Kindergarten and Career Comebacks for Mothers: Is Access to Public School Enough?*

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Abstract

Over the past 70 years, female labor force participation has surged, yet gender disparities in employment persist, partly due to the disproportionate childrearing responsibilities women face. Publicly funded childcare may alleviate these constraints, influencing mothers' labor supply and long-term human capital investments. This study examines how access to public early childhood education in the U.S. impacts mothers' labor supply decisions in the short and long term. Using a Regression Discontinuity design based on children's kindergarten eligibility cutoffs, we analyze administrative data on maternal employment from the early 2000s to 2014. Results show a modest employment increase of 0.23 percentage points for mothers with early kindergarten access, which continues two years after the treated year before diminishing. Effects are strongest for highly educated mothers and those with no younger children. Additionally, employment responses are greater in regions with longer school days, highlighting the importance of program design in shaping outcomes.

Keywords: Maternal labor supply, human capital investments, public schooling, kindergarten
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1 Introduction

Parenthood is associated with large and long-term reductions in women's employment and earnings. This "child penalty" is typified by permanently altered employment trajectories for women, with drops in participation, hours, and wages that never fully recover and are not experienced by men (Kleven, Landais and Leite-Mariante, 2024; Kleven et al., 2019). In the United States, the child penalty largely operates through extensive margin differences in participation (Kleven, 2023). The persistence of the child penalty is surprising, given mothers' broad underlying interest in work.[1] Gender gaps that arise after childbirth are not due to comparative advantages or biological differences between mothers and fathers, but are likely due to differences in gendered preferences, gender norms, or gender-based discrimination (Andresen and Nix, 2022). Because of prevailing gender patterns, mothers often experience time and resource constraints related to child rearing and family responsibilities that affect their ability to dedicate time to the labor force in a way that fathers do not (Goldin et al., 2022). These initial, gendered patterns could nudge women out of the labor market at childbirth for extended periods of time. Longer periods of reduced labor market attachment could contribute to persistent child penalty effects if human capital depreciates non-linearly (Anderson et al., 2002), if it changes preferences, or if there are adjustment costs associated with shifting from home production to market work.

Policies that relax time and resource constraints for mothers, such as publicly subsidized childcare, could be used as levers to facilitate labor market re-entry and by so doing, indirectly support long-term career growth. In fact, for many mothers, publicly provided early childhood education increases maternal labor force attachment in the short run (Cascio, 2009; Cascio and Schanzenbach, 2013; Fitzpatrick, 2010, 2012; Gelbach, 2002; Gibbs et al., 2024; Wikle and Wilson, 2023). Beyond childcare access, the timing of when that access occurs may be relevant to the dynamics of mothers' labor market trajectories, and providing

[1] In a 2007, Pew Research Center study, 70 percent of mothers with children under 18 said that either working part-time or full-time would be ideal for them (Taylor et al., 2007).

earlier access to school may ameliorate the long-run effects of time out of the labor market.

In this paper, we exploit kindergarten eligibility cutoffs in the United States to understand how gaining access to publicly subsidized early childhood education one year earlier affects mothers' labor market attachment in both the short- and long-run. This allows us to better understand how time out of the labor market and family policies affect gender gaps and child penalties in the United States. We estimate these relationships by linking mothers with kindergarten-aged children across various Social Security and US Census Bureau surveys and administrative datasets. We use this novel dataset in a regression discontinuity design to compare employment trajectories for nearly 7.5 million mothers whose children barely gain access to kindergarten one year earlier relative to mothers whose children miss the kindergarten cutoff deadline.

Children born just before their state's cutoff are 10.5 percentage points more likely to be enrolled in any schooling relative to children born just after a cutoff, meaning that for one tenth of the sample, access to kindergarten has a substantive change in the counterfactual care setting. Consistent with the relaxing of childcare constraints, we find that access to kindergarten one year earlier increases annual maternal employment by 0.23 percentage points. Scaling by the first stage impact on any school enrollment suggests that having a child attend school one year earlier increases contemporaneous, annual maternal employment by 2.2 percentage points. Despite the fact that counterfactual children, born just after the cutoff, gain access to the same schooling the next year, we find that annual employment rates remain significantly elevated for two years after the relevant kindergarten deadline (second grade for the eligible children) before fading out. Even though untreated mothers received the same benefit one year later, the increased ability to enter the labor market one year earlier has effects that persist beyond the kindergarten year for several years. We do not see evidence of running variable manipulation or discontinuous changes in demographics at the threshold, consistent with the regression discontinuity's causal assumptions.

Employment effects are concentrated among mothers whose youngest children enter

kindergarten, consistent with existing work (Cascio, 2009; Fitzpatrick, 2012; Gelbach, 2002). Perhaps surprisingly, mothers in more advantaged households (non-Hispanic White, college educated, and in two-parent households) are the most responsive to kindergarten eligibility. Employment point estimates are also larger among mothers in states with more stereotypical gender norms. Additionally, the data show that policy structure matters. Mothers' employment is most responsive in places where children have access to full-day kindergarten, consistent with research suggesting that program structure and program hours likely shape mothers' responses to early childhood education access (Dhuey et al., 2021; Gibbs et al., 2024; Wikle and Wilson, 2023).

Although gaining access to schooling one year earlier does not lead to widespread persistence in labor force attachment, patterns of persistence are strongest if it is the mother's youngest child or if they are living in full-day kindergarten access states. For both groups, employment effects begin to appear before the kindergarten year. This is likely because women in these settings make care arrangements earlier, or have access to public education earlier in a way that relaxes time constraints and facilitates earlier labor market re-entry. These patterns are consistent with notions that time out of the labor market has dynamic effects on maternal labor force attachment. Kindergarten access has no effect on employment or earnings of fathers. As such, earlier access to public schooling leads to small decreases in child penalties in the United States, but these gains are only transitory.

To better understand why gaining access to schooling earlier does not lead to persist changes in maternal labor force attachment we turn to the American Time Use Survey and Current Population Survey. These data provide evidence that mothers continue to face household demands that affect labor supply decisions, even after gaining access to childcare through schooling. Mothers with infants and toddlers spend significantly more time than fathers providing childcare. But, as youngest children age into school these gender gaps close. However, large gaps between mothers and fathers in the amount of time spent on non-childcare home production remain, even as the children age. Gaining access to subsidized

childcare does not relax the additional home production expectations that mother face. Evidence from the CPS suggest that spills over to labor market attachment. The gender gap in reporting childcare as a reason for working part-time or being absent from work shrinks as the youngest child ages, but the presence of other family and personal obligations (not including childcare) continues to drive a wedge in labor market attachment between mothers and fathers. The gendered preferences, norms, or discrimination that affect the initial allocations of household management between mothers and fathers continue to affect maternal labor supply decisions in ways that are not fully and permanently ameliorated by family policy that subsidizes childcare.

This work complements and extends existing literature in key ways. First, this study exploits a large and recent sample, making it the most comprehensive evaluation of short- and long-run maternal labor supply responses to public early childhood education access in the U.S. that we know of. Second, we document the long-run effects of subsidized childcare through schooling in the US, which until recently has been unknown. Third, the novel data linkages and large sample facilitate an important analysis of subgroups that informs past research on mechanisms driving labor supply responses. Finally, we highlight the relevance of other gendered constraints that keep mothers less-attached to the labor market, even after childcare constraints are relaxed, suggesting policy discussions surrounding the child penalty must move beyond subsidized childcare.

2 Motivation

Over the past 70 years, as the labor market has become more accessible to women and as mothers have simultaneously shifted toward more intentional parenting paradigms (Bianchi et al., 2006; Sani and Treas, 2016), more mothers and potential mothers face binding constraints when facing joint decisions about work and family. For these reasons, a persistent child penalty continues to be the primary driver of broader gender gaps in employment outcomes (Kleven, Landais and Leite-Mariante, 2024). In the context of the trade offs between

work and family faced by mothers with young children, policies that reduce immediate and long-term tension between work and family may be helpful for families. Often this is proposed as subsidized childcare, in the form of publicly provided early education programs for children, which may relax mothers' time and monetary constraints. These policies may immediately relax mothers time and resource constraints, suggesting short-run consequences for families. However, these policies may also have indirect longer-term consequences for families if providing access to early childhood education supports mothers' career trajectories.

Consider the simple, conceptual model of a mother's decision to pursue paid work at time t. Mothers' get benefits from work which are a function of wages $w(e_t)$, which depend on experience (e_t), and other non-pecuniary benefits of work γ_t. However, working is costly, and these costs are potentially driven by childcare costs associated with work (λ_t), tastes towards work (ϕ_t), and the opportunity cost of work (o_t). This term captures the value of other activities the mother might engage in if she is not working, such as family and household management. A mother will decide to work if

$$b(w(e_t), \gamma_t) \geq c(\lambda_t, \phi_t, o_t) \tag{1}$$

Policy that reduces childcare costs (λ_t), like granting access to public early childhood education, increase the benefits of work, relative to costs. However, if child penalties were entirely driven by childcare access, they would disappear or shrink once everyone eventually gains access to subsidized childcare, through public schooling. As gender gaps in employment do not disappear upon school entry, there must be additional dynamic effects at play.

As Andresen and Nix (2022) document, gendered norms, gendered preferences, or gender discrimination could be crucial. If the initial allocation of tasks between partners is gendered, it might result in more mothers initially exiting the labor force at childbirth than fathers. Short-run time out of the labor market to care for children can lead to long-term labor market differences, even if mothers want to eventually return to work. This could operate through several channels. First, time out of the labor market can affect the returns to experience

$(w(e_t))$ if there is human capital depreciation and particularly if this depreciation is non-linear (Kuka and Shenhav, 2024; Mincer and Polachek, 1974; Polachek, 1981). Second, preferences towards work (ϕ_t) might change as women spend more time out of the labor market. Finally, mothers' initial time out of the labor market after childbirth might lead families to build routines and allocate home production to mothers in a way that are costly to adjust if she were to re-enter the labor market, thus changing the opportunity cost of work (o_t). For example, if stay-at-home mothers disproportionately take on responsibilities for meal planning and preparation, child transportation, school interactions (Buzard et al., 2024), home production, and household maintenance while the children are young, the family might face large adjustment costs (in both time and money) if the mother later returns to work. There is little direct evidence of this channel, but there is evidence that maternal employment is more sensitive to school calendars and unplanned school cancellations (Duchini and Van Effenterre, 2022; Graves, 2013; Price and Wasserman, 2024).

Each of these channels would affect the decision to work differently, but all potentially lead to a reduction in labor force attachment.[2] As such, the amount of time spent out of the labor market and the timing of subsidized childcare provision could have long-run consequences for maternal labor force attachment. We test these hypotheses by exploiting kindergarten eligibility birthdate cutoffs, to determine if a one-year difference in access to public kindergarten has persistent labor market effects.

There is growing body of evidence that demonstrates the impact of early childhood education not just for children, but for parents as well. Research to date includes short-run evaluations of early childhood education and maternal labor supply, contributing to more understanding about how the early childhood education landscape in the United States contributes to mothers' employment (see review by Morrissey (2017)). The evidence coming from these studies is mixed, due to differences in policy settings, cultural contexts, time periods, and sample compositions. Our study most closely compares with Fitzpatrick (2012).

[2]The effect of time out of the labor market on tastes towards work is theoretically ambiguous.

Like us, her study uses a regression discontinuity strategy in the kindergarten year but focuses on an earlier time period by using the 1980 and 2000 Censuses. Her study, as well as other studies based in a universal kindergarten or preschool settings find labor supply responses among single mothers whose youngest child is entering early childhood education (Cascio, 2009; Cascio and Schanzenbach, 2013; Fitzpatrick, 2010, 2012; Gelbach, 2002), and responses among other mothers are less consistent (perhaps in part due to lack of precision). In general, this literature demonstrates that maternal labor supply elasticities are getting smaller over time, suggesting marginal mothers have changed as more and more mothers have entered the labor market over the past few decades. Even with this body of research, open questions remain about which mothers are most responsive and why, questions that our study provides insight into. Additionally, this work all focuses on contemporaneous maternal employment outcomes, and is unable to examine the long-run implications of early childhood education for mothers.

One contemporaneous study evaluates long-run implications of returns to universal pre-kindergarten in New Haven, Connecticut (Humphries et al., 2024). Using an admissions lottery, this paper finds that access to early childhood education elevates employment hours and earnings of parents, with persistence for at least six years after pre-kindergarten. Their sample is composed of a low-income majority-minority school district with children who are younger than children in our study. Our paper complements this work as we evaluate broad swaths of the United States in a quasi-experimental setting. Relatedly, research on the long-run implications of providing families with childcare subsidies point toward persistence in labor supply beyond the initial treatment (Erceg, 2023; Herbst, 2017).

At initial treatment, mothers may differ in their responsiveness to access to early childhood education. Past literature has generally focused on mothers with no younger children and single mothers (Cascio, 2009; Cascio and Schanzenbach, 2013; Fitzpatrick, 2010, 2012; Gelbach, 2002). In reality, responses are likely influenced by micro-level, cultural, and policy contexts facing families. Exploring more margins of heterogeneity with larger samples and

more than one geographic area provides new insight into why some mothers may or may not be responding to access to early childhood education. Program structure in terms of how many hours of early childhood education are offered (Dhuey et al., 2021; Gibbs et al., 2024), local gender norms (Cavapozzi et al., 2021), and family socio-economic status (Kalil et al., 2012) all vary within the universal kindergarten context of the United States. Exploring these moderators provides valuable insight into mechanisms and the nature of maternal responses in labor markets.

3 Data

We take advantage of restricted access, linked US Census Bureau (Census) and Social Security Administration (SSA) data in a regression discontinuity (RD) setting to estimate the long-run and heterogeneous effects of school access on maternal labor supply. Without these linked data this analysis would not be feasible. The only US-based datasets that include all of necessary RD elements are small surveys, such as the Panel Study of Income Dynamics (PSID) or the National Longitudinal Survey of Youth (NLSY). We construct a dataset that follow millions of mothers over time.

We use the 2016-2019 Census Household Composition Key (CHCK) to identify parent to child linkages for the nearly all births occurring in the US between 1997 and 2018. These parent-child linkages are then linked using Personal Identification Keys (PIKs) to the SSA Numident, which records the child's exact date of birth. Using the PIK, children are linked to the Master Address File (MAF) in the year they turn five. This allows us to identify the state of residence and corresponding kindergarten cutoff the child and mother face. Women with children born within 90 days of the applicable kindergarten cutoff are then linked to the collapsed Linked Employer-Household Dynamics (LEHD) job-level files yielding a quarterly employment panel for each individual. We further collapse this to the yearly level to examine total annual earnings and an employment indicator that equals one if the individual has any earnings during the year. We stagger years to start in quarter 3 and continue though

quarter 2, to match the timing of the school year.[3] Our LEHD sample follows approximately 7,490,000 mothers from two years before the focal kindergarten year to 4 years after.

We also link the CHCK sample to the American Community Survey (ACS) between 2001 and 2019. This will allow us to measure first stage effects on school enrollment for approximately 279,000 children as well as other maternal human capital investments that could also be changing once children go to school, such as educational attainment. We provide detail on each component of this linked data in the data appendix.

4 Empirical Approach

In each state kindergarten eligibility is determined by rigid age-eligibility cutoffs.[4] For example, to be eligible for kindergarten in many states, a child must have turned five years old before September 1st. As such, a mother that has a child that turns 5 on September 1st and a mother that has a child that turns 5 on September 2nd might appear to have similar life circumstances but face very different childcare and education options during the next year. Since eligibility dates vary across states and over time, parents cannot perfectly manipulate their child's date of birth relative to the school eligibility cutoff. Families who fall on one side of the cutoff are likely to be similar to those that fall just on the other side of the cutoff, except that one group will experience the associated benefit of increased childcare and education options. This strategy has been used previously to examine the impact of public preschool and kindergarten access on concurrent maternal employment (Fitzpatrick, 2010, 2012), but we extend it to examine labor supply dynamics and heterogeneous responses.

In the top panel of Figure 1 we plot the share of children enrolled in any school in ten day bins.[5] Begin born just before the applicable kindergarten eligibility cutoff date significantly

[3]Our project was given approval to use LEHD data from 19 states, but we are also able to observe if there is any earnings in all 50 states.

[4]In 8 states cutoffs are determined by the local education authority, but there are still age-eligibility cutoffs.

[5]The last bin includes 11 days as it includes birthdays that are 80 to 90 (inclusive) days after the kindergarten cutoff.

increases the probability of being enrolled in any school by 10.5 percentage points, or that for one in ten mothers their child's counterfactual care setting is altered by the kindergarten access.[6]

We estimate how gaining access to kindergarten affects a mother's labor supply using the following reduced form regression discontinuity

$$Y_i = \beta_0 + \beta_1 BornBefore_i + \beta_2 (Birthdate - Cutoff)_i + \beta_3 (Birthdate - Cutoff)_i * BornBefore_i + X_i'\Gamma + \varepsilon_i \quad (2)$$

The primary outcomes of interest mother-level annual employment and earnings, obtained from the LEHD. $BornBefore_i$ is a binary variable that equals one if the child was born before the relevant kindergarten eligibility cutoff in their state of residence. The variable $(Birthdate - Cutoff)_i$ is a continuous variable that measures the number of days between the child's birth and the kindergarten eligibility cutoff. The matrix X_i includes state-by-days relative to the cutoff fixed effects. Standard errors clustered at the state-by-days relative to the cutoff level. Throughout, we restrict the sample to children and mothers of children born within 90 days of the school eligibility cutoff, giving a three month bandwidth. However, as seen in Table A4, estimates are robust to reducing the bandwidth to one month on each side of the cutoff.

The coefficient of interest is β_1, which captures the effect of gaining eligibility to attend kindergarten on maternal labor supply. Unfortunately, the child-level outcomes used to estimate the first stage are only available in the ACS sample. As such, we are unable to estimate the second stage relationship between child school attendance and maternal labor supply in the LEHD focal mothers sample. Instead, we estimate the first stage and reduced form relationships separately, and evaluate the corresponding Wald estimator, analogous to a two-sample, two-stage least squares.

[6] As seen in Figure A1, being born before the cutoff increases the probability of being enrolled in kindergarten by 41.4 percentage points

We use this specification to estimate both contemporaneous and long-term effects. We estimate effects for years, relative to the focal kindergarten eligibility year, separately to understand the dynamic effects of gaining access to school one year earlier. We also estimate effects for subgroups to understand which mothers are affected and if there are particular settings that influence mother's responsiveness to gaining access.

Our key identifying assumption is that expected potential outcomes evolve smoothly through the kindergarten eligibility cutoff. This will be the case if children born just before and just after the applicable kindergarten eligibility date have the same potential outcomes on average. In other words, if timing of birth relative to the cutoff is as good as random. The distribution of births evolves smoothly through the cutoff and we do not see evidence of birth date manipulation around the cutoff in our data (Figure A2). We also do not observe discontinuous differences in the mother's race/ethnicity, immigration status, educational attainment, presence of father, and age at birth of the child on either side of the eligibility cutoff (Figure A3).

5 Results

5.1 Contemporaneous Maternal Employment Effects

Mothers with children born before the cutoff have higher levels of employment relative to those past the cutoff (Figure 1).[7] At the cutoff, the probability of being employed during the child's kindergarten year increases by 0.23 percentage points As the kindergarten eligibility cutoff only shifted 10.5 percent of kindergarten-aged children into school from alternative care arrangements, this would suggest that having a child enroll in school increases annual maternal employment by 2.2 percentage points. We see no significant change in earnings at the threshold, but when we examine the inverse hyperbolic sine of earnings we observe a marginally significant 1.7 percent increase in earnings. As there is no level change in

[7]Regression estimates for both the first stage and reduced form are provided in Table A1.

earnings, this is likely driven by changes in employment at the extensive margin (Table A1). These Wald estimates are similar in magnitude to the IV scaled estimates from Fitzpatrick (2012), but because of our sample size we are able to statistically detect differences around the cutoff for the full sample

As in Fitzpatrick (2012), we also explore heterogeneity by maternal characteristics. Once again, because of our sample size we are able to explore potential differences across groups but maintain statistical precision. We re-estimate equation (2), but restrict the sample based on the mother's characteristics (Figure 2). When stratifying by race the point estimates are largest for Non-Hispanic White mothers, and smaller for Non-Hispanic Black, Hispanic, and Non-Hispanic Other mothers, although not statistically distinguishable. The effect of gaining kindergarten access is increasing in maternal education. The point estimate is small and negative for mothers with less than high school, around 0.2 percentage points for high school and some college educated mothers, and 0.48 percentage points and significant for college educated mothers. This is more than twice as large as the aggregate estimate. The point estimate is larger for mothers who reside with the father than for single mothers, but they are not statistically different. Whether or not the mother has additional younger children beyond the focal child yields the largest difference in causal treatment effects. Mothers without younger children increase their annual labor supply by 0.54 percentage points when their youngest gains access to kindergarten, while we see no effect for mothers with younger children. The effects are statistically different for these groups.

We next explore heterogeneity by variation in the generosity of childcare being provided through kindergarten. Many states offer half day programming, which only provides 2-3 hours of childcare a day and likely has to be paired with additional childcare to facilitate maternal work. The secular shift to full-day kindergarten in the US has led to increases in maternal labor supply (Gibbs et al., 2024). We estimate effects separately for mothers in states that mandate school districts to offer full-day kindergarten and states that do not. Mothers in states that mandate full-day kindergarten access experience the largest

treatment effect across all groups. Gaining access to kindergarten with full-day options increases maternal annual labor supply by 0.72 percentage points. If we scale by the first stage estimate this would suggest that labor supply increased by as much as 7 percent when children enroll in full-day kindergarten.[8] Meanwhile the effect in states without full-day kindergarten is small and insignificant.

Another potentially interesting dimension of heterogeneity is variation in prevailing gender norms. Andresen and Nix (2022) suggest that the child penalty is driven by differences in preferences, gender norms, or discrimination. As Kleven (2023) shows, the child penalty in employment and earnings is larger in states with more conservative gender norms. Gaining access to subsidized childcare through kindergarten eligibility might also affect mothers differently in states with different gender norms. The direction of this relationship is theoretically ambiguous. If more women in states with more conservative gender norms are inherently less attached to the labor market, we might see no effect of gaining access to additional childcare. Alternatively, if women in states with more liberal gender norms are already in the labor force, the additional access to subsidized childcare might be inframarginal. Although we cannot statistically distinguish the effects in states with stronger and weaker gender norms, the effect is four times larger in strong gender norm states than in weak gender norm states. This would suggest that gaining access to early childhood education translates into more maternal labor supply when the prevailing norms discourage mothers from working. If public school is viewed as a socially acceptable setting to place children into, subsidizing other care settings such as childcare may not elicit the same response.

5.2 Maternal Employment Effects Over Time

Gaining access to subsidized childcare one year earlier increases contemporaneous maternal employment. If the amount of time out of the labor market affects future attachment this could have persistent employment effects. Using the linked LEHD mothers, we re-estimate

[8]In the ACS we cannot differentiate between full-day or part-day kindergarten, so we cannot estimate the first stage relationship of the cutoff on enrolling in full-day kindergarten.

equation (2), but replace the outcome with annual employment in years before and after the applicable kindergarten cutoff year. In Figure 3 we plot estimates from two years prior to the kindergarten year (when the child is approaching their third birthday) to 4 years after the kindergarten year, when children born before the cutoff would be entering fourth grade.

Prior to the kindergarten year we see small, insignificant differences in annual employment between mothers with children who will eventually be eligible for kindergarten relative to mothers with children who will barely miss the cutoff and only be eligible the next year. As documented above, we see a statistically significant increase in the rate of employment among mothers who gain access to kindergarten in the kindergarten year. Even though the treatment only lasts one year, and the untreated group receives the same access the next year, we estimate a similarly large and statistically significant effect one year later. The effect persists through the second grade year, although it declines and is only statistically significant at the ten percent level. After the second grade year the estimate returns to zero, suggesting no permanent differences in labor force attachment associated with gaining access to kindergarten one year earlier. Gaining access to subsidized childcare one year earlier temporarily increases employment, but it does not lead to persistent increases in maternal labor force attachment.

We re-estimate the dynamic employment effects for the two strata that exhibit the largest differences in the initial kindergarten year: whether younger children are present and whether the state requires full-day kindergarten access. In the top panel of Figure 4 we plot the effects for mothers whose focal child is the youngest and for mothers who have younger children. Among mothers with younger children employment trajectories are unchanged. However, among mothers without younger children having a child born before the kindergarten eligibility threshold increases annual employment during the focal kindergarten, first grade, and second grade years. Point estimates are still relatively large in the focal third and fourth grade year, but they are no longer statistically significant. The effect in the year *before kindergarten* is also large and statistically significant. There are two possible mechanisms.

First, eligibility dates for preschool programs often align with local kindergarten eligibility dates. As such, mothers whose child was eligible for kindergarten was also likely eligible to enter preschool in the prior year. These programs are typically less time-intensive than kindergarten, which can help explain the smaller effect in the preschool year than in later years. Second, mothers might preemptively adjust labor supply and other care settings prior to their youngest child's kindergarten eligibility.

We explore the role of program hours generosity in the bottom panel of Figure 4. We estimate smaller, marginally significant increases in annual employment during the kindergarten and first grade years associated with kindergarten access in states that do not require full-day access. Among mothers in states that do mandate full-day kindergarten access, gaining access to kindergarten is associated with large, persistent gains in annual employment, significant in all years through the fourth grade year except for the third grade year. However, as observed among mothers without younger children, estimated effects prior to the kindergarten year are large and marginally significant. States that support full-day kindergarten also likely have more robust preschool programs, which could help to explain these preemptive effects.

5.3 Alternative Responses

Research on mothers' responses to early childhood education access for their children has focused on employment, when in reality labor supply decisions, human capital investment decisions, and fertility and childrearing decisions are jointly made through a process of intrahousehold bargaining. This points to the potential for additional indirect channels to emerge. Table A3 confirms that these indirect channels are not mediating long-run labor supply responses as it demonstrates that children's access to early childhood education does not alter mothers' education, mothers' marital status and family structure, or mothers' fertility decisions. Unlike mothers, we see no immediate or persistent effects for fathers (Figure A7).

6 The Role of Childcare vs. Other Family Obligations

We find very little evidence that gaining access to childcare one year earlier has long-run effects on maternal labor force attachment. Providing access to childcare when the child is 5 is unlikely to mitigate child penalties. It is possible, that this intervention occurs too late. Using the monthly Current Population Survey (CPS) and the American Time Use Survey (ATUS) we provide descriptive evidence of why mothers with dependent children report lower levels of labor force attachment and how they allocate their time. The monthly CPS asks respondent detailed questions about work arrangements and non-work, including asking why workers were absent from work in the previous week and why workers were not working full time.[9] Using these measures, we document the relative importance of childcare as an employment friction for mothers and fathers. For both workers who were absent last week and part-time workers we plot the fraction of mothers and fathers who report that childcare problems are the reason for reduced labor market engagement *by the age of their youngest child* in Figure 5. We also plot the fraction of parents who report other family or personal obligations as the main reason. Family obligations do not include problems with childcare. For both groups of workers we see that concerns about childcare are relatively more important for mothers with infants and toddlers than for fathers with young children. However, as the youngest child ages into school years, the preventative role of childcare problems for mothers converges to that of fathers.

The same is not true for other family or personal obligations. For both groups of workers and at all child ages family obligations are cited more often than childcare concerns as a obstacle to increased labor market engagement. Mothers are more likely than fathers to report family obligations as the relevant obstacle to employment, and unlike childcare these gaps do not close as the child ages. Although the levels do fall some for mothers as the youngest child ages, family obligations drive a persistent wedge between mothers

[9] In Figure A8 we also look at why individuals that wanted to work were not looking for work.

and fathers in the likelihood that they are absent from work or working part time. These patterns are consistent with initial allocations of household management between mothers and fathers determined when children enter the home persisting even after children are school eligible. As families allocate household management tasks across parents, many of these assignments are sticky even when time constraints for mothers are relaxed by the provision of childcare. This is consistent with recent work showing that mothers bear additional household management tasks beyond just watching children that affect labor supply behavior (Buzard et al., 2024). Although access to school one year earlier has contemporaneous effects, there are not persistent effects in part because these other household management duties remain among mothers. Providing access to subsidized childcare at younger ages could counteract these patterns, but by the time the child is 5 many of the household routines are already set in place and costly to adjust.

7 Discussion

Our study of kindergarten access reveals that publicly provided early childhood education has a significant effect on short-run employment outcomes of mothers with a five-year-old child. During the kindergarten year, employment increases by 0.23 percentage points relative to similar mothers whose children are not eligible for kindergarten. We find evidence that employment responses persist several years beyond the kindergarten year, especially among mothers who have the strongest short-run responses. Persistence in labor market attachment is most pronounced in areas with full-day kindergarten mandates; mothers who get access to kindergarten one year later still have not caught up in their labor force participation five years later. It takes time for mothers who get access to kindergarten one year later to catch up in the labor market. This suggests that one additional year of work is impactful for mothers' employment trajectories and prompts questions about what channels of influence—such as returns to work experience or compensating differentials—are at play.

Our research highlights important areas of heterogeneity in the responses to access to

kindergarten. Consistent with past research on early childhood education and maternal employment, we found no effects among mothers who had younger children at home and all effects loaded on mothers whose youngest child was kindergarten aged (Cascio, 2009; Cascio and Schanzenbach, 2013; Fitzpatrick, 2010, 2012; Gelbach, 2002). This suggests that caring for younger children remains an important motivator to not work, even as early childhood education is offered to older children. Responses were stronger among more educated mothers. The reasons for this may simply be that the opportunity cost of not working is higher for more educated mothers, which may disproportionately pull them toward employment when children gain access to school. This pattern may also be the result of known education gradients in how mothers approach motherhood and investments in their children (Kalil et al., 2012).

Despite short-run responses, mothers do not experience permanent changes in career trajectories from an extra year of childcare. While providing child care improves the feasibility of employment contemporaneously, it does not seem to be a policy channel that disrupts the persistence of the child penalty. Mothers continue to face constraints related to family obligations that remain, even when childcare is provided, limiting the long-term efficacy of childcare policy in reducing child penalties. This pattern is consistent with evidence from Europe that parental leave policies and subsidized childcare do not shrink child penalties (Kleven, Landais, Posch, Steinhauer and Zweimuller, 2024).

This research sheds light on a broader question about the policy impact of universal early childhood education on the parents of children served by school access. Our findings suggest that providing early childhood education for children remains an important policy lever to support maternal employment in the short-run. This is especially true in areas with more traditional gendered cultural beliefs and norms. Additionally, early childhood education program generosity in terms of the length of the school day elicits stronger employment responses that persist until at least fourth grade, a finding that aligns with an emerging literature (Cowan et al., 2023; Dhuey et al., 2021; Duchini and Van Effenterre, 2022; Graves,

2013; Wasserman, 2023; Wikle and Wilson, 2023). Children's care is a primary consideration for mothers, and mothers often sacrifice earnings growth and make fewer career investments when children need a flexible and available caregiver (Adams-Prassl, 2023; Goldin, 2014; Mas and Pallais, 2017). In this context, program length of day is salient to mothers as they evaluate employment feasibility. Understanding the implications of program structure on families is helpful for program designers so that going forward, early childhood education programs will have the largest social value when designed with the needs of children as well as parents in mind.

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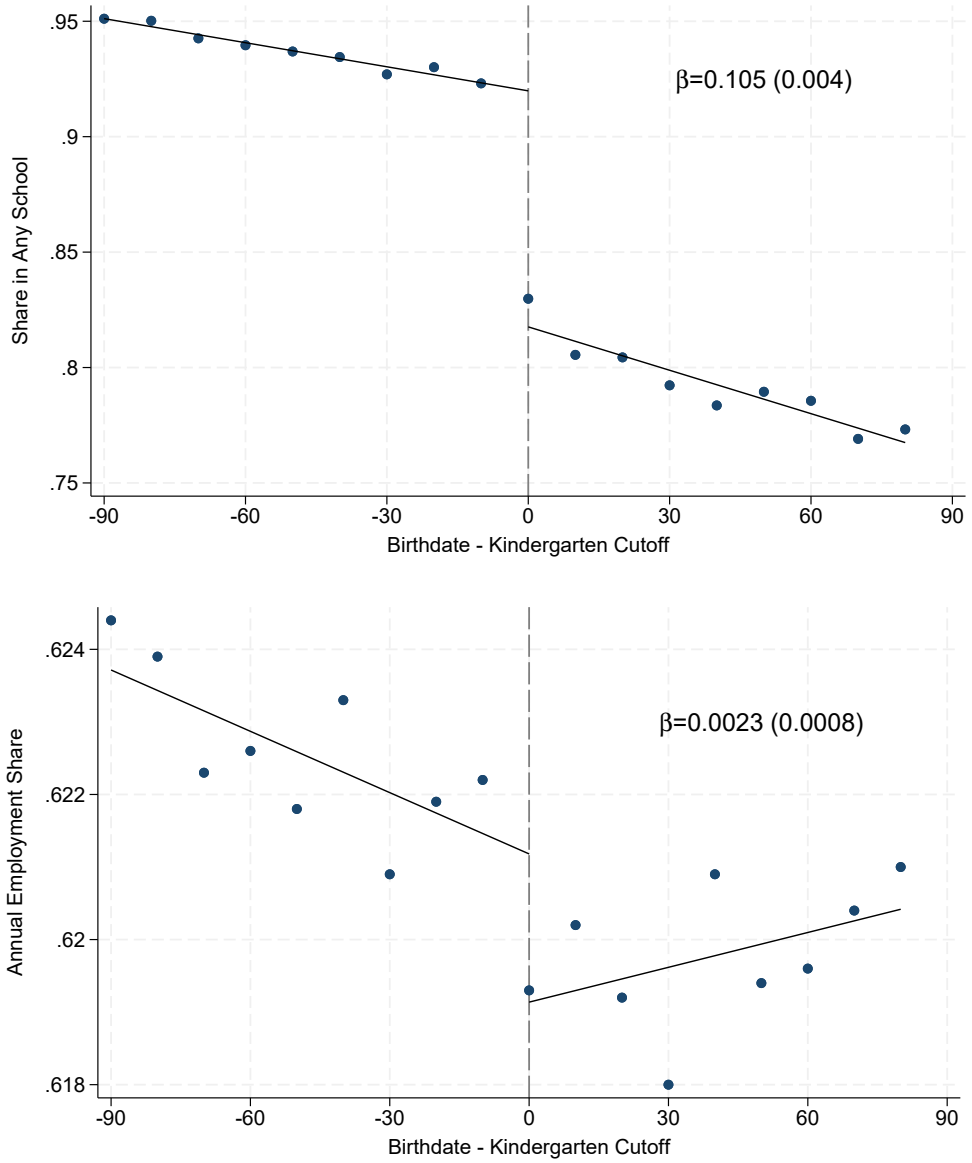
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8 Tables and Figures

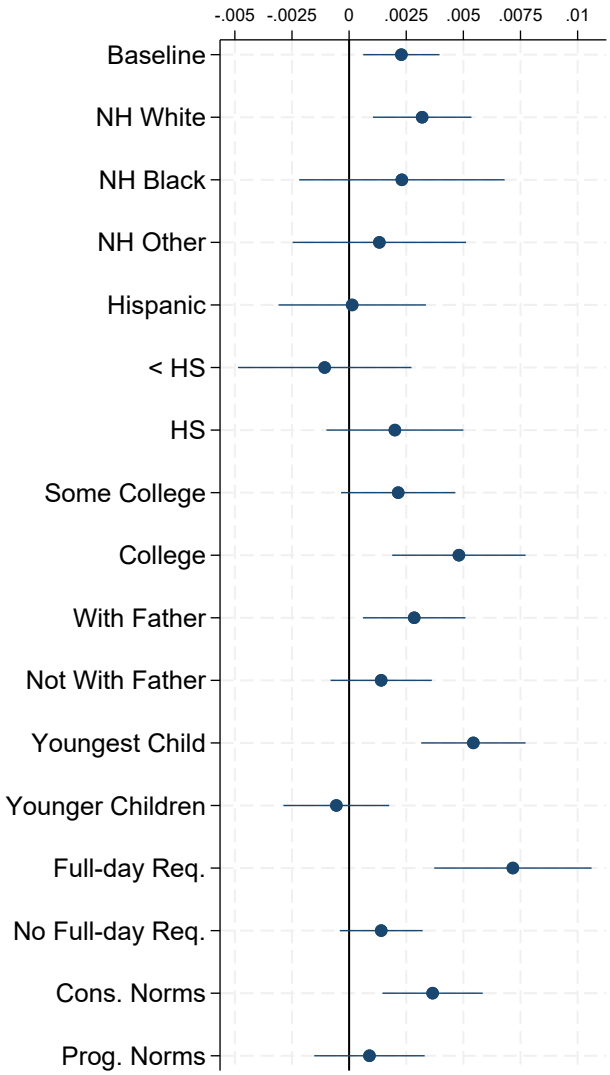
Figure 1: Effect of School Birth Date Eligibility Cutoff on School Enrollment and Maternal Employment



NOTE: Top panel sample restricted to children in the 2001-2019 ACS whose birthday was within 90 days of the state school eligibility cutoff. Bottom panel sample restricted to mothers in the 2014 LEHD who had a child whose birthday was within 90 days of the state school eligibility cutoff. The number of children is plotted in 10 day date-of-birth bins, except for the last bin which includes births 80–90 days after the applicable school eligibility cutoff.

SOURCE: Author's own calculations using the 2001–2019 ACS microdata, linked to the Numident for exact date of birth and the 2014 LEHD, linked to the Census Household Composition Key and Numident for focal child's exact date of birth. Disclosure number CBDRB-FY24-P2706-R11598.

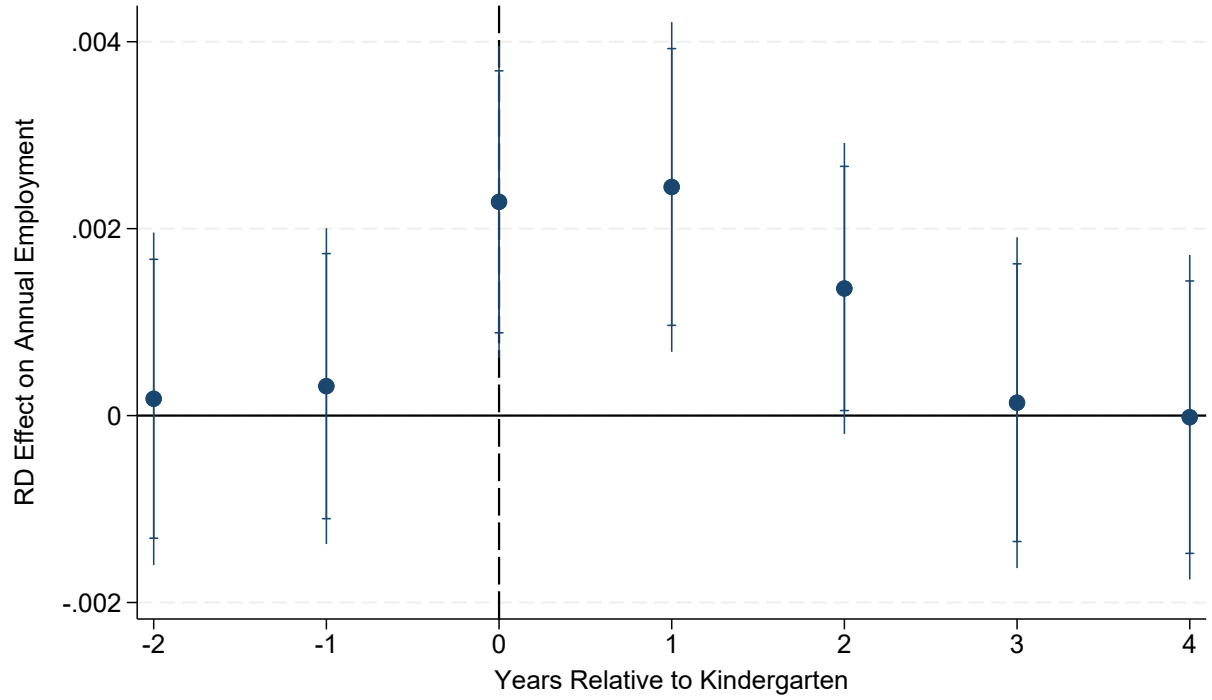
Figure 2: Heterogeneous Effects of School Birth Date Eligibility Cutoff on Annual Maternal Employment



NOTE: Sample restricted to mothers in the 2014 LEHD who had a child whose birthday was within 90 days of the state school eligibility cutoff. The effect is estimated separately for each year. Days between birthdate and kindergarten cutoff are controlled for linearly and allowed to vary on either side of the cutoff. Standard errors corrected for clusterin at the day from the cutoff level. 95-percent confidence intervals are included.

SOURCE: Author's own calculations using 2014 LEHD, linked to the Census Household Composition Key and Numident for focal child's exact date of birth. Disclosure number CBDRB-FY24-P2706-R11598.

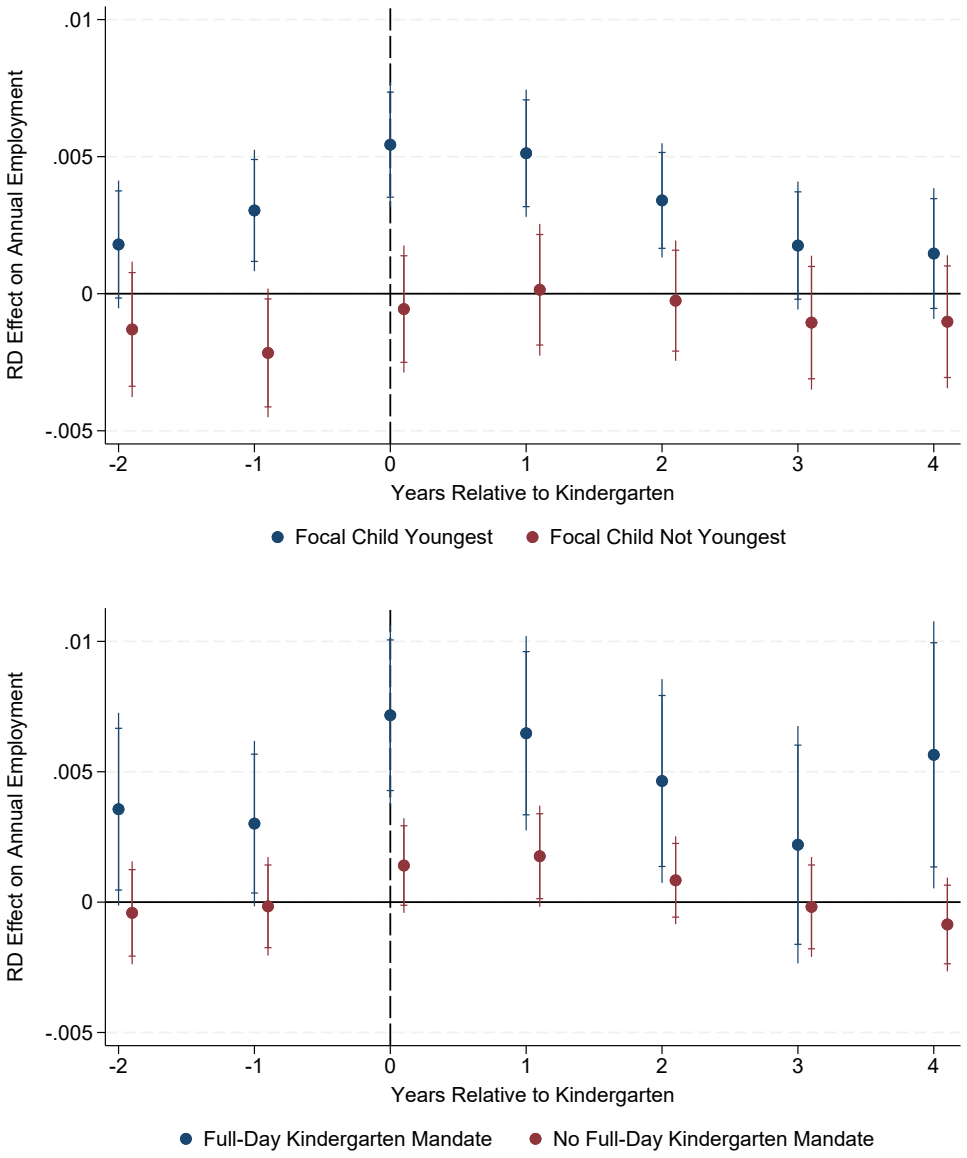
Figure 3: Effect of School Birth Date Eligibility Cutoff on Employment of Mothers Over Time



NOTE: Sample restricted to mothers in the 2014 LEHD who had a child whose birthday was within 90 days of the state school eligibility cutoff. These mothers are then followed each year from two years prior to the relevant kindergarten eligibility cutoff to four years after, when the eligible children would have entered fourth grade. The effect is estimated separately for each year. Days between birthdate and kindergarten cutoff are controlled for linearly and allowed to vary on either side of the cutoff.

SOURCE: Author's own calculations using 2014 LEHD, linked to the Census Household Composition Key and Numident for focal child's exact date of birth. Disclosure number CBDRB-FY24-P2706-R11598.

Figure 4: Heterogeneity: Effect of School Birth Date Eligibility Cutoff on Employment of Mothers Over Time

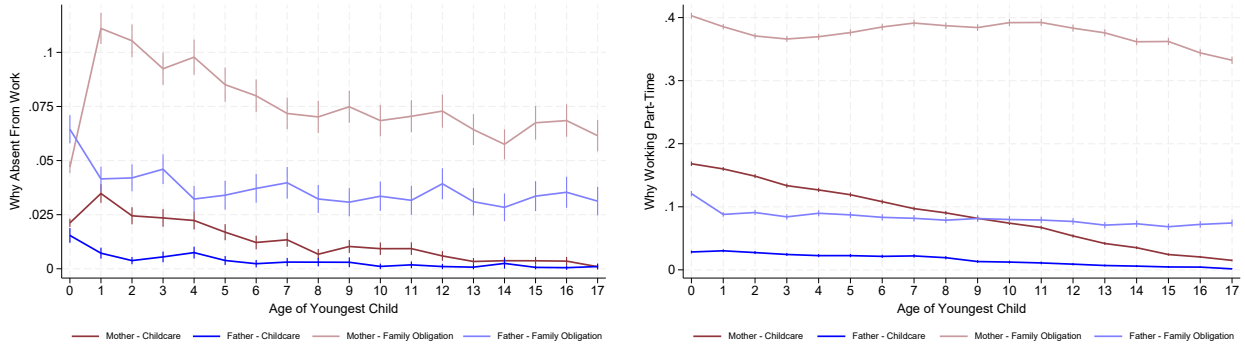


NOTE: Sample restricted to mothers in the 2014 LEHD who had a child whose birthday was within 90 days of the state school eligibility cutoff. These mothers are then followed each year from two years prior to the relevant kindergarten eligibility cutoff to four years after, when the eligible children would have entered fourth grade. The effect is estimated separately for each year. Days between birthdate and kindergarten cutoff are controlled for linearly and allowed to vary on either side of the cutoff.

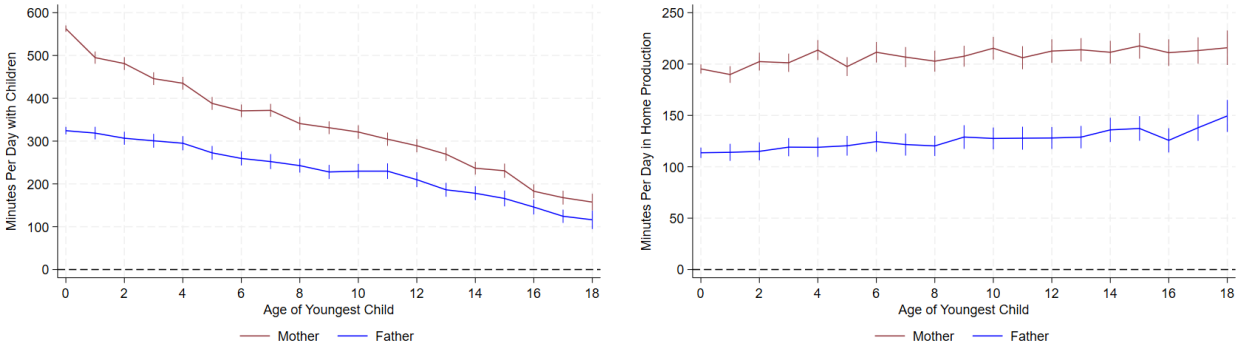
SOURCE: Author's own calculations using 2014 LEHD, linked to the Census Household Composition Key and Numident for focal child's exact date of birth. Disclosure number CBDRB-FY24-P2706-R11598.

Figure 5: Reasons for Reduced Labor Market Engagement

A) CPS Data



B) ATUS Data

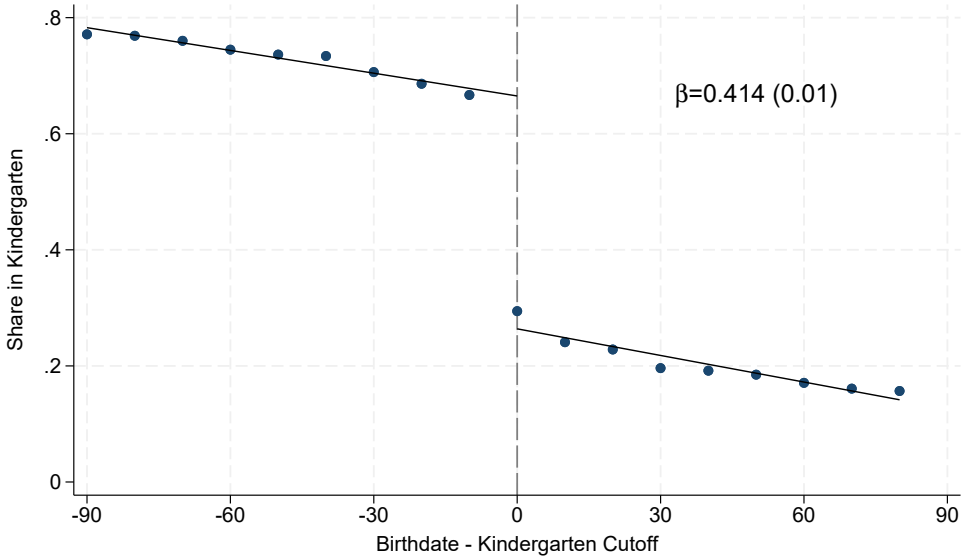


NOTE: Sample restricted to mothers and fathers in the monthly CPS between 2000 and 2019. The red lines are for mothers the blue lines are for fathers. In the left panel the sample is restricted to individuals who reported being absent from work last week. In the right panel the sample is restricted to individuals who reported working part-time last week. The share of people that listed childcare or family/personal obligations as the reason for not being more engaged in the labor market (either absent or working part-time). These groups are mutually exclusive.

SOURCE: Author's own calculations using 2000-2019 monthly CPS.

9 Online Appendix Tables and Figures

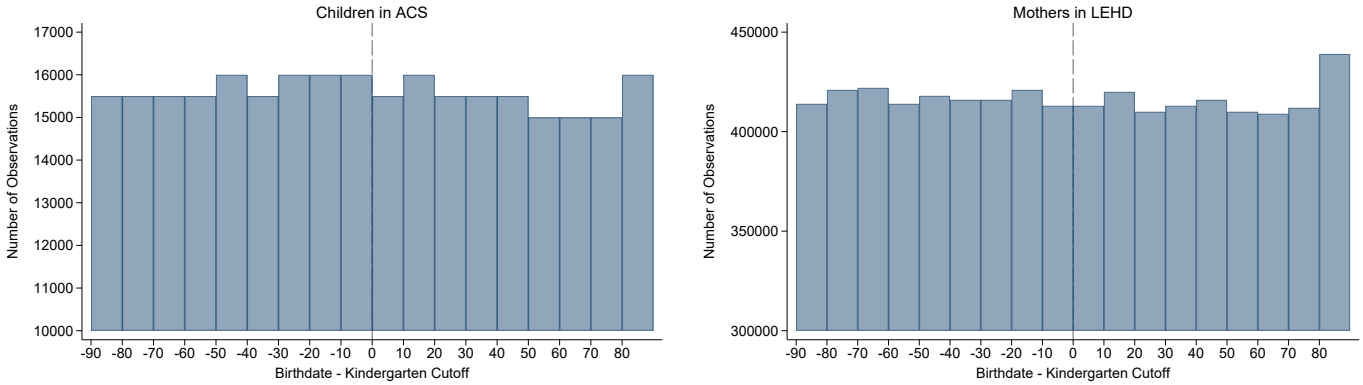
Figure A1: Effect of School Birth Date Eligibility Cutoff on Kindergarten Enrollment



NOTE: Sample restricted to children in the 2001-2019 ACS whose birthday was within 90 days of the state school eligibility cutoff. The average rate of enrollment in kindergarten is plotted in 10 day date-of-birth bins, except for the last bin which includes births 80–90 days after the applicable school eligibility cutoff.

SOURCE: Author's own calculations using the 2001–2019 ACS microdata, linked to the Numident for exact date of birth. Disclosure number CBDRB-FY24-P2706-R11598.

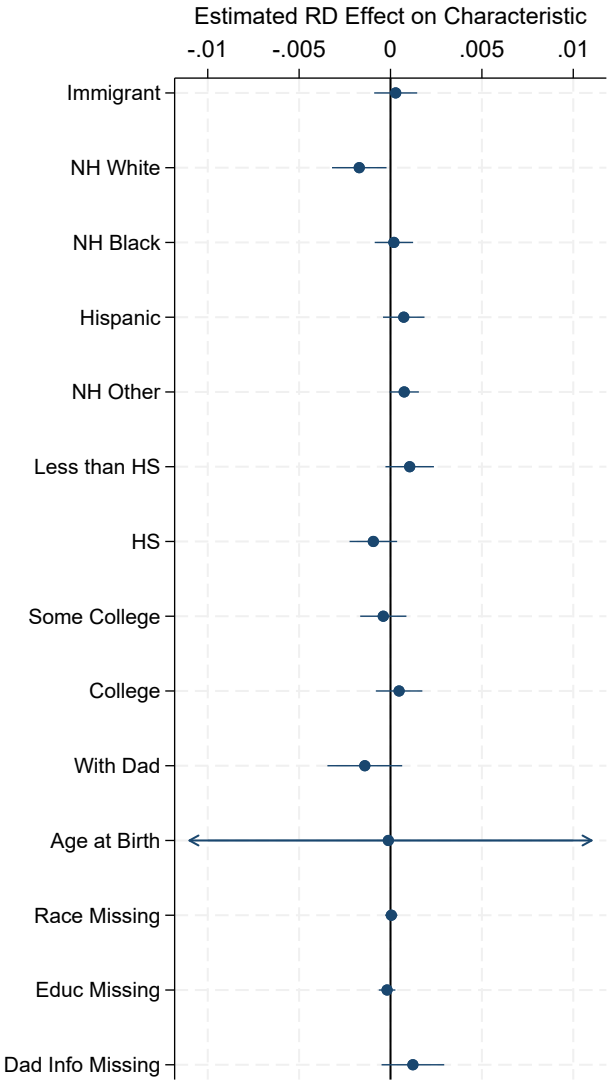
Figure A2: Distribution of Children and Mothers Around School Birth Date Eligibility Cutoff



NOTE: In the left panel sample restricted to children in the 2001-2019 ACS whose birthday was within 90 days of the state school eligibility cutoff. The number of children is plotted in 10 day date-of-birth bins, except for the last bin which includes births 80–90 days after the applicable school eligibility cutoff. In the right panel sample restricted to mothers in the 2014 LEHD who had a child whose birthday was within 90 days of the state school eligibility cutoff. The number of children is plotted in 10 day date-of-birth bins, except for the last bin which includes births 80–90 days after the applicable school eligibility cutoff.

SOURCE: Author's own calculations using 2001–2019 ACS microdata, and 2014 LEHD, linked to the Numident for exact date of birth. Disclosure number CBDRB-FY24-P2706-R11598.

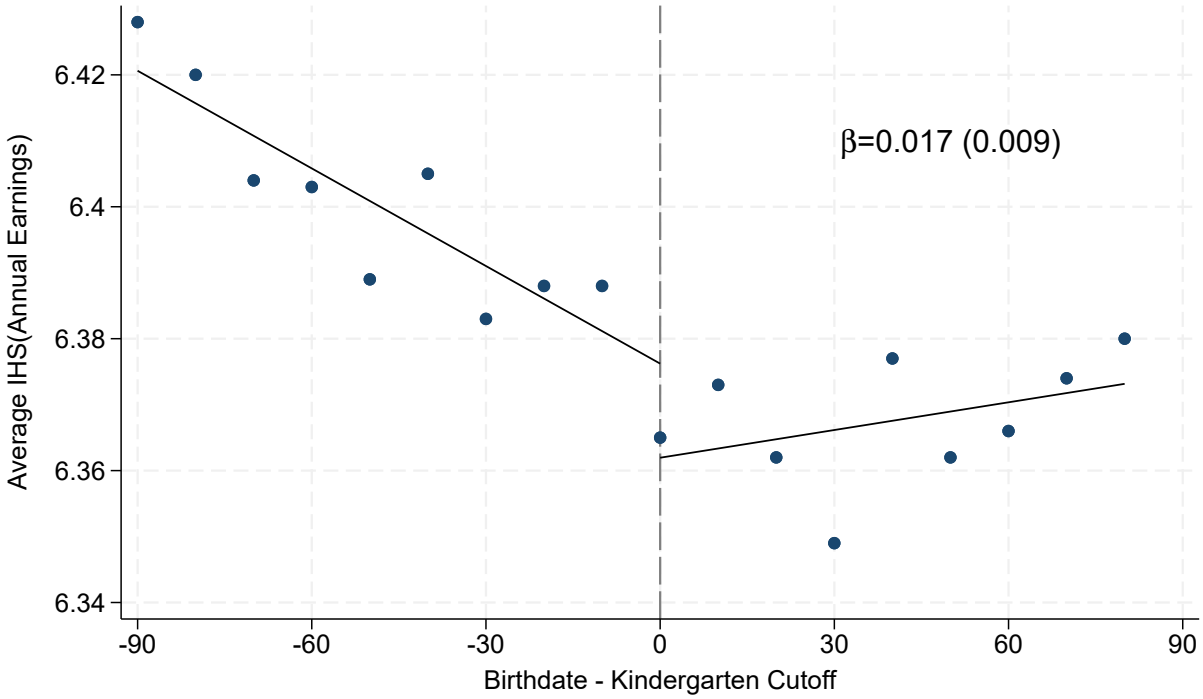
Figure A3: Estimated Effect of School Birth Date Eligibility Cutoff on Baseline Characteristics



NOTE: The sample is restricted to mothers in the 2014 LEHD who had a child whose birthday was within 90 days of the state school eligibility cutoff. Days between birthdate and kindergarten cutoff are controlled for linearly and allowed to vary on either side of the cutoff. Standard errors are clustered at the days relative to the cutoff level.

SOURCE: Author's own calculations using 2014 LEHD, linked to the Census Household Composition Key and Numident for focal child's exact date of birth. Disclosure number CBDRB-FY24-P2706-R11598.

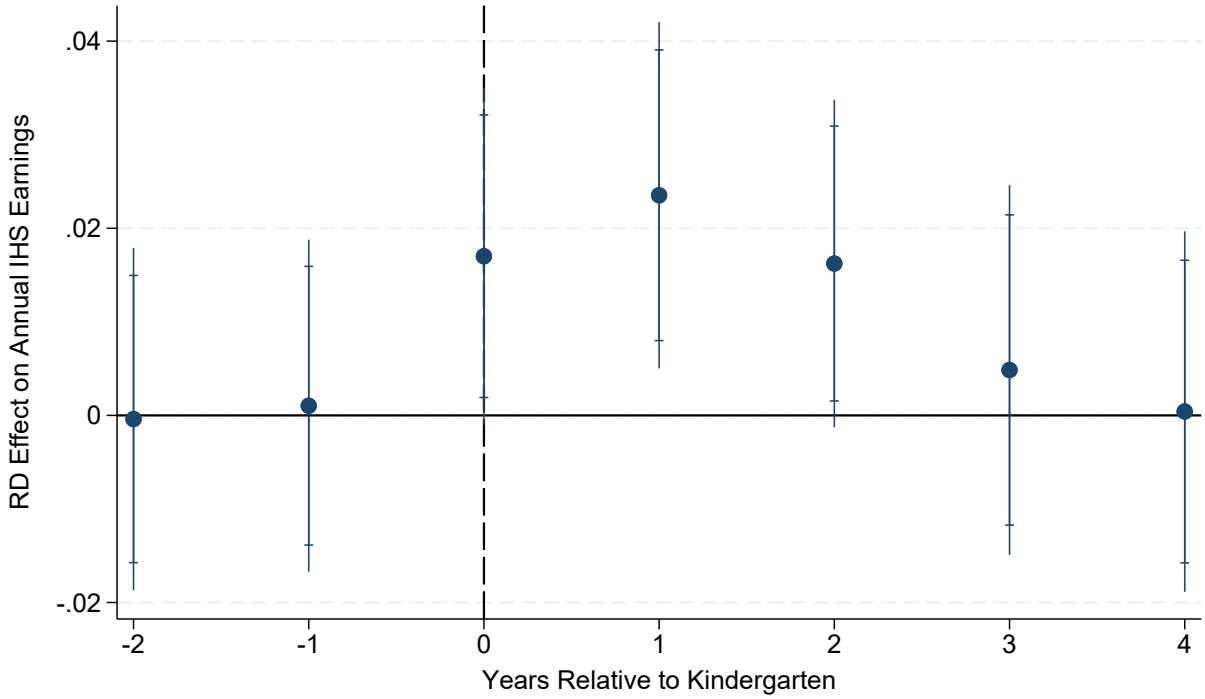
Figure A4: Effect of School Birth Date Eligibility Cutoff on Inverse-Hyperbolic Sine of Earnings of Mothers



NOTE: Sample restricted to mothers in the 2014 LEHD who had a child whose birthday was within 90 days of the state school eligibility cutoff. The number of children is plotted in 10 day date-of-birth bins, except for the last bin which includes births 80–90 days after the applicable school eligibility cutoff.

SOURCE: Author's own calculations using 2014 LEHD, linked to the Census Household Composition Key and Numident for focal child's exact date of birth. Disclosure number CBDRB-FY24-P2706-R11598.

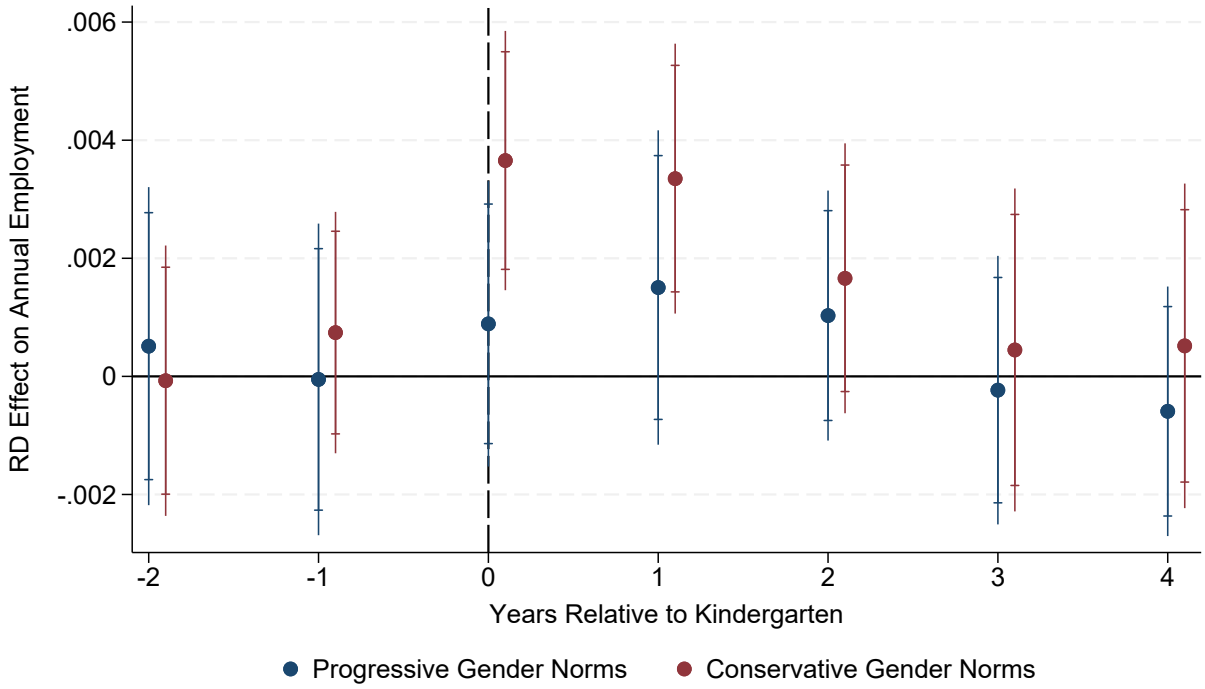
Figure A5: Effect of School Birth Date Eligibility Cutoff on Inverse-Hypoerbolic Sine of Earnings of Mothers Over Time



NOTE: Sample restricted to mothers in the 2014 LEHD who had a child whose birthday was within 90 days of the state school eligibility cutoff. These mothers are then followed each year from two years prior to the relevant kindergarten eligibility cutoff to four years after, when the eligible children would have entered fourth grade. The effect is estimated separately for each year. Days between birthdate and kindergarten cutoff are controlled for linearly and allowed to vary on either side of the cutoff.

SOURCE: Author's own calculations using 2014 LEHD, linked to the Census Household Composition Key and Numident for focal child's exact date of birth. Disclosure number CBDRB-FY24-P2706-R11598.

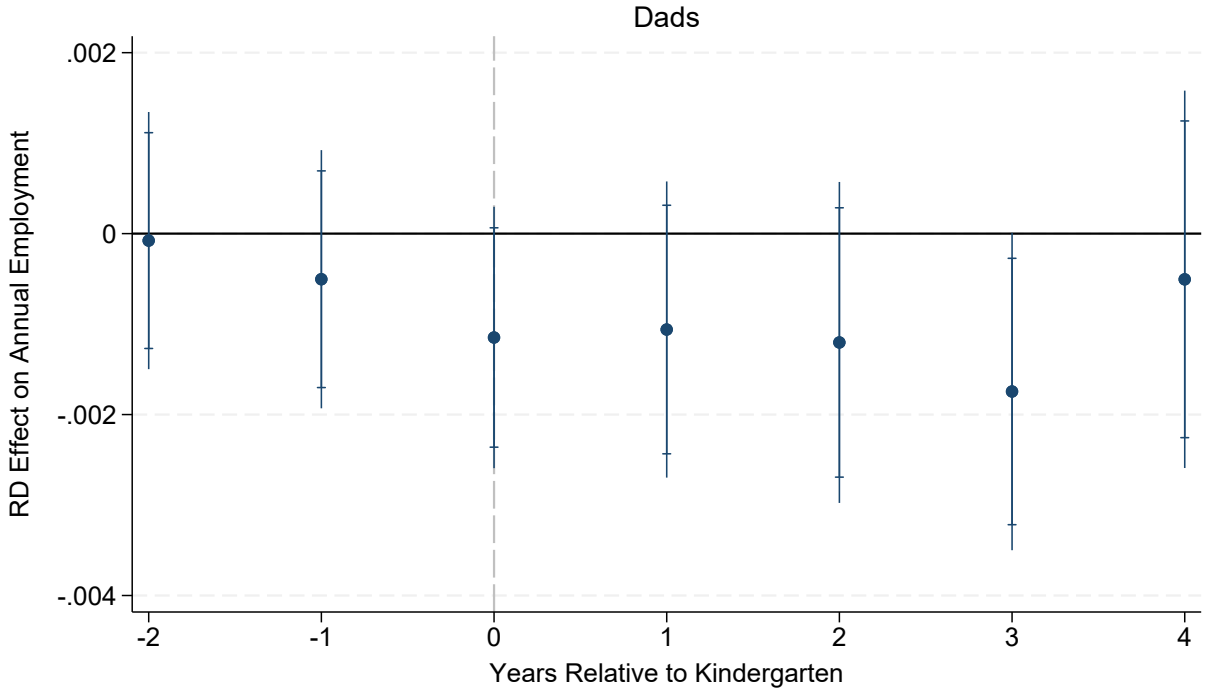
Figure A6: Heterogeneity by Gender Norms: Effect of School Birth Date Eligibility Cutoff on Employment of Mothers Over Time



NOTE: Sample restricted to mothers in the 2014 LEHD who had a child whose birthday was within 90 days of the state school eligibility cutoff. These mothers are then followed each year from two years prior to the relevant kindergarten eligibility cutoff to four years after, when the eligible children would have entered fourth grade. The effect is estimated separately for each year. Days between birthdate and kindergarten cutoff are controlled for linearly and allowed to vary on either side of the cutoff.

SOURCE: Author's own calculations using 2014 LEHD, linked to the Census Household Composition Key and Numident for focal child's exact date of birth. Disclosure number CBDRB-FY24-P2706-R11598.

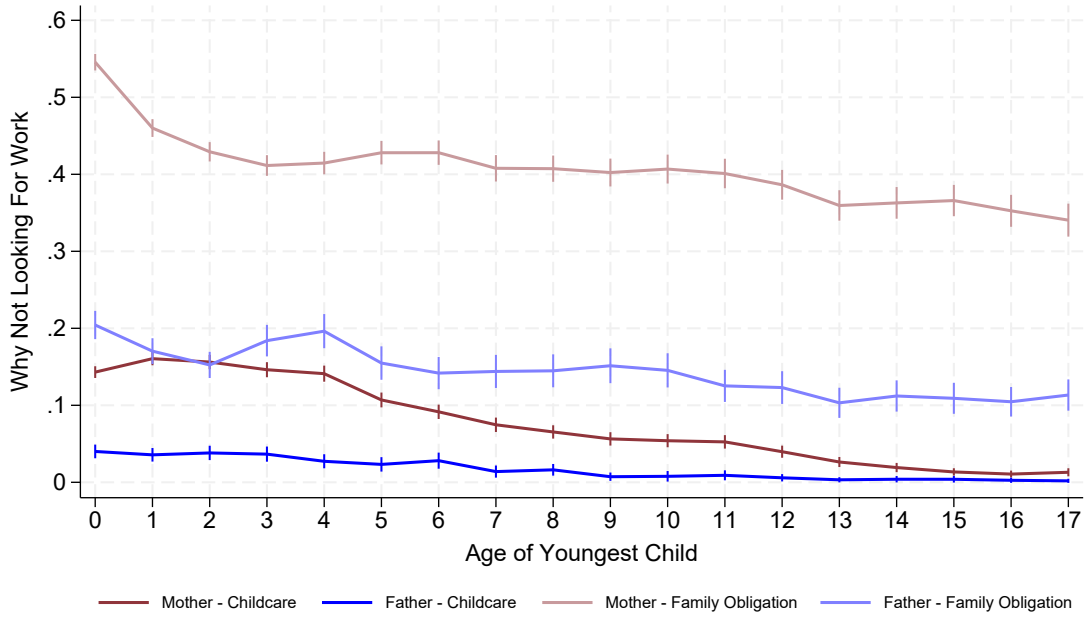
Figure A7: Fathers: Effect of School Birth Date Eligibility Cutoff on Employment of Fathers Over Time



NOTE: Sample restricted to fathers in the 2014 LEHD who had a child whose birthday was within 90 days of the state school eligibility cutoff. These fathers are then followed each year from two years prior to the relevant kindergarten eligibility cutoff to four years after, when the eligible children would have entered fourth grade. The effect is estimated separately for each year. Days between birthdate and kindergarten cutoff are controlled for linearly and allowed to vary on either side of the cutoff.

SOURCE: Author's own calculations using 2014 LEHD, linked to the Census Household Composition Key and Numident for focal child's exact date of birth. Disclosure number CBDRB-FY24-P2706-R11598.

Figure A8: Reasons for Not Looking For Work When Unemployment and Wanting to Work in the CPS



NOTE: Sample restricted to mothers and fathers in the monthly CPS between 2000 and 2019. The red lines are for mothers the blue lines are for fathers. In the right panel the sample is restricted to individuals who reported that they did not look for work in the past four weeks, but had said that they wanted a job. The share of people that listed childcare or family obligations as the reason for not being more engaged in the labor market (either absent, working part-time, or not looking for work). These groups are mutually exclusive.

SOURCE: Author's own calculations using 2000-2019 monthly CPS.

Table A1: Effect of School Birth Date Eligibility Cutoff on School Enrollment and Annual Employment of Mothers

	Children		Mothers		
	In Kindergarten (1)	In School (2)	Employed (3)	Earnings (4)	IHS Earnings (5)
Birthday<Cutoff	0.4135***	0.1049***	0.002287***	-9.308	0.01701*
	(0.009970)	(0.003683)	(0.000852)	(95.24)	(0.009177)
Data Set	ACS	ACS	LEHD	LEHD	LEHD
Observations	279,000	279,000	7,496,000	7,496,000	7,496,000

NOTE: In columns (1) and (2) the sample is restricted to children in the 2001-2019 ACS whose birthday was within 90 days of the state school eligibility cutoff. In columns (3)–(5) the sample is restricted to mothers in the 2014 LEHD who had a child whose birthday was within 90 days of the state school eligibility cutoff. Days between birthdate and kindergarten cutoff are controlled for linearly and allowed to vary on either side of the cutoff. Standard errors are clustered at the days relative to the cutoff level. $p < 0.01$ ***, $p < 0.05$ **, $p < 0.1$ *. Disclosure number CBDRB-FY24-P2706-R11598.

Table A2: Changes in Mothers Characteristics Around the School Birth Date Eligibility Cutoff

	Immigrant (1)	NH White (2)	NH Black (3)	Hispanic (4)	NH Other (5)	Less than HS (6)	HS (7)	Some College (8)	College (9)	With Father (10)	Mother's Age at Birth (11)	Race Missing (12)	Education Missing (13)	Father's Info Missing (14)
Birthday<Cutoff	0.000284	-0.001709**	0.000186	0.000725	0.000751*	0.001050	-0.000938	-0.000394	0.000470	-0.001406	-0.000116	0.000047	-0.000188	0.001225
	(0.000601)	(0.000761)	(0.000536)	(0.000579)	(0.000409)	(0.000677)	(0.000664)	(0.000645)	(0.000649)	(0.001044)	(0.01264)	(0.000171)	(0.000232)	(0.000875)
Observations	7,496,000	7,496,000	7,496,000	7,496,000	7,496,000	7,496,000	7,496,000	7,496,000	7,496,000	7,496,000	7,496,000	7,496,000	7,496,000	7,496,000

NOTE: The sample is restricted to mothers in the 2014 LEHD who had a child whose birthday was within 90 days of the state school eligibility cutoff. Days between birthdate and kindergarten cutoff are controlled for linearly and allowed to vary on either side of the cutoff. Standard errors are clustered at the days relative to the cutoff level. $p < 0.01$ ***, $p < 0.05$ **, $p < 0.1$ *. Disclosure number CBDRB-FY24-P2706-R11598.

Table A3: Effect of School Birth Date Eligibility Cutoff on Alternative Human Capital Decisions of Mothers

	Employed (1)	Wage Income (2)	IHS Wage Income (3)	In School (4)	Has HS Degree (5)	Has 4-year Degree (6)	Has Advanced Degree (7)	Number of Children (8)	Married (9)	Divorced or Separated (10)
					Kindergarten Year ACS					
Birthday<Cutoff	0.009227**	147.8	0.1127***	-0.000755	0.000251	-0.003362	0.002595	-0.001129	-0.003424	-0.001497
	(0.003593)	(313.3)	(0.03832)	(0.002378)	(0.002302)	(0.003907)	(0.002862)	(0.009778)	(0.003472)	(0.002433)
Observations	246,000	246,000	246,000	246,000	246,000	246,000	246,000	246,000	246,000	246,000
					First through Third Grade Year ACS					
Birthday<Cutoff	-0.000296	-79.62	0.01818	-0.002014	0.001481	-0.002057	0.000923	-0.000983	-0.002085	0.001365
	(0.002326)	(185.)	(0.02474)	(0.001420)	(0.001382)	(0.002113)	(0.001555)	(0.006398)	(0.002072)	(0.001499)
Observations	698,000	698,000	698,000	698,000	698,000	698,000	698,000	698,000	698,000	698,000

NOTE: In the top panel, the sample is restricted to mothers in the 2001-2019 ACS who had a child whose birthday was within 90 days of the applicable state kindergarten school eligibility cutoff. In the bottom panel, the sample is restricted to mothers in the 2001-2019 ACS who had a child whose birthday was within 90 days of the applicable state kindergarten school eligibility cutoff, but the mother is observed one to three years later (when the child would be on the margin of entering first through third grade). Days between birthdate and kindergarten cutoff are controlled for linearly and allowed to vary on either side of the cutoff. Standard errors are clustered at the days relative to the cutoff level. $p < 0.01$ ***, $p < 0.05$ **, $p < 0.1$ *. Disclosure number CBDRB-FY24-P2706-R11598.

Table A4: Robustness to Bandwidth: Effect of School Birth Date Eligibility Cutoff on Annual Employment of Mothers

	Employed (1)	Earnings (2)	IHS Earnings (3)
Birthday<Cutoff	0.002847**	33.35	0.02184*
	(0.001224)	(149.7)	(0.01315)
(Birthday<Cutoff)*Days from Cutoff	0.000021	2.114	0.000040
	(0.000069)	(6.608)	(0.000742)
Days from Cutoff	0.000009	-1.842	0.000038
	(0.000049)	(4.94)	(0.000504)
Observations	2,532,000	2,532,000	2,532,000

NOTE: Sample is restricted to mothers in the 2014 LEHD who had a child whose birthday was within 30 days of the state school eligibility cutoff. This shortens the bandwidth from 90 days to 30 days. Days between birthdate and kindergarten cutoff are controlled for linearly and allowed to vary on either side of the cutoff. Standard errors are clustered at the days relative to the cutoff level. $p < 0.01$ ***, $p < 0.05$ **, $p < 0.1$ *. Disclosure number CBDRB-FY24-P2706-R11598.

10 Online Data Appendix

10.1 Census Household Composition Key (CHCK)

The Census Household Composition Key (CHCK) is a restricted-use Census Bureau data product that links parents to children. Using the SSA Numident, which records exact birth date, and census records, the CHCK is a crosswalk between child Personal Identification Keys (PIKs) and mother and father PIKs (Genadek et al., 2021). PIKs are scrambled unique identifiers, that are consistent across a subset of Census surveys and data sources.[10] The CHCK was first constructed in 2016, and captures births going back to 1997 (Genadek et al., 2021). Each year the process is repeated to capture all new births, and any additional parent-child linkages that could not be made before. We start with the 2016 CHCK, and add any additional children who were not linked from the 2017-2019 CHCK. Children are linked independently to their mothers and fathers. As such, we observe more mother-child linkages than father-child linkages.

The CHCK is linked to the SSA numident, allowing us to observe each child's exact date of birth. We use the Numident date of birth to identify each child's birthdate relative to the kindergarten cutoff in the appropppriate state. From this, we construct our main analysis samples: children that are born within 90 days of their corresponding state kindergarten cutoff date and mothers of children born within 90 days of their appropriate state cutoff date.

10.2 Master Address File

Although the CHCK contains parent-child linkages and child exact date of birth, it does not contain geographic information. A child's state of residence is needed to determine when they were born relative to the applicable state kindergarten eligibility cutoff. The Master Address File (MAF) uses address information to link individuals to addresses (ResearchDataGov, 2022). To conduct the Decennial Census and census surveys, such as the American Community Survey (ACS) the U.S. Census Bureau maintains a database of residential addresses in the United States using U.S. Postal Service change of address databases and Demographic Area Address Listing Files (Uhl, 2011).

Using the MAF, we identify the state a child lives in in the year they turn 5. This allows us to calculate the child's date of birth relative to the applicable kindergarten eligiblity cutoff. For example, the kindergarten eligiblity cutoff in California is Sept. 1st. If we identify a child born on Sept. 15th and living in California when they turn age five, we record them as being 14 days from the applicable kindergarten cutoff. We also use the MAF to identify if a child is living at the same residence as their mother and their father.

10.3 LEHD

We link the analysis sample from the CHCK to the Linked Employer-Household Dynamics (LEHD) employer file. The LEHD is a panel of firm-employee level-quarterly earnings constructed from state unemployment insurance earning records. The LEHD also contains individual PIKs, allowing us to collapse to the worker-level and observe total annual earnings for each individual and link this worker employment panel to our CHCK analysis sample. We were granted access to data from 19 states across the country. We used the 2014 LEHD extract, meaning we can follow workers from the year the state started sharing data with the Census Bureau (typically the early 2000s) through the first quarter of 2015.

Using the LEHD we construct three main measures. First, we construct total earnings during the school year. Because we are interested in the effects of kindergarten eligiblity, we measure maternal employment to correspond to the school calendar as close as possible. We construct annual earnings from the third quarter of the calendar year to the second quarter of the following calendar year. This allows us to observe employment from July to June. In most states, kindergarten starts in either August or September and continues through May or June. Second, we construct a binary measure that equals one if the individual had any positive earnings during the school year.[11] Final, we take an inverse hyperbolic sine transformation

[10] Although the PIK is meant to be unique, it is probabilistically assigned so there are a few cases where the PIK is not unique. In these cases we keep the first observation.

[11] Results are similar if we impose an earnings threshold above zero.

of annual earnings, to facilitate a percent change interpretation, but still include zeros.

10.4 American Community Survey (ACS)

Although the LEHD provides a detailed panel of employment, it does not allow us to observe other decisions or investment behaviors of mothers. To capture potential changes in these behavior we use the American Community Survey (ACS). THe ACS is a random sampling survey of nearly 1 million households conducted each year by the U.S. Census Bureau. We use the ACS between 2001 and 2019. The ACS replaces the long form of the Decennial Census and asks participants a range of questions about employment, earnings, education, fertility, and family formation. The ACS is also PIK'ed allowing us to link individuals in our analysis sample to ACS observations. Because the ACS is a survey sample, we do not observe a panel, but we are able to capture outcomes for a random subset of individuals at different points in time relative to the kindergarten event.

We focus on four types of outcomes for mothers in the ACS. First, we construct analogous employment and earnings measures as used in the LEHD analysis. Second, we construct an indicator that equals one if the student is currently enrolled in school as well as a set of educational attainment dummies that indicate if the individual has reached a specific level of educational attainment (e.g., high school graduate, college graduate, advanced degree). Third, we examine the number of own children the individual has in their household. This allows us to estimate if kindergarten eligiblity affects fertility behavior. Finally, we construct an indicator that equals one if the mother is married, to estimate if the kindergarten cutoff affects family formation and marriage.

We also use the ACS to examine the first stage relationship between the kindergarten eligibility cutoff and school enrollment. First, we link children in the ACS to the CHCK analysis sample. We then use the school enrollment measures to see if the child is enrolled in school, and what level of school they are enrolled in. This measure will allow us to determine the fraction families whose school enrollment decision is affected by the state mandated kindergarten enrollment cutoff. We show results for enrollment in kindergarten, but to better understand the counterfactual care setting we are more interested in enrollment in any school. This measure will allow us to capture the share of children who shift from non-school childcare to kindergarten schooling.

10.5 Kindergarten Cutoff Dates Data

We link these administrative data to a database of state-level kindergarten age-eligibility policies to identify treatment status. School age eligibility cutoffs are determined at the state level. Some states further relinquish this determination to the local education authority (school district). As such, there is a patchwork of public preschool and kindergarten eligibility deadlines that vary across states but also over time within states. Agencies, like the National Center for Education Statistics, provide publicly available information on school eligibility cutoff deadlines for kindergarten in each state for a point in time. Using these snapshots as a starting point, we examine each state's education code to determine the kindergarten eligibility birthdate deadline for each state in each year from 1999 to 2020. We use these school-eligibility cutoff deadlines to determine when a focal child was eligible to begin public school. During this time period 8 states deferred to local education authorities to determine the kindergarten eligiblity cutoff.[12] Between 1999 and 2020, there are kindergarten cutoffs ranging from June 1 to January 1, with September 1st the most common cutoff date, followed by September 30, August 1, and August 31. These four dates account for approximately two thirds of the state-year birthdate cutoffs.

10.6 Linked Analysis Samples

We combine these data sets to constructed our linked analysis samples. First, we link individuals using PIKs from the CHCK to the Numident. Using a child's birthday recorded in the Numident, we identify children's

[12]This includes Colorado, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Vermont, and Washington for part of the sample from 1999 to 2004.

birthdate relative to the school age-eligibility cutoff in their state in the year that they turn 5.[13] We limit the sample to children born within 90 days of the relevant state cutoff and use the PIK to identify these children in the ACS to observe their school-related outcomes around the kindergarten cutoff. This yields our sample of approximately 279,000 focal children, observed between 2001 and 2019.

Next, we use the CHCK parent-child linkages to identify the mothers of focal children. Using PIKs we link focal mothers to their observations in the ACS and the LEHD. Using the employment history in the LEHD we examine the effect of gaining kindergarten eligibility on mothers' employment and earnings over time. Using the ACS we measure education and family structure, in addition to employment outcomes. The kindergarten year ACS sample includes approximately 246,000 mothers.[14] The ACS is an annual survey that goes out to approximately one percent of households each year, as such, many mother-child relationship recorded in the CHCK do not link to the ACS, because they were never interviewed. The LEHD is constructed from administrative records, rather than survey samples, which means that unlike the ACS, in the LEHD we have the universe of employment records for 19 states, so we are able to link significantly more mothers to their employment histories. The kindergarten year LEHD sample of mothers includes approximately 7,496,000 mothers who had children born within 90 days of the relevant state kindergarten cutoff. This large sample allows us to estimate effects with more precision and explore dimensions of heterogeneity with more statistical precision than has been used previously. We then follow this focal sample of mothers forward and backward in time to determine how access to early childhood schooling due to age-eligibility affects short-, medium-, and long-run employment outcomes for mothers.

[13]For children born in the first quarter of the year, we make this comparison in the previous year, as this is the relevant kindergarten year.

[14]The ACS sample of children and mothers are not the same because we restrict the ACS sample of mothers to mothers currently residing with the child. About 12 percent of the ACS sample children are not living with their mother, but with only their father or another relative.