

Child Care Choices, Cognitive Development, and Kindergarten Enrollment

“Academic redshirting” or delaying children’s entrance to kindergarten is increasingly popular, with approximately 21% five-year olds not yet enrolled in kindergarten in 2002 compared to around 10% in 1980 (Deming and Dynarski, 2008; Elder and Lubotsky, 2009). More recent data show that 9% of kindergartners started their first year of school after they turned 6 years old in the fall of 2010, and 43% started when they were between 5½ and 6 years old. Overall, approximately 6% children were delayed-entry kindergartners, while another 6% repeated kindergarten (National Center for Education Statistics, 2013). It is likely that school entry laws have motivated a shift towards later enrollment in the United States. Between 1975 and 2000, twenty-two states had increased the minimum school entry age (Stipek, 2002). On the other hand, multiple studies suggest that parents also play an increasingly active role in either delaying their children’s entrance to kindergarten or having their children repeat kindergarten in order to improve early school experience, especially if children are perceived to exhibit lesser cognitive and physical skills compared to their peers (for example, Graue and DiPerna, 2000).

Heckman (2008) contends that the critical gap in relevant skills for later life success in school and labor market outcomes between advantaged and disadvantaged children emerges before they enter school. He concludes that the quality of parenting, and not necessarily family income or parental education, determines the extent of advantage among children, and that childhood programs targeting the early years have the highest return to investment. Elder and Lubotsky (2009) also find that differential cognitive skills are primarily driven by accumulation of skills prior to kindergarten and that the differences decline rapidly as children age. However, examining cognitive development in the formative years is difficult, especially with the

additional challenge of identifying the causal effect of different child care settings. Increasing demand for child care as a result of increasing maternal employment has spurred numerous studies exploring the role of child care on cognitive and non-cognitive skills, with mixed findings and often limited to selected socio-economic groups (for example, Baker et al., 2008; Berlinski et al., 2009; Bernal and Keane, 2011; Havnes and Mogstad, 2011). And if indeed there is a strong connection between increased public investment in pre-kindergarten programs and high social rate of return then it is worth exploring the links between child care, cognitive achievement, and school enrollment. But, very little evidence exists between non-parental childcare utilization patterns and kindergarten readiness among children younger than 5 years of age. We answer three questions in the current study – (i) how do wages and childcare prices determine choice of child care; (ii) do different forms of child care settings affect cognitive development differently; and, (iii) is there evidence that pre-kindergarten cognitive ability influences kindergarten enrollment?

I. Data

The data are drawn from the pre-kindergarten and kindergarten waves of the Early Childhood Longitudinal Study – Birth Cohort (ECLS-B), a nationally representative sample of children born in the U.S. in 2001. Most children, about three-fourths, entered kindergarten in 2006-2007 and the rest who were born later in 2001 entered kindergarten in the 2007-2008 school year. We use two measures of early cognitive development in this study – reading and mathematics scores. They were assessed using a battery of items from various domains of knowledge and skills. A

‘theta’ ability measure was constructed by the ECLS-B administrators to make longitudinal comparisons possible.

We limit analysis to households with at least one biological parent, and to households utilizing paid care in the form of either center care or Head Start, unpaid non-parental care in the form of unpaid relative care, and to households not using any form of non-parental care in the pre-kindergarten wave. Household-level variables include child care expenditure, children’s time in care setting(s), logarithm of household permanent income (i.e. logarithm of income averaged across waves), number of adults in the household, number of children in the household, housing situation, and urban area residency. Child-level variables include age, gender, race and ethnicity, and health endowment (birth weight and breastfed or not). Parent-level variables include work status, work hours, salary, education level, and age. Child care expenditures are observed only when parents use paid child care services (regardless of labor supply), and salaries are observed when mothers participate in labor market. We use various state-level welfare rules, economic characteristics, and child care regulations to predict market wages and market price of child care. Finally, we compare state-level kindergarten cut-off dates and children’s age at the time of the survey to assess kindergarten age-eligibility. Kindergarten entrance age varies from state to state. The entrance cut-off dates are obtained from the Education Commission of the States, 2005.

II. Summary of trends

In analyzing the role of different child care settings on early cognitive achievement, we compare center care, Head Start, unpaid relative care, and parental care. The amount of time spent in various care arrangements is equivalent to the total number of hours spent in different non-parental care settings in an average week. In the pre-kindergarten wave approximately 3% of the households combined use of center care and unpaid relative care, while 4% of the households used both Head Start and unpaid relative care in the same week. Center care was the most commonly used type of care. 55% of the households sent their children to center care for 23 hours/week on an average. As expected, Head Start was more common among lower income households. The median permanent household income was about \$39,200 per year, and around 80% of the households from among those who did use Head Start earned less than the median income. Lower income households (based on the median cut-off) spent approximately \$1.10/hour on center care while higher income households spent approximately \$3.41/hour. However, lower income households used center care for almost 26 hours/week compared to 22 hours/week by higher income households, possibly because single-mother households were also more likely to be lower income households. Of all single-mother households, approximately 84% earned less than the median income. In the pre-kindergarten wave and among working-mother households using center care, both lower income and higher income households spent approximately 10% of mother's weekly earned income on center care per week. As fractions of weekly total household income, however, lower income households spent 9% on center care per week while higher income households spent around 5%.

Approximately 19% households lived in states without set cut-off dates for kindergarten enrollment, and 7.4% children from these states delayed school entry. 5.9% households in states with set cut-off dates delayed enrolling their children in kindergarten. Of the households who

delayed kindergarten enrollment, 48% used center care and 13% used Head Start. In the pre-kindergarten wave, average unadjusted cognitive score of children who eventually delayed enrollment was 19% less than those who did not delay. The reading theta score ranged from -2.5 to 2.6 (mean = -0.5 , standard deviation = 0.8) and the math theta score ranged from -2.8 to 2.4 (mean = -0.5 , standard deviation = 0.8) in the pre-kindergarten wave. In the kindergarten wave, the reading theta score ranged from -2.1 to 3.1 (mean = 0.4 , standard deviation = 0.9) and the math theta score ranged from -2.4 to 3.1 (mean = 0.4 , standard deviation = 0.8) among children who did not delay enrollment.

III. Empirical Framework

Parents are assumed to maximize utility, subject to a time constraint, a budget constraint, and a production function for childhood cognitive development. In order to keep the estimation procedure tractable, we replace parents' maximization problem with the mother's maximization problem. That is, we treat mother's market work time and leisure time as endogenous, and father's market work time and leisure time as exogenous. In the empirical translation, a simultaneous estimation framework is used. Cognitive development outcomes – early reading and mathematics scores – are hypothesized to be functions of time spent in parental and non-parental care, various child and household characteristics, and child's health endowment variables. However, choice of care settings is possibly subject to price of care and market wages. Thus, the amount of time spent in j^{th} type of care setting is, itself, a function of

predicted hourly price of child care, predicted hourly market wage rate, and other child-level, parent-level, and household-level covariates.

In analyzing the impact of pre-kindergarten cognitive ability on the likelihood of delaying kindergarten enrollment, independent variables include pre-kindergarten reading and math theta ability scores, differences in predicted child care prices and wage rates between pre-kindergarten and kindergarten waves, if child resides in a state with no specific cut-off date, and a vector of child-level and household-level variables.

IV. Results

Higher wage rates increased maternal labor market hours, greater use of center care, and lesser use of Head Start and unpaid relative care (estimates not shown here). Additionally, two-parent households had greater demand for center care, while single-mother households utilized Head Start and unpaid relative care more. There is no statistically significant difference in the supply of labor market hours between the two types of working mothers.

In Table 1, we present the estimated effects of amount of time spent in different non-parental care settings (compared to time in parental care) on cognitive outcomes. Longer center care use is associated with higher pre-kindergarten reading and math scores. A one standard deviation increase in hours spent in center care per week is associated with 0.1 standard deviation increase in predicted reading as well as math scores. On the other hand, mother's time in labor market is negatively associated with reading scores. A one standard deviation increase in mother's

working hours per week is associated with 0.04 standard deviation decrease in predicted reading scores.

Table 1: Reading and math scores: Results from simultaneous equations estimation

Variables	Reading score		Math score	
	<i>t</i> -stat	95% CI	<i>t</i> -stat	95% CI
Amount of time (per 10 hrs/wk) in:				
Center care	4.07	(0.022, 0.064)	4.70	(0.030, 0.073)
Head Start	0.36	(- 0.020, 0.028)	1.45	(- 0.006, 0.043)
Unpaid relative care	- 1.11	(- 0.058, 0.016)	0.55	(- 0.027, 0.049)
Mother's work hrs (per 10 hrs/wk)	- 3.15	(- 0.029, - 0.007)	- 1.39	(- 0.020, 0.003)
Logarithm of permanent income	9.97	(0.124, 0.185)	9.46	(0.120, 0.183)
Two-parent household	0.82	(- 0.030, 0.073)	1.08	(- 0.024, 0.083)

Note: Additional covariates described in the text are included in the estimation but not shown here.

In determining the role of pre-kindergarten cognitive scores on delayed enrollment in kindergarten, we find that higher math scores were associated with lower likelihood of delayed enrollment. Marginal effects are presented in Table 2.

Table 2: Delay kindergarten enrollment: Results from probit estimation

Variables	Marginal effect	<i>t</i> -stat	95% CI
Pre-K reading score	0.010	1.34	(- 0.004, 0.024)
Pre-K math score	- 0.023	- 3.56	(- 0.037, - 0.011)

Change in predicted care price (\$/hour)	- 0.001	- 0.01	(- 0.005, 0.005)
Change in predicted wage (per \$100/wk)	0.003	0.93	(- 0.003, 0.008)
If lives in a state without cut-off date	- 0.017	- 2.00	(- 0.032, - 0.002)
Logarithm of permanent income	0.018	2.58	(0.004, 0.031)
Two-parent household	0.009	0.71	(- 0.015, 0.034)

Note: Additional covariates described in the text are included in the estimation but not shown here.

The probability of delayed enrollment is lowered by 0.02 for a one-point increase in math theta score. On the other hand, higher income households were more likely to delay enrolling their children in kindergarten. Interestingly, those residing in states without specific cut-off dates were less likely to delay enrollment, with lower probability of delayed enrollment by 0.02.

V. Conclusion

In summary, we study the role of child care settings in the development of cognitive ability among very young children. We present new evidence regarding differential impacts of paid and unpaid non-parental child care settings on pre-kindergarten reading and mathematics scores. Our results show that market wages impact mothers' employment decisions as well as demand for child care, while demand for center care is largely inelastic to price. We also find that center care utilization is positively associated with higher reading and math scores at pre-kindergarten age, and that children with higher math scores are less likely to delay enrollment in kindergarten. Delaying kindergarten entry is likely to be financially burdensome to households due to an

additional year of child care or lower household income or both. The most advantaged, in terms of cognitive measures, are those children who have access to pre-kindergarten center care. On the other hand, the most disadvantaged are the children from lower income households who do not have access to center care.

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