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A Matter of Time? Measuring Effects of Public Schooling Expansions on Families' Constraints

Abstract

As women increasingly entered the labor force throughout the late 20th century, the challenges of balancing work and family came to the forefront. We leverage pronounced changes in the availability of public schooling for young children—through duration expansions to the kindergarten day—to better understand mothers' and families' constraints. We first show that mothers of children in full-day kindergarten spend significantly more time at work, less time with their children, less time performing household duties, and less time commuting with their children in the middle of the day relative to mothers with half-day kindergarteners. Exploiting full-day kindergarten variation across place and time from 1992 through 2022, combined with the narrow age targeting of kindergarten, we document the impact of full-day kindergarten access on parental labor supply, family childcare costs, and children's subsequent academic outcomes. Our estimates of the maternal employment effects imply that full-day kindergarten expansions were responsible for as much as 24 percent of the growth in employment of mothers with kindergarten-aged children in this time frame.

JEL-Codes: H750, I280, J130, J220.

Keywords: public schooling, kindergarten, maternal labor supply.

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1 Introduction

Since 1970, mothers have steadily entered the labor market in large numbers, leading to employment rates on par with the employment of men and women with no children in the home (see Figure 1). Mothers have also proven to be strongly attached to the labor force, as evident in the rapid rebound in their employment from the COVID-19 pandemic-induced recession. This "quiet revolution" has contributed to a "grand gender convergence" in the labor market (Goldin, 2006, 2014). Despite the convergence in employment rates, it is clear that the division of other household responsibilities has not converged. Today, mothers of young children are both more likely to be working and spending more time with their children than they were even a few decades ago, potentially creating a tension as mothers' time constraints become binding. While economists have studied the determinants and consequences of maternal employment, far less is known about the role of the policy environment in shaping families' decisions, particularly in current contexts. If mothers are not time- or resource-constrained, changes in childcare policy and public schooling availability may have little to no impact. However, if mothers' constraints are binding, family decisions may respond to policy surrounding family resources. We leverage public schooling expansions across the U.S. in the form of full-day kindergarten provision to better understand how nationwide policy shifts that relax constraints and facilitate flexibility affect parents and families.

Over the last 30 years, the share of kindergarteners in full-day schooling in the United States has nearly doubled. In a relatively short period of time, states which previously supported only half-day kindergarten programs significantly changed course and began offering (and in many cases, mandated provision of) full-day kindergarten programs. Once the exception, full-day kindergarten has become the normative kindergarten context, with over 80 percent of kindergarteners enrolled in full-day programming. This growth is perhaps one of the most dramatic, but least examined, changes to the delivery of early childhood education in the United States. Not only does public kindergarten facilitate investments in children's human capital, it also relaxes time and resource constraints of parents who would otherwise provide for children's care (Cascio, 2009).

This study explores the impact of the substantial full-day kindergarten expansions across states and over time on parents and children. We first show descriptively when, where, and among whom the shift to full-day kindergarten participation is the most pronounced. Considering that access to full-day kindergarten for children may change the way parents allocate time and resources, we then show that kindergarten length of day matters for families' time allocation. Given these descriptive patterns, we next leverage the substantial variation in full-day kindergarten exposure across states and over time, and the narrow

age targeting of kindergarten, to isolate the effects of full-day kindergarten expansions on parents'—and in particular, mothers'—labor supply and childcare expenses, as well as children's subsequent academic performance. While this work speaks directly to the broader impact of full-day kindergarten policy, it also pertains to the likely effects of many federal, state, and local education policies regarding time in school and school schedules on parents and families.

Full-day kindergarten expansions have led to widespread and dramatic changes in the kindergarten landscape. Indeed, between 1992 and 2022, the share of kindergarteners nationally in full-day programming nearly doubled, from 43 to 83 percent. Perhaps surprisingly, early adoption of full-day kindergarten was not driven by states with other, progressive early education policies. The trend began largely in the South, followed by adoption in the Northeast and Midwest, with full-day kindergarten participation lagging in the West. It is also of note that trends in full-day kindergarten participation are similar across maternal marital status, education level, and child race/ethnicity. There has been a corresponding increase in state-level public policy and public resources devoted to full-day kindergarten. This increased access to longer kindergarten programming has the potential to change the time allocation of mothers and fathers.

Using the American Time Use Survey, we next document, descriptively, how access to full-day kindergarten affects the time allocation of mothers and fathers. Full-day kindergarten access is associated with stark differences in time at work, housework, time spent with children, and time traveling with children. Among mothers with children in full-day kindergarten, patterns of time use are more similar to those of mothers with older school-aged children, while mothers with half-day kindergarteners work less throughout the day, spend more time with children (particularly between 8 AM and 3 PM), and spend significantly more time with children in the car between 11 AM and 1 PM. Meanwhile, fathers' time with children does not differ by full-day kindergarten status, and fathers with half-day kindergarten students actually spend more time at work than fathers of full-day kindergarten students. These time use patterns suggest that the expansion of full-day kindergarten has relaxed time and resource constraints of mothers in ways that facilitate greater flexibility to participate in the labor market.

We provide the first large-scale evidence on how full-day kindergarten expansions have affected mothers and their ability to engage or engage more intensively in the labor market. We compare labor supply outcomes of mothers with kindergarten-aged children to similar mothers in their state and metropolitan area with slightly older school-aged children to see if increased access to full-day kindergarten affects the labor supply behavior of mothers with kindergarteners. Our identifying assumption is that employment outcomes of parents with kindergarten-aged children would have evolved similarly to employment of parents with older children in the same local labor market if access to full-day kindergarten had not expanded.

We observe increases in the likelihood that mothers worked at all in the last year, with increases in both

part- and full-time work, and more hours and weeks worked. A 10 percentage-point increase in full-day kindergarten enrollment increases maternal employment in the last year by 0.45 percentage points. These patterns are consistent with the descriptive time use evidence which shows that during school hours, mothers of full-day kindergarteners spend less time with children, provide less midday transportation for them, and instead use school hours to work more. Increases in full-day kindergarten enrollment have no corresponding effect on the labor supply of fathers. Heterogeneity analyses suggest that employment effects were fairly broadly realized and not solely concentrated among disadvantaged mothers, as prior research has seen for other public schooling expansions. This finding aligns with the fact that full-day kindergarten expansions generally pull more advantaged populations into full-day settings, as full-day kindergarten had previously been a targeted intervention aimed at disadvantaged children. These estimates are robust to including individual and family controls, controlling for changes in preschool availability, restricting to the pre-COVID time period, or restricting to the non-South. We find similar effects of the expansions when we use state-level full-day kindergarten policy changes to instrument for full-day kindergarten access.

Both the increase in maternal employment and the descriptive time use results suggest that for many households, access to publicly provided childcare relaxes mothers' time constraints rather than a household budget constraint. If full-day kindergarten had not expanded, many mothers would have provided the additional childcare. However, we also find suggestive evidence that household childcare expenses fell meaningfully for those families using paid childcare. The shift to full-day kindergarten provision — and the accompanying relaxing of mothers' time constraints — sheds light on how family childcare needs affect men and women differently, providing background to the additional obstacles women face in balancing labor force participation and parenthood.

Ultimately, changes in investments in children both at school and at home have implications for child development. Full-day kindergarten access is associated with less mother-child time and more maternal employment. It is possible these changes in time use are detrimental to child development and outweigh any benefit from spending more time at school. As this is an empirical question, we also explore the subsequent effects on children's academic achievement. To do so, we exploit the variation in full-day kindergarten access across states and over time during this period of expansion. To better understand the net effect on child outcomes, we use a similar identification strategy to explore the effect of full-day kindergarten access on children's grade school test scores. We find that a 10 percentage-point increase in the full-day kindergarten share leads to improvements in third grade math and reading test scores of 0.02 standard deviations, but that this gain fades out by eighth grade. As such, it appears that the trade off between in-school time and maternal time investments associated with full-day kindergarten access does not harm children's academic outcomes in the short run, and may in fact boost performance, especially in math and for particular subgroups.

The paper proceeds as follows. Section 2 discusses the rationale for studying this question, reviews previous related research, and presents trends in full-day kindergarten access. Section 3 documents how parental time use differs by their children's full-day kindergarten status. Section 4 details the analysis of parental labor supply, including the data and empirical strategy. In Section 5, we summarize the results of the labor supply and childcare expenses analysis for parents, and in Section 6, we discuss implications for child outcomes and results for children's test scores. Section 7 concludes.

2 Motivation

Economists have long been interested in how women allocate time and effort to household production and market-based employment (Becker, 1981; Goldin, 2006, 2021). As women, and mothers, have participated in the labor market at increasing rates, their decisions around balancing family life and work have become more pertinent. Gender differences in the demand for flexible work arrangements have been pointed to as a potential cause that there has not been complete convergence in the gender gap (Goldin, 2014). While increases in women's labor force participation could crowd out parental time investments in children, trends in parental time use illustrate that — across the distribution of family socioeconomic status — parents are also spending more time with their children (Prickett and Augustine, 2021; Wray et al., 2021). Over the past three decades, the time parents devote to child care (i.e., focused time with children) has been increasing in the United States (Bianchi et al., 2006; Sayer et al., 2004) as well as in many Western countries (Dotti Sani and Treas, 2016; Wray et al., 2021).

Abundant evidence demonstrates that mothers' time use and labor force attachment tracks closely with their children's ages and schooling trajectories (Goldin et al., 2022; Price and Wasserman, forthcoming). Existing evidence suggests that public schooling can function as subsidized childcare, pointing to the expansion from half to full-day provision as a factor that could affect mothers' labor force participation. In this vein, estimated childcare cost elasticities of maternal employment range from 0 to approximately -1, with the most credible estimates between -0.1 and -0.5 (Anderson and Levine, 1999; Morrissey, 2017). Overall, subsidization of childcare for young children contributes to increased maternal employment (Blau and Currie, 2006; Blau and Tekin, 2007; Herbst, 2010; Tekin, 2007).

While overall childcare cost elasticities are relevant, there is also evidence that speaks specifically to the effects of public education on women's labor force attachment and generally finds that school enrollment increases maternal labor supply, often concentrated among certain subgroups of women (Barua, 2014; Cascio, 2009; Gelbach, 2002). Using birthdate-based school enrollment rules, Fitzpatrick (2012) finds that the labor supply of single mothers of five-year olds without additional young children increases as a result of a child's

enrollment in public kindergarten, but is unchanged for other mothers. Similarly, evidence from expansions to Head Start in the 1990s and from the randomized Head Start Impact Study shows that access to the federally-funded preschool program for young children from disadvantaged households increases employment and earnings of single mothers (Wikle and Wilson, 2023). Cascio and Schanzenbach (2013) find a positive effect on maternal employment among mothers of four-year olds, as compared to mothers of five-year olds, when universal preschool was introduced in Georgia and Oklahoma, concentrated among mothers with high school diplomas or less schooling. There was no effect among more educated mothers.

Limited evidence exists on how families adjust when children have access to full-day kindergarten. Cannon et al. (2006) use a recursive bivariate probit model to jointly model full-day kindergarten enrollment and maternal employment, finding that mothers with children in full-day kindergarten are more likely to be working full-time. Dhuey et al. (2021) exploit the school roll-out of universal kindergarten in Ontario, Canada (which corresponds to 4-year-old preschool in the U.S.) to find that mothers increase hours worked and decrease work absenteeism. This approach, however, faces a similar concern that the timing of universal kindergarten adoption might be correlated with other factors affecting maternal labor supply.

Parents themselves express that their decision to utilize full-day kindergarten relates to both perceived benefits to their children as well as family resource constraints related to child care, transportation, midday transitions, stress, and work (Boardman, 2005; Elicker and Mathur, 1997; Rothenberg, 1995). Employed parents in particular report reduced parenting demands when full-day kindergarten becomes available (Stover and Pelletier, 2018). The existing evidence is certainly suggestive that full-day kindergarten expansions that provide public schooling as subsidized childcare may affect the labor market attachment of marginal mothers.

Investment in early childhood has gained significant traction in recent years as an efficient and equitable means to compensate for the impoverished developmental environments in which many disadvantaged children grow up (Currie, 2001; Heckman, 2000; Heckman and Masterov, 2007). The developmental literature has coalesced around the notion that children experience declining developmental plasticity and thus early investments—by altering cognitive and social skill development when the brain is most malleable and able to adapt its functioning—are more likely to substantially and permanently affect long-term life chances (Knudsen et al., 2006; Shonkoff and Phillips, 2000).

There is also a growing body of empirical evidence that early childhood programs reap long-term effects for participants, generating substantial private and social returns that far outweigh program costs. Long-term evidence from the Abecedarian Project, Boston pre-kindergarten programs, Head Start, the Perry Preschool Project, and the Project STAR class-size reduction intervention suggests that interventions in the preschool and early school years can have substantial effects on schooling attainment, labor market success, and other measures of adult health and well-being (Chetty et al., 2011; Deming, 2009; Gray-Lobe

et al., 2022; Schweinhart et al., 2005). Benefits include better health and higher rates of college-going (Campbell et al., 2014; Dynarski et al., 2013). These "existence proofs" have focused significant attention on the early childhood years, but far less is known about how to implement programs effectively at scale, whether programs should be targeted or universally provided, and at what age programs are most effective. And while the evidence base on participant effects is growing, very little is known about the effects of such interventions on the parents and families of those exposed, particularly in current contexts and in light of large and growing public investments in the early childhood years more recently.

To more fully understand the relationship between full-day kindergarten policies and household decision-making, this study seeks to explore the effects of expansions on families, through maternal employment, time use, childcare expenses, and child outcomes. This study complements and extends the existing literature in a few important ways. First, the research design relies on a quasi-experimental approach, leveraging differential exposure to kindergarten policy changes by geography, over time, and relative to similar families with slightly older children to generate plausibly causal estimates of program impacts. We also use policy instruments to capture plausibly exogenous changes in access. The study focuses on compositional changes in full-day kindergarten attendees to better understand who is affected by policy changes, particularly when an intervention shifts from a targeted approach to near-universal availability. Finally, we focus on a range of outcomes to better understand the interaction of full-day kindergarten policies and families' decision-making and resource allocation. Time use, maternal employment, childcare expenses, and children's academic progress are important pieces to fully capture how early childhood education policy affects children and families. No work to date has leveraged the large changes in full-day kindergarten policy across the U.S. in the 1990s and 2000s to look at these outcomes of interest.

2.1 Full-day Kindergarten: Trends and Policy Context

Although the federal government releases administrative data on total state-level kindergarten enrollment, these data do not differentiate between full-day and half-day enrollment. There is no administrative data source that provides full- and half-day kindergarten enrollment separately. To document the expansion in full-day kindergarten enrollment we rely on the Current Population Survey (CPS) October School Enrollment Supplement. The October Supplement is completed by 100,000 to 150,000 individuals each year in October and includes schooling related questions, including the grade or level of schooling in which household members are currently enrolled. Importantly, full-day and half-day kindergarten are reported as separate levels. As such, we can estimate state-level averages and trends over time in the share of kindergarteners enrolled in full-day kindergarten. On average, just over 1,800 kindergarten students are included each year. Because

of the small kindergarten sample, we do not estimate full-day enrollment rates for geographic areas smaller than states. We also construct three-year rolling averages (-1,0,+1) to reduce measurement error from small samples in some states. We exploit this October Supplement data to document descriptively the changes in the full-day kindergarten landscape over time. More details related to the October School Enrollment Supplement of the CPS are included in the Data Appendix.

Full-day kindergarten as a policy lever has been an area of considerable activity over the past three decades. The structure of kindergarten has changed significantly over time. As depicted in Figure 2, full-day kindergarten eclipsed half-day provision as a proportion of all kindergarten enrollment in 1995 and now constitutes greater than three-quarters of kindergarten enrollment in both private and public schools.[1] There has not been a corresponding change in full-day pre-school enrollment during this time period. Notably, recent increases in full-day kindergarten access are driven by expansion in public schools (Appendix Figure A2).

Both levels and trends of full-day kindergarten vary by Census region (Figure 3). Ever since 1990 the full-day kindergarten share in the South has been high, starting at 71 percent, and rising to 86 percent by 2019. The growth in the other Census regions has been more pronounced. Full-day enrollment in the Northeast started at a moderate level in 1990 (45 percent) but had slightly surpassed the South at 87 percent by 2019. The West and the Midwest both had low full-day kindergarten shares at 24 percent in 1990, but full-day enrollment in the Midwest has grown rapidly to match the South and Northeast at 86 percent in 2019, while full-day enrollment has grown at a slower rate in the West, only reaching 73 percent by 2019. These regional trends mask considerable variation across states, with many Southern states maintaining near complete full-day enrollment over the entire period, and some states in the West (Idaho and Utah) never reaching 50 percent full-day enrollment shares (Appendix Figure A3).[2]

The increase in full-day enrollment is demographically broad based. As seen in Figure 4, the patterns are fairly similar by race, maternal marital status, and maternal education.[3] Non-Hispanic Black children, and children with never married mothers have higher full-day enrollment shares initially, but these converge by 2019. These patterns are consistent with the shift from full-day kindergarten as a policy intervention targeted towards low-income households to a universal policy.

To a large extent, the increase in full-day kindergarten enrollment is correlated with state-level policy. Over this time period we see a corresponding rise in state-level, full-time equivalent kindergarten teachers, the number of states requiring districts to provide full-day options, and the number of states passing other

[1] Patterns are similar if we look at the share of 5-year-olds enrolled in full-day kindergarten, suggesting this is not driven by increases in kindergarten attendance (Appendix Figure A1).

[2] We do not find evidence that the rapid expansion in full-day kindergarten was accompanied by a decline in teacher quality or a change in the composition of kindergarten teachers (Appendix Figure A4).

[3] Given the higher initial levels in the South we plot demographic trends separately for the South and Non-South.

legislation that encourages full-day kindergarten (Figure A10). There was brief federal attention on full-day kindergarten during the Obama Administration, but all policy activity on full-day kindergarten has taken place at the local and state levels. Several states have made considerable legislative efforts towards full provision of full-day kindergarten, including Arizona, Indiana, Ohio, Oregon, and Minnesota. While only 11 states formally define full-day kindergarten in state statute, 24 states specify a funding formula that funds full-day kindergarten at or above the level of funding for first grade (Parker et al., 2016). Interestingly, while full-day kindergarten participation has increased substantially over time, other aspects of the early childhood experience have remained relatively stable, including preschool and Head Start participation (see Figure 2).

As enrollment in full-day kindergarten has increased, there are underlying policy changes at the state level that have supported increased access to and funding for full-day kindergarten in public schools (Figure A10). A scan of databases maintained by the Education Commission of the States and the National Conference of State Legislators, as well as internet and LexisNexis searches of individual states' legislative histories, revealed two main categories of state policy action related to full-day kindergarten: (1) mandates that require school districts to offer full-day kindergarten, and (2) other full-day-friendly policies that encourage, fund, or otherwise facilitate expansion, but fall short of a requirement on districts. The latter category includes legislation that provides more state funding for full-day kindergarten, alters the funding formula for kindergarten students to incentivize full-day kindergarten provision, or otherwise induces or supports greater full-day kindergarten availability. Using the passage of both full-day provision mandates on districts and "softer" legislative efforts that were supportive of full-day kindergarten provision and expansion, we construct a policy instrument to isolate changes in enrollment due to the policy setting (Figure A11). Detailed information about the compilation of policy changes and construction of the policy instrument is found in the Policy Appendix.

3 Full-day Kindergarten and Parental Time Use

Given the dramatic changes in the share of households who have access to full-day kindergarten, often as a result of state-level policy, it seems plausible that this would affect the way that families, and particularly primary caregiver parents, spend their time. To descriptively explore how having a child in full-day versus half-day kindergarten relates to mothers' and fathers' time use on school days, we use data from the American Time Use Survey (ATUS) from 2003-2019 (Flood et al., 2023a). The ATUS sample used in this study includes parents with a full-day kindergartener, half-day kindergartener, or second grader (for comparison) based on a linked October School Enrollment Supplement from the CPS. In addition, the sample is restricted to parents who were surveyed on weekdays during the school year. This left a sample of 1,167 mothers and 778 fathers.

Demographic characteristics of parents of half-day kindergarteners and parents of full-day kindergarteners were generally similar.[4]

We provide estimates of mothers' and fathers' time use separately if they have a child in full-day kindergarten, half-day kindergarten, or second grade (for reference). These estimates capture both selection and any treatment effect associated with attending full-day kindergarten. We see descriptive evidence that a child's kindergarten context corresponds to large differences in parental time use on school days. Table 1 reveals large differences in time use between mothers of half-day kindergarten children and mothers of full-day kindergarten children (see column 7). Mothers whose children attend a full day of kindergarten work an additional 60 minutes more than their counterparts with children in half-day kindergarten. Mothers of full-day kindergarten children look most like mothers of second graders who have access to full-day school for their slightly older children (see column 8). For example, there is no difference in market work time when comparing mothers of full-day kindergarteners and mothers of second graders.

Table 1 suggests that when a family has a child in half-day kindergarten, mothers are the ones who usually show increased investments in child and home domains and are less attached to market work. Mothers of full-day kindergarteners spend 57 fewer minutes with their children each day compared to mothers of half-day kindergarteners (with a larger gap when considering only time with young children). Although overall time with children differs for mothers of half- versus full-day kindergarteners, most measures of quality time investments thought to be important for development are not sensitive to a child's kindergarten context. Daily one-on-one time, quality time, reading, physical care, academic time, time spent in direct childcare are the same for all mothers of kindergarteners. Mothers of full-day kindergarteners spend more time with children than mothers of second graders overall, which is not surprising considering some of the gap can be attributed to known decreases in parental time with children as children age (Wikle and Cullen, 2022). Gender gaps in work time and parental time with children are largest among parents of half-day kindergarteners (column 10) compared to parents of full-day kindergarteners (column 9), as highlighted in column 11.

Differences in overall time prompt questions about family tempo—whether parent-child interactions and reduced work hours seen for mothers of half-day kindergarteners happen during typical school hours. Figure 5 delineates time use of mothers and fathers throughout the day to emphasize differences in timing on school days when children attend full- versus half-day kindergarten. We focus on three main categories of time use: time working, time with children and time traveling with children. Mothers of full-day kindergarteners are over 10 percentage points (30 percent) more likely to work during school hours than mothers of half-day kindergarteners and only slightly less likely to be working than mothers with second graders. The patterns in

[4]Detailed information about the sample and time use variable construction is found in the Data Appendix.

maternal employment converge around 5pm, with slightly more mothers of half-day kindergarteners working in the evening than mothers with full-day kindergarteners. For fathers, the pattern reverses, with fathers of half-day kindergarteners about 10 percentage points more likely to be working during school hours than fathers of full-day kindergarteners, perhaps to compensate for mothers' lower levels of labor force participation.

Time spent with children during typical school hours differs by kindergarten context as well. The difference in time with children during school hours between mothers of full-day kindergarteners and half-day kindergarteners suggests that families of half-day kindergarteners do not completely replace the missing school hours with out-of-home childcare.[5] Without these expansions in full-day kindergarten, many mothers would be providing the additional childcare. For fathers of full- versus half-day kindergarteners, we observe virtually no differences in time with children throughout the school day. One of the most stark differences between full- and half-day kindergarten families is in midday travel. Interestingly, mothers of full-day kindergarteners don't often travel with children in the middle of the day, whereas mothers of half-day kindergarteners are two or even three times more likely to be traveling with children between 11am and 1pm, suggesting differences in transportation needs in families with half-day kindergarteners. Fathers do not differ in their midday travel patterns based on kindergarten context.

These results on time use are descriptive. They combine both differential selection between full-day and half-day kindergarten families and any effect of full-day kindergarten access on time use. However, these patterns suggest that parents' time use, and particularly mothers', is sensitive to a child's kindergarten schedule. The half-day kindergarten schedule might introduce constraints that affect mothers' ability to spend their time in other activities, such as market work. We turn attention now to quasi-experimental models to shed light on how full-day kindergarten access affects parental labor supply, childcare expenses, and children's test scores.

4 Empirical Approach

We investigate the impact of greater full-day kindergarten provision using variation in the full-day kindergarten share across states and over time, and by comparing parents of kindergarteners to parents of older children. As much of the variation in full-day kindergarten provision is induced by state-level policy changes, we also provide estimates where we exploit variation in when states implemented policies to scale up (immediately or over time) provision of full-day kindergarten.

[5] Much of the difference in mother's time with children is driven by time with the focal kindergartener, not siblings (Figure A5).

4.1 Data

To explore the impact of full-day kindergarten expansions on outcomes, this study primarily relies on the 1990-2021 CPS October School Enrollment Supplement for full-day kindergarten data and the 1992-2022 repeated cross-sections of the Annual Social and Economic Supplement (ASEC) of the CPS, a detailed survey of more than 75,000 households conducted each March, for employment outcomes (Flood et al., 2023b).

To understand parental labor supply responses to full-day kindergarten access, we use the 1992-2022 CPS ASEC. We restrict the sample to parents with a child between the ages of 5 and 9 in the home, and examine patterns separately for men and women. Using the household roster, we are able to identify parents who have a kindergarten-aged child in March (ages 5 and 6) or a slightly older, grade school-aged child (ages 7 to 9). By construction, comparison families in our sample do not also have a kindergarten-aged child. We merge the individual ASEC observations in March to the state-level full-day kindergarten enrollment share constructed from the CPS October School Enrollment Supplement in the preceding calendar year, to capture enrollment in the same academic year.

In the ASEC, we observe two types of labor supply outcomes. First, we observe the individuals' reported labor force participation and employment status in the week prior to the survey (the ASEC is conducted in March). We also observe retrospective outcomes relating to the individual's labor supply during the previous calendar year, including whether the individual worked in the last year, whether or not the individual worked full-time or part-time in the previous year, usual hours worked during the past year, weeks worked in the past year, and individual wage income during the previous calendar year. We also observe demographic measures including race, marital status, and educational attainment.

Our treatment variable is a measure of local full-day kindergarten availability for each family. We use the three-year rolling average proportion of full-day kindergarten students in each state for each year constructed from the CPS October Supplement, as described above. This measure provides a state-by-year measure of full-day kindergarten access. Combined with within-place variation, we estimate how increased full-day access affects parental labor supply.[6]

4.2 Estimation Strategy

As seen in Figure 2, there has been a dramatic increase in full-day kindergarten enrollment over the past 30 years, with the share of kindergarteners in full-day kindergarten nearly doubling between 1990 and 2020. Kindergarten teacher-student ratios and the presence of state-level full-day access mandates or other full-day-friendly policies have experienced a similar trend in growth over this same time period. This study employs a

[6]Details related to our use of the CPS ASEC and October Supplement are included in the Data Appendix.

quasi-experimental approach, leveraging variation in the provision of full-day kindergarten across states and over time. One concern is that the states and labor markets that expand full-day kindergarten provision are selected in ways that are correlated with potential outcomes, such as maternal employment or children's test scores. For example, people in areas with upward trending female labor force participation might lobby state leaders for broader full-day kindergarten access. This could introduce bias into our estimates. To overcome this potential bias, we exploit within-state and within-local labor market variation in whether or not a given family has access to full-day kindergarten. We explore how state-level increases in full-day kindergarten provision affect labor supply decisions of parents with kindergarten-aged children (ages 5 and 6), relative to parents with slightly older children in first, second, and third grade (ages 7, 8, and 9).

Our baseline specification for assessing the impact of full-day kindergarten expansions on parental labor supply is as follows

$$Y_{imst} = \beta_0 + \beta_1 FullDayK_{st-1} * (Have\ Child\ 5\text{-}6) + \beta_2 (Have\ Child\ 5\text{-}6) + \gamma_{st} + \lambda_{mt} + \varepsilon_{imst} \qquad (1)$$

where Y is the employment outcome for an individual i in metropolitan areas (MSA) m in state s in year t. *FullDayK* is the treatment variable measured in the prior fall $(t-1)$, which measures the proportion of kindergarten students in full-day settings in a particular state and year. This is interacted with a binary indicator variable, *Have Child 5-6*, that equals one if the parent has a child that is 5- or 6-years old. The direct effect of having a 5- or 6-year-old is also included, while the direct effect of the full-day kindergarten share is absorbed by the state-by-year fixed effects. State-by-year fixed effects (γ) control for time varying trends within the state, while MSA-by-year fixed effects (λ) make this a comparison between parents in the same MSA at the same time. As such, any local trend in labor markets or gender norms that might affect the outcome and the provision of full-day kindergarten is held constant. The sample is limited to parents with a child between the ages of 5 and 9. As such, the coefficient β_1 is an intention-to-treat estimate of the effect of the full-day kindergarten share increasing for families with a kindergarten-aged child, relative to families with a slightly older child. The full-day kindergarten share ranges from 0 to 1. Standard errors are heteroskedasticity-robust, clustered at the state level.

Analyses are conducted separately for mothers and fathers to explore differential responses by parent gender. The estimates from equation (1) are provided in Table 2. Subgroup estimates of the effect on employment for different groups of mothers are provided in Figure 6.

Our main specification relies on a triple-difference approach to isolate effects. Our identifying assumption is that parents of kindergarten-aged children would have experienced the same trends in employment as parents of slightly older children in the same labor market if the increase in full-day provision had not

occurred. Many of the drivers of full-day kindergarten provision may be correlated with geography, but this strategy holds those characteristics fixed within a given metropolitan area. Threats to this strategy would have to be concurrently timed with kindergarten expansions in affected states, and also be narrowly targeted to kindergarten-aged children.

To further assuage concerns about the exogenous nature of local penetration of full-day kindergarten in a given area, we also use an instrumental variables approach to identify the relationship between full-day kindergarten access and maternal labor supply. In our setting, states instituted a variety of policies which expanded funding and seats in full-day kindergarten, giving rise to policy variation over time and across states, as discussed in more detail in Section 2.1.

The instrumental variable approach implicitly assumes policy movements were unexpected and exogenous from families' characteristics and decisions. With these instruments, we isolate variation in full-day kindergarten share that is driven by policy changes rather than local trends or norms that could influence parental labor supply. We estimate the IV model in a typical two stage process. First, the potentially endogenous local penetration rates are regressed on a policy instrument that indicates whether or not the state has a full-day-friendly policy (including a provision mandate) in place. Next, we estimate equation (1) using predicted values for full-day kindergarten penetration. Elements of the second stage mirror the main specification, including conducting separate analyses for mothers and fathers. The policy instrument is highly predictive of the full-day kindergarten share at the state level, leading to a 26 percentage point (standard error of 0.046) increase in the full-day share (see Appendix Table A1). We use this IV approach to confirm that our baseline estimates are not driven by changes in local demand for full-day kindergarten (which might be correlated with outcomes) and that the patterns persist if we isolate changes in full-day access that are due to policy action.

5 Results – Mothers and Fathers

5.1 Parental Labor Supply

As described in the empirical strategy, we present results from the triple difference models for mothers' and fathers' employment outcomes in Table 2. Each column in each panel presents the results of a separate regression. The treatment variable is the continuous full-day kindergarten participation proportion (0-1) and the outcomes are either binary or continuous measures of hours, weeks, or wages. The effect sizes correspond to a shift from no full-day kindergarten provision to all full-day kindergarten provision. The average annual increase in full-day kindergarten participation is two-percentage points.

While the estimates correspond to a large shift in full-day kindergarten, we find evidence of positive effects on mothers' labor force participation as displayed in Panel A of Table 2. A shift from no full-day kindergarten (i.e., all kindergarten is provided in half-day format) to all full-day kindergarten corresponds to a 6.4 percentage-point increase in being in the labor force at the time of the ASEC. This effect represents a nine percent increase off a base of 68 percent labor force participation for mothers, suggesting full-day kindergarten induces increases in labor supply among the mothers of kindergarteners. In the same vein, full-day kindergarten induces an increase of 5.0 percentage points in employment. Looking at a more retrospective measure of employment points in the same direction– movement to full-day kindergarten corresponds to a 4.5 percentage point increase in the likelihood of a mother working last year, representing an increase of 6 percent.

A complete full-day kindergarten expansion increases the full-time employment rate last year by 2.4 percentage points and the part-time employment rate by 2.1 percentage points, suggesting the increase in employment is roughly equally split between full-time and part-time workers. However, it is unclear whether mothers entering the labor force moved into full-time work or if some mothers working part-time moved into full-time work and mothers entering the labor force moved into part-time work. An increase in the full-day kindergarten share from 0 to 1 is associated with an additional 2.1 weeks of work during the previous year (6.8 percent) and a 1.7-hour increase in usual hours worked during the previous year (6.8 percent). We see that an increase in the full-day kindergarten share from 0 to 1 increases the likelihood that a mother has any wage income by 5.7 percentage points, similar to the effects on employment. The increase in full-day kindergarten share from 0 to 1 is also associated with an imprecisely estimated increase of $1,278 dollars.[7] Since we cannot observe everyone in the CPS over time, it is unclear to what extent these effects are driven by the extensive or intensive margin. However, as explained below, we evaluate intensive margin responses for a subset of respondents that we can link over time.

Turning attention to fathers we see that men with kindergarten-aged children do not adjust labor supply along any of the dimensions we examine (Panel B of Table 2), with point estimates close to zero. These patterns stand in contrast to those observed for mothers. For most fathers, labor supply appears to be insensitive to the public provision of childcare through early childhood education, whereas for mothers, who are more often primary care providers for children, we see sensitivity.

In Figure 6, we present results of subgroup analyses among mothers, split by women's education level, marital status, and race. These analyses show that maternal employment gains associated with the increase in full-day kindergarten access are not just concentrated among disadvantaged families. Perhaps due to the

[7] In Figure A6, we document the effect of the full-day kindergarten share on the individual wage income distribution and find that the changes are concentrated among women earnings between 0 and $20,000 or above $55,000.

universal nature of expansions, women who were married and living with their spouse present, more educated women, and white women also benefited from the full-day kindergarten expansions.[8]

We probe the robustness of these results in Table 3. The effect of the full-day kindergarten share on employment during the previous calendar year is robust to removing the MSA-by-year fixed effects, including controls for mother's demographics (e.g., race/ethnicity, marital status, education level, and age fixed effects), excluding states in the South, which was early in adopting full-day kindergarten, or if we exclude observations from 2020–2022 during the COVID-19 pandemic. During this time period, there were some changes in preschool provision and use, including the 1990s Head Start expansions and the first states adopting universal pre-kindergarten programs. We find that the results are similar if we control for the preschool teacher-to-student ratio, the share of 3- and 4-year-olds in preschool, and the share of 3- and 4-year-olds in full-day preschool in the previous school year, all interacted with the indicator for having a child that was 5 or 6.[9] In all specifications, effects for fathers remain small and insignificant.

As noted above, the cross-sectional nature of the ASEC prevents a complete decomposition of extensive and intensive margin effects. However, the CPS sampling framework surveys households according to a 4-8-4 rotation, so households are in the survey for four months, out for eight months, and then back in for four months. As such, we can identify a subset of parents for whom we observe employment measures in the ASEC one year prior. We provide estimates for mothers who were employed during their first observed ASEC wave, and see no effect on employment (access to full-day kindergarten does not appear to prevent exit) and a marginally significant 0.84 hour increase in usual hours worked (Table 3). The effect on wage income is over $550 larger, consistent with an intensive margin response in addition to the extensive margin increase in employment. These point estimates are consistent with the results found in Table 2.

One concern is that full-day kindergarten coverage is driven by households wanting to increase maternal employment. To see if this is the case, we exploit the state-level passage of full-day friendly policies. As seen in Figure A9, if we compare full-day kindergarten enrollment trends in states that pass full-day friendly legislation to states that did not enact full-day friendly legislation in a stacked panel, we see that the passage of full-day friendly policies are associated with imprecisely estimated increases in the full-day kindergarten share.[10] When we leverage state-level full-day friendly policy changes to instrument for full-day kindergarten availability, we see broadly similar patterns in Table 4.[11] Most patterns emerging from this alternate specification — to isolate variation plausibly exogenous to the individual — point in the same direction as

[8]Results are slightly larger, but not significantly different if we focus on outcomes of mothers whose own mother is in the household (Appendix Table A2). We also do not find evidence that the expansion of full-day kindergarten led to an increase in parental schooling or education (Appendix Table A3.)

[9]The other outcomes in Table 2 are similar in magnitude and significance when including the preschool controls.

[10]To be consistent with the employment analysis, the 3 year full-day kindergarten share rolling average is used as the outcome, in part contributing to the preemptive increase in $t-1$.

[11]First stage and reduced form estimates provided in Appendix Table A1.

results found in the main specification and are of a similar magnitude. As seen in Panel A of the table, a shift from no full-day kindergarten to all full-day kindergarten increases mothers' labor force participation at the time of the ASEC interview by 5.9 percentage points. Given a base of 68 percent, this translates to an employment increase of 8.7 percent. Full-day kindergarten increases contemporaneous employment of mothers by a marginally significant 6.2 percentage points. When considering measures that better capture longer-term employment experiences, we see that movement to full-day kindergarten corresponds with increased employment over the past year by 5.0 percentage points, equivalent to an increase of 7.1 percent. The estimates for full-time and part-time employment are similar, but imprecisely estimated. We see a similar increase in usual weekly work hours of 2.6 additional hours a week and an insignificant 2.8 week increase in weeks worked. Results show similarly sized increases in the likelihood of reporting any wage income, while the point estimate on wage income is over four times as large (but only marginally significant). We see no responses for fathers (see Panel B).

5.2 Household Childcare Expenses

For many kindergarteners, the expansion to full-day kindergarten displaces childcare performed by their mothers. This helps to explain the maternal labor supply response to the expansions. However, some households were already receiving out-of-home care. For example, 68% of children ages 3 to 5 receive at least five hours of non-parental care per week in either paid or unpaid settings (Datta et al. (2023)). For these families, the expansion of full-day kindergarten might not affect maternal labor supply, but rather relax the household budget constraint.

Using data from the Consumer Expenditure Survey (CEX), we document how an increase in the full-day kindergarten share affects household childcare expenses (U. S. Department of Labor, 2023).[12] Our approach to estimating impacts of full-day kindergarten expansions on household childcare expenses is analogous to our approach on parental labor supply, except that the CEX only provides state-level geography which slightly changes the interpretation. The CEX provides mixed evidence of the effects on childcare expenses (Table 5). When comparing expenses of households with a kindergartener to households with slightly older school aged children, we estimate an insignificant decrease of $1.38 in monthly childcare expenses in households with kindergarten-aged children for a 10 percentage point increase in the full-day kindergarten share. However, if we compare households with a kindergartener to households with younger children (where childcare is more regularly needed and used), we estimate a significant decrease of $4.31 in monthly childcare expenses in households with kindergarten-aged children for a 10 percentage point increase in the full-day kindergarten

[12]Because of the structure of the CEX, we cannot isolate child-specific expenses, only the total expenditures on childcare at the household level. More details related to our use of CEX data are included in the Data Appendix.

share. Since many families do not pay for childcare (i. e. a parent provides care or the family uses unpaid care), the average decrease represents a larger decrease among those paying for childcare. These point estimates relative to the base level of childcare expenses in the CES ($170 per month) suggest a meaningful reduction in child care costs for families paying for childcare.

6 Child Outcomes

The shift to full-day kindergarten in the United States has created more school-level investment in young children and potentially freed up family resources previously spent on childcare, but has also led to more maternal time out of the home at work. As these patterns might push child outcomes in opposite directions, we evaluate the net effect of increasing full-day kindergarten access on children.

We examine this along one measurable dimension: children's test scores. We evaluate performance in reading and math in third through eighth grades at the state-by-year level, standardized across state tests and aggregated in the Stanford Education Data Archive (SEDA; Reardon et al. (2023)) from 2009-2019. These test scores come from annual testing, administered in the late spring of each academic year. These are then standardized using the National Assessment of Educational Progress (NAEP) to obtain comparable estimates across states and over time (see the data appendix for more detail).[13]

Using the state-level, annual standardized performance by grade in the SEDA, we implement an approach analogous to our estimation of labor supply responses in Equation (1). Using the SEDA, we link grade cohorts for each state back to the year that third graders were in kindergarten. We then consider how the full-day kindergarten share of the third grade cohort affects differences in outcomes for third graders, relative to fifth graders. As before, we link test scores (in the spring) to kindergarten enrollment from the previous fall. With the age adjustment, we are making a similar comparison of 5- and 6-year-olds to older children (likely 7- and 8-year-olds) as we made when using the CPS. We estimate the effect of the state-level full-day kindergarten share of standardized test scores, as follows:

$$\textit{Std. Score}_{sgt} = \beta_1 \textit{Share Younger Grade in Full-day}_{st} * 1(\textit{In Younger Grade}_g) + \beta_2 1(\textit{In Younger Grade}_g) + \phi_{st} + \varepsilon_{sgt} \quad (2)$$

[13]Test scores are just one dimension of children's outcomes. It would also be informative to examine children's long-run outcomes, such as high school graduation. However, our identification strategy and variation are not suited to exploring these long-run outcomes for several reasons. First, our strategy uses a triple-difference to compare contemporaneous outcomes for mothers with kindergarten-aged children and mothers with older children to account for local conditions that might be correlated with kindergarten expansions. The same contemporaneous triple-difference approach is not possible when examining a terminal outcome, such as high school graduation. Second, because of cross-state mobility, we can only assign individuals to their kindergarten treatment level with measurement error, unless we are able to observe their location in kindergarten, in a panel. The further in time from kindergarten, the more measurement error will be introduced.

where *Std. Score* is the standardized test score (either math or reading/language arts) in state s for grade g in year t. Scores are standardized to be comparable across states. The coefficient β_1 represents the effect of a one unit increase in the full-day kindergarten share for the younger of the two grades on test scores for the younger grade. We also control for an indicator for being in the younger grade to capture level differences in performance across grades. State-by-year fixed effects are included to make this a comparison between students in the younger grade and the older grade in the same state and year. Standard errors are corrected for clustering at the state-level. Throughout, we restrict the sample to third and fifth graders. As such, we are examining how the full-day kindergarten share of the third graders is related to test scores for third graders relative to its relation to test scores for fifth graders in the same state at the same time. As in equation (1), we include older children to account for differential trends across place that could affect the outcome. These results are provided in Table 6 for the overall average, as well as for different race/ethnicity, sex, and poverty status groups.

One concern with this specification is it does not account for the fact that the older students (fifth graders) were also exposed to treatment, full-day kindergarten share, to some extent. As such, we expand this analysis to trace out the effect of full-day kindergarten share on test scores within a cohort over time. For each year we determine the kindergarten start year for each grade. We use this start year to define the cohort. For example, third graders in 2009, fourth graders in 2010, and eighth graders in 2014 are all observations of the 2005-2006 cohort, as this was the year that they were in kindergarten.

We next assign each cohort the state-level full-day kindergarten share calculated from the October CPS. We then estimate the following regression

$$Score_{csgy} = \sum_{g=3}^{8} \beta_g Full\text{-}day\ Share_c * (Grade\ g) + \delta_{sy} + \theta_c + \gamma_g + \varepsilon_{csgy} \tag{3}$$

The outcome is the average, standardized score (either math or reading/language arts) for cohort c in state s in grade g in year y. The β_g coefficients trace out the effect of the full-day kindergarten share in the cohort's kindergarten year on average test scores from third through eighth grades. Cohort and grade level fixed effects are included to control for cohort-specific or grade-specific effects. Because cohorts overlap (e.g., both the 2005 cohort and the 2006 cohort will be observed in 2010, as fourth and fifth graders) we are able to include state-by-year fixed effects. As such, we can account for any state-level trends that might be changing the provision of full-day kindergarten and affecting children's test scores. Standard errors are corrected for clustering at the state-level. We limit the sample to cohorts that we observe in all years between third and eighth grade to avoid compositional changes across grades over time. This means that our estimates

include cohorts that started kindergarten between 2005 and 2011.[14] The effects from third to eighth grade are plotted with 95-percent confidence intervals for the overall average, as well as for different race/ethnicity, sex, and poverty status groups in Figure 7.

Table 6 shows results from the first analytical approach, comparing children in third grade to children in fifth grade. In this specification, a school moving from half-day kindergarten to full-day kindergarten experiences a 0.1 standard deviation increase in school math and reading test scores by third grade relative to students two years older. Consistent with the nature of a policy that is universal, boosts in student achievement are broadly applicable, and are found among Black students, Hispanic students, White students, disadvantaged students, boys and girls.

When evaluating persistence of impacts from moving to full-day kindergarten, the patterns remain qualitatively similar to those seen in the previous specification. Figure 7 demonstrates that a 10 percent increase in the state full-day kindergarten share is accompanied by gains in math test scores that remain elevated by 0.02 standard deviation in third grade. In fact, test scores remain elevated through sixth grade, although they appear to fade over time. Test score improvements appear to be concentrated among White children, with particularly large gains among disadvantaged students, although this also appears to diminish over time. We see no evidence of effects on reading/language arts scores, and estimates are actually negative (but not significant) for Hispanic and Asian students.[15] In sum, findings from both specifications on child test scores suggest that any negative effects on child performance from the decrease in maternal time investment is more than offset in the short run by the gains associated with increased in-school time investments.

7 Discussion

One of the most dramatic changes in the modern labor force has been the increased attachment of mothers. Between 1970 and 2000, the employment rate of mothers with school-aged children increased by approximately 30 percentage points, while full-time employment of mothers nearly doubled. Employment rates for all mothers except those with the youngest children have caught up to the employment rates of men and childless women. Despite this rise in maternal labor force attachment, there are still stark gender differences in the household division of childcare and housework. In addition to working more, mothers continue to spend more time in childcare. We show — using a pronounced change to public schooling for young children

[14] Because of data constraints, the child outcome analysis does not cover the same time period as the maternal labor supply analysis. However, if we re-estimate labor supply effects for this shorter, later time period, we find similar patterns and magnitudes, although the estimates are less precise (Figure A8 and Table A4).

[15] Given that full-day kindergarten penetration was much higher in the South during the analysis period, we re-estimate results excluding the South in Appendix Figure A7 and find stronger evidence of improvements in math for non-minority and disadvantaged students, and no effects on reading/language arts. We also observe strongly negative effects for Hispanic and Asian children.

— that policy surrounding the structure of schooling can affect maternal time constraints and their availability for market work. The time mothers spend in childcare, work, and other activities is sensitive to the structure of public school provision.

While there is a limited body of work on the impact of full-day kindergarten on students, this work sheds light on a broader question – that of the policy impact of expanding full-day kindergarten on the parents of children served by the longer school day. We find that full-day kindergarten expansions across U.S. states in the 1990s and 2000s had a significant impact on women's engagement with the labor force. For a 10-percentage point increase in the state-level full-day kindergarten share, mothers of kindergarteners are 0.5 percentage points more likely to be employed, relative to similar mothers with slightly older children. These effects are economically significant. Between 1992 and 2022, the full-day kindergarten share increased by 40 percentage points nationally. Our findings suggest that expansions in full-day kindergarten can explain 2 percentage points, or approximately 24 percent, of the 8.5 percentage-point increase in employment among mothers of 5- and 6-year-olds between 1992 and 2022. School schedules that remove typical work hour disruptions can substantively reduce the employment gap that remains for mothers with young children.

While prior work documents the effects of *targeted* public school expansions on maternal employment, particularly for disadvantaged mothers (Cascio, 2009; Cascio and Schanzenbach, 2013; Wikle and Wilson, 2023), the effects of full-day kindergarten expansions are more broadly realized. This result is likely driven by the shift over this time period of full-day kindergarten from a largely targeted intervention to a near-universal program. In other words, more advantaged mothers, as measured by education level, marital status, or race, are precisely the mothers moved into program exposure by these policy expansions. These patterns serve as the foundation for understanding broad-based effects on these mothers' time use and labor supply as well as their children's academic achievement.

The extant literature hypothesizes that public provision of early childhood education acts as a childcare subsidy, but we show directly that mothers time their workday around children's school schedules and use the extended kindergarten school day to increase market work. These results imply that policies and proposals that reduce or increase in-school time, including duration expansions to public pre-kindergarten programs, shifts to four-day school weeks, and year-round schooling, have important implications for the family. Beyond school enrollment, temporal aspects of school timing may be important for parents' constraints, schedules, and employment. Temporal work flexibility includes the number and timing of hours worked and the extent that employees have discretion over work hours (Price and Wasserman, forthcoming). Childcare factors often induce mothers to move toward jobs with flexibility, and mothers often prioritize job flexibility over earnings growth as a way to manage frictions between childcare and employment (Adams-Prassl, 2023; Cubas et al., 2023; Goldin, 2014; Mas and Pallais, 2017; Wasserman, 2023). Because mothers carry a disproportionate

share of childcare responsibilities, their schedules and employment are often most responsive to changes in temporal aspects of school timing in a variety of contexts. For example, mothers reduce work time and labor supply during summer breaks (Cowan et al., 2023; Price and Wasserman, forthcoming), increase labor supply when school move from a four-day week to a five-day school week (Duchini and Van Effenterre, 2022), and increase labor supply when children are moved off of year-round school schedules that break up the school year (Graves, 2013). Our work suggests that, as with full-day kindergarten expansions, other schooling policy levers, such as universal preschool, after school programming, and four-day school weeks, are likely to affect labor market participation of mothers with young children.

In recent decades, the expansion of full-day kindergarten has been one of the primary ways that public funds have been used to support young children's early development, and we know little about the impact of these shifts. Our paper measures the net policy effect of relaxing parents' time and resource constraints. This evidence contributes to our improved understanding of the broader return on early childhood and early schooling investments and the implications for families and parents.

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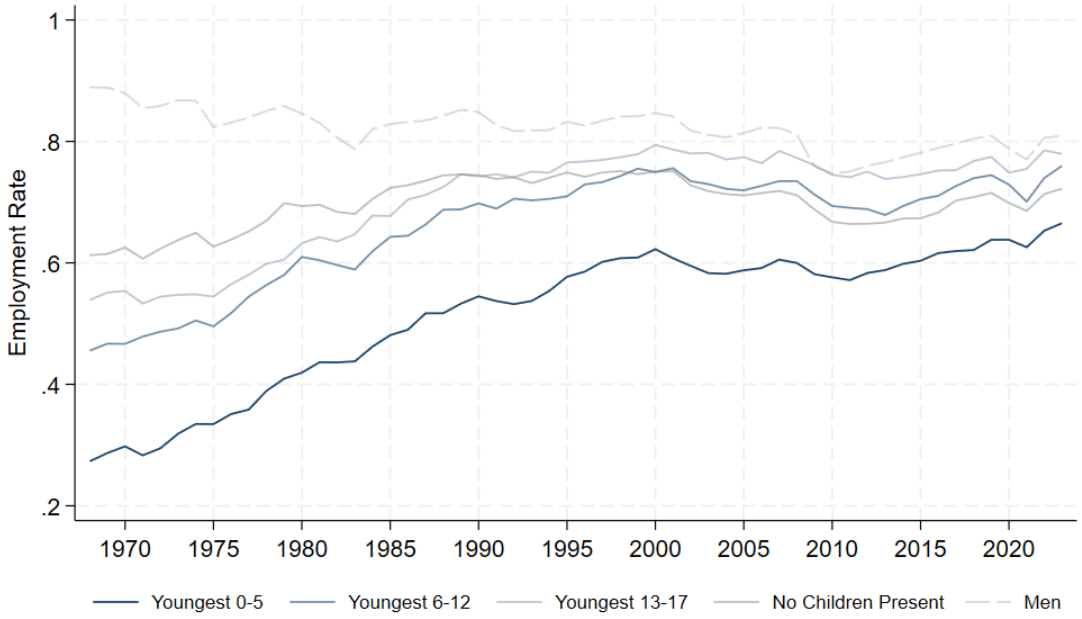
Tables and Figures

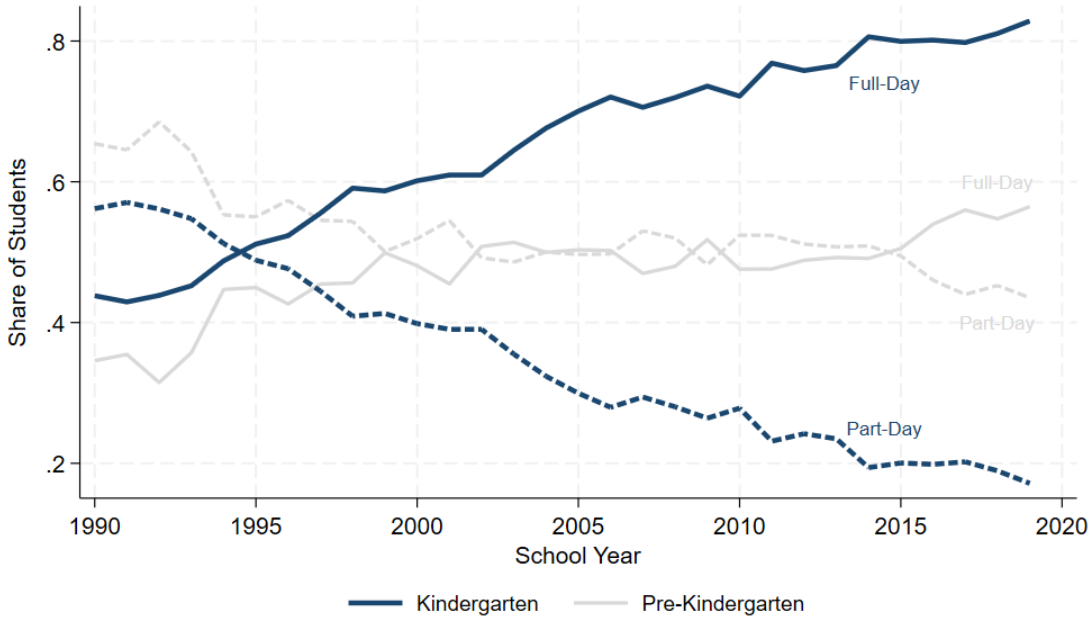
Figure 1: Long-Run Employment Trends of Women



NOTE: Sample restricted to adults 18-54 in the CPS ASEC between 1968 and 2023. Women are split by the age of their youngest child. For reference, the employment rates of men are provided in the dashed gray line. Individual weights are used to make this nationally representative.

SOURCE: CPS ASEC 1968-2023.

Figure 2: Full- and Half-Day Kindergarten and Pre-Kindergarten Enrollment



NOTE: Sample restricted to children ages 3-7 from the CPS October Supplement between 1990 and 2019 who reported either being in nursery/pre-kindergarten or in kindergarten. Individual weights are used to make this nationally representative.

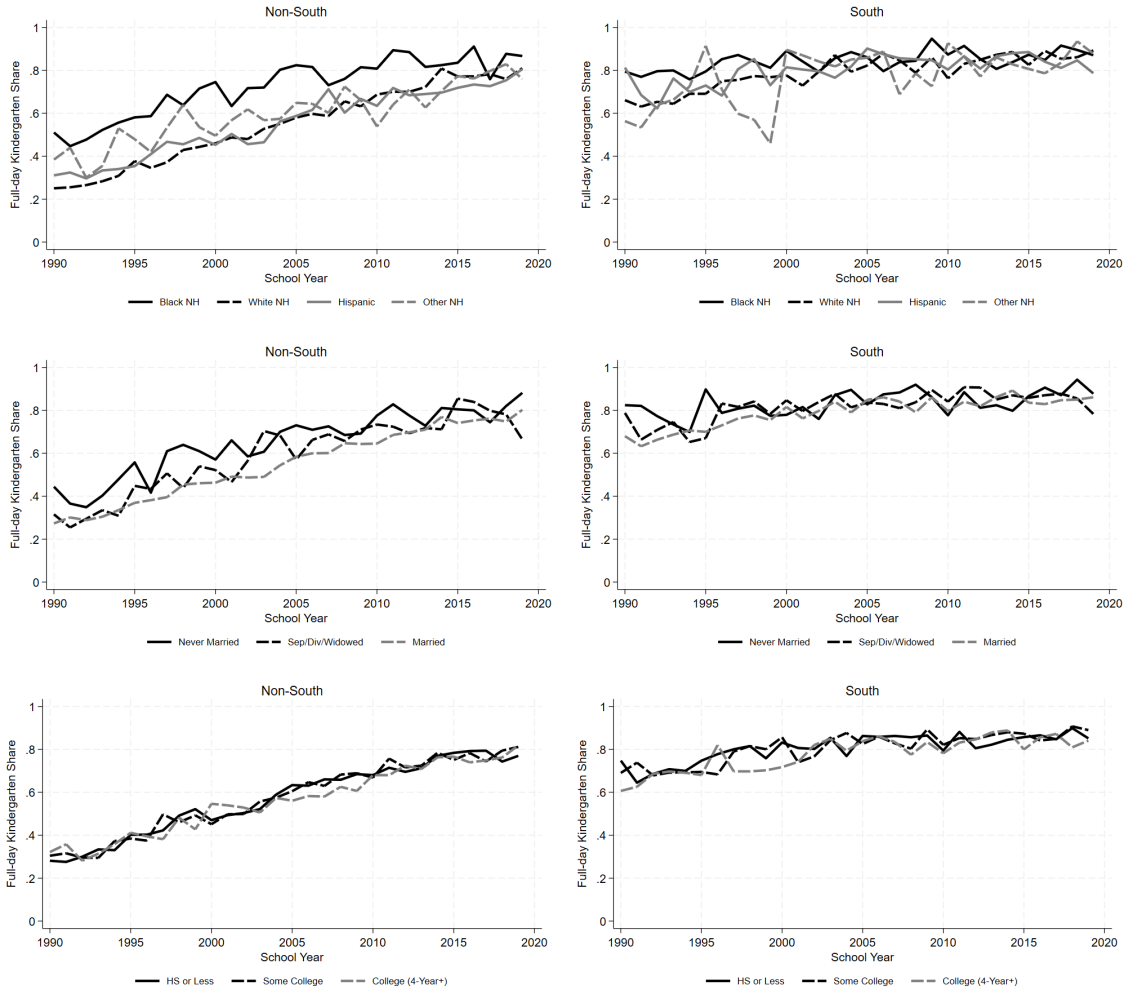
SOURCE: CPS October School Enrollment Supplement 1990-2019.

Figure 3: Full-Day Kindergarten Enrollment by Region

NOTE: Sample restricted to children ages 3-7 from the CPS October Supplement between 1990 and 2019 who reported being in kindergarten. Individual weights are used to make this nationally representative.

SOURCE: CPS October School Enrollment Supplement 1990-2019.

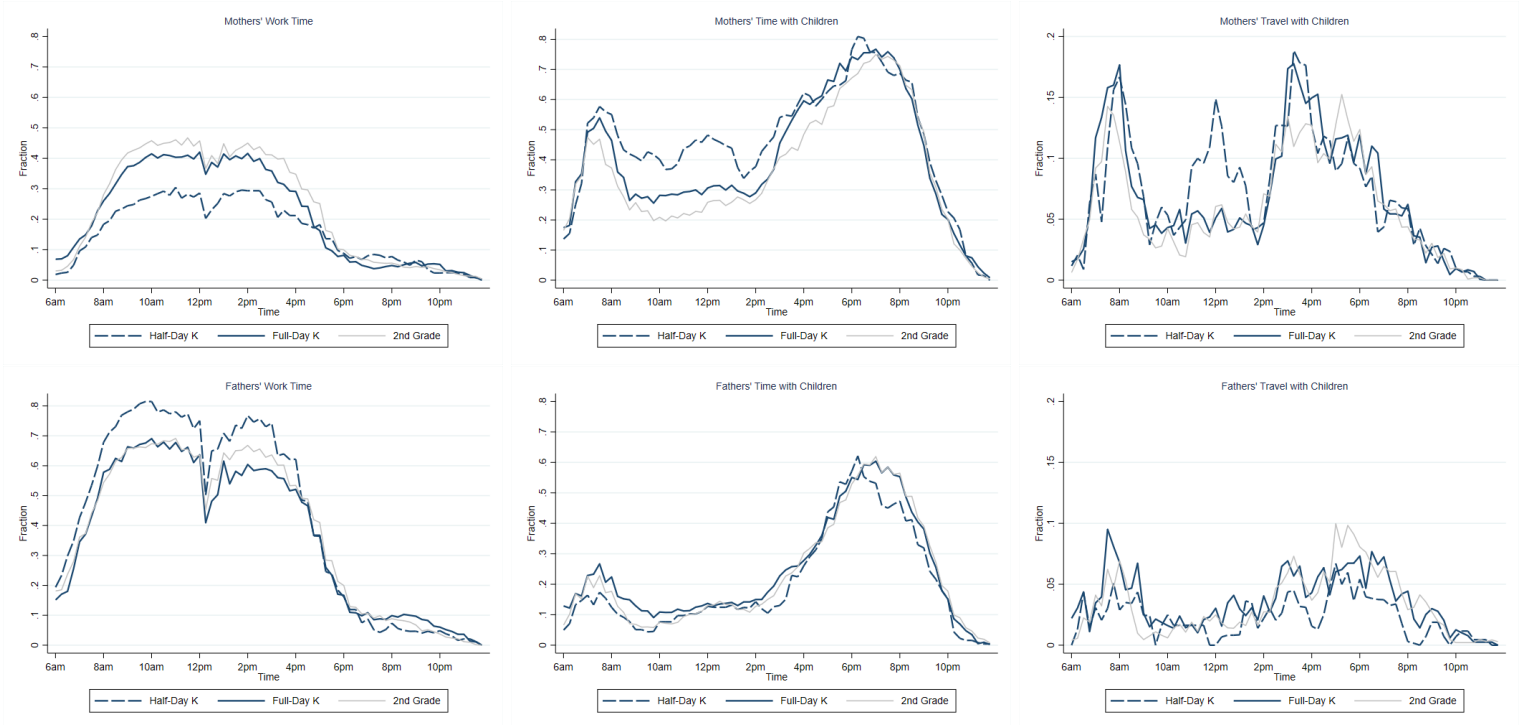
Figure 4: Full-Day Kindergarten Enrollment by Demographics



NOTE: Sample restricted to children ages 3-7 from the CPS October Supplement between 1990 and 2019 who reported being in kindergarten. Individual weights are used to make this nationally representative.

SOURCE: CPS October School Enrollment Supplement 1990-2019.

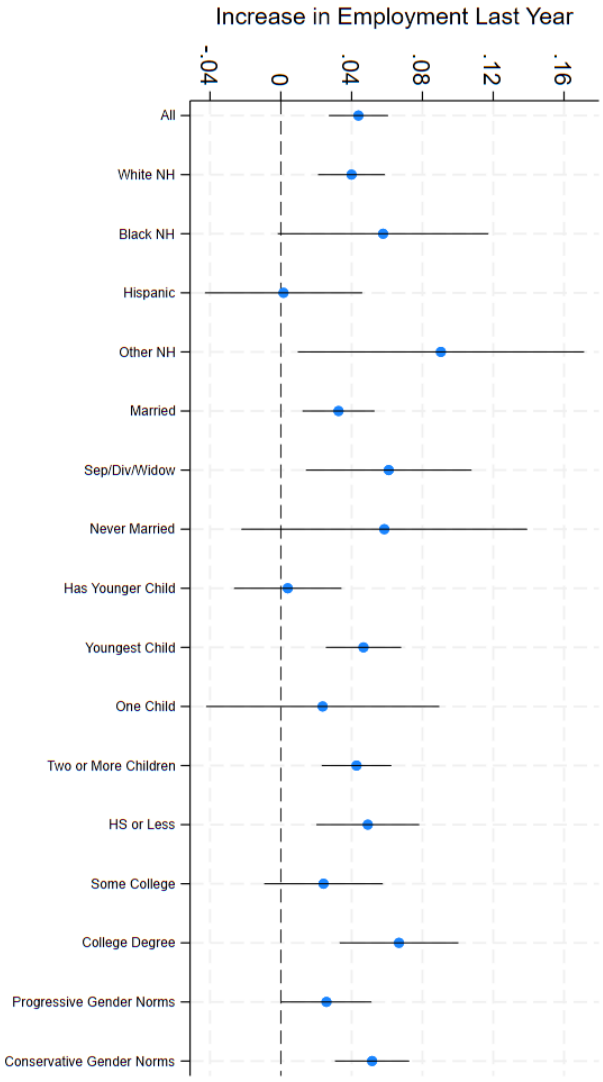
Figure 5: Parent Time Use by Grade and Type of Child's School Enrollment



NOTE: Sample restricted to parent with a child in kindergarten or second grade who linked with the CPS October Supplement just before the ATUS interview.

SOURCE: ATUS 2003-2022

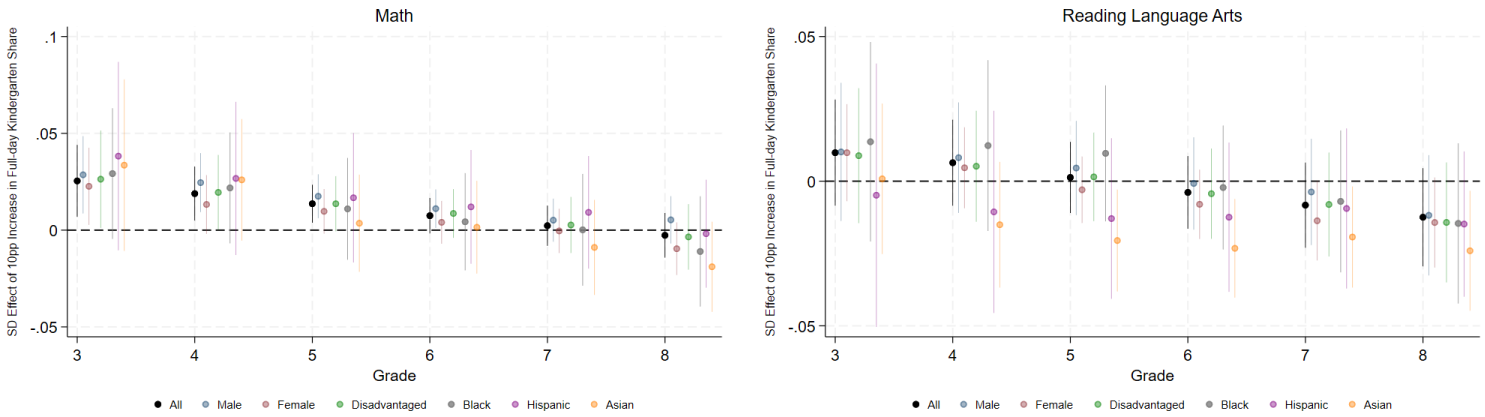
Figure 6: Heterogeneous Impacts of Full-Day Kindergarten Share on Maternal Employment



NOTE: Sample restricted to mothers and fathers with a child between the ages of 5 and 9. The full-day kindergarten share is constructed from the CPS October Supplement. As such, we use the measure from the previous year, as this corresponds to the same school year as the March ASEC observation. Because the October Supplement samples are small, we use the state 3-year rolling average of the full-day kindergarten share. State-by-year fixed effects are including, absorbing the direct effect of the Full-day Kindergarten share and controlling for state-specific trends in parental employment. MSA-by-year fixed effects are also included, making this a comparison between parents with 5- and 6-year-olds and parents of 7- to 9-year-olds in the same MSA and year. This holds labor market conditions fixed between the treatment and counterfactual groups. Standard errors corrected for clustering at the state level with 95 percent confidence intervals plotted.

SOURCE: Authors' calculations from the CPS ASEC 1992-2022.

Figure 7: Dynamic Impact of Full-Day Kindergarten Share on Test Scores, by Group



NOTE: Sample restricted to state-cohort specific average test scores by demographic groups for cohorts that started school between fall 2006 and 2011 and have test scores for all six years between 3rd and 8th grade. The full-day kindergarten share is constructed from the CPS October Supplement. As such, we use the enrollment measure from the previous year, as this corresponds to the same school year as the SEDA test observation. Because the October Supplement samples are small, we use the state 3-year rolling average of the Full-day Kindergarten share. State-by-year fixed effects are including, making this a comparison between different aged children in the same state and year. Cohort fixed effects are also included, to absorb secular trends in test scores. Standard errors corrected for clustering at the state level with 95 percent confidence intervals plotted.

SOURCE: Authors' calculations from the SEDA 2009-2019.

Table 1: Parent Time Use by Grade and Type of Child's School Enrollment

	Mothers			Fathers							
	Half-Day K (1)	Full-Day K (2)	Second Grade (3)	Half-Day K (4)	Full-Day K (5)	Second Grade (6)	(2)-(1) (7)	(2)-(3) (8)	(2)-(5) (9)	(1)-(4) (10)	Diff-N-Diff (9)-(10) (11)
Time Use on School Days											
Primary Measures											
Work	160.44	220.22	246.93	439.05	391.56	423.78	59.78***	-26.71*	-171.34***	-278.61***	107.27***
Time with Children	459.17	402.22	358.85	195.33	239.55	222.43	-56.95***	43.37***	162.67***	263.83***	-101.16***
Home Duties	230.19	197.53	198.50	88.60	104.93	85.30	-32.66***	-0.97	92.60***	141.59***	-49.00**
Leisure	235.24	225.32	215.35	240.43	255.57	243.10	-9.92	9.97	-30.25***	-5.19	-25.06
Quality Parental Time Investment Measures											
One On One Time with Children	245.87	245.07	240.97	310.87	280.97	264.75	-0.80	4.09	-35.91**	-65.01**	29.10
Quality Time with Children	110.01	98.69	89.56	71.50	71.14	70.97	-11.32	9.13*	27.55***	38.51***	-10.96
Reading with Children	7.74	7.35	3.93	5.24	2.84	2.30	-0.39	3.42***	4.51***	2.50	2.00
Playing with Children	22.79	13.09	10.78	14.80	19.11	11.71	-9.69***	2.31	-6.02**	7.98*	-14.00***
Physical Care of Children	80.01	79.98	64.35	25.18	28.41	25.32	-0.03	15.63***	51.57***	54.83***	-3.26
Academic Time with Children	29.13	32.05	29.67	13.10	12.50	14.74	2.92	2.38	19.55***	16.03***	3.52
Direct Childcare	176.98	177.32	151.38	69.81	83.82	75.68	0.34	25.94***	93.50***	107.17***	-13.67
Time with Children Under 5	280.01	207.35	158.35	117.84	107.26	81.61	-72.66***	48.99***	100.09***	162.17***	-62.09**
Traveling with Children	39.46	37.61	31.72	12.67	21.81	20.40	-1.85	5.88*	15.80***	26.79***	-10.99*
Observations	198	443	526	117	295	366					

NOTE: Sample restricted to parents in the ATUS from 2003-2022 with a child in kindergarten or second grade who linked with the CPS October Supplement just before the ATUS interview. p< 0.01 ***, p< 0.05 **, p<0.1 *.

Table 2: Impact of Full-Day Kindergarten Share on Labor Supply of Parents with 5- to 6-year-olds Relative to Parents with 7- to 9-year-olds

	In Labor Force (1)	Employed (2)	Employed Last Year (3)	Full-Time Last Year (4)	Part-time Last Year (5)	Usual Hours Last Year (6)	Weeks Worked Last Year (7)	Wage Income Last Year> 0 (8)	Wage Income Last Year (2020) (9)
					Sample: Mothers				
Share Full-day Kindergarten$_{t-1}$	0.064***	0.050***	0.045***	0.024**	0.021*	1.685***	2.141***	0.057***	1277.5
*Have Child 5-6	(0.009)	(0.009)	(0.008)	(0.011)	(0.011)	(0.402)	(0.396)	(0.009)	(925.033)
Have Child 5-6	-0.099***	-0.092***	-0.083***	-0.070***	-0.013	-3.434***	-4.584***	-0.090***	-3355.6***
	(0.006)	(0.006)	(0.006)	(0.008)	(0.009)	(0.292)	(0.270)	(0.006)	(596.190)
Dependent Mean	0.68	0.64	0.70	0.50	0.21	24.92	31.65	0.67	24619.34
Observations	326,267	326,267	326,267	326,267	326,267	326,267	326,267	326,267	326,267
					Sample: Fathers				
Share Full-day Kindergarten$_{t-1}$	0.008	0.004	0.003	0.003	0.001	-0.125	0.442	-0.003	-298.8
*Have Child 5-6	(0.005)	(0.010)	(0.004)	(0.005)	(0.004)	(0.304)	(0.288)	(0.007)	(1547.073)
Have Child 5-6	-0.000	-0.002	0.002	0.001	0.001	0.350	-0.094	0.010**	-325.1
	(0.004)	(0.008)	(0.002)	(0.004)	(0.003)	(0.234)	(0.201)	(0.005)	(1080.518)
Dependent Mean	0.94	0.88	0.94	0.90	0.04	41.79	46.62	0.88	63155.52
Observations	266,083	266,083	266,083	266,083	266,083	266,083	266,083	266,083	266,083

NOTE: Sample restricted to mothers and fathers in the CPS ASEC between 1992 and 2022 that had a child between the age of 5 and 9. Outcomes in column (1) and (2) refer to outcomes in the proceeding week (the ASEC is conducted in March). The rest of the outcomes refer to the previous calendar year. The full-day kindergarten share is constructed from the CPS October supplement. As such, we use the measure from the previous year, corresponding to the same school year as the March ASEC observation. Because the October supplement samples are small, we use the state 3-year rolling average of the full-day kindergarten share. State-by-year fixed effects are including, absorbing the direct effect of the full-day kindergarten share and controlling for state-specific trends in parental employment. MSA-by-year fixed effects are also included, making this a comparison between parents with 5- and 6-year-olds and parents of 7- to 9-year-olds in the same MSA and year. This holds labor market conditions fixed between the treatment and counterfactual groups. Standard errors corrected for clustering at the state level. p< 0.01 ***, p< 0.05 **, p<0.1 *.

Table 3: Robustness: Impact of Full-Day Kindergarten Share on Labor Supply of Parents with 5- to 6-year-olds Relative to Parents with 7- to 9-year-olds

	Employed Last Year						First Wave Employed		
	Baseline	No MSA-by-Year Fixed Effects	Parental Controls	Preschool Controls	Restrict to Non-South	Pre-COVID	Employed Last Year	Usual Hours Last Year	Wage Income Last Year (2020)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
					Sample: Mothers				
Share Full-day Kindergarten$_{t-1}$	0.045***	0.044***	0.044***	0.045***	0.047***	0.040***	0.004	0.843*	1828.6
*Have Child 5-6	(0.008)	(0.008)	(0.009)	(0.013)	(0.012)	(0.009)	(0.005)	(0.455)	(1346.243)
Have Child 5-6	-0.083***	-0.082***	-0.080***	-0.064***	-0.084***	-0.081***	-0.009**	-1.337***	-2338.7**
	(0.006)	(0.006)	(0.006)	(0.015)	(0.007)	(0.006)	(0.004)	(0.332)	(909.521)
Dependent Mean	0.70	0.70	0.70	0.70	0.70	0.70	0.97	34.39	33015.02
Observations	326,267	326,366	326,266	310,967	224,389	301,855	143,690	143,690	143,690
					Sample: Fathers				
Share Full-day Kindergarten$_{t-1}$	0.003	0.002	0.003	0.001	-0.003	0.000	-0.001	-0.354	-1111.2
*Have Child 5-6	(0.004)	(0.004)	(0.004)	(0.008)	(0.005)	(0.004)	(0.002)	(0.244)	(1902.442)
Have Child 5-6	0.002	0.003	-0.004	0.010	0.005*	0.003	0.001	0.402**	-288.0
	(0.002)	(0.002)	(0.003)	(0.008)	(0.003)	(0.003)	(0.001)	(0.173)	(1131.575)
Dependent Mean	0.94	0.94	0.94	0.94	0.94	0.94	0.99	44.17	65048.78
Observations	266,083	266,252	266,079	253,722	186,544	245,661	154,822	154,822	154,822

NOTE: Sample restricted to mothers and fathers in the CPS ASEC between 1992 and 2022 that had a child between the age of 5 and 9. The full-day kindergarten share was constructed from the CPS October supplement. As such, we use the measure from the previous year, as this corresponds to the same school year as the March ASEC observation. Because the October supplement samples are small, we use the state 3-year rolling average of the full-day kindergarten share. State-by-year fixed effects are including, absorbing the direct effect of the Full-day Kindergarten share and controlling for state-specific trends in parental employment. MSA-by-year fixed effects are also included, making this a comparison between parents with 5- and 6-year-olds and parents of 7- to 9-year-olds in the same MSA and year. This holds labor market conditions fixed between the treatment and counterfactual groups. Column (1) provides our baseline estimates from Table (2). Column (2) excludes MSA-by-year fixed effects. Column (3) controls for parental characteristics including race, education, and marital status bins, and age fixed effects. Column (4) includes preschool controls and finds that the estimates are not significantly affected. These controls include the preschool teacher-to-student ratio, the share of 3- and 4-year-olds in preschool, and the share of 3- and 4-year-olds in full day preschool in the previous school year, all interacted with the indicator for having a child that was 5 or 6. Column (5) only includes the Non-South, to ensure this is not driven only by the early adopting states in the South. Column (6) excludes observations from 2020 and 2021 to avoid concerns about the pandemic. Columns (7)-(9) limit the sample to individuals who can be linked across ASEC CPS waves one year apart, and conditions the sample on parents who reported working last year in their first survey wave. This allows us to examine expensive margin responses among those who were working previously. Standard errors corrected for clustering at the state level. p< 0.01 ***, p< 0.05 **, p<0.1 *.

Table 4: IV Estimates: Impact of Full-Day Kindergarten Share on Labor Supply of Parents with 5- to 6-year-olds Relative to Parents with 7- to 9-year-olds

	In Labor Force (1)	Employed (2)	Employed Last Year (3)	Full-Time Last Year (4)	Part-Time Last Year (5)	Usual Hours Last Year (6)	Weeks Worked Last Year (7)	Wage Income Last Year> 0 (8)	Wage Income Last Year (2020) (9)
					Sample: Mothers				
Share Full-day Kindergarten$_{t-1}$	0.059**	0.062*	0.050**	0.031	0.019	2.629**	2.785	0.081**	5941.1*
*Have Child 5-6	(0.029)	(0.031)	(0.022)	(0.033)	(0.017)	(1.277)	(1.702)	(0.033)	(3114.723)
Have Child 5-6	-0.096***	-0.101***	-0.086***	-0.075***	-0.011	-4.069***	-5.016***	-0.106***	-6487.7***
	(0.019)	(0.020)	(0.015)	(0.024)	(0.013)	(0.889)	(1.165)	(0.024)	(2139.912)
Dependent Mean	0.68	0.64	0.70	0.50	0.21	24.92	31.65	0.67	24619.34
Observations	326,267	326,267	326,267	326,267	326,267	326,267	326,267	326,267	326,267
					Sample: Fathers				
Share Full-day Kindergarten$_{t-1}$	0.002	0.025	0.014	0.003	0.010	0.147	1.062	0.012	-2441.0
*Have Child 5-6	(0.013)	(0.024)	(0.012)	(0.015)	(0.011)	(0.859)	(0.838)	(0.020)	(3711.548)
Have Child 5-6	0.004	-0.016	-0.005	0.001	-0.006	0.169	-0.508	0.000	1104.2
	(0.009)	(0.016)	(0.008)	(0.010)	(0.007)	(0.576)	(0.543)	(0.013)	(2602.933)
Dependent Mean	0.94	0.88	0.94	0.90	0.04	41.79	46.62	0.88	63155.52
Observations	266,083	266,083	266,083	266,083	266,083	266,083	266,083	266,083	266,083

NOTE: Sample restricted to mothers and fathers in the CPS ASEC between 1992 and 2022 that had a child between the age of 5 and 9. Outcomes in column (1) and (2) refer to outcomes in the proceeding week (the ASEC is conducted in March). The rest of the outcomes refer to the previous calendar year. The Full-day Kindergarten share constructed from the CPS October supplement. As such, we use the measure from the previous year, as this corresponds to the same school year as the March ASEC observation. Because the October supplement samples are small, we use the state 3-year rolling average of the Full-day Kindergarten share. We use an indicator for having a full-day friendly policy in place, interacted with an indicator for having a child 5-6 to instrument for *Share Full-day Kindergarten* $*$ *Have Child 5-6*. First stage and reduced form evidence is provided in Appendix Table A1. State-by-year fixed effects are including, absorbing the direct effect of the Full-day Kindergarten share and controlling for state-specific trends in parental employment. MSA-by-year fixed effects are also included, making this a comparison between parents with 5- and 6-year-olds and parents of 7- to 9-year-olds in the same MSA and year. This holds labor market conditions fixed between the treatment and counterfactual groups. Standard errors corrected for clustering at the state level. p< 0.01 ***, p< 0.05 **, p<0.1 *.

Table 5: Impact of Full-Day Kindergarten Share on Monthly Childcare Expenses in Households with 5- to 6-year-olds

	Relative to Families of Children Ages 7-9 (1)	Relative to Families of Children Ages 0-4 (2)
Share Full-day Kindergarten$_{t-1}$	-13.834	-43.130**
*Have Child 5-6	(16.907)	(19.441)
Have Child 5-6	71.470***	-20.024
	(12.562)	(14.289)
Dependent Mean	105.91	169.76
Observations	124,871	152,404

NOTE: Sample restricted to households in the Consumer Expenditure Survey between 2002 and 2019 that had a child between the age of 5 and 9 (column 1) or ages 0 and 6 (column 2). Outcomes in column (1) estimated impacts using households with a child between the age of 7 and 9 as a counterfactual group, and outcomes in column (2) estimated impacts using households with a child between the ages of 0 and 4 as a counterfactual group. The sample is restricted to childcare expenses during the school year. The full-day kindergarten share was constructed from the CPS October supplement. Year adjustment in the CEX were made for expense reports from January to June to align CEX data with the same academic year used in the CPS. Because the October supplement samples are small, we use the state 3-year rolling average of the Full-day Kindergarten share. State-by-year fixed effects are including, absorbing the direct effect of the Full-day Kindergarten share and controlling for state-specific trends in parental employment, which makes this a comparison between households with 5- and 6-year-olds and households of either older or younger children in the same state and year. Standard errors corrected for clustering at the household level. p< 0.01 ***, p< 0.05 **, p<0.1 *.

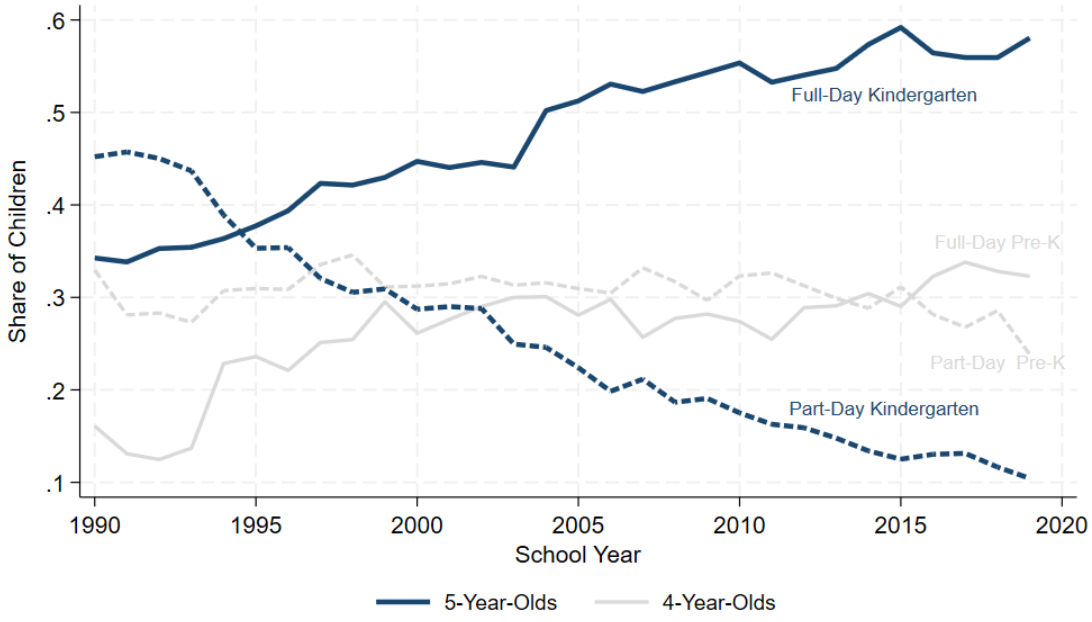
Table 6: Impact of Full-Day Kindergarten Share on Student Test Scores

	Math							Reading and Language Arts						
	All	Asian	Black	Hispanic	Female	Male	Disadvantaged	All	Asian	Black	Hispanic	Female	Male	Disadvantaged
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
							Third Grade vs. Fifth Grade							
Share Younger Grade Full-day Kindergarten	0.096***	0.076	0.082*	0.097***	0.103***	0.110***	0.100***	0.091***	0.080*	0.046	0.060*	0.084***	0.107***	0.100***
*In Younger Grade	(0.032)	(0.052)	(0.041)	(0.032)	(0.034)	(0.034)	(0.035)	(0.021)	(0.042)	(0.032)	(0.031)	(0.024)	(0.026)	(0.023)
In Younger Grade	-0.063**	-0.133***	-0.051	-0.080***	-0.083***	-0.059**	-0.057**	-0.047***	-0.090***	0.001	-0.043*	-0.057***	-0.045**	-0.038**
	(0.025)	(0.039)	(0.031)	(0.025)	(0.026)	(0.026)	(0.027)	(0.015)	(0.031)	(0.021)	(0.025)	(0.017)	(0.020)	(0.016)
Dependent Mean	0.00	0.52	-0.52	-0.30	-0.00	0.01	-0.33	0.02	0.36	-0.43	-0.30	0.14	-0.09	-0.32
Observations	998	978	976	978	986	988	994	994	924	948	966	984	984	990

NOTE: Sample restricted to 3rd and 5th grade level observations. The full-day kindergarten enrollment rate (3-year rolling average) from 4 years prior is used because enrollment is observed in October while test scores are measured in the spring of the corresponding school year. State-by-year fixed effects are included. Standard errors corrected for clustering at the state level. p< 0.01 ***, p< 0.05 **, p<0.1 *.

Additional Tables and Figures (Online Appendix)

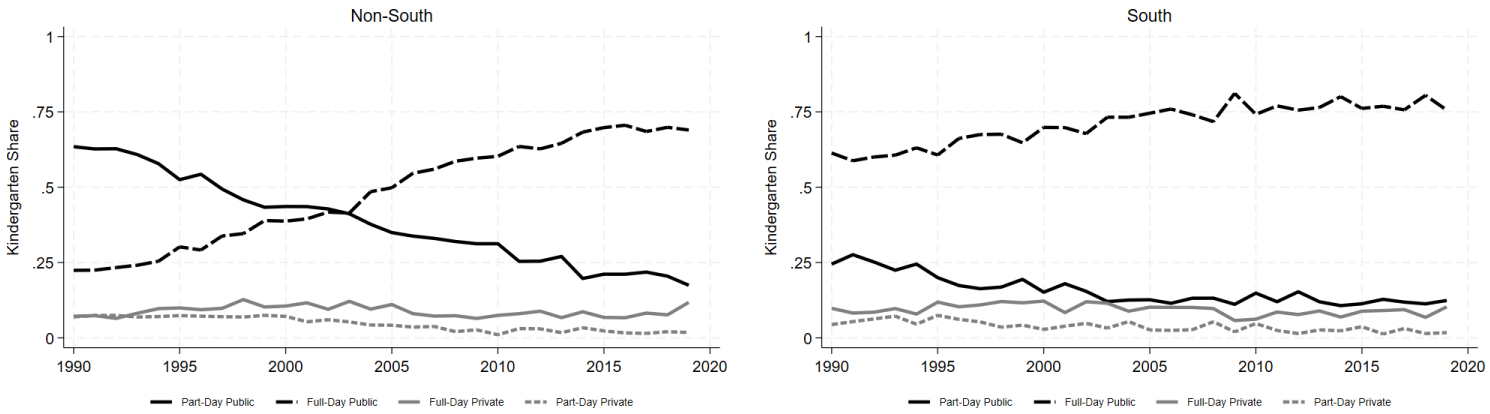
Figure A1: Full-Day and Part-Day Kindergarten and Pre-Kindergarten Enrollment



NOTE: Sample restricted to 4- and 5-year-olds from the CPS October Supplement between 1990 and 2019. Individual weights are used to make this nationally representative. A small fraction of 4-year-olds are enrolled in kindergarten.

SOURCE: CPS October School Enrollment Supplement 1990-2019.

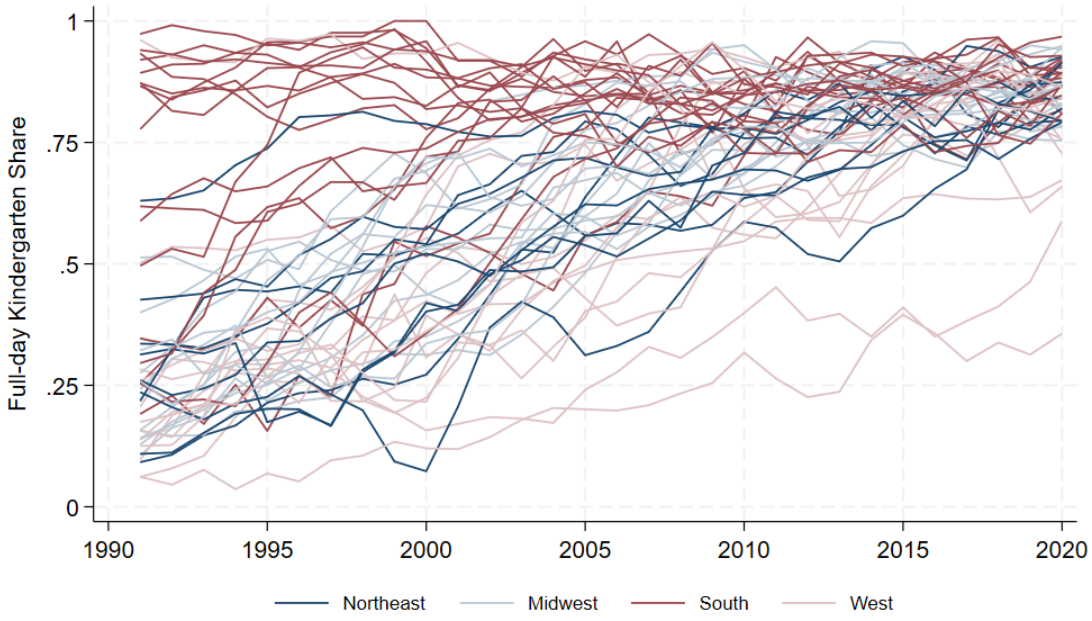
Figure A2: Public vs. Private Kindergarten Enrollment



NOTE: Sample restricted to children ages 3-7 from the CPS October Supplement between 1990 and 2019 who reported being in kindergarten. Individual weights are used to make this nationally representative.

SOURCE: CPS October School Enrollment Supplement 1990-2019.

Figure A3: Full-Day Kindergarten Enrollment Share by State



NOTE: Sample restricted to children ages 3-7 from the CPS October Supplement between 1990 and 2019 who reported being in kindergarten. Individual weights are used to make this nationally representative.

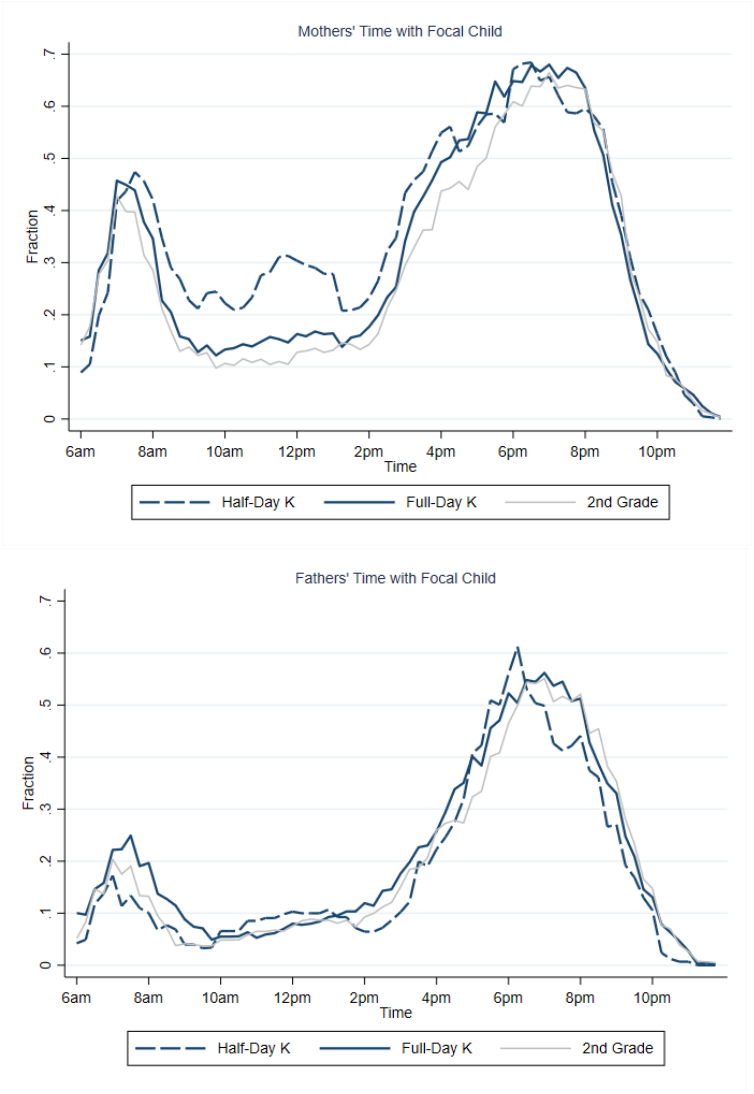
SOURCE: CPS October School Enrollment Supplement 1990-2019.

Figure A4: Characteristics of Pre-Kindergarten and Kindergarten Teachers Over Time

NOTE: Sample restricted to individuals reporting occupation code 2300, pre-kindergarten or kindergarten teacher, between 1991 and 2022. The sample is then collapsed to the annual level, using ASEC survey weights to construct mean characteristics of pre-k and kindergarten teachers.

SOURCE: Authors' calculations from the CPS 1991-2022.

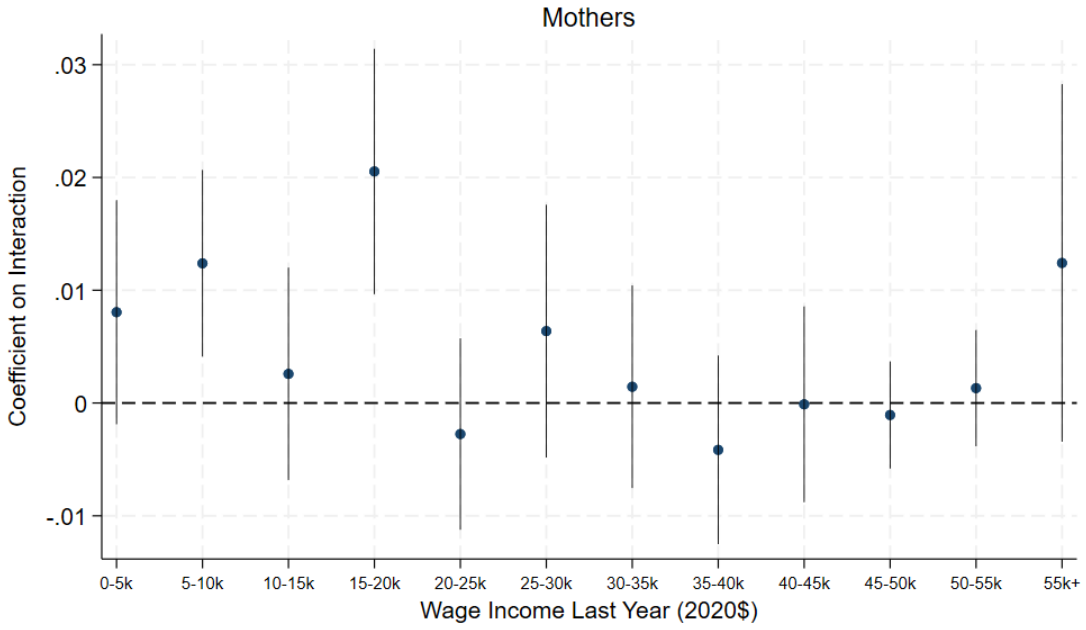
Figure A5: Parent Total Time with Focal Child in Full-Day versus Half-Day Kindergarten



NOTE: Focal child refers to their kindergarten child or their second grader in comparison families.Sample restricted to parent with a child in kindergarten or second grade who linked with the CPS October Supplement just before the ATUS interview.

SOURCE: ATUS 2003-2022

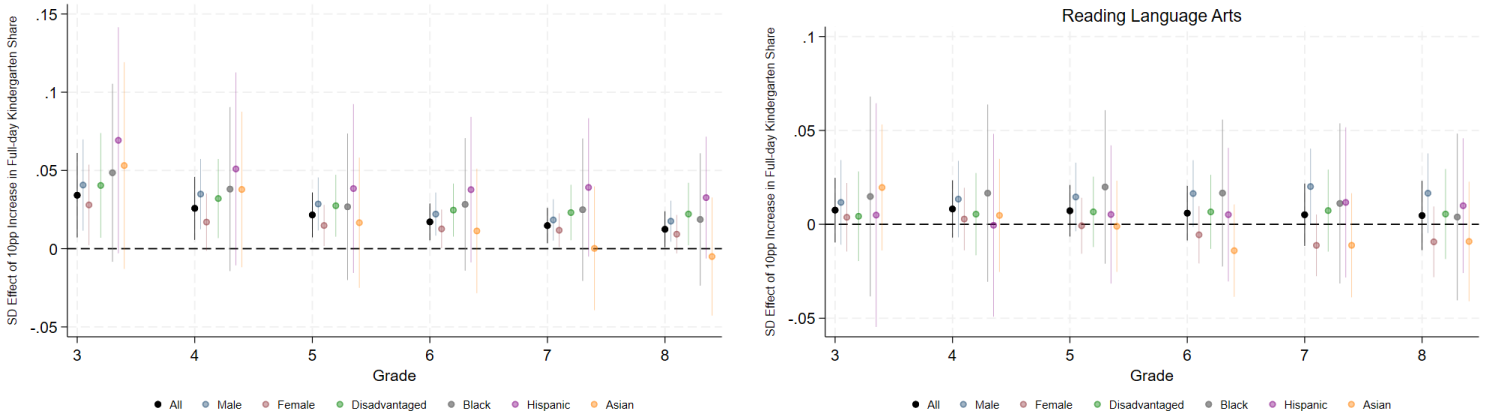
Figure A6: Effect of Full-Day Kindergarten Share on Wage Income of Mothers with 5 to 6-year-olds Relative to Mothers with 7 to 9-year-olds



NOTE: Sample restricted to mothers and fathers in the CPS ASEC between 1992 and 2022 that had a child between the age of 5 and 9. Each point represents the coefficient on the interaction between full-day kindergarten share and an indicator for if the mother has a 5- or 6-year-old child, where the outcome in a binary indicator for having wage income within the specified bin. The full-day kindergarten share is constructed from the CPS October Supplement. As such, we use the measure from the previous year, as this corresponds to the same school year as the March ASEC observation. Because the October Supplement samples are small, we use each state's 3-year rolling average of the full-day kindergarten share. State-by-year fixed effects are included, absorbing the direct effect of the full-day kindergarten share and controlling for state-specific trends in parental employment. MSA-by-year fixed effects are also included, making this a comparison between parents with 5- and 6-year-olds and parents of 7- to 9-year-olds in the same MSA and year. Standard errors are corrected for clustering at the state level, with 95 percent confidence intervals plotted.

SOURCE: Authors' calculations using ASEC CPS 1992-2021.

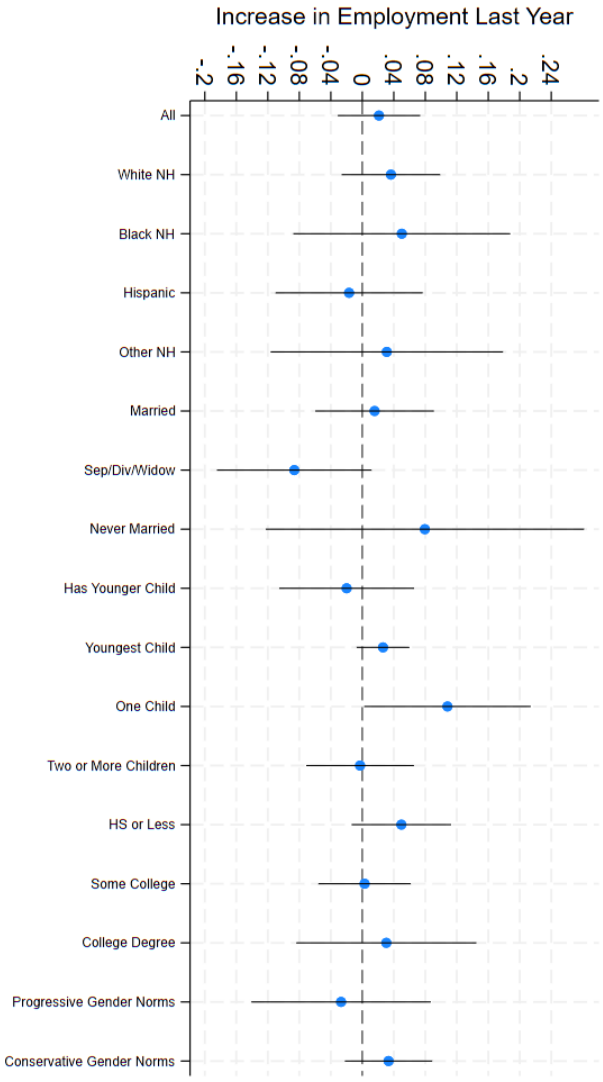
Figure A7: Dynamic Impact of Full-Day Kindergarten Share on Test Scores in the Non-South, by Group



NOTE: Sample restricted to state-cohort specific average test scores by demographic groups for cohorts that started school between 2006 and 2011 and have test scores for all six years between 3rd and 8th grade. The Full-day Kindergarten share constructed from the CPS October supplement. As such, we use the measure from the previous year, as this corresponds to the same school year as the March ASEC observation. Because the October supplement samples are small, we use the state 3-year rolling average of the Full-day Kindergarten share. State-by-year fixed effects are including, making this a comparison between different aged children in the same state and year. Cohort fixed effects are also included, to absorb secular trends in test scores. Standard errors corrected for clustering at the state level with 95 percent confidence intervals plotted.

SOURCE: Authors' calculations from the SEDA 2009-2019.

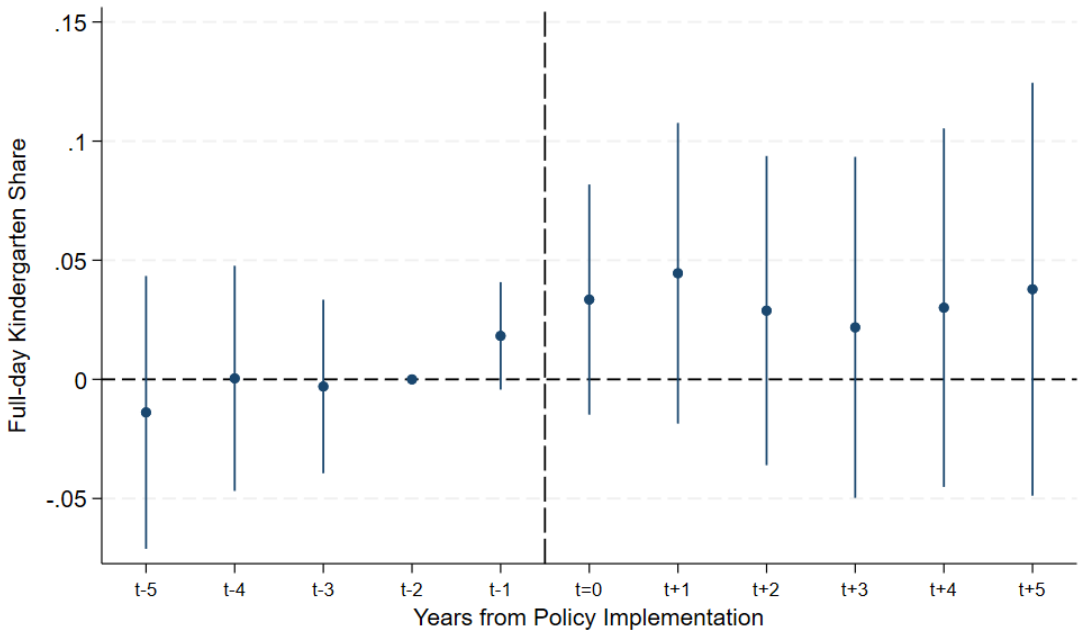
Figure A8: Heterogeneous Impacts of Full-Day Kindergarten Levels on Employment of Mothers, 2006-2016 Subsample



NOTE: Sample restricted to mothers and fathers in the CPS ASEC between 2006 and 2016 that had a child between the age of 5 and 9. The Full-day Kindergarten share constructed from the CPS October supplement. As such, we use the measure from the previous year, as this corresponds to the same school year as the March ASEC observation. Because the October supplement samples are small, we use the state 3-year rolling average of the Full-day Kindergarten share. State-by-year fixed effects are including, absorbing the direct effect of the Full-day Kindergarten share and controlling for state-specific trends in parental employment. MSA-by-year fixed effects are also included, making this a comparison between parents with 5- and 6-year-olds and parents of 7- to 9-year-olds in the same MSA and year. This holds labor market conditions fixed between the treatment and counterfactual groups. Standard errors corrected for clustering at the state level with 95 percent confidence intervals plotted.

SOURCE: Authors' calculations from the CPS 2006-2016.

Figure A9: Event Study Impact of Full-Day Friendly Policies on Full-Day Kindergarten Share 3-Year Rolling Average



NOTE: Level of observation is the state by year level. The outcome is the 3-year rolling average of the full-day kindergarten share in the state, constructed from the CPS October Supplement. For each state that enacts a full-day friendly policy, a separate event study panel is created. The year the policy is implemented is year $t = 0$ for the enacting state and for all other states that never enact a full-day friendly policy. These states provide a counterfactual for the "treated" state that implemented the policy. The event study panel for each of these states is then stacked, so that a state-year observation for a state that did not implement a full-day friendly policy will appear multiple times. The 3-year rolling average of the full-day kindergarten share is then regressed in the balanced panel (+/-5 years) on event time dummies, interacted with treatment dummies, with state, year, and panel by year fixed effects. The panel by year fixed effects makes this a comparison between the treatment state and the counterfactual states in the same panel over time. Standard errors corrected for clustering at the state level with 95 percent confidence intervals plotted.

SOURCE: Authors' calculations from the CPS 1991-2021.

Table A1: IV Estimates First Stage and Reduced Form: Impact of Full-Day Policy on Labor Supply of Parents with 5 to 6-year-olds Relative to Parents with 7 to 9-year-olds

	First Stage Full-day Share*Child 5-6 (1)	In Labor Force (2)	Employed (3)	Employed Last Year (4)	Full-Time Last Year (5)	Part-time Last Year (6)	Usual Hours Last Year (7)	Weeks Worked Last Year (8)	Wage Income Last Year> 0 (9)	Wage Income Last Year (2020) (10)
					Sample: Mothers					
Full-day Availability Mandate	0.260***	0.011*	0.008	0.010**	0.005	0.005	0.517**	0.338	0.017***	954.5*
*Have Child 5-6	(0.046)	(0.006)	(0.005)	(0.004)	(0.005)	(0.004)	(0.207)	(0.246)	(0.005)	(512.151)
Full-day Friendly Policy	0.106*	0.011	0.014**	0.008	0.006	0.002	0.408	0.697**	0.013*	1155.2**
*Have Child 5-6	(0.054)	(0.007)	(0.007)	(0.005)	(0.007)	(0.004)	(0.259)	(0.343)	(0.007)	(519.546)
F-stat	22.19									
Dependent Mean	0.67	0.68	0.64	0.70	0.49	0.21	24.89	31.58	0.66	24345.85
Observations	326,267	335,609	335,609	335,609	335,609	335,609	335,609	335,609	335,609	335,609
					Sample: Fathers					
Full-day Availability Mandate	0.263***	-0.001	-0.004	0.001	-0.000	0.001	-0.127	0.088	0.002	-1629.0**
*Have Child 5-6	(0.046)	(0.003)	(0.004)	(0.002)	(0.003)	(0.002)	(0.133)	(0.152)	(0.004)	(718.698)
Full-day Friendly Policy	0.108**	0.001	0.012**	0.004	0.001	0.003	0.131	0.277	0.002	659.9
*Have Child 5-6	(0.053)	(0.003)	(0.005)	(0.004)	(0.004)	(0.003)	(0.227)	(0.218)	(0.005)	(906.922)
F-stat	23.59									
Dependent Mean	0.67	0.94	0.88	0.94	0.90	0.04	41.83	46.64	0.88	62696.41
Observations	266,083	273,501	273,501	273,501	273,501	273,501	273,501	273,501	273,501	273,501

NOTE: Sample restricted to mothers and fathers in the CPS ASEC between 1992 and 2022 that had a child between the age of 5 and 9. The outcome in column (1) is the three year rolling average of the share of kindergarten students in full-day programming, at the state level interacted with whether the parent has a child that is between 5 and 6. Columns (2)-(10) replicate the reduced form version of Table 2. State-by-year fixed effects are including, absorbing the direct effect of the Full-day Kindergarten share and controlling for state-specific trends in parental employment. MSA-by-year fixed effects are also included, making this a comparison between parents with 5- and 6-year-olds and parents of 7- to 9-year-olds in the same MSA and year. This holds labor market conditions fixed between the treatment and counterfactual groups. Standard errors corrected for clustering at the state level. p< 0.01 ***, p< 0.05 **, p<0.1 *.

Table A2: Impact of Full-Day Kindergarten Share on Labor Supply of Parents with 5 to 6-year-olds Relative to Parents with 7 to 9-year-olds, by Grandmother in Home

	In Labor Force (1)	Employed (2)	Employed Last Year (3)	Full-Time Last Year (4)	Part-time Last Year (5)	Usual Hours Last Year (6)	Weeks Worked Last Year (7)	Wage Income Last Year> 0 (8)	Wage Income Last Year (2020) (9)
				Sample: Mothers with Grandmother in Household					
Share Full-day Kindergarten$_{t-1}$	0.073	0.034	0.042	0.007	0.035	1.418	2.477	0.058	-799.1
*Have Child 5-6	(0.052)	(0.063)	(0.059)	(0.070)	(0.030)	(2.834)	(2.679)	(0.056)	(2317.838)
Have Child 5-6	-0.079**	-0.062	-0.062	-0.040	-0.022	-2.424	-4.093**	-0.070*	-1189.2
	(0.038)	(0.046)	(0.045)	(0.052)	(0.020)	(2.216)	(1.895)	(0.041)	(1378.514)
Dependent Mean	0.70	0.62	0.69	0.53	0.17	25.33	31.08	0.67	19848.73
Observations	16,360	16,360	16,360	16,360	16,360	16,360	16,360	16,360	16,360
				Sample: Mothers with No Grandmother in Household					
Share Full-day Kindergarten$_{t-1}$	0.062***	0.049***	0.043***	0.023*	0.020	1.603***	2.048***	0.054***	1278.6
*Have Child 5-6	(0.009)	(0.009)	(0.009)	(0.012)	(0.012)	(0.428)	(0.419)	(0.009)	(996.038)
Have Child 5-6	-0.100***	-0.093***	-0.083***	-0.071***	-0.012	-3.446***	-4.565***	-0.090***	-3348.6***
	(0.006)	(0.006)	(0.006)	(0.009)	(0.009)	(0.320)	(0.287)	(0.007)	(640.315)
Dependent Mean	0.68	0.64	0.70	0.49	0.21	24.89	31.68	0.66	24922.03
Observations	307,992	307,992	307,992	307,992	307,992	307,992	307,992	307,992	307,992

NOTE: Sample restricted to mothers in the CPS ASEC between 1992 and 2022 that had a child between the age of 5 and 9. Outcomes in column (1) and (2) refer to outcomes in the proceeding week (the ASEC is conducted in March). The rest of the outcomes refer to the previous calendar year. The top panel restricts the sample to mothers whose own mother is on the household roster. The bottom panel restricts the sample to mothers whose own mother is not on the household roster. The Full-day Kindergarten share constructed from the CPS October supplement. As such, we use the measure from the previous year, as this corresponds to the same school year as the March ASEC observation. Because the October supplement samples are small, we use the state 3-year rolling average of the Full-day Kindergarten share. State-by-year fixed effects are including, absorbing the direct effect of the Full-day Kindergarten share and controlling for state-specific trends in parental employment. MSA-by-year fixed effects are also included, making this a comparison between parents with 5- and 6-year-olds and parents of 7- to 9-year-olds in the same MSA and year. This holds labor market conditions fixed between the treatment and counterfactual groups. Standard errors corrected for clustering at the state level. p< 0.01 ***, p< 0.05 **, p<0.1 *.

Table A3: Impact of Full-Day Kindergarten Share on Schooling of Parents with 5 to 6-year-olds Relative to Parents with 7 to 9-year-olds

	In School (1)	Enrolled in College (2)	Full-time College (3)	Part-time College (4)	In School Last Year (5)
			Sample: Mothers		
Share Full-day Kindergarten$_{t-1}$	0.003	0.004	0.006	-0.002	0.015**
*Have Child 5-6	(0.005)	(0.005)	(0.004)	(0.003)	(0.006)
Have Child 5-6	0.002	0.001	-0.000	0.002	-0.006
	(0.004)	(0.003)	(0.003)	(0.002)	(0.004)
Dependent Mean	0.06	0.06	0.03	0.03	0.07
Observations	184,227	184,227	184,227	184,227	184,227
			Sample: Fathers		
Share Full-day Kindergarten$_{t-1}$	-0.000	0.001	0.002	-0.001	0.004
*Have Child 5-6	(0.005)	(0.005)	(0.004)	(0.003)	(0.006)
Have Child 5-6	0.004	0.004	0.001	0.003	0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.005)
Dependent Mean	0.03	0.03	0.01	0.02	0.04
Observations	146,657	146,657	146,657	146,657	146,657

NOTE: Sample restricted to mothers and fathers in the October CPS between 1994 and 2021 that had a child between the age of 5 and 9. Because the October supplement samples are small, we use the state 3-year rolling average of the Full-day Kindergarten share. State-by-year fixed effects are including, absorbing the direct effect of the Full-day Kindergarten share and controlling for state-specific trends in parental employment. MSA-by-year fixed effects are also included, making this a comparison between parents with 5- and 6-year-olds and parents of 7- to 9-year-olds in the same MSA and year. This holds labor market conditions fixed between the treatment and counterfactual groups. Standard errors corrected for clustering at the state level. p< 0.01 ***, p< 0.05 **, p<0.1 *.

Table A4: Impact of Full-Day Kindergarten Share on Labor Supply of Parents with 5 to 6-year-olds Relative to Parents with 7 to 9-year-olds, During SEDA Availability Years (2006-2016 Cohorts)

	In Labor Force (1)	Employed (2)	Employed Last Year (3)	Full-Time Last Year (4)	Part-time Last Year (5)	Usual Hours Last Year (6)	Weeks Worked Last Year (7)	Wage Income Last Year> 0 (8)	Wage Income Last Year (2020) (9)
					Sample: Mothers				
Share Full-day Kindergarten$_{t-1}$	0.045	0.027	0.031	0.020	0.010	1.388	1.509	0.042*	1532.9
*Have Child 5-6	(0.029)	(0.029)	(0.025)	(0.024)	(0.017)	(1.119)	(1.199)	(0.024)	(1712.311)
Have Child 5-6	-0.081***	-0.071***	-0.068***	-0.063***	-0.005	-3.005***	-3.794***	-0.072***	-3039.5**
	(0.022)	(0.023)	(0.019)	(0.019)	(0.013)	(0.841)	(0.875)	(0.018)	(1166.909)
Dependent Mean	0.68	0.63	0.69	0.49	0.20	24.52	31.47	0.65	25720.36
Observations	130,496	130,496	130,496	130,496	130,496	130,496	130,496	130,496	130,496
					Sample: Fathers				
Share Full-day Kindergarten$_{t-1}$	0.007	0.005	-0.001	0.007	-0.008	0.455	0.360	-0.012	633.3
*Have Child 5-6	(0.009)	(0.019)	(0.010)	(0.012)	(0.009)	(0.614)	(0.602)	(0.013)	(3963.811)
Have Child 5-6	-0.001	-0.004	0.004	-0.003	0.008	-0.207	-0.053	0.020**	-776.1
	(0.006)	(0.013)	(0.007)	(0.009)	(0.007)	(0.450)	(0.404)	(0.009)	(2725.946)
Dependent Mean	0.94	0.87	0.94	0.89	0.05	41.06	46.17	0.88	65254.50
Observations	106,508	106,508	106,508	106,508	106,508	106,508	106,508	106,508	106,508

NOTE: Sample restricted to mothers and fathers in the CPS ASEC between 2006 and 2016 that had a child between the age of 5 and 9. Outcomes in column (1) and (2) refer to outcomes in the proceeding week (the ASEC is conducted in March). The rest of the outcomes refer to the previous calendar year. The Full-day Kindergarten share constructed from the CPS October supplement. As such, we use the measure from the previous year, as this corresponds to the same school year as the March ASEC observation. Because the October supplement samples are small, we use the state 3-year rolling average of the Full-day Kindergarten share. State-by-year fixed effects are including, absorbing the direct effect of the Full-day Kindergarten share and controlling for state-specific trends in parental employment. MSA-by-year fixed effects are also included, making this a comparison between parents with 5- and 6-year-olds and parents of 7- to 9-year-olds in the same MSA and year. This holds labor market conditions fixed between the treatment and counterfactual groups. Standard errors corrected for clustering at the state level. p< 0.01 ***, p< 0.05 **, p<0.1 *.

Data Appendix

Full-day Kindergarten Data

We primarily rely on the October School Enrollment Supplement of the Current Population Survey (CPS) to measure trends in full-day kindergarten participation from 1990 to 2023 (Flood et al., 2023b). The CPS is a nationally representative survey in the United States which is administered by the U. S. Census Bureau. Participating households provide information for eight waves that span over sixteen months. Going back before 1990, all households being surveyed during October are offered additional education questions. Families report school enrollment for each child in the household, including participation in full-day and half-day kindergarten. We limit the sample to child-level reports for children between the ages of 3 and 7 that are reported to be in kindergarten. This captures 99.9 percent of all kindergarteners. We then aggregate these reports to the state level each year to study broad trends in full-day kindergarten. The full-day kindergarten data is constructed as weighted annual counts of total kindergarten students and full-day kindergarten students in each state, calculated as a full-day proportion, and averaged as three-year moving averages. Because school enrollment reports are made at the child level, we can evaluate trends with sensitivity to geography and family demographics.

Analyses of enrollment trends focus on the period of 1990 through 2019 to avoid complications with reporting and actual enrollment in the October 2020 Supplement and beyond due to the COVID-19 pandemic.

We supplement the full-day kindergarten participation data with data from the National Center for Education Statistics' Common Core of Data on full-time equivalent kindergarten teachers and other education resource measures by state for the same years (National Center for Education Statistics, 2023).

Parent Time Use Data

We draw time use data from the American Time Use Survey (ATUS) (Flood et al., 2023a). The dataset is nationally representative of households in the United States. The Bureau of Labor Statistics administers the survey in connection with the CPS. Households are selected to participate in the ATUS from a random sample of the outgoing rotation of the CPS. The ATUS is a subsample of the CPS offered two to five months after the final wave of the CPS. The ATUS holds an interview with one household member to document their time use over a 24-hour period from 4:00am of the day preceding the interview until 4:00am of the interview day. Time diary data collection using the Day Reconstruction Method has been validated (Kahneman et al. (2004)) and provides high quality and detailed data on family time use.

The October School Enrollment Supplement of the CPS has detailed information on whether a child is

enrolled in full- versus half-day kindergarten. We leverage this information by linking ATUS respondents to their most previous October Supplement. Not all ATUS respondents took the CPS October supplement. Given the October supplement linking and school day requirement, all included respondents were surveyed in the ATUS from December to May. Importantly, the linking facilitates a comparison of families with children in different kindergarten contexts. We used information from the family roster in the October supplement of the CPS to identify parents with a child in either half-day kindergarten or full-day kindergarten. No parents had both a half- and full-day kindergartener. We also identified parents who had a child in second grade and no child in kindergarten, so that we could use these parents who all had slightly older children in a full-day school context as a comparison group.

We measured time use variable from the ATUS. The primary measures of interest were work time, time spent with any children, and travel time with children. We also measured additional activities relevant to the parenting context such as one-on-one time, developmental care time, etc. (see Table 1 for a complete list of time use variables). Time use measures were developed in two ways. First, we measured the total minutes spent through the day to study the duration of time devoted to activities and companions. Second, to explore the timing of parent-child time and other activities through the day, we measured as a binary variable whether a parent participated in an activity of interest or not for each 15-minute intervals through the sample day.

Parental Employment Data

We obtain parental employment measures from the March Current Population Survey (CPS) (Flood et al., 2023b). The CPS collects responses from approximately 65,000 households each month in a rotating sample. Participants are surveyed for four months, leave the sample for eight months, and then re-enter to be surveyed for four final months. Each March, the monthly CPS is accompanied by the Annual Social and Economic Supplement (ASEC). As part of the ASEC supplement, the household respondent is asked to report on work and income related outcomes, including employment, usual hours worked, weeks worked, and wage income in the previous calendar year. We use these measures (in addition to the monthly employment question) to create our main outcomes of interest. We convert dollar measures to 2020 dollars using the personal consumption expenditures price index.

We identify parents as someone with any of their own children living in the household. We use the relationship to head of household, and parent location variables (created by IPUMS) to identify the ages of parents' children. The main sample is then restricted to mothers or fathers with a child between the ages of 5 and 9 in the household. Treated families are those with a kindergarten-aged child (ages 5 and

6), and comparison families have children ages 7-9 and no kindergarten-aged children. We merge full-day kindergarten enrollment rates constructed from the CPS Education Supplement in October (described above) to March ASEC observations with a one year lag. As such, kindergarten enrollment from October 2015 is applied to parental employment records from March 2016, as these dates are in the same school year. Because of this lagged merge, the analysis sample runs from 1992 to 2022.

Childcare Expenses Data

Household childcare expenditure data were drawn from the Consumer Expenditure Survey (U. S. Department of Labor (2023)). The dataset is nationally representative of households in the United States. The Bureau of Labor Statistics administers the survey in an ongoing manner, and households rotate into the survey each month through the year. The survey provides state-level geography information for most households in the survey.

In this project, we used data from the Interview Survey, which collects information about large and/or recurring expenses to the household over the prior 3 months. The focus of the data collection on large and recurring expenses may cause us to underestimate childcare costs in households with smaller or irregular childcare costs. The survey provides information on the month and year expenses were incurred. All information is collected at the household level, preventing any analysis of child-specific expenses. As part of the data collection, households are asked to report the dollar amount spent on babysitting and/or childcare for each of the three prior months. We convert the dollar measure to 2020 dollars using the personal consumption expenditures price index. We treat each month as a separate observation in order to separate school-year and summer months.

Using ages of each household member found in the household roster, we identify the presence of children ages 0 to 9. We classified any household with children ages 5 and 6 as kindergarten-aged. We group households with children ages 0 through 4 and no kindergarten-aged children, and designate them as the younger comparison group. We group households with children ages 7 through 9 and no kindergarten-aged children, and designate them as the older comparison group.

Student Achievement Data

Data on student performance on standardized tests are obtained from the Stanford Education Data Archive (SEDA), a data product of the Educational Opportunity Project at Stanford (Reardon et al., 2023). Each year, states are required to test students between third and eight grade in both math and reading/language arts. This test information is then sent to the Department of Education. SEDA uses a restricted version of

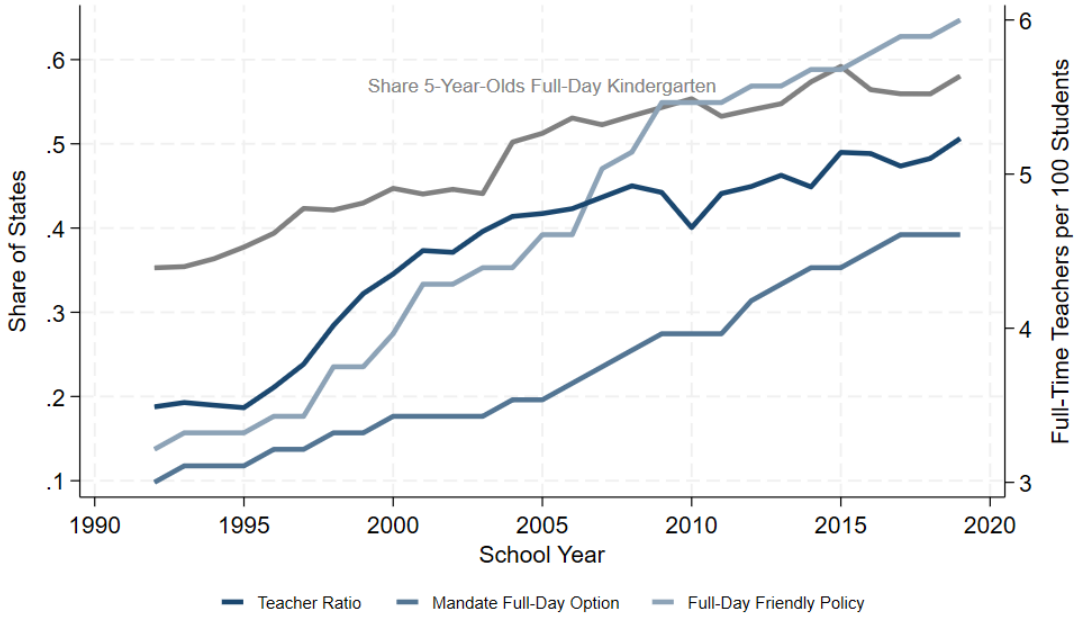
this data to construct test performance measures that are comparable across states, grade, and time, even though states use different exams and report test results differently. Every two years, the Department of Education's National Center for Education Statistics (NCES) conducts the National Assessment of Educational Progress (NAEP) among fourth and eight graders. This exam is administered to a sample of individuals in each state, making it possible to measure level differences in performance across states. The SEDA data standardizes state level performance measures, relative to the state-level NAEP to construct standardized test scores that are comparable across states and time.

We use the 5.0 version of the SEDA cohort standardized data for the years 2009 through 2019. SEDA also provides data from 2020 on, but due to the pandemic and methodological differences we focus on the 2009-2019 data. The data correspond to test scores from the end of year testing, as such, we merge test scores to full-day kindergarten shares from the previous October CPS, which corresponds to the same school year. We use two separate specifications when examining student achievement. For Table 6 we only use student test scores from the third and fifth grade cells. We then merge these to the state-level kindergarten full-day shares that correspond to the third graders' kindergarten year. For Figure 7 we use data for all grade cohorts (third through eighth). Similarly, we date these back to the cohort's kindergarten entry year to identify the full-day kindergarten share when they were in kindergarten. For this analysis we limit the sample to kindergarten cohorts we observe for all grades from third through eighth, to ensure that the grade level estimates are not due to differential selection of which cohorts are included in the sample. We use the SEDA pre-defined score estimates by gender, race/ethnicity, and free and reduced price lunch receipt, which proxies for low-income status.

Policy Appendix

This appendix documents the construction of the state-level policy instruments used in the analysis, including details about the existence and timing of full-day kindergarten policies in each state. Because policies were formulated and implemented at the state level, there was variation in scope and timing across the U.S. and throughout our analytic timeframe of interest. Figure A10 illustrates the correspondence between the growth in the share of five-year olds in full-day kindergarten settings alongside the growth in the number of full-time equivalent kindergarten teachers per 100 students and the proliferation of state-level full-day kindergarten policies.

Figure A10: Full-Day Kindergarten Enrollment and Policy Environment



NOTE: Sample restricted to 5-year-olds from the CPS October Supplement between 1992 and 2019. Individual weights are used to make this nationally representative. Full-time equivalent kindergarten teachers and total student enrollment by grade obtained from the Common Core of Data.

SOURCE: CPS October School Enrollment Supplement 1992-2019, National Center for Education Statistics' Common Core of Data 1992-2019, and authors' compilation of state-level policy changes.

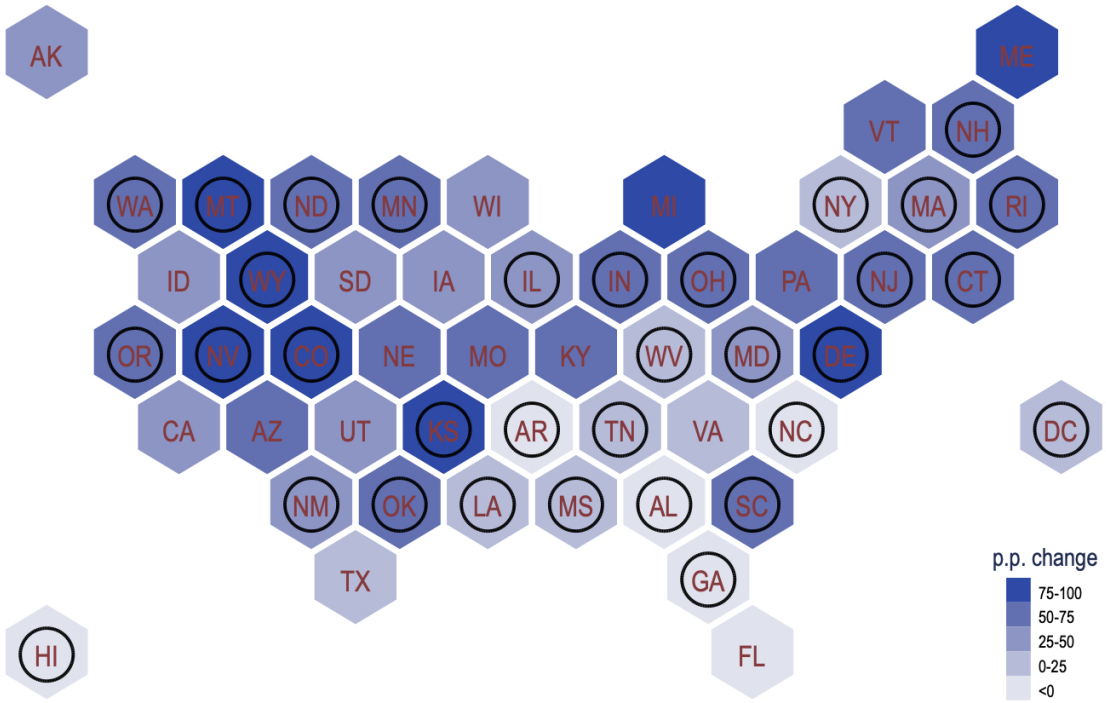
Nature of Policy Variation

To reflect the variation in scope, we categorize full-day kindergarten policies at the state level into two groups. We first document policy changes in states that enacted statewide full-day kindergarten mandates. These policies require school districts in the state *to offer* a full-day kindergarten option to any child/family who wants that option. We then document all other policies that facilitate the expansion or provision of full-day

kindergarten in the state, which we term full-day kindergarten "friendly" policies. The policy instrument used in the analysis includes any policies that were supportive of full-day kindergarten expansion in the state, including the mandates. In states with multiple policy changes, we use the earliest policy change to assign a state as "treated" by a full-day kindergarten policy. Figure A11 displays the state-level changes in full-day kindergarten participation from 1990 through 2019, and also indicates which states had any full-day kindergarten friendly policy enacted in the same time period.

In some cases, full-day friendly policies allocated state funding if districts want to offer full-day kindergarten (e.g., Indiana, Utah) or established a council or review committee to support full-day kindergarten expansion in the state (e.g., Oregon). In some cases, the date on the enactment of the friendly policy marked the start of a phased rollout of a statewide mandate (e.g., New Mexico, Washington), with the phased rollout targeting provision in the most disadvantaged districts early. One important point to highlight is the mix of states that were early adopters. All eight states that adopted full-day kindergarten mandates prior to 2000 were located in the South.

Figure A11: State-Level Changes in Full-Day Kindergarten Participation and Policy



NOTE: The color gradient indicates the within-state change in the full-day kindergarten share between 1990 and 2019. Circles around state labels indicate the states that experienced any state-level full-day kindergarten policy change between 1990 and 2019.

SOURCE: CPS October School Enrollment Supplement 1990-2019 and authors' compilation of state-level policy changes.

Process of Compiling Policy Variation

To identify legislative action and policy changes, we took three major steps: (1) a state-by-state scan of current code, including Lexis-Nexis database searches, (2) a search of policy tracking databases maintained by the Education Commission of the States and the National Conference of State Legislatures, and finally, (3) a media scan of related articles.

The first step enabled us to capture current code with respect to kindergarten and, in some cases, allowed us to track the dates of major legislative changes prior to the current situation. To better fill in the policy changes over the full time frame of interest, we also used the Education Commission of the States' state policy databases [16] and the National Conference of State Legislatures' database.[17].

Finally, we conducted an extensive scan of newspaper and media articles to ensure we had identified all the state-level policy and legislative changes in the relevant time frame. We first searched the ReadEx newspaper archives, *America's Historical Newspapers*, for articles on "full-day kindergarten" or "all-day kindergarten" in any article post-1990. Since the database focuses on particularly newspapers, we also searched the main newspaper in each state (e.g., *The Indianapolis Star* for Indiana) for the same time frame. Finally, we conducted a Google news search for the same search terms and each state name. Table A5 presents the results of this search process: the dates of state-level policy changes by type of policy, mandates and any full-day friendly policy.

[16]The Education Commission of the States (ECS) State Policy Database, Full-day Kindergarten State Legislation, for the period 1994–2020 (retrieved October 1, 2023) and ECS State Education Policy Tracking for the period 2020–2024 (retrieved March 31, 2024).

[17]The National Conference of State Legislatures Education Legislation Bill Tracking covering the period 2008–2022 (retrieved October 1, 2023).

Table A5: Full-Day Kindergarten Policy Changes by State

State	Full-Day K Mandate	Any Full-Day K-Friendly Policy
Alabama	1990	–
Alaska	–	–
Arizona	–	–
Arkansas	1984	–
California	–	–
Colorado	–	2001, 2005, 2007, 2008
Connecticut	–	2014
Delaware	2008	2003
DC	2000	–
Florida	–	–
Georgia	1987	2009
Hawaii	2012	–
Idaho	–	2022
Illinois	2027	1970, 2024
Indiana	2012	2007
Iowa	–	–
Kansas	–	2017, 2022
Kentucky	2022	2021
Louisiana	1990	2004
Maine	–	–
Maryland	2007	1998
Massachusetts	–	2007
Michigan	–	–
Minnesota	2014	1998
Mississippi	2006	1985
Missouri	–	–
Montana	–	2007
Nebraska	–	–
Nevada	–	2005
New Hampshire	–	2019
New Jersey	–	2000, 2010
New Mexico	2004	2001
New York	–	2005, 2007, 2018
North Carolina	1985	–
North Dakota	–	2008
Ohio	–	2009
Oklahoma	2013	2001, 2005
Oregon	–	2009, 2015
Pennsylvania	–	–
Rhode Island	2016	–
South Carolina	1998	–
South Dakota	–	–
Tennessee	1993	–
Texas	–	–
Utah	–	2022
Vermont	–	–
Virginia	2022	–
Washington	2017	2007, 2011
West Virginia	1996	–
Wisconsin	–	–
Wyoming	2009	–