f(D) is typified by a fixed cost (a_2) and decreasing hourly costs in 2 tiers: D_H per hour for the first 4 hours, and D_L for

[8]For example see New York State OCFS (2014) pages 14-24.

each additional hour (see Figure 2). Then, women will work 8 hours (and not 4) only if $W_i * 8 - f(8) > W_i * 4 - f(4)$ without Pre-K entitlement and $W_i * 8 - f(4) > W_i * 4$ with Pre-K entitlement. This functional form is chosen for algebraic convenience, and only a fixed cost of childcare is required for some women to reduce hour with Pre-K entitlement and decreasing marginal cost of childcare increases the range of wage rates affected.

The possible effect of 4 hours free daily Pre-K can then be summarized by wages in 4 intervals (see Figure (3) and Figure (4)). Women earning a wage high enough (W_H) will rationally choose to work full time with or without state pre-k.[9] Similarly, women with a relatively low wage (W_L) will choose zero work hours even with Pre-K entitlement.[10] Women with wages in between, however, may exhibit one of two distinct changes. Women with moderately low wages (W_{ML}) will not enter the workforce in absence of free Pre-K but will work part time during Pre-K hours.[11] Similarly, women with moderately high wages (W_{MH}) will choose to work with or without Pre-K entitlement, but will rationally switch to part time employment facing Pre-K to avoid the fixed costs of obtaining and arranging childcare after Pre-K hours.[12]

In short, the addition of half day Pre-K may have differing effects across 4 intervals. Sufficiently high or low wage women will be unaffected, while women of moderate wages may either decrease or increase hours. Some women may enter the workforce during Pre-K hours, while others may reduce hours to avoid arranging additional childcare after Pre-K hours.

4 Data and Institutional Context

Analysis of child school attendance will primarily focus on data from the American Communities Survey (ACS). The ACS represents an annual cross sections of the entire United

[9] W_H are wages such that $W_i * 4 - a_1 > f(4)$.
[10] W_L are wages such that $W_i < a_1/4$.
[11] W_{ML} are wages that satisfy $a_1/4 < W_i < (f(8) - a_1)/8$.
[12] W_{MH} are wages that satisfy $(f(8) - a_1)/8 < W_i < (f(4) - a_1)/4$.

States with 1% sampled from every state and has both format and questions similar to the decennial census.[13] Focus will be on children aged 9 or younger and their mothers for the period of 2002-2013.[14] Total sample includes 3,105,400 children aged 0-9 years and 629,882 aged 4-5 years.[15] For summary statistics on children school attendance see Tables (1). Note that school attendance among 4-5 year olds is 4.7% higher in UPK states. School attendance is also 3.3% higher among 3 year olds. No differences are found for children past Pre-K age.

Although some descriptive evidence below will use observations from the ACS, for primary analysis of mothers' labor force behavior I will use longitudinal data from the Survey of Income and Program Participation (SIPP) Core Modules. Although it is smaller in sample size than the ACS data, it allows differentiation between quarters of the year. This allows comparison between fall months - when state Pre-K programs are offered, and the summer months when it is not. I merge all core waves of the 2001, 2004, and 2008 panels yielding observation on 286,732 mothers with a Pre-K aged child from 2002-2013.[16] I will also show results on childcare use from SIPP Topical Modules. SIPP provides a topical module on childcare utilization once per panel. Merging the relevant modules from 2001, 2004, and 2008 panels yields observations on 74,307 mothers of Pre-K aged children. For summary statistics on mothers' labor supply see Table (2). Note that there appears to be no clear pattern between UPK status and mothers' labor supply.

The SIPP childcare module includes a total of 13 different childcare options. To simplify

[13]ACS began in 2000 with a 1-in-750 sample, growing to 1-in-100 since 2005.

[14]Child-parent links were made using IPUMS constructed variables POPLOC and MOMLOC which identify probable mother and fathers. Similar estimates result restricting the sample to heads-of-household, which allows inclusion of only child-parent relationships explicitly stated in each survey.

[15]Children eligible for Pre-K in the Census data can be either 4 or 5 years old, even though Pre-K is explicitly schooling for 4-year olds in most states. This is the result of ambiguity regarding age at start of school year because although age can be known precisely for all children observed, month of observation is not available in public release ACS data. That is, many children appearing as 5-years old may have been 4 at start of school year. Because ACS samples are performed evenly across all months, roughly half of all children age 4 each fall will be observed in ACS at each ages 4 and 5.

[16]For Core data, SIPP households are interviewed every four months regarding their activity in each of the preceding four months. Because this paper is not concerned with month-to-month transitions, I retain only the last month for each wave. This should alleviate possible seam bias and measurement error due to decreasing recall over longer time periods, and still show labor supply changes across both years and quarters.

comparison I combine childcare sources as follows. I define 'informal care' as having a child cared for by a sibling, grandparent, other relative, or other non-relative at least one day per week. Similarly, let 'formal care' include children cared for by childcare centers, head start, family day care, or preschool. Let parent care be child cared for at least one day per week by a parent that works or attends school, and StayAtHome be a child with a strictly stay-at-home designated caretaker. SIPP summary statistics on childcare utilization can be found in Table (3).[17] Note that school attendance appears higher and both formal and informal care use appears lower in UPK states.

First I will consider the apparent correlation between state Pre-K enrollment and school attendance as well as mothers' labor supply. Data on state Pre-K enrollment comes from the National Institute for Early Education Research (NIEER) "State of Preschool" annual yearbooks.[18] The NIEER yearbooks are the result of surveys from prekindergarten administrators in each state. Yearbooks include data on the percent of all children aged 4 (at start of school year) attending "state prekindergarten programs" in each state in each year. For the purpose of measurement, this includes all Pre-K programs that are funded by the state with education as a primary goal (not childcare) and does NOT include federal Head Start programs or those explicitly for children with special needs.[19]

Comparing state Pre-K enrollment to school attendance and mothers' labor supply data from the ACS reveals very different patterns for two-parent and single mother families. Table (4) shows correlations by mothers' marital status both with and without conditioning on state and year fixed effects. Although state Pre-K enrollment and school attendance are positively correlated for children of married and unmarried households; conditioning on both year and state fixed effects suggests that increasing state Pre-K enrollment by 50% of state 4-year-olds induces an additional 3.2% of children with married mothers to attend school,

[17]Note that the composition of school here will differ slightly from that in the ACS. ACS school attendance includes preschool and nursery school, but only for children 3 or older. To prevent 'school' attendance by children under 3, I will group preschool with other non-school formal care arrangements.

[18]Available http://nieer.org/yearbook

[19]Pre-K enrollment is missing in year 2004 so these are taken as the average of enrollment in 2003 and 2005.

with no effect on those with unmarried parents. Figures (5) and (6) show that this difference is only present for Pre-K aged children with married mothers. Likewise, there appears to be no significant unconditional correlation between state Pre-K enrollment and mothers' labor hours. Adding state and year fixed effects, however, suggests that increases in state Pre-K enrollment are associated with decreases in mothers' labor hours; in fact, transitioning from state Pre-K enrollment of 0 to 50% of state 4-year-olds is associated with a decrease in mothers' work hours of approximately 0.8 hours per week. Figures (7) and (8) show this result by hourly margin - with married mothers decreasing work hours at every margin as state Pre-K enrollment increases, and unmarried mothers not significantly affected. Table (5) shows that this pattern is also only present for mothers with children aged 4-5 years.

Changes in observed state Pre-K enrollment can be caused by many things. One source of variation in state Pre-K enrollment is states' passage of UPK legislation, which is typically followed by large increases in both funding and eligibility. Table (1) shows that UPK states are typified by much higher (about 30%) enrollment and that 15.2% of 4-5 year olds sampled live in a UPK state. In order to show the effect of changes in Pre-K enrollment resulting from state UPK reform, analysis will focus on the three states which experienced major expansionary Pre-K reforms during the period of observation: Florida, Iowa, and Vermont. Enrollment trends in the three UPK states are compared to the four states with previous UPK reforms and all other states in Figure (9). These three states are a natural choice for several reasons. Most importantly, these states made dramatic increases in their state Pre-K enrollment that can be linked to legal reform in an observed year that was distinctly educational (not economic) in focus. Second, these three states experienced the largest increases in state Pre-K enrollment during the sample period. Lastly, state Pre-K in these states is currently available in almost all districts and is offered regardless of family income.

Florida's Pre-K program was started in 2002 through a petition sponsored by 'Parents for Readiness Edu. for our Kids' to amend the state constitution guaranteeing universal Pre-K availability. After receiving 514,667 signatures, a ballot was put to public vote requiring that

"every four-year-old child in Florida shall be offered a high quality pre-kindergarten learning opportunity by the state no later than the 2005 school year."[20] Florida voters amended the state constitution in 2002 to establish universal voluntary Pre-K which began in fall of 2005.[21] By allowing parents to enroll children in any Pre-K program meeting state standards (including those offered by schools, childcare centers, home care centers, etc.) it was able to expand very rapidly in a short period of time, with NIEER data showing that Florida state Pre-K enrollment increased to almost 50% of state 4-year olds in its first year.

Iowa began Pre-K in 1989 with its Shared Vision program, targeted at low income families. Universal Pre-K began with the creation of Statewide Voluntary Preschool Program in 2007 after legislators passed HF 877 with primarily support from state Democrats.[22] The law was educational in focus, stating clearly "the purpose of the preschool program is to provide an opportunity for all young children in the state to enter school ready to learn."[23] Since introducing SVPP Iowa has increased its coverage from 18% to 90% of school districts, increasing the total percent of state 4-year olds enrolled in state Pre-K to almost 60%.

Vermont's Pre-K is currently offered through Act 62 which is primarily educational in focus but also cites high childcare usage statewide as a reason for increasing public Pre-K.[24] Before 2011, school districts were limited in how many Pre-K students they could count on their annual school census. Because state funding for each town's Pre-K program is based on their school census numbers, this essentially put a cap on how many Pre-K students the state would support each year. State Pre-K enrollment expanded sharply in the 2010 school year as this cap. Note that Vermont formally considers itself a 'Universal' Pre-K state beginning in 2016, but has enrollment and eligibility similar to other 'Universal' states after this cap was removed so I will count this as the beginning of UPK in Vermont. Vermont's current Pre-K program enrolls almost 75% of state 4-year olds and is available to all students in 91%

[20] http://dos.elections.myflorida.com/initiatives/fulltext/pdf/34708-1.pdf

[21] http://election.dos.state.fl.us/initiatives/initdetail.asp?account=34708&seqnum=1

[22] https://votesmart.org/bill/4035/12560#12560

[23] https://coolice.legis.iowa.gov/cool-ice/default.asp?category=billinfo&service=iowacode&ga=83&input=256C

[24] http://www.leg.state.vt.us/docs/legdoc.cfm?URL=/docs/2008/acts/ACT062.HTM

of school districts.

The resulting programs in these three states are similar in many ways. All three offer half day pre-kindergarten, with 3-4 hours per day offered 4-5 days per week. Vermont and Iowa Pre-K initiatives are explicitly academic-year. Florida residents can choose between academic year and summer programs, with over 90% enrolling in the academic year program.[25] Spending ranges from $2242 per child per year in Florida to $3863 per child per year in Vermont, with Iowa spending $2596 per year per child. This is small in comparison to the average family income of $70,207 for parents of Pre-K aged children in these states, and $85,071 in two-parent households which appear most affected by Pre-K eligibility.

Figures (10) - (13) show annual state averages of child school attendance and mothers' weekly labor hours for 4-5 year olds in Iowa and Florida from 2002-2013, by mothers' marital status. Here Vermont is excluded because its small sample size (only about 100 observations per year) causes yearly averages to move substantially from year to year. Fiture (10) shows that school attendance of 4-5 year olds with married parents were near national averages in both Florida and Iowa before their UPK reforms in 1995 and 1997. After UPK reform, school attendance increased to about 4% above national average. Figure (11) shows no such changes for children with unmarried mothers. Similarly, Figure (12) shows that the national average weekly labor supply for married mothers with 4-5 year olds increased by about 1 hour per week. However, Florida mothers show no increase over this period, and Iowa mothers appear to decrease labor supply sharply following 2007 UPK reform. As with school attendance, Figure (13) shows that UPK reform does not appear associated with significant changes for unmarried mothers.[26] These graphs motivate the empirical strategy that follows in the next section, in which the effect of state UPK reform will be estimated via difference-in-difference.

[25] http://www.oppaga.state.fl.us/reports/pdf/0823rpt.pdf

[26] Although it is not a focus of this paper, this graph also shows that unmarried mothers appear much more strongly affected by the 2009 recession. This average recession effect will be differenced out in analysis below with the inclusion of Year fixed effects. The possibility of bias due to state differences in recession effects will be examined through the apparent effects of UPK on untreated age groups - namely children aged 2-3 and 6-7 years.

5 Empirical Specification

I define binary variable 'UPK' at the state level to be '1' in all years after UPK legislation has passed, and '0' in all years before.[27] This is then used as the independent variable of interest, providing estimates of the effect of Pre-K eligibility on both school attendance and mothers' labor supply. Importantly, all three states offer 'universal' pre-k, without income requirements for eligibility so mothers have no incentive to either reduce actual or claimed work hours.

The empirical strategy of this paper is to compare the school enrollment and mothers' labor supply of children that live in UPK states to those who do not. With school enrollment (for example), this is accomplished most simply via a linear difference-in-difference that can be represented by:

$$YC_{j,t} = I(\alpha_0 + \gamma_t + \delta_j + \beta_1 UPK_{j,t} + u_{j,t} > 0) \tag{5}$$

where $YC_{j,t}$ is average school enrollment in state 'j' in year 't', $UPK_{j,t}$ is the variable of interest - denoting the existence of Universal Pre-K in a given state and year, γ_t gives year-fixed effect, and δ_j gives state-fixed effect. Identification of β_1 comes by comparing changes in state Pre-K eligibility to changes in state averages of school enrollment ($YC_{j,t}$). If states experienced changes in average mothers' age, education, marital status, or family composition then the estimates of β_1 could be biased by any correlation between these changes and child school attendance. For this reason, I will estimate:

$$YC_{i,j,t} = I(\alpha_0 + \gamma_t + \delta_j + \beta_0 X_{i,j,t} + \beta_1 UPK_{j,t} + u_{i,j,t} > 0) \tag{6}$$

where $X_{i,t}$ is an individual's matrix of other covariates including mother's age, mother's education level,[28] mother's marital status, and indicators for whether given child is either

[27] Other states with universal Pre-K programs include Georgia (beginning in 1993), New York and Oklahoma (since 1998), and West Virginia (since 2002). These states will be included as "Universal Pre-K States", but their status will not drive identification due to lack of observations before the start of UPK in that state.

[28] no college, some college, and 4 or more years of college

youngest or eldest of those observed. Note that instead of state averages I will use $YC_{i,j,t}$ as dependent variable but that since $UPK_{j,t}$ varies by state identification comes through variation across time in state-covariate cell averages. I estimate (6) via Linear Probability Model, with standard errors clustered by state due to possible correlation of errors within each state (Bertrand et. all 2004).[29]

The effect of UPK legislation on mothers' labor hours can be represented similarly via:

$$YM_{i,j,t} = \begin{cases} YM_{i,j,t}* & \text{if } YM_{i,j,t}* \geq 0 \\ 0, & \text{otherwise} \end{cases} \tag{7}$$

$$YM_{i,j,t}* = \alpha_0 + \gamma_t + \delta_j + \beta_0 X_{i,j,t} + \beta_1 UPK_{j,t} + u_{i,j,t}$$

where $YM_{i,j,t}*$ is the mothers' weekly work hours observed. Two complications arise here that were not present before. First, the presence of multiple children per households makes it difficult to estimate effects separately for each child. Therefore I define the treatment group as mothers with a child aged 4-5 and will compare their outcomes to those of women with no child aged 4-5. To make treatment and control groups otherwise as similar as possible, I will consider control groups having either at least one child either 2-3 or at least one child 6-7 years old. Second, mothers' work hours are only observed when non-negative. Note again that because $UPK_{j,t}$ varies only by state, identification comes through comparison through time across state-covariate cell averages. Since these averages are nonzero, censoring should not be problematic.[30] I will also show LPM estimates with dependent variable being binary indicators for mothers working more than 0, 10, 20, 30, and 40 hours. Although these do not estimate average marginal effect on hours, they do not require distributional assumptions and allow differentiation between changes in labor force participation, full time employment, etc.

[29]Throughout, most results shown will be LPM. Marginal effects via a logit model give nearly identical results in all cases, so bias due to LPM in unlikely.

[30]Similar results also hold using Tobit, further confirming that censoring is not likely to be problematic.

I will also show results using triple differences (DIDID) an alternate way to address the presence of multiple children per household.

$$YM_{i,j,t} = \begin{cases} YM_{i,j,t}* & \text{if } YM_{i,j,t}* \geq 0 \\ 0 & \text{otherwise} \end{cases} \tag{8}$$

$$YM_{i,j,t}* = \alpha_0 + \gamma_t + \delta_j + \beta_0 X_{i,j,t} + \Gamma(UPK * AgeGroup)_{jt} + u_{i,j,t}$$

where $(UPK * AgeGroup)$ contains the interactions of UPK and indicators for having a child aged 2-3, 4-5, and/or 6-7.

A similar specification to those above will be used to estimate the effect of UPK reform on the utilization of each of the five' types of childcare ('q'):

$$YCC^q_{i,j,t} = I(\alpha_0 + \gamma_t + \delta_j + \beta_0 X_{i,j,t} + \beta_1 UPK_{j,t} + u_{i,j,t} > 0) \tag{9}$$

As before I will estimate separately for families with and without child aged 4-5.

Equations above assume that $Cov(u_{i,j,t}, UPK_{j,t}|X_{i,j,t}, \gamma_t, \delta_j) = 0$ i.e. that states' UPK status is not correlated with unobserved factors influencing school attendance or labor supply. This assumption would be violated if state UPK passage was correlated with current or anticipated state economic conditions, or changes in mothers' labor supply. The is addressed in part by comparison to results for children who are not treated - no significant changes for children aged 2-3 or 6-7 would cast doubt on correlation of Pre-K enrollment levels on state specific economic factors. Moreover I will show separate results adding state specific linear time trend to limit the possible effect of changes in unobserved state specific factors. Lastly, I will compare outcomes separately across fall and summer: since states offer their major Pre-K program only during the school year, mothers' work outcomes should not be affected in summer months.

6 ACS: Child School Attendance

Results in Table (6) show that UPK legislation has a substantial effect on State Pre-K enrollment of eligible children in a linear regression using all 50 states from year 2002-2013. Estimates with or without state and year fixed effects suggest that state adoption of UPK causes an increase in state Pre-K enrollment by almost 40%. Changes in actual school attendance, however, are much smaller. Table (7) shows that the adoption of UPK legislation is associated with an increase in school attendance by 3.6% of state 4-5 year olds. Observations from all 50 states are included and there are 29,749 observations for the 3 states with UPK reform; 7,941 observations before and 21,808 observations after UPK introduction. Increases in school attendance are fairly similar across education groups, with little difference in coefficient estimated for children of mothers with no, some, or 4 year of college.[31] Very little change is seen for children with unmarried parents. This is likely because single parent families are typified by significantly lower income level so many of these families will be eligible for targeted state Pre-K programs and/or Head Start.[32]

It is also worth noting that the estimated effect of Pre-K enlargement on school enrollment is small in magnitude. Some of this can be explained by the ambiguity in age vs Pre-K eligibility in ACS data. Children can attend Pre-K in the year which they are 4-years old by the fall start date; however, because month of survey is not available in public ACS data, half of the Pre-K eligible children are observed each at ages 4 and 5. This means about half of the children aged both 4 and 5 are either too young or too old to be eligible, respectively. The effect of UPK on school attendance of eligible children can therefore be approximated by doubling the coefficient - state adoption of UPK increases school attendance by at most 7% of state four-year olds. This means that passage of UPK reform is associated with an

[31] Although mothers' education group is endogenous over the lifespan, the short time period between UPK introduction and implementation makes sample selection bias here unlikely. Moreover, regressing UPK legislation on mothers' educational attainment suggests that mothers do not significantly increase or decrease college attendance after these reforms.

[32] Average family income for unmarried mothers with Pre-K aged child in these three states is $25,399. This is very close to the 2014 Federal Poverty Level for a family of 4 ($24,250) and only 126% the Federal Poverty level for a family of 3 ($20,090) https://www.healthcare.gov/glossary/federal-poverty-level-FPL/

increase in state Pre-K enrollment by 38% of Pre-K eligible children, but only a 7% increase in school attendance; therefore it appears that most children enrolled in state Pre-K after UPK reform would have attended school of some sort during their Pre-K year in absence of any state program.

Similar regressions coefficients show the estimated effect of Pre-K enlargement separately by child age, from 3-9. Figure (14) shows that children with unmarried mothers are not significantly influenced to attend school in at any age.[33] Interestingly, Figure (15) shows the effects by year for married mothers. Note first that children eligible for state Pre-K are significantly more likely to attend school at ages 4 and 5. Moreover, there is essentially no effect of UPK on school at ages 6-9 years old, which suggests that these reforms are not correlated with other school reforms or significant changes in schooling behavior. Interestingly, UPK laws do appear to decrease school attendance among children aged 3 with married mothers - possibly due to crowding out as mentioned in Bassok (2014).

7 SIPP: Mothers' Labor Supply and Childcare

UPK legislation appears to decrease the labor hours of married women with eligible children. Table (8) shows estimates of equation (7). Again the results differ significantly by mother's marital status. For married mothers, increasing state Pre-K to full enrollment is associated with a 2.8% decrease in full time employment and 3.4% decrease in working 30 or more hours per week, significant at the 1% and 5% confidence level respectively. Again, these estimates include observations from all 50 states with a total of 2,843 observations in the 3 states passing UPK legislation; these observations are split fairly evenly with 1,377 observations before and 1,466 after UPK adoption. Unmarried mothers with a child aged 4-5 years show no decreases at any margin. Moreover, no similar changes are found for mothers with children aged 2-3 and/or 6-7. This suggests that the decrease in labor hours of

[33] Although a 1% increase in 6 year old attendance is statistically significant, this is quite small in magnitude.

mothers with children aged 4-5 are unlikely to be explained by local economics changes which would have to influence only mothers with Pre-K eligible children. Results regressing in one equation with interaction of UPK and age group are less clear; Table 9 shows decreases in full time employment for all age groups and no other changes.

Table (10) reports comparison of mothers' outcomes during fall versus summer. Mothers' hours appear to be suppressed at all margins during fall months when Pre-K programs are offered. Conversely very few changes are apparent in summer months - with only a 1.6% decrease in fulltime status, significant at the 10% level. Again, because mothers' labor supply is suppressed only during the school year and only for mothers of children aged 4-5 it appears unlikely that the observed decreases in mothers' labor supply can be attributed to changes in local economic conditions. Note that these decreases in mothers' school-year hours are somewhat robust. Table (11) shows that evidence of decreased hours during the school year persists adding one-year lag in the dependent variable or state-specific linear time trend. Table (12) shows that the decrease in school-year hours for mothers of 4-5 year olds are observed for all education groups. This matches results above suggesting that school attendance was also affected equally regardless of mothers' educational attainment.

Tables (13) and (14) show the marginal effects of UPK legislation on hours via estimating Equations (7) and (8) with LPM. Regressing separately by child age group shows mothers with a 4-5 year old decrease their labor hours by 3.5 hours per week, and only in the fall when Pre-K programs are offered. No decreases appear during the summer or age groups, although there does appear to be an increase in summer work hours for mothers of 2-3 year olds. This result does not appear in the more conservative estimate regressing the effect of UPK in one equation using interaction variables as in Equation (8). This estimate suggests that with mothers of 4-5 year olds working 1.3 hours less per week, again only during fall months and not summer when Pre-K is not offered.

The topical modules offered in each SIPP panel ask each "designated parent" (i.e. primary caretaker) about parents' childcare choices. Table (15) shows that Pre-K expansion

is associated with increased school attendance as well as a decrease in use of informal care (such as friends and relatives) in for children aged 4-5. Sample includes 421 observations for the 3 states with UPK reform; 208 before and 213 after. Interestingly there is a decrease in stay-at-home parents. This provides some support that Pre-K expansion may increase labor force participation among primary caretakers on the extensive margin. This decrease in strictly stay-at-home parents, however, is accompanied by a large increase in childcare by working parents at least one day per week (an increase over 10% if state Pre-K expands by 50% of state 4-year-olds). For 2-3 year olds, in contrast, there are no changes in parent-care which suggests that results are not driven by state trends unrelated to Pre-K expansion. Interestingly, there is a decrease in formal care for younger children - possibly due to crowding out in states such as Florida (as observed in Bassok 2014). Childcare by parents is still unaffected.

The pattern of work decreases reasonably matches the predictions shown in section 3. First, work decreases are most robust for those working full time (or close to full time). Moreover, SIPP data confirms that mothers are substituting paid care for parent-care time, as the model predicts should be common among women with wages satisfying W_{MH}. It is surprising, however, that there is little evidence of labor force increases on the intensive margin. This could be for several reasons. First, state Pre-K expansion does not appear to have large effects on overall school attendance. With only small changes in total school attendance, the population possibly induced to work must be relatively small. In contrast, possible work disincentives due to the need for supplementary childcare will be relevant to all women with Pre-K aged children. Second, it may be more difficult for women to find jobs during only the free school-day hours. Also, there may be additional long run fixed costs to labor entry - if many low wage women were not previously planning to enter the workforce during their child's Pre-K year, it may be difficult to enter the workforce and/or find a good job match.

8 Conclusions

Previous work has shown increases in early childhood education can have dramatic short and long term effects on child outcomes, especially when programs are targeted at low income groups. Although universal Pre-K may increase kindergarten readiness, this paper casts doubt on claims that non-targeted Pre-K expansion is an important tool for helping mothers return to work. First, state Pre-K programs have a small effect on school attendance of Pre-K aged children. Moreover, state Pre-K programs appear to have essentially no effect on the attendance of children with unmarried parents - likely due to availability of other programs (like Head Start and targeted state programs).

Non-targeted universal state Pre-K programs also appear to suppress the labor hours of mothers with eligible children. UPK adoption is associated with about 1 fewer work hour per week for all mothers with Pre-K aged children (4-5 years). No similar changes are found for mother with only older (aged 6-7 years) or younger (aged 2-3 years) children. Looking at the distribution of work hours, changes appear to come primarily from mothers reducing hours around full-time and nearly full time margins. These changes are unlikely to be due to income effects because similar results were not found in more generous full day programs. These changes are consistent with a static labor supply model with fixed costs to childcare and labor force entry. With introduction of universal pre-k, some women will rationally reduce work hours and care for their own children after Pre-K hours end to avoid finding, arranging, and paying for additional childcare.

Due to the small effect on child school attendance and apparent negative effect on mothers' labor hours, it does not appear that the adoption of universal half-day Pre-K is an important policy for supporting mothers' labor supply as some claim. Moreover, previous work suggests that full day programs may not lead to the unintended labor force reduction I find with half day programs. Although full day programs are necessarily more expensive per student, a targeted full day program could use eligibility requirements to ensure fewer students receive state funding that would have attended absent any state programs.

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10 Appendix

Figure 1: Wage Rates

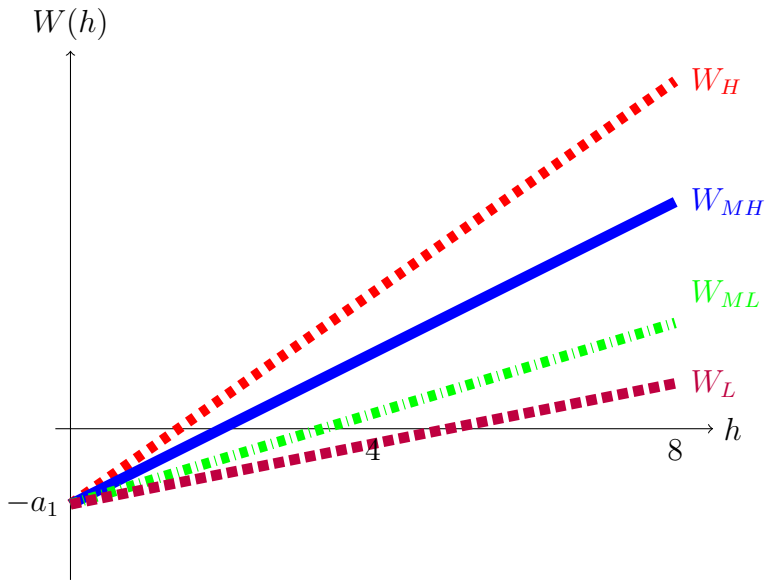


Figure 2: Childcare Costs

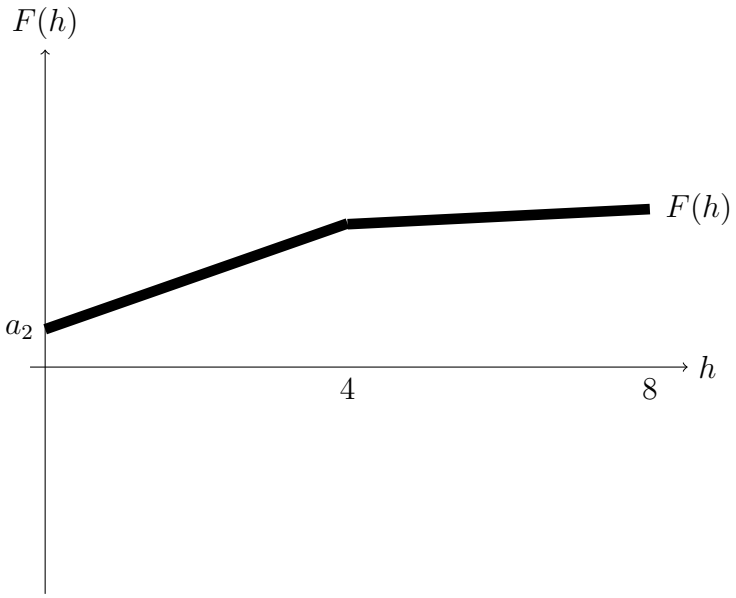


Figure 3: Wage Minus Childcare - No Pre-K

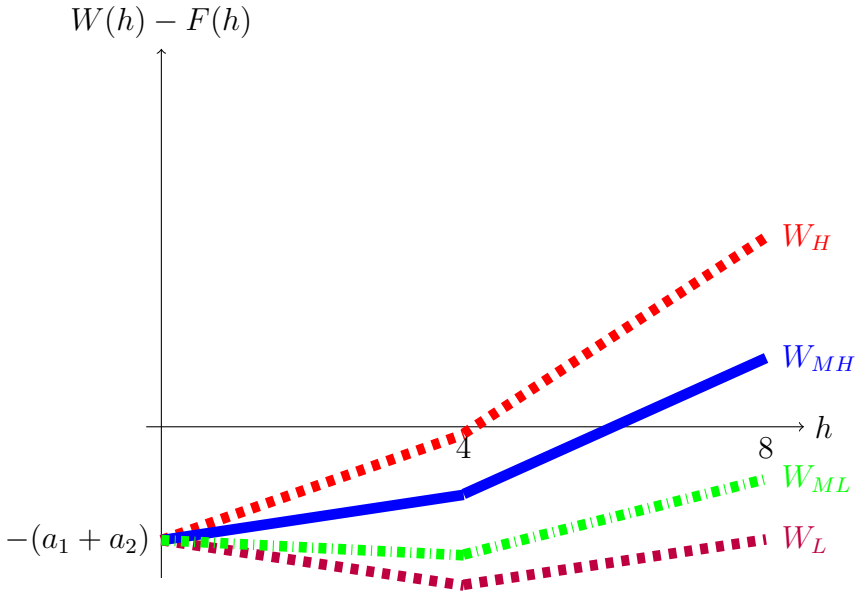


Figure 4: Wage Minus Childcare - With Pre-K

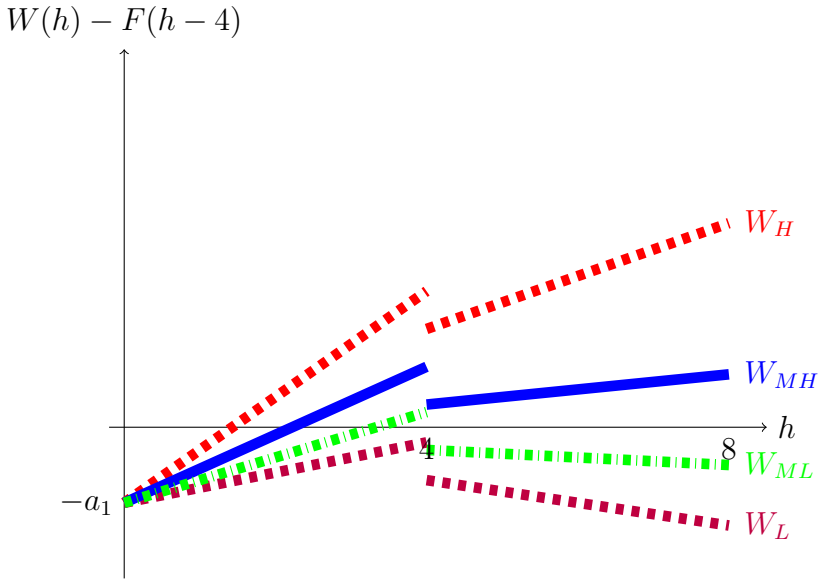


Table 1: ACS, Summary Stats (Child)

	All		UPK		∼UPK	
Variable	Mean	SE	Mean	SE	Mean	SE
UPK	0.152	(0.000)	1	.	0	.
School Att (Age 3)	0.357	(0.001)	0.385	(0.003)	0.352	(0.001)
School Att (Age 4-5)	0.739	(0.001)	0.787	(0.002)	0.730	(0.001)
School Att (Age 6-7)	0.975	(0.000)	0.976	(0.001)	0.975	(0.000)
N	891,688		91,811		499,877	

Estimated population means using national-level individual weights with standard errors in parenthesis.

Table 2: SIPP, Summary Stats, Mothers' Labor Supply, With 4-5 y/o

	All		UPK		NO UPK	
Variable	Mean	SE	Mean	SE	Mean	SE
Hours	19.957	(0.070)	19.698	(0.192)	19.996	(0.075)
Worked	0.569	(0.002)	0.555	(0.005)	0.571	(0.002)
10+ Hrs/Week	0.544	(0.002)	0.534	(0.005)	0.545	(0.002)
20+ Hrs/Week	0.486	(0.002)	0.488	(0.005)	0.486	(0.002)
30+ Hrs/Week	0.416	(0.002)	0.425	(0.005)	0.414	(0.002)
40+ Hrs/Week	0.058	(0.002)	0.042	(0.002)	0.060	(0.001)
N	74,307		9,527		64,780	

Estimated population means using national-level individual weights with standard errors in parenthesis.

Table 3: SIPP, Summary Stats, Childcare Used, Child Age 4-5 Years

	All		UPK		NO UPK	
Variable	Mean	SE	Mean	SE	Mean	SE
School	0.255	(0.004)	0.306	(0.013)	0.248	(0.005)
Informal Care	0.296	(0.004)	0.266	(0.012)	0.300	(0.005)
Formal Care	0.224	(0.004)	0.201	(0.011)	0.227	(0.004)
Parent Care	0.156	(0.004)	0.137	(0.009)	0.158	(0.004)
StayAtHome	0.436	(0.005)	0.462	(0.014)	0.432	(0.005)
Parent+StayAtHome	0.170	(0.004)	0.151	(0.010)	0.172	(0.004)
N	10,328		1,266		9,062	

Estimated population means using national-level individual weights with standard errors in parenthesis.

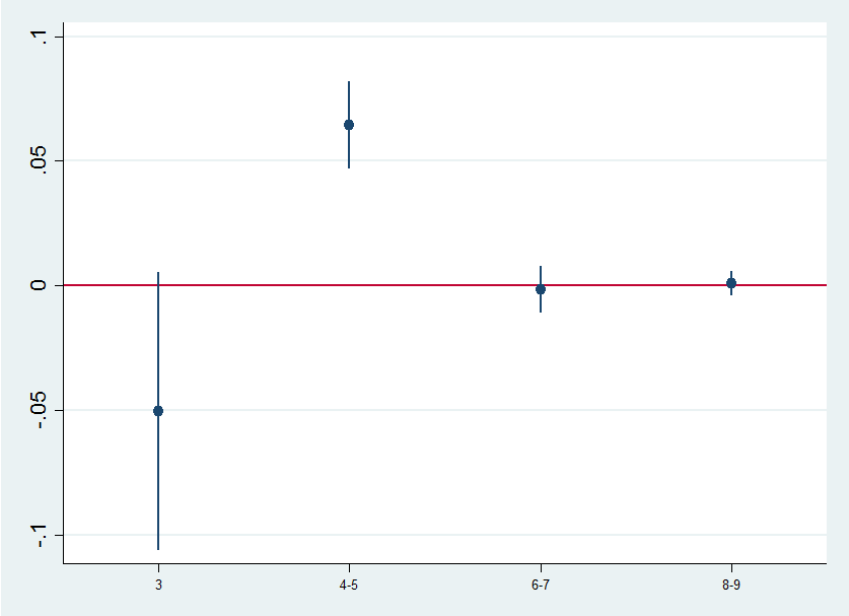
Table 4: ACS, Pre-K Enrollment vs. School and Mothers' Hours, Age 4-5

	Child School Attendance			
PreK	0.124**	-0.000	0.119*	0.064***
	(0.040)	(0.018)	(0.046)	(0.009)
N	110225	110225	480531	480531
Year, State FE	NO	YES	NO	YES
Mother Married	NO	NO	YES	YES

	Mothers' Labor Hours			
PreK	0.169	0.161	0.670	-1.665***
	(1.110)	(2.108)	(1.428)	(0.460)
N	104261	104261	455906	455906
Year, State FE	NO	YES	NO	YES
Mother Married	NO	NO	YES	YES

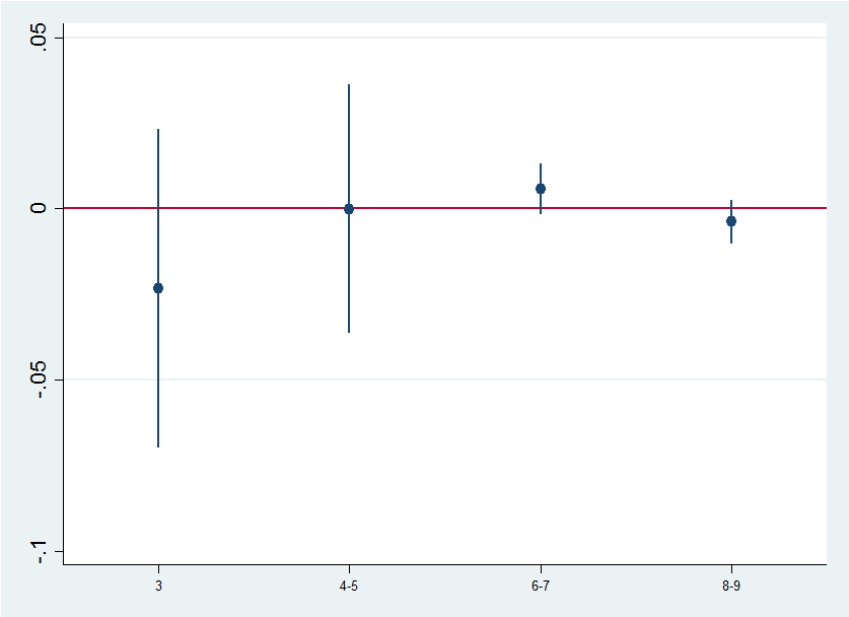
*Standard errors clustered by state and using national-level individual weight in parenthesis. ***,**, and * indicate statistical significance at 1%, 5%, and 10% confidence level respectively*

Figure 5: State Pre-K Enrollment vs. School Attendance By Age, Mother Married



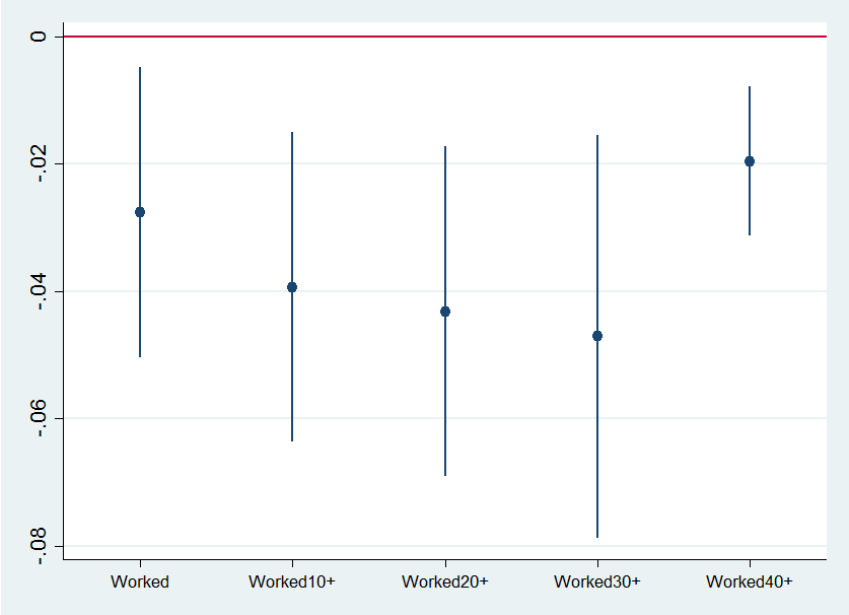
State enrollment levels via NIEER annual The State of Preschool yearbooks. Covariates include state and year fixed effects.

Figure 6: State Pre-K Enrollment vs. School Attendance By Age, Mother Unmarried



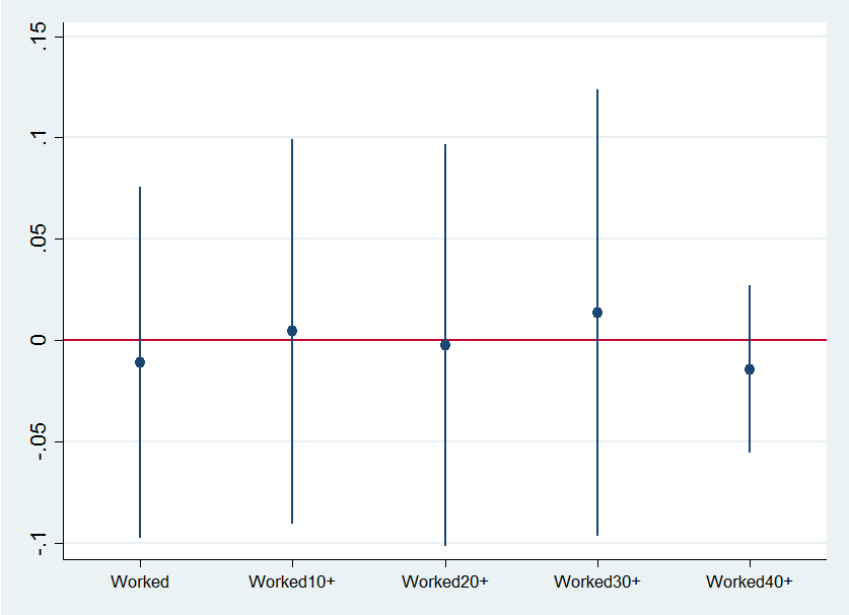
State enrollment levels via NIEER annual The State of Preschool yearbooks. Covariates include state and year fixed effects.

Figure 7: State Pre-K Enrollment vs. Mothers' Hours, With 4-5 Year Old, Mother Married



State enrollment levels via NIEER annual The State of Preschool yearbooks. Covariates include state and year fixed effects.

Figure 8: State Pre-K Enrollment vs. Mothers' Hours, With 4-5 Year Old, Mother Unmarried



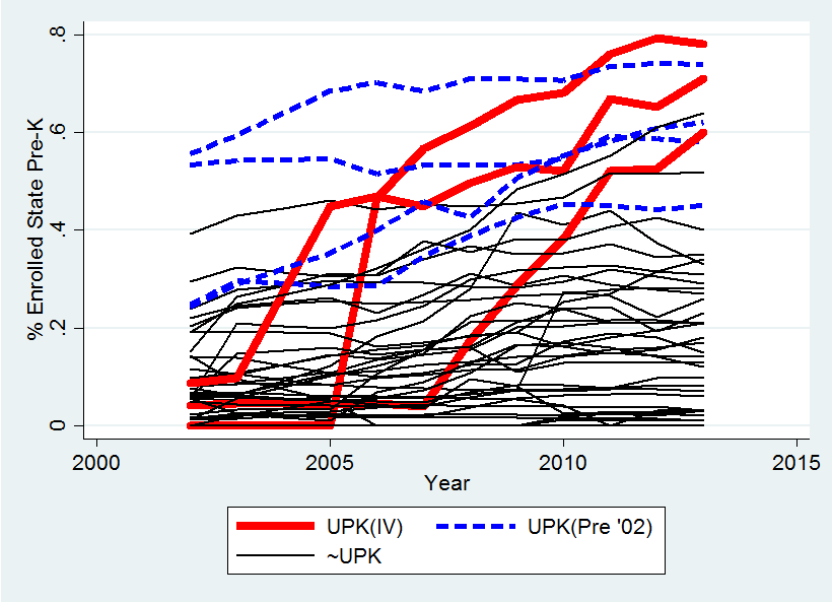
State enrollment levels via NIEER annual The State of Preschool yearbooks. Covariates include state and year fixed effects.

Table 5: ACS, UPK*I{Child Ages} on Mothers' Hours, Married

	Weekly Work Hours				
	Worked	10+ Hrs	20+ Hrs	30+ Hrs	40+ Hrs
PreK*I{Has 4-5 Year Old}	0.000	0.000	-0.009	-0.020***	-0.013***
	(0.007)	(0.008)	(0.006)	(0.007)	(0.004)
PreK*I{Has 2-3 Year Old}	-0.003	0.003	0.003	-0.002	-0.007
	(0.008)	(0.010)	(0.011)	(0.012)	(0.006)
PreK*I{Has 6-7 Year Old}	0.004	0.002	-0.004	-0.008	-0.004
	(0.011)	(0.012)	(0.012)	(0.012)	(0.003)
N	1041465	1041465	1041465	1041465	1041465

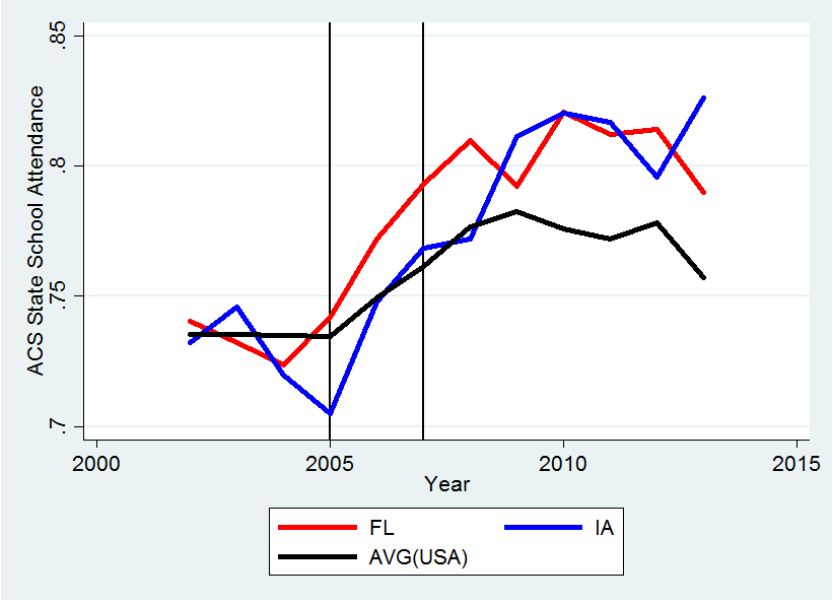
State enrollment levels via NIEER annual The State of Preschool yearbooks. Covariates include state and year fixed effects.
Standard errors clustered by state and using national-level individual weight in parenthesis.
****,**, and * indicate statistical significance at 1%, 5%, and 10% confidence level respectively*

Figure 9: State Pre-K Enrollment and UPK Status



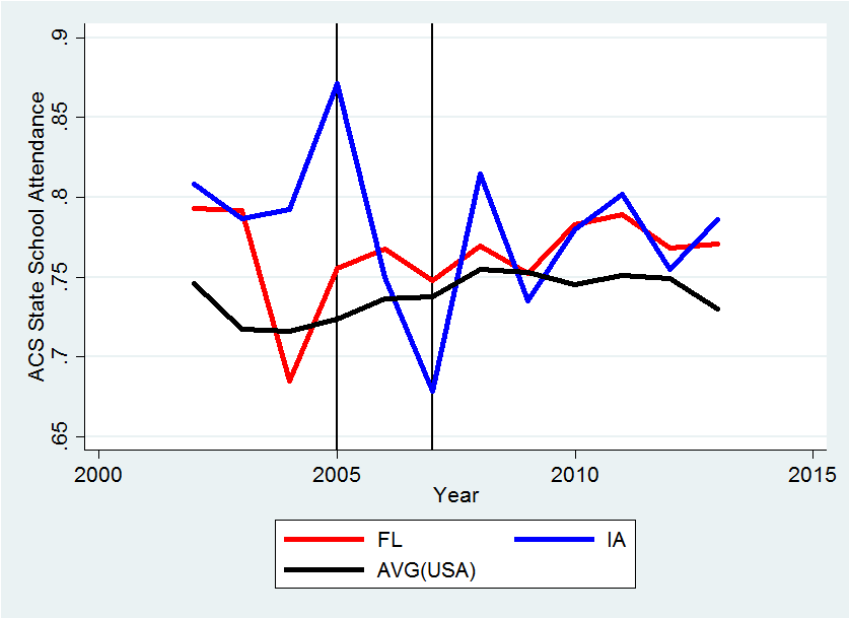
State enrollment levels via NIEER annual The State of Preschool yearbooks

Figure 10: FL and IA School Attendance, 4-5 Year Olds, Mother Married



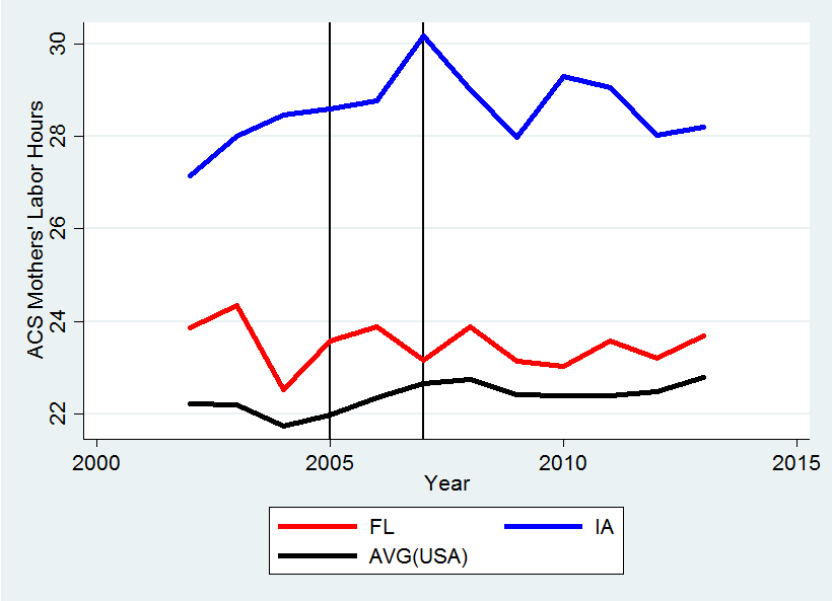
Average of ACS School Attendance, Age 4-5 years, Mother married

Figure 11: FL and IA School Attendance, 4-5 Year Olds, Mother Unmarried



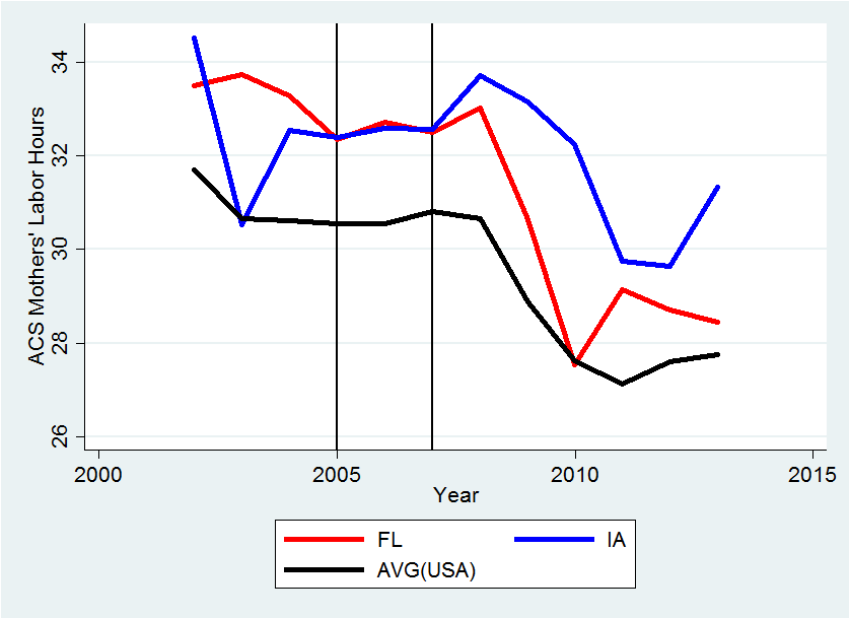
Average of ACS School Attendance, Age 4-5 years, Mother married

Figure 12: FL and IA Mothers' Labor Hours, With 4-5 Year Olds, Married



Average of ACS Weekly Labor Hours, With child age 4-5 years, married

Figure 13: FL and IA Mothers' Labor Hours, With 4-5 Year Olds, Unmarried



Average of ACS Weekly Labor Hours, With child age 4-5 years, unmarried

Table 6: UPK on State Pre-K Enrollment of 4-Year-Olds

	State Pre-K Enrollment	
UPK	0.399***	0.377***
	(0.054)	(0.105)
N	600	600
STATE FE	N	Y
YEAR FE	N	Y

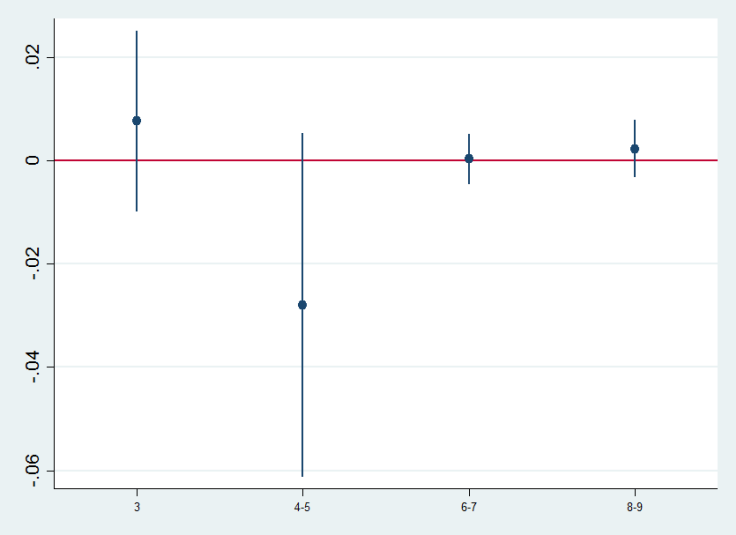
*Standard errors clustered by state and using national-level individual weight in parenthesis. ***,**, and * indicate statistical significance at 1%, 5%, and 10% confidence level respectively.*

Table 7: ACS, UPK on Schooling, Aged 4-5

	Child School Attendance By Mothers' Marital, Edu				
	Unmarried All	Married All	Married No College	Married Some College	Married 4-Year Degree
UPK	-0.028*	0.036***	0.037***	0.033***	0.037***
	(0.017)	(0.004)	(0.005)	(0.010)	(0.005)
N	110589	481099	157057	118960	205082

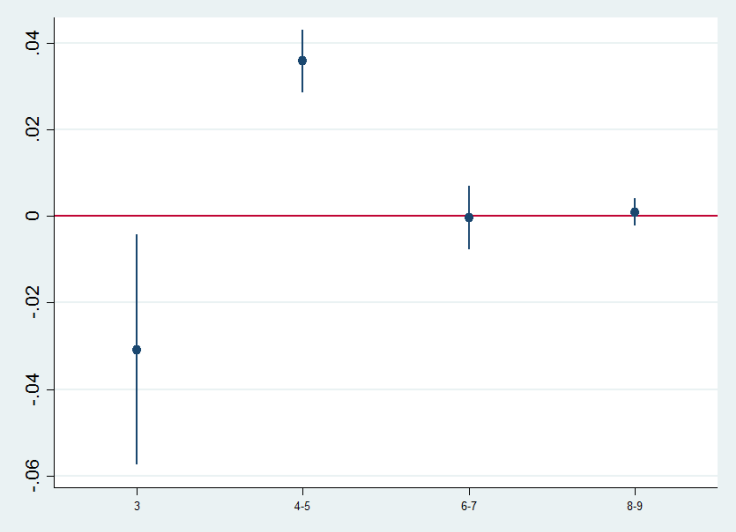
*Standard errors clustered by state and using national-level individual weight in parenthesis. ***,**, and * indicate statistical significance at 1%, 5%, and 10% confidence level respectively. Covariates include year, mother's age, education, state, and indicators for oldest/youngest child status*

Figure 14: ACS, UPK on Child School Attendance, By Age, Unmarried



Estimated coefficients, with vertical bars showing 95% confidence interval. Additional covariates include year, mother's age, education, state, and indicators for oldest/youngest child status

Figure 15: ACS, UPK on Child School Attendance, By Age, Married



Estimated coefficients, with vertical bars showing 95% confidence interval. Additional covariates include year, mother's age, education, state, and indicators for oldest/youngest child status

Table 8: SIPP, UPK on Mothers' Hours, By Age & Mothers' Marital Status

	Weekly Work Hours				
	Worked	10+ Hrs	20+ Hrs	30+ Hrs	40+ Hrs
	Married, With 4-5 Year Old				
UPK	-0.006	-0.009	-0.010	-0.030**	-0.027***
	(0.011)	(0.012)	(0.014)	(0.012)	(0.005)
N	50623	50623	50623	50623	50623
	Unmarried, With 4-5 Year Old				
UPK	-0.003	0.008	0.008	0.022	-0.007
	(0.014)	(0.016)	(0.015)	(0.019)	(0.008)
N	35818	35818	35818	35818	35818
	Married, No 4-5 Year Old (Has 2-3 Year Old)				
UPK	0.004	0.015	0.016	0.029	-0.006
	(0.015)	(0.016)	(0.016)	(0.022)	(0.007)
N	35818	35818	35818	35818	35818
	Married, No 4-5 Year Old (Has 6-7 Year Old)				
UPK	-0.017	-0.024	-0.033	-0.038	-0.021
	(0.037)	(0.031)	(0.041)	(0.038)	(0.017)
N	35953	35953	35953	35953	35953

*Standard errors clustered by state and using national-level individual weight in parenthesis. ***,**, and * indicate statistical significance at 1%, 5%, and 10% confidence level respectively. Covariates include year, mother's age, education, state, and indicators for child ages.*

Table 9: SIPP, UPK*I{Child Ages} on Mothers' Hours, Married

	Weekly Work Hours				
	Worked	10+ Hrs	20+ Hrs	30+ Hrs	40+ Hrs
UPK*I{Has 4-5 Year Old}	-0.005	-0.009	-0.009	-0.012	-0.010***
	(0.009)	(0.009)	(0.009)	(0.010)	(0.004)
UPK*I{Has 6-7 Year Old}	-0.007	-0.011	-0.015	-0.018	-0.012***
	(0.013)	(0.013)	(0.014)	(0.014)	(0.003)
UPK*I{Has 2-3 Year Old}	-0.013	-0.011	-0.014	-0.011	-0.010**
	(0.010)	(0.012)	(0.012)	(0.013)	(0.004)
N	113502	113502	113502	113502	113502

Standard errors clustered by state and using national-level individual weight in parenthesis.
****,**, and * indicate statistical significance at 1%, 5%, and 10% confidence level respectively.*
Covariates include year, mother's age, education, state, and indicators for child ages.

Table 10: SIPP, UPK on Mothers' Hours, Married, With 4-5 Year Old, By Season

	Weekly Work Hours				
	Worked	10+ Hrs	20+ Hrs	30+ Hrs	40+ Hrs
	Summer (June- Aug)				
UPK	0.017	0.023	0.034	0.008	-0.016*
	(0.015)	(0.015)	(0.022)	(0.022)	(0.008)
N	12662	12662	12662	12662	12662
	NOT Summer (Sept-May)				
UPK	-0.014	-0.020	-0.025*	-0.042***	-0.030***
	(0.012)	(0.012)	(0.014)	(0.011)	(0.005)
N	37961	37961	37961	37961	37961
	Fall (Sept-Nov)				
UPK	-0.084***	-0.083***	-0.101***	-0.127***	-0.011*
	(0.020)	(0.021)	(0.030)	(0.022)	(0.006)
N	12529	12529	12529	12529	12529

Standard errors clustered by state and using national-level individual weight in parenthesis.
****,**, and * indicate statistical significance at 1%, 5%, and 10% confidence level respectively.*
Covariates include year, mother's age, education, state, and indicators for child ages.

Table 11: SIPP, UPK on Mothers' Hours, Married, With 4-5 Y/O, School Year

	Weekly Work Hours				
	Worked	10+ Hrs	20+ Hrs	30+ Hrs	40+ Hrs
	With State-Specific Linear Time Trend				
UPK	0.015	0.014	0.017	0.016	-0.040*
	(0.019)	(0.023)	(0.023)	(0.023)	(0.022)
N	37961	37961	37961	37961	37961
	With One-Year Lag in Dependent Variable				
UPK	0.006	-0.000	-0.008	-0.017*	0.001
	(0.010)	(0.009)	(0.011)	(0.009)	(0.007)
N	24169	24169	24169	24169	24169

Standard errors clustered by state and using national-level individual weight in parenthesis.
****,**, and * indicate statistical significance at 1%, 5%, and 10% confidence level respectively.*
Covariates include year, mother's age, education, state, and indicators for child ages.

Table 12: SIPP, UPK on Mothers' Hours, With 4-5 Year Old, By Edu, School Year

	Weekly Work Hours				
	Worked	10+ Hrs	20+ Hrs	30+ Hrs	40+ Hrs
UPK*I{No College}	-0.029	-0.039	-0.053**	-0.069**	-0.026***
	(0.029)	(0.028)	(0.025)	(0.031)	(0.009)
UPK*I{Some College}	-0.044*	-0.049**	-0.050*	-0.068**	-0.015**
	(0.023)	(0.021)	(0.029)	(0.029)	(0.007)
UPK*I{4 Years+ College}	0.030	0.024	0.023	0.005	-0.047***
	(0.020)	(0.019)	(0.022)	(0.022)	(0.008)
N	37961	37961	37961	37961	37961

Standard errors clustered by state and using national-level individual weight in parenthesis.
****,**, and * indicate statistical significance at 1%, 5%, and 10% confidence level respectively.*
Covariates include year, mother's age, education, state, and indicators for child ages.

Table 13: SIPP, OLS UPK on Mothers' Hours, By Child Ages, Married

	Weekly Work Hours		
	Has 4-5 y/o	NO 4-5 y/o	
		2-3 y/o	6-7 y/o
	Full Year		
UPK	-0.626	0.499	-1.330
	(0.467)	(0.606)	(1.534)
N	50623	35818	35953
	Fall (Sept-Nov)		
UPK	-3.533***	1.665	-1.508
	(0.920)	(1.115)	(1.051)
N	12529	8806	8891
	Summer (Jun-Aug)		
UPK	0.731	2.088**	-1.589
	(0.678)	(0.892)	(1.547)
N	12662	8974	9014

*Standard errors clustered by state and using national-level individual weight in parenthesis. ***,**, and * indicate statistical significance at 1%, 5%, and 10% confidence level respectively. Covariates include year, mother's age, education, state, and indicators for child ages.*

Table 14: SIPP, OLS UPK on Mothers' Hours, By Child Ages, Married

	Weekly Work Hours		
	Full Year	Fall	Summer
UPK*I{Has 4-5 Year Old}	-0.461	-1.293**	-0.636
	(0.365)	(0.601)	(0.537)
UPK*I{Has 6-7 Year Old}	-0.587	-0.901	-0.412
	(0.504)	(0.745)	(0.557)
UPK*I{Has 2-3 Year Old}	-0.555	-0.299	-1.128
	(0.460)	(0.720)	(1.048)
N	113502	28019	28443

*Standard errors clustered by state and using national-level individual weight in parenthesis. ***,**, and * indicate statistical significance at 1%, 5%, and 10% confidence level respectively. Covariates include year, mother's age, education, state, and indicators for child ages.*

Table 15: SIPP, UPK on Childcare Use

	Percent of Families Using CC Method				
	School	Informal	Formal	Parent	Home
	With 4-5 Year Old				
UPK	0.044***	-0.007	-0.071***	0.165***	-0.112***
	(0.010)	(0.017)	(0.011)	(0.038)	(0.019)
N	7158	7158	7158	7158	7158
	NO 4-5 Year Old, With 2-3 Year Old				
UPK	0.005	0.047***	-0.053***	0.032	0.022
	(0.011)	(0.013)	(0.015)	(0.030)	(0.029)
N	5095	5095	5095	5095	5095

*Standard errors clustered by state and using national-level individual weight in parenthesis. ***,**, and * indicate statistical significance at 1%, 5%, and 10% confidence level respectively. Covariates include year, mother's age, education, state, and indicators for child ages.*