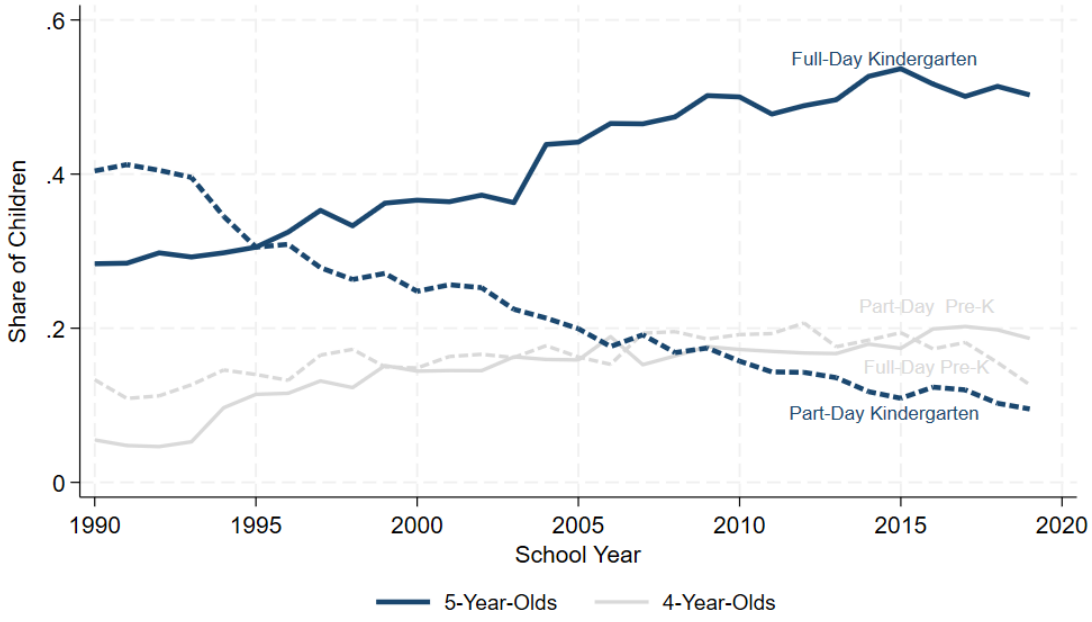
Appendix A: Additional Tables and Figures (Online Appendix)

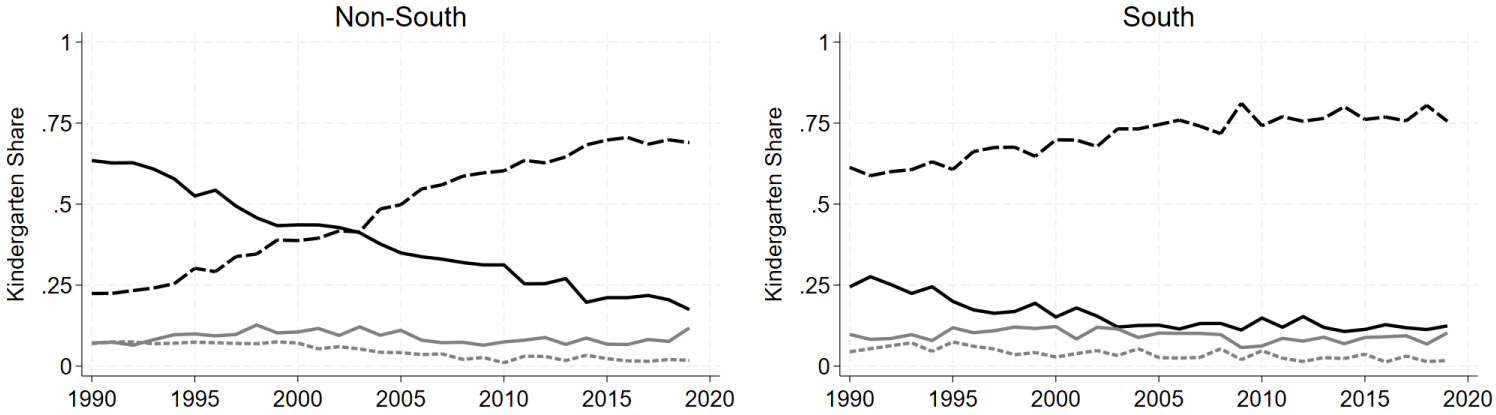
Figure A1: Full-Day and Part-Day Kindergarten and Pre-Kindergarten Enrollment



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.

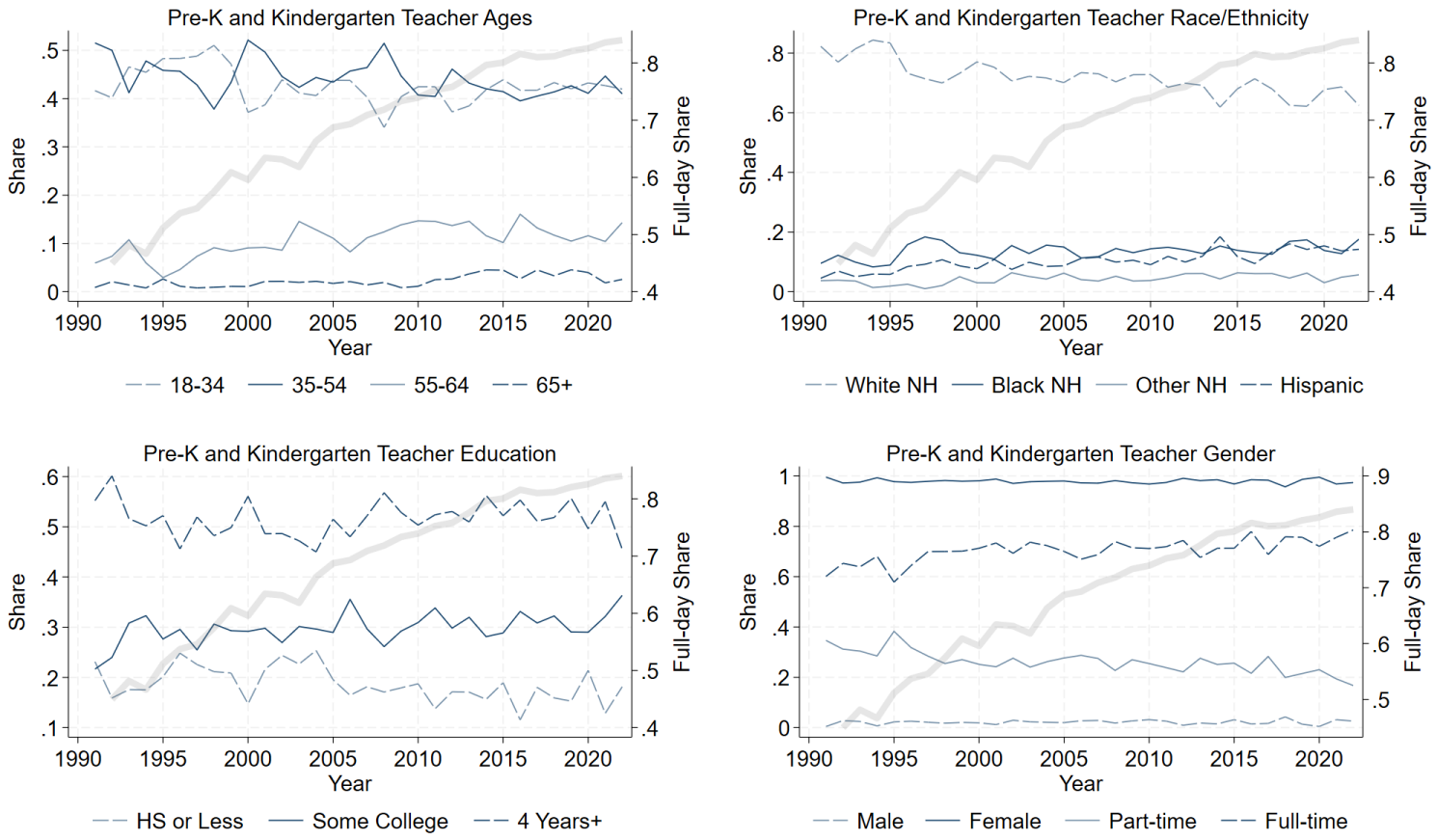
Figure A2: Public vs. Private Kindergarten Enrollment



NOTE: Sample restricted to children ages 3 to 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.

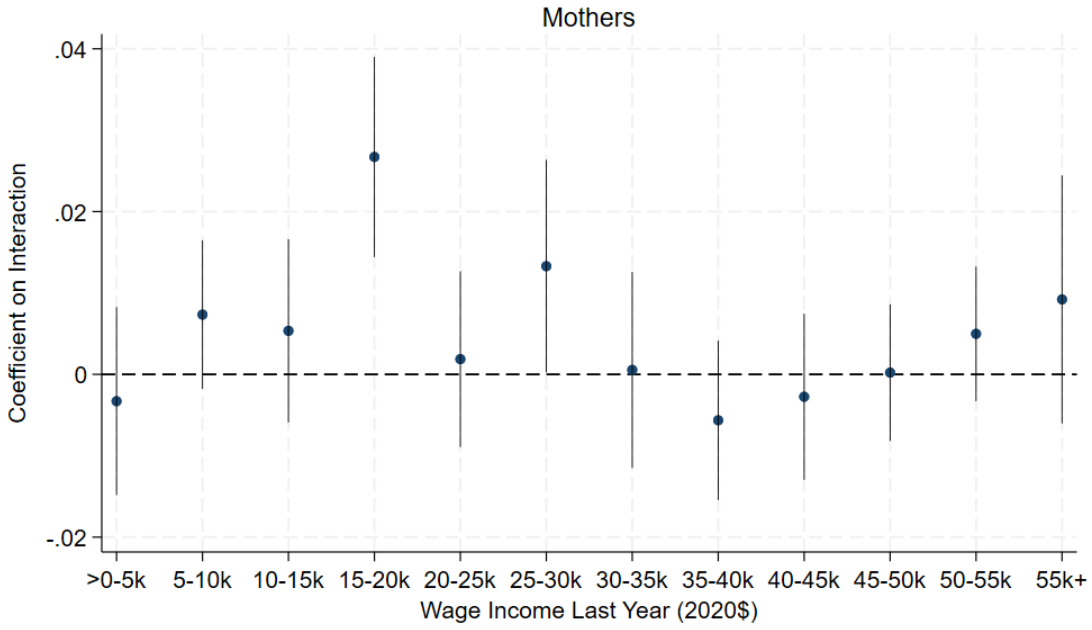
Figure A3: Characteristics of Pre-Kindergarten and Kindergarten Teachers Over Time



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. For comparison, the light gray line aligns with the right-hand-side axis and shows trends in the share of kindergartners in public school who attend full-day kindergarten (also shown in Figure 2).

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

Figure A4: 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 with a child between the ages 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 is a binary indicator for having wage income within the specified bin. The full-day kindergarten share is constructed from the CPS October Supplement and captures the share of kindergartners in public school that attend full-day. 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 clustered at the state level to account for potential correlation between the error terms within the state, with 95 percent confidence intervals plotted.

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

Table A1: Schooling Substitution: Impact of Full-Day Kindergarten Share on Other School Enrollment Margins

	5-Year-Olds							6-Year-Olds in t+1	
	Half-day Public (1)	Full-day Private (2)	Half-day Private (3)	Full-day Pre-k (4)	Half-day Pre-k (5)	First Public (6)	First Private (7)	First Public (8)	First Private (9)
Share Full-day Kindergarten$_{t-1}$	-0.735***	0.003	-0.069***	-0.041***	-0.075***	-0.025	-0.002	0.080***	-0.022
	(0.037)	(0.014)	(0.014)	(0.015)	(0.016)	(0.020)	(0.004)	(0.027)	(0.014)
Dependent Mean	0.21	0.06	0.03	0.07	0.08	0.04	0.01	0.65	0.07
Observations	1,632	1,632	1,632	1,632	1,632	1,632	1,632	1,632	1,632

NOTE: Observation at the state by year level from 1991 to 2022 constructed from CPS October Supplement microdata. For each observation, the share of 5-year-olds in each type of schooling is constructed. For columns (8) and (9) the type of schooling is constructed for 6-year-olds in the following year, to observe persistent changes in school enrollment. The Share Full-day Kindergarten is the share of 5-year-olds in the CPS October Supplement that were enrolled in public full-day kindergarten. State and year fixed effects are included. Observations are weighted using the March ASEC sampling weights. Standard errors are clustered at the state level to account for potential correlation between the error terms within the state. 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 Presence of Younger Children

	Outcome: Last Week		Outcome: Last Year				
	Employed (1)	Hours (2)	Employed (3)	Full-Time (4)	Weeks Worked (5)	Wage Income> 0 (6)	Wage Income (2020) (7)
			Sample: Mothers for Whom Focal Child is Youngest				
Share Full-day Kindergarten$_{t-1}$	0.045***	1.271***	0.035***	0.015	2.060***	0.047***	-893.5
*Have Child 5-6	(0.013)	(0.474)	(0.013)	(0.016)	(0.671)	(0.013)	(2005.898)
Dependent Mean	0.69	24.46	0.75	0.54	34.46	0.71	27246.55
Observations	205,069	200,174	205,069	205,069	205,069	205,069	205,069
			Sample: Mothers with Younger Children				
Share Full-day Kindergarten$_{t-1}$	0.041	1.249	0.029	0.010	1.996	0.035	2654.6
*Have Child 5-6	(0.028)	(1.308)	(0.028)	(0.029)	(1.405)	(0.027)	(1852.968)
Dependent Mean	0.55	18.19	0.62	0.42	26.89	0.58	20190.96
Observations	120,208	116,717	120,208	120,208	120,208	120,208	120,208

NOTE: Sample restricted to mothers in the CPS ASEC between 1992 and 2022 with a child between the ages of 5 and 9. Outcomes in column (1) and (2) refer to outcomes in the preceding week (the ASEC is conducted in March). The remaining outcomes refer to the previous calendar year. The top panel restricts the sample to mothers whose youngest child is the focal child in the 5- to 9-year-old sample. The bottom panel restricts the sample to mothers who have a younger child than the focal child in the household. The full-day kindergarten share is constructed from the CPS October Supplement and captures the share of kindergartners in public school that attend full-day. 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 included, absorbing the direct effect of the full-day kindergarten share and controlling for state-specific trends in parental employment. State fixed effects are also interacted with the indicator for having a child ages 5 or 6. 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. Observations are weighted using the March ASEC sampling weights. Standard errors are clustered at the state level to account for potential correlation between the error terms within the state. p< 0.01 ***, p< 0.05 **, p<0.1 *.

Table A3: 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 Maternal Grandmother in Home

	Outcome: Last Week		Outcome: Last Year				
	Employed (1)	Hours (2)	Employed (3)	Full-Time (4)	Weeks Worked (5)	Wage Income> 0 (6)	Wage Income (2020) (7)
	Sample: Mothers with Maternal Grandmother in Household						
Share Full-day Kindergarten$_{t-1}$	0.083	2.872	-0.039	-0.083	2.649	0.006	3918.5
*Have Child 5-6	(0.080)	(3.140)	(0.081)	(0.090)	(3.756)	(0.088)	(4202.455)
Dependent Mean	0.62	22.29	0.69	0.53	31.08	0.67	19848.73
Observations	16,360	15,975	16,360	16,360	16,360	16,360	16,360
	Sample: Mothers with No Maternal Grandmother in Household						
Share Full-day Kindergarten$_{t-1}$	0.049***	1.534***	0.041***	0.025*	2.383***	0.054***	-115.0
*Have Child 5-6	(0.014)	(0.563)	(0.013)	(0.013)	(0.715)	(0.014)	(1423.025)
Dependent Mean	0.64	22.13	0.70	0.49	31.68	0.66	24922.03
Observations	307,992	300,043	307,992	307,992	307,992	307,992	307,992

NOTE: Sample restricted to mothers in the CPS ASEC between 1992 and 2022 with a child between the ages of 5 and 9. Outcomes in column (1) and (2) refer to outcomes in the preceding week (the ASEC is conducted in March). The remaining 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 is constructed from the CPS October Supplement and captures the share of kindergartners in public school that attend full-day. 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 included, absorbing the direct effect of the full-day kindergarten share and controlling for state-specific trends in parental employment. State fixed effects are also interacted with the indicator for having a child ages 5 or 6. 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. Observations are weighted using the March ASEC sampling weights. Standard errors are clustered at the state level to account for potential correlation between the error terms within the state. p< 0.01 ***, p< 0.05 **, p<0.1 *.

Table A4: 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$_{t-1}$	-0.002	0.003	-0.001	0.004	0.006
*Have Child 5-6	(0.008)	(0.007)	(0.006)	(0.005)	(0.006)
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$_{t-1}$	-0.002	0.002	0.005	-0.003	-0.011
*Have Child 5-6	(0.007)	(0.006)	(0.005)	(0.005)	(0.008)
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 with a child between the ages of 5 and 9. The full-day kindergarten share constructed from the CPS October Supplement and captures the share of kindergartners in public school that attend full-day. 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 included, absorbing the direct effect of the full-day kindergarten share and controlling for state-specific trends in parental employment. State fixed effects are also interacted with the indicator for having a child ages 5 or 6. 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. Observations are weighted using the monthly CPS sampling weights. Standard errors are clustered at the state level to account for potential correlation between the error terms within the state. p< 0.01 ***, p< 0.05 **, p<0.1 *.

Table A5: Sensitivity to Movers: Impact of Full-Day Kindergarten Share on Moving and Labor Supply of Parents with 5- to 6-year-olds Relative to Parents with 7- to 9-year-olds

		Exclude Cross-State Movers						
	Moved States in Past Year (1)	Employed (2)	Hours (3)	Employed (4)	Full-Time (5)	Weeks Worked (6)	Wage Income> 0 (7)	Wage Income (2020) (8)
				Sample: Mothers				
Share Full-day Kindergarten$_{t-1}$	-0.006	0.054***	1.783***	0.043***	0.030**	2.579***	0.059***	302.6
*Have Child 5-6	(0.005)	(0.015)	(0.599)	(0.014)	(0.014)	(0.739)	(0.014)	(1368.860)
Dependent Mean	0.02	0.64	22.26	0.70	0.50	31.81	0.67	24788.81
Observations	326,267	318,907	310,756	318,907	318,907	318,907	318,907	318,907
				Sample: Fathers				
Share Full-day Kindergarten$_{t-1}$	-0.001	0.006	-0.247	-0.004	-0.000	0.016	-0.004	-1144.7
*Have Child 5-6	(0.004)	(0.011)	(0.653)	(0.006)	(0.008)	(0.448)	(0.008)	(1565.167)
Dependent Mean	0.02	0.89	38.84	0.94	0.90	46.67	0.88	63258.12
Observations	266,083	260,332	254,795	260,332	260,332	260,332	260,332	260,332

NOTE: In column (1) the sample is restricted to mothers and fathers in the CPS ASEC between 1992 and 2022 with a child between the age of 5 and 9, the same sample used throughout. In columns (2)-(9) individuals that moved from out of state in the past year are excluded. The full-day kindergarten share constructed from the CPS October Supplement and captures the share of kindergartners in public school that attend full-day. 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 included, absorbing the direct effect of the full-day kindergarten share and controlling for state-specific trends in parental employment. State fixed effects are also interacted with the indicator for having a child ages 5 or 6. 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. Observations are weighted using the March ASEC sampling weights. Standard errors are clustered at the state level to account for potential correlation between the error terms within the state. p< 0.01 ***, p< 0.05 **, p<0.1 *.

Table A6: IV Estimates 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

	Outcome: Last Week		Outcome: Last Year				
	Employed (1)	Hours (2)	Employed (3)	Full-Time (4)	Weeks Worked (5)	Wage Income> 0 (6)	Wage Income (2020) (7)
				Sample: Mothers			
Full-day Friendly Policy	0.022**	0.814**	0.016**	0.013	1.187**	0.023***	1033.4*
*Have Child 5-6	(0.009)	(0.326)	(0.006)	(0.009)	(0.478)	(0.008)	(586.434)
Dependent Mean	0.64	22.09	0.70	0.49	31.58	0.66	24345.85
Observations	335,609	327,050	335,609	335,609	335,609	335,609	335,609
				Sample: Fathers			
Full-day Friendly Policy	0.003	-0.102	0.003	-0.000	0.172	0.003	776.4
*Have Child 5-6	(0.006)	(0.356)	(0.005)	(0.006)	(0.319)	(0.005)	(952.445)
Dependent Mean	0.88	38.75	0.94	0.90	46.64	0.88	62696.41
Observations	273,501	267,634	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 with a child between the ages of 5 and 9. Estimates replicate the reduced form version of Table 3. 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. State fixed effects are also interacted with the indicator for having a child ages 5 or 6. 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. Observations are weighted using the March ASEC sampling weights. Standard errors are clustered at the state level to account for potential correlation between the error terms within the state. p< 0.01 ***, p< 0.05 **, p<0.1 *.

Table A7: Individual Enrollment IV Estimates: Impact of Full-Day Attendance on Labor Supply of Mothers

	First Stage	Reduced Form		IV Estimates	
	All Children in Full-day	Employed	Hours Last Week	Employed	Hours Last Week
	(1)	(2)	(3)	(4)	(5)
		Sample: Mothers			
Friendly Policy*Have Child 5-6	0.104***	0.021***	1.047***		
	(0.027)	(0.007)	(0.220)		
All Children in Full-day				0.204***	10.113***
				(0.055)	(3.745)
F-Statistic	15.3				
Dependent Mean	0.87	0.65	22.26	0.65	22.26
Observations	188,379	188,379	188,379	188,379	188,379

NOTE: Sample restricted to mothers in the October CPS between 1994 and 2022 with a child between the ages of 5 and 9. The endogenous treatment measure "All Children In Full-day" is an indicator that equals one if all of the mother's children between the ages of 5 and 9 are enrolled in full-day school. The mother might have children under age 5 that are not enrolled in full-day school. The excluded instrument is an indicator for whether there is a full-day friendly policy passed in the state interacted with an indicator for whether the mother has a kindergarten-aged child, 5- or 6-years-old. Column (1) is the first stage, columns (2)-(3) are the reduced form, and columns (4)-(5) are the individual-level two stage estimates. 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. State fixed effects are also interacted with the indicator for having a child ages 5 or 6. 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. Observations are weighted using the CPS monthly sampling weights. Standard errors are clustered at the state level to account for potential correlation between the error terms within the state. $p< 0.01$ ***, $p< 0.05$ **, $p<0.1$ *.

Appendix B: 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 children between the ages of 3 and 7 who are reported to be in public kindergarten. This sample captures 99.9 percent of all public kindergartners.

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 in public schools and full-day kindergarten students in public schools in each state, calculated as a full-day proportion, and averaged as three-year moving averages. While the use of three-year rolling averages smooths out some of the sampling noise in the yearly estimates, variation remains. 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 years of overlap (National Center for Education Statistics, 2023). The Common Core of Data begins in 1992.

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 kindergartner. 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 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 five and nine in the household. Treated families are those with a kindergarten-aged child (ages five and six), and comparison families have children ages 7- to 9-years-old 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

Childcare expenditure data at the household level were drawn from the Consumer Expenditure Survey from 1992–2022 (U. S. Department of Labor, 2023), except for two quarters in 1993 which were omitted due to missing state geography information. 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.

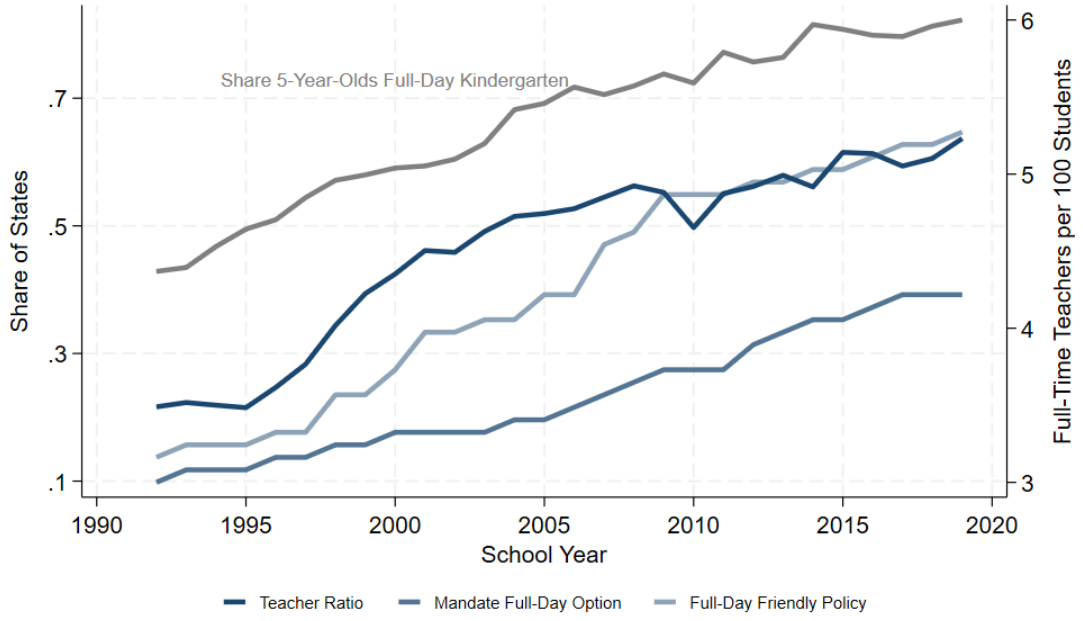
In this project, we used data from the Interview Survey, which collect information about large and/or recurring expenses to the household over the prior 3 months. The focus of the data collection on large and recurring expenses may cause us to underestimate childcare costs in households with smaller or irregular childcare costs. The survey provides information on the month and year that 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 child care 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 identified the presence of any children under 10-years-old. We classified any household with children ages five and six as kindergarten-aged. We group households with children under 5-years-old and no kindergarten-aged children, and designate them as the younger comparison group. We group households with children ages 7- to 9-years-old and no kindergarten-aged children, and designate them as the older comparison group.

Appendix C: 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 time frame of interest. Figure C1 illustrates the correspondence between the growth in the share of 5-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 C1: 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.

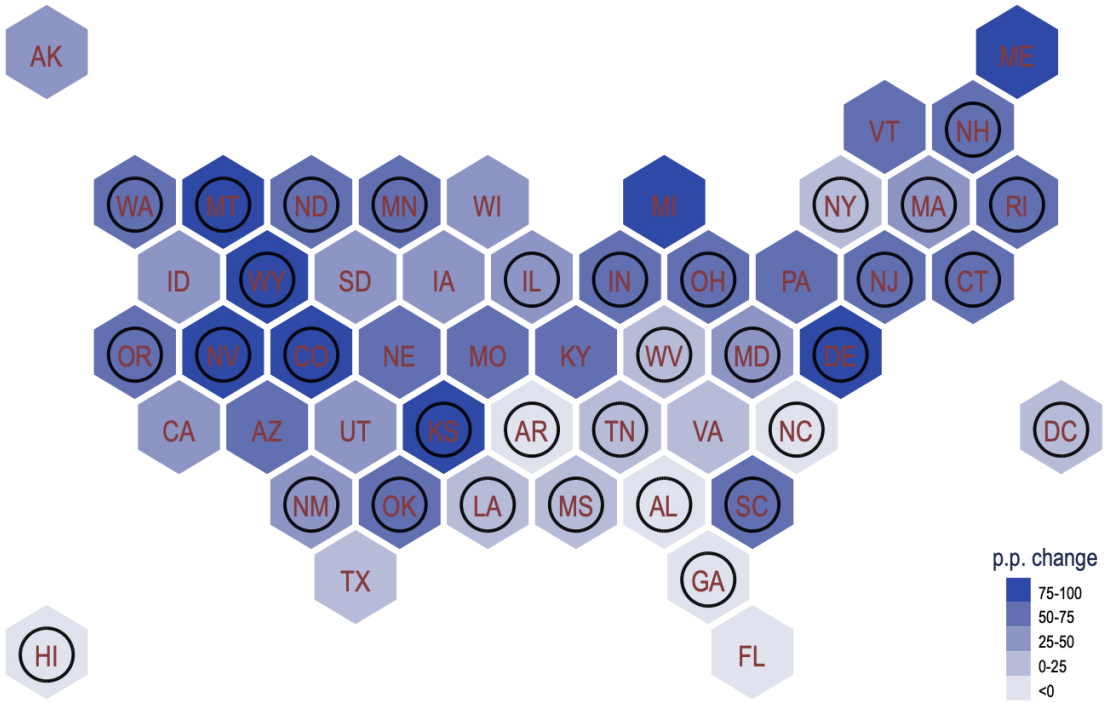
Nature of Policy Variation

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 C2 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 C2: State-Level Policy Changes and Full-Day Kindergarten Share Over Time



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 [33] and the National Conference of State Legislatures' database.[34].

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 C1 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.

[33]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).

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

Table C1: Full-Day Kindergarten Policy and Enrollment Changes by State

State	Full-Day K Mandate (1)	Other Full-Day K-Friendly Policy (2)	2019 Full-Day K Share (3)	Change from 1991 to 2019 (4)
Alabama	1990	–	0.845	-0.155
Alaska	–	–	0.802	0.304
Arizona	–	–	0.840	0.756
Arkansas	1984	–	0.875	-0.058
California	–	–	0.613	0.387
Colorado	–	2001, 2005, 2007, 2008	0.845	0.744
Connecticut	–	2014	0.840	0.586
Delaware	2008	2003	0.872	0.715
DC	2000	–	0.878	0.004
Florida	–	–	0.867	-0.038
Georgia	1987	2009	0.874	-0.040
Hawaii	2012	–	0.820	-0.165
Idaho	–	2022	0.451	0.404
Illinois	2027	1970, 2024	0.739	0.416
Indiana	2012	2007	0.957	0.880
Iowa	–	–	0.769	0.347
Kansas	–	2017, 2022	0.866	0.733
Kentucky	2022	2021	0.868	0.635
Louisiana	1990	2004	0.916	-0.072
Maine	–	–	0.892	0.843
Maryland	2007	1998	0.827	0.583
Massachusetts	–	2007	0.802	0.504
Michigan	–	–	0.912	0.792
Minnesota	2014	1998	0.912	0.776
Mississippi	2006	1985	0.886	-0.110
Missouri	–	–	0.834	0.320
Montana	–	2007	0.897	0.797
Nebraska	–	–	0.785	0.662
Nevada	–	2005	0.842	0.657
New Hampshire	–	2019	0.879	0.573
New Jersey	–	2000, 2010	0.844	0.494
New Mexico	2004	2001	0.594	0.385
New York	–	2005, 2007, 2018	0.864	0.248
North Carolina	1985	–	0.905	-0.091
North Dakota	–	2008	0.925	0.672
Ohio	–	2009	0.766	0.513
Oklahoma	2013	2001, 2005	0.915	0.724
Oregon	–	2009, 2015	0.825	0.696
Pennsylvania	–	–	0.755	0.504
Rhode Island	2016	–	0.727	0.594
South Carolina	1998	–	0.804	0.495
South Dakota	–	–	0.869	0.608
Tennessee	1993	–	0.951	0.180
Texas	–	–	0.828	0.203
Utah	–	2022	0.304	0.265
Vermont	–	–	0.818	0.763
Virginia	2022	–	0.894	0.302
Washington	2017	2007, 2011	0.808	0.660
West Virginia	1996	–	0.745	0.252
Wisconsin	–	–	0.840	0.482
Wyoming	2009	–	0.881	0.763

NOTE: Columns (1) and (2) provide the dates of state-level policy changes, including full-day K mandates and other full-day K-friendly policies. Our policy instruments are constructed based on the earliest date of any policy change in our time period from either column. Column (3) provides the 2019 share of public school kindergartners in full-day K, measured as a 3-year rolling average, and column (4) provides the percentage point change in that value from 1991 to 2019.

SOURCE: Authors' compilation of state-level policy changes and CPS October School Enrollment Supplement 1990–2020.

Appendix D: Child Outcomes Appendix

While full-day kindergarten expansions in the U.S. have resulted in more in-school instructional time for young children and potentially freed up family resources previously spent on child care, these policy shifts have also led to increased maternal employment and less maternal time with children. These changes could lead to effects on children in opposing directions, but we are limited in our ability to explore the net impact on children's development and learning. In this appendix, we present analysis from approaches similar to those used to estimate impact on parental employment and childcare expenses to explore the impact of greater full-day kindergarten provision on children's subsequent academic outcomes.

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 in third through eighth grade in both math and reading/language arts. This test information is then sent to the U.S. 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 and later, but due to the pandemic and methodological differences, we focus on the 2009–2019 data. For our purposes, we rely on student test scores from the third and fifth grade cells. The data correspond to test scores from end-of-year testing, and as such, we merge test scores to state-level full-day kindergarten shares from the October CPS that correspond to the third graders' kindergarten year. 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. We conduct analogous analyses when examining student achievement, described in more detail in the next section, with results presented in Tables D1 and D2

Student Achievement Analysis

We examine effects on child outcomes along one measurable dimension: children's test scores.[35] 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 (captured in the spring of third grade) to kindergarten enrollment from the corresponding 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 looking at parental employment outcomes in the ASEC. We estimate the effect of the state-level full-day kindergarten share on standardized test scores, as follows:

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

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. State-by-grade fixed effects are included to allow for the average difference between grades to be state-specific. Standard errors are clustered 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 Tables D1 and D2 for the overall average, as well as for student subgroups by race/ethnicity, sex, and poverty status.

[35] 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.

These estimates imply that moving from half-day kindergarten to full-day kindergarten produces no change in later math test scores, but a 0.035 standard deviation increase in third grade reading test scores relative to students two grade levels older. Boosts in students' reading/language arts achievement are concentrated among Hispanic students, boys, and disadvantaged students. We also estimate the analogous policy instrument specification, in which we predict the share with adoption of a full-day friendly policy, in the bottom panel of each table. With this approach, we document a similar pattern of effects but the effect sizes are larger with much larger standard errors. None of the IV results are significant at conventional levels. In sum, findings from both specifications suggest that some groups experience test score gains (particularly in reading/language arts), but perhaps more importantly, 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.

We also estimate the stacked panel event study analogous to the maternal labor attachment analysis for test scores in Figure D1. Here, the outcome is the difference in standardized test scores between the third and fifth grade cohorts (to capture the third difference). We see imprecise and mostly flat pre-trends, consistent with the parallel trends assumption, followed by slightly elevated but still imprecisely estimated coefficients in the period following the adoption of a state-level full-day kindergarten policy. These patterns align with the previous results finding no evidence of net losses and, potentially, imprecisely estimated gains.

Table D1: Impact of Full-Day Kindergarten Share on Student Math Test Scores

	Math						
	All	Asian	Black	Hispanic	Female	Male	Disadvantaged
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	OLS: Third Grade vs. Fifth Grade						
Share Younger Grade Full-day Kindergarten	-0.002	0.002	0.084*	0.027	0.004	0.008	0.015
*In Younger Grade	(0.027)	(0.066)	(0.047)	(0.041)	(0.031)	(0.029)	(0.035)
Dependent Mean	0.00	0.52	-0.52	-0.30	-0.00	0.01	-0.33
Observations	998	978	976	978	986	988	994
	IV: Third Grade vs. Fifth Grade						
Share Younger Grade Full-day Kindergarten	0.070	0.213	0.107	-0.047	-0.035	0.173	0.014
*In Younger Grade	(0.092)	(0.194)	(0.169)	(0.183)	(0.107)	(0.108)	(0.087)
Dependent Mean	0.00	0.52	-0.52	-0.30	-0.00	0.01	-0.33
Observations	998	978	976	978	986	988	994

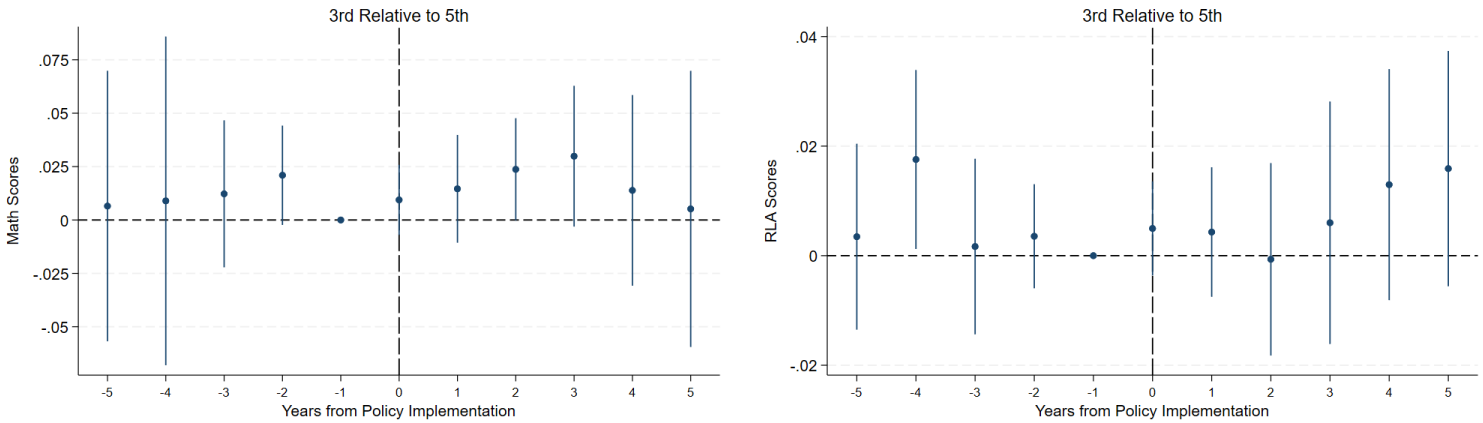
NOTE: Sample restricted to third and fifth grade-level observations. The full-day kindergarten enrollment share (3-year rolling average) from four years prior is used because enrollment is observed in October while test scores are measured in the spring of the corresponding school year. The first stage effect of *full-day friendly policy∗In Younger Grade* is 0.132 with a t-statistic of 3.01. State-by-year fixed effects are included. State fixed effects are also interacted with the indicator for having a child ages 5 or 6. Standard errors are clustered at the state level to account for potential correlation between the error terms within the state. p< 0.01 ***, p< 0.05 **, p<0.1 *.

Table D2: Impact of Full-Day Kindergarten Share on Student Reading and Language Arts Test Scores

	ReadingLanguage Arts						
	All	Asian	Black	Hispanic	Female	Male	Disadvantaged
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	OLS: Third Grade vs. Fifth Grade						
Share Younger Grade Full-day Kindergarten	0.035**	-0.049	0.092	0.101**	-0.026	0.103***	0.057**
*In Younger Grade	(0.016)	(0.061)	(0.055)	(0.046)	(0.023)	(0.022)	(0.026)
Dependent Mean	0.02	0.36	-0.43	-0.30	0.14	-0.09	-0.32
Observations	994	924	948	966	984	984	990
	IV: Third Grade vs. Fifth Grade						
Share Younger Grade Full-day Kindergarten	0.051	0.088	0.116	0.414	-0.051	0.158	0.008
*In Younger Grade	(0.046)	(0.199)	(0.335)	(0.290)	(0.086)	(0.103)	(0.045)
Dependent Mean	0.02	0.36	-0.43	-0.30	0.14	-0.09	-0.32
Observations	994	924	948	966	984	984	990

NOTE: Sample restricted to third and fifth grade-level observations. The full-day kindergarten enrollment share (3-year rolling average) from four years prior is used because enrollment is observed in October while test scores are measured in the spring of the corresponding school year. The first stage effect of *full-day friendly policy∗In Younger Grade* is 0.133 with a t-statistic of 3.07. State-by-year fixed effects are included. State fixed effects are also interacted with the indicator for having a child ages 5 or 6. Standard errors are clustered at the state level to account for potential correlation between the error terms within the state. p< 0.01 ***, p< 0.05 **, p<0.1 *.

Figure D1: Event Study Impact of Full-Day Kindergarten Share on Math and Reading Test Scores



NOTE: First, state-level test scores by grade are lagged three years, so that the test scores for the third-grade cohort correspond to policy changes affecting the kindergarten year. For each state that enacts a full-day friendly policy between 2006 and 2016 (to match the years third-grade data are available, 2009-2019), a separate event study panel is created that includes the enacting state and all other states that never enacted a full-day friendly policy. 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 difference in standardized test scores (either math or reading, language arts) between the third-grade cohort and fifth-grade cohort is then regressed on the sample between 5 years prior and 5 years post policy implementation, including 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. The outcome represents the difference in test scores for the focal treated cohorts (third grade) relative to an older cohort (fifth grade). Standard errors are clustered at the state level with 95 percent confidence intervals plotted.

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