

**“Academic Redshirting” in Kindergarten: Prevalence, Patterns & Implications**

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## **“Academic Redshirting” in Kindergarten: Prevalence, Patterns & Implications**

### **Abstract**

We use two nationally-representative datasets to estimate the prevalence of kindergarten “redshirting”—the decision to delay a child’s school entry. We find that between 4 and 5.5 percent of children delay kindergarten, a lower number than typically reported in popular and academic accounts. Male, white and high-SES children are most likely to delay kindergarten and schools serving larger proportions of white and high-income children having far higher rates of delayed entry. We find no evidence that children with lower cognitive or social abilities at age four are more likely to redshirt, suggesting parents’ decisions to delay entry may be driven by concerns about children’s relative position within a kindergarten cohort. Implications for policy are discussed.

**Keywords:** school readiness, kindergarten, academic redshirting

## **“Academic Redshirting” in Kindergarten: Prevalence, Patterns & Implications**

According to scholarly and popular reports, “redshirting” in kindergarten—the practice of delaying a child’s entry into kindergarten for a year—is increasingly common (Bazelon 2008; Paul 2010; Weil 2007; Graue and DiPerna 2000). In the past, nearly all children entered kindergarten at age five, but a recent New York Times article noted that in 2008, 17 percent of kindergarten entrants were at least six years old (Paul, 2010). The shift towards later school entry is partially explained by changes in school entry laws, but may also be due to an increase in the prevalence of redshirting (Deming & Dynarski, 2008). Some accounts suggest parents increasingly delay kindergarten entry because they believe their child is not developmentally ready for the increasing demands of school (Cosden, Zimmer, & Tuss, 1993; Graue, Kroeger, & Brown, 2002; Noel & Newman, 2003). Others argue that redshirting reflects parents’ strategic desire to ensure their child enters kindergarten older, taller, and with higher levels of social and cognitive skills than their schoolmates (Frey, 2005; Graue et al., 2002; Matlack, 2011)

Our paper attempts to fill a gap in the growing redshirting literature by carefully describing the prevalence and correlates of delayed school entry. Existing research and media reports differ widely in their estimates of the prevalence of redshirting. We are able to provide more credible estimates (and from more recent cohorts) than prior research. Understanding these patterns has important implications if decisions by some parents to delay their children’s school entry affect other children. For instance, high rates of redshirting may influence a kindergarten cohorts’ age composition which in turn might shape learning via altered curricula, instruction, or peer relations. The potential for such externalities makes an examination of individual redshirting behavior a matter of public policy interest.

We find that between 4 and 5.5 percent of children delay kindergarten, a lower number than typically reported. Male, white and high SES children are most likely to delay kindergarten. Further, at the local level we find high variation in redshirting practices, with schools serving more high-income and white children displaying higher rates of redshirting.

## **Background**

### **How Prevalent is Redshirting?**

In the early half of the 20<sup>th</sup> century, as kindergarten became institutionalized as part of the public school system, the percentage of five year olds enrolled rose from near 0 to 60 percent (Cuban, 1992). More recently, however, the trend has reversed. The percentage of six year olds enrolled in first grade or above has gradually dropped from 96 percent in 1968 to 83 percent in 2010 (Deming & Dynarski, 2008; Paul, 2010). Between 1975 and 2000, 22 states increased the minimum entry age for kindergarten (Stipek, 2002). However, policy shifts in entry laws only partially explain why children are entering kindergarten at a later age. Changes in the prevalence of kindergarten “redshirting”—delaying a child’s kindergarten entry for a year for developmental or social reasons—may also play a part.

In recent years, several studies have provided estimates of redshirting based on nationally-representative data. Using the Child Health Supplement to the 1988 National Health Interview Survey, Byrd, Weitzman, & Auinger, (1997) find that in a national sample of children ages 7 to 17 born in the late 1970s, approximately 12 percent are “old-for-grade” and have never repeated grades (their proxy for redshirting). Using parent-reported data from the National Household Education Survey (NHES) of 1993 and 1995, Zill, Loomis, & West, (1997) report that approximately 9 percent of first and second graders born in the late 1980s delayed kindergarten entry. Lincove & Painter (2006), who use retrospective data from the National

Education Longitudinal Study of 1988 (a cohort of students born in the mid-1970s), also report redshirting rates around 9 percent but base these estimates only on children with summer birthdays (for whom redshirting is likely most common). Finally, estimates from the kindergarten cohort of the Early Childhood Longitudinal Study (ECLS-K), which tracks a nationally-representative sample of children who entered kindergarten in 1998 (born in the early 1990s) are lower; 5 percent if calculations are based on children's age at kindergarten entry and 7 percent if parents' reports of are used (Datar, 2006a).

These studies, which place the national red-shirting rate between 5 and 12 percent, rely on data from cohorts born in the mid-1970s through the early 1990s, with the lowest estimated rates for the more recent birth cohorts. Kindergarten entry behaviors may have shifted in recent years due to changes in kindergarten cutoff dates and kindergarten entry exams, increased understanding about child development, large-scale expansions in preschool opportunities and increased school-level accountability (Barnett, Epstein, Friedman, Sansanelli, & Hustedt, 2009; Jacob, 2005; Shonkoff & Phillips, 2000; Stipek, 2002). In addition, these studies rely on retrospective parental reports or fairly crude proxies to identify redshirting and most do not account for differences across states in school entry laws (Datar, 2006a is an exception). To date, none of the nationally-representative studies have used prospective data that includes detailed information about children's abilities and circumstances in the years prior to their school entry decision. The current study leverages prospective, nationally representative data to provide more recent and reliable estimates of redshirting.

### **Who Redshirts?**

The popular press emphasizes that white children, boys, and children from families with

more resources are over-represented among redshirters, a claim confirmed by earlier research (Datar, 2006b; Dobkin & Ferreira, 2010; Zill et al., 1997). Data from the National Household Education Survey of 2007, a survey of parents with children ages 3-5 not yet enrolled in school, indicates that 3 percent of parents with a high school diploma or less planned to delay kindergarten entry compared to 12 percent of parents with a Bachelor's degree, and that white parents were more than twice as likely to plan to redshirt relative to Black and Hispanic parents (O'Donnell & Mulligan, 2008).

No study we are aware of has examined whether kindergarten entry decisions relate to measures of children's cognitive, social and physical development *before* school entry. If the children who redshirt are those with the lowest academic or social skills at the time when they are eligible to enroll, their delayed entry will tend to compress the skill distribution of a kindergarten cohort. Conversely, if those who enter late are disproportionately from more advantaged backgrounds and have higher social and cognitive skills, their decisions may widen the skill distribution of a kindergarten cohort. In the current study we examine whether redshirting children appear "less ready" on a variety of parent, caregiver and direct measures of development relative to similar-aged children who start kindergarten when eligible. We also explore whether racial, gender, and socioeconomic differences in redshirting behavior can be partly explained by differences in children's development and school readiness.

Finally, we provide a simple descriptive analysis of the extent to which redshirting practices differ across schools nationwide. When parents make kindergarten entry decisions they may be influenced by their neighbors and friends, preschool teachers, kindergarten teachers and others. Norms around redshirting likely differ meaningfully across communities. Indeed, in their investigation of delayed kindergarten entry across Wisconsin school districts, Graue and

DiPerna (2000) found rates varying from 3 to 94 percent. We therefore supplement our national description of redshirting with a school-level analysis, exploring how much redshirting varies and whether schools' demographic composition explains this variation.

### **Does Redshirting Affect the Composition of Kindergartener Cohorts?**

Although individual parents make kindergarten entry decisions based on the costs and benefits they perceive for their own child and family, the aggregated decisions of parents could have ramifications for the learning experiences of all children over and above any individual impacts. One mechanism by which redshirting could impact students' experiences in kindergarten is by influencing the range of children's cognitive, social, and physical development within kindergarten cohorts.<sup>1</sup> In the current paper we describe how redshirting relates to the *within-school* distribution of kindergarten students' ages as well as cognitive skills at school entry.

To summarize, the current paper adds to the previous literature in several ways. First, we provide more reliable and current information about the extent of redshirting nationwide, and the characteristics of children who delay school entry. Second, we examine whether the decision to delay kindergarten is related to children's demographic characteristics, to measures of their pre-kindergarten cognitive and social development, and to school contexts. Finally, we examine the extent to which redshirting effects the composition of kindergarten cohorts within schools.

## **Methods**

### **Data**

This paper utilizes data from two cohorts of the Early Childhood Longitudinal Study. The Birth Cohort (ECLS-B) is the first study to track a large, nationally-representative sample from birth to school entry. The base sample includes approximately 10,700 infants born in 2001. Data were

collected at five time points and each wave includes direct child assessments as well as parent interviews. Wave 4 was conducted in the fall of 2006 when the majority of the sample began kindergarten. Approximately a quarter of the sample was not yet age-eligible for kindergarten in their state or was age eligible but did not enroll. The fifth round of data collection tracked the subsample of children who entered kindergarten in the fall of 2007. We therefore observe each child both in the year they turn five (2006) and in the year they enter kindergarten (2006 or 2007), regardless of whether these occur in the same or different years.

The data provides information about each child's month of birth as well as their state of residence at age five. We use these two pieces of information, combined with data on state kindergarten cut-off dates, to determine whether the child was age eligible for kindergarten in fall 2006 and the distance (in months) between their birthday and the state cut-off. Data on state kindergarten cut-off dates, collected by the Education Commission of the States, is presented in Table 1. Entry cut-off dates vary from as early as July 1 (Indiana) to January 1 (Connecticut), with a modal entry cut-off date of September 1.<sup>2</sup>

We use data on gender, race and family socio-economic status to examine whether the rate of compliance with kindergarten entry laws varies across groups. In addition, the data include several measures of children's "school readiness," including measures of cognitive and social development. The combination of measures available in the ECLS-B allows us to assess the extent to which the timing of kindergarten entry is associated with children's cognitive, social, and physical development. The direct cognitive assessments provide measures of children's pre-literacy and mathematics ability when the children are approximately 48 months. These assessments measure skills including phonological awareness, letter recognition, print conventions, number sense, counting, and pattern understanding.



In addition to direct assessments, the ECLS-B surveyed each child's primary care provider (preschool teacher, babysitter, etc.) and included a series of questions about the child's behavior, social skills and maturity. The items, which are modified from the Preschool and Kindergarten Behavioral Scales, Second Edition, ask caregivers whether the child makes friends easily, shares toys, works independently and acts impulsively. We use factor analysis to construct a single measure from the twenty teacher-reported measures and standardize it with mean 0 and standard deviation 1. Higher values indicate better adjustment and social skills.<sup>3</sup> Parents also answer similar questions about their child's social skills. We construct an analogous factor and find the correlation with the provider-reported assessments is modest (0.35).

Finally, parents were asked about their child's proficiency on a set of "basic" skills which include letter and color recognition as well as counting. We constructed a variable that ranges from 0 to 3 depending on the number of the basic skills the child could demonstrate across the following three measures: (1) child knows (at least) some of the letters of the alphabet; (2) child can identify the colors red, yellow, blue, and green by name and; (3) child can count up to 10 or higher. Just over 70 percent of the children in our sample met all three of these basic skills, and an additional 18 percent met two of three.

For the purpose of this study, the key strength of the ECLS-B is that it provides prospective information about an age cohort of children prior to kindergarten entry, and includes several direct measures of child development. It allows us to more accurately measure the correlates of delayed school entry than has previously been possible. A limitation of the dataset, however, is that it does not allow us to observe groups of kindergarteners nested within the same school or neighborhood. Rates of redshirting likely differ substantially across schools and communities. In order to assess this, and to explore whether redshirting impacts the composition

of incoming kindergartener's cohorts *within their school*, we use the Early Childhood Longitudinal Study, Kindergarten Cohort (ECLS-K), which includes data on a nationally representative sample of kindergarteners in Fall 1998.

Our ECLS-K sample includes all first-time public school kindergarteners with a completed parent survey in fall 1998, a sample of approximately 12,000 children. We define each child as a redshirter if they entered kindergarten for the first time a year or more after they were first eligible, as calculated based on their date of birth and their state's kindergarten entry cutoff in 1998 (Datar, 2006b).<sup>4</sup> We aggregate the individual redshirting variable for all children attending kindergarten in the same school to construct a school level measure, and we use the same approach to construct measures of each school's racial and socio-economic composition. On average, we observe 18 children per school. We explore whether schools' redshirting rate is related to the age-spread of kindergarteners in a school, defined as the difference between the 10<sup>th</sup> and 90<sup>th</sup> percentile of the school's age distribution. We also explore whether redshirting rates are related to the spread of school-entry academic abilities, as measured by the within-school standard deviation of literacy and mathematics test scores on the ECLS-K tests administered in fall of kindergarten.

Finally, as a check on our estimate of redshirting prevalence, we also use data from the October Supplement of the Current Population Survey (CPS). The CPS surveys a nationally representative sample of households annually; in October, parents are surveyed regarding the school enrollment status of their children (U.S. Department of Commerce, 2006). Although the CPS does not include children's birthdates, we can estimate the proportion of redshirter by examining the proportion of 6-year-olds enrolled in kindergarten in October 2006 and adjusting for the proportion we would expect to be enrolled if all students enrolled when eligible.

## Analytic Approach

**How many children redshirt?** We classify ECLS-B children as redshirters if their fifth birthday falls before their state’s cut-off date for kindergarten enrollment, but they do not enroll in kindergarten until 2007 (a year after they are eligible).<sup>5</sup> We classify children as on-time entrants if they are born before their state’s cut-off and enroll in kindergarten in 2006 or if they are born after their state’s cutoff and enroll in 2007. Finally, we classify children as “greenshirters” (early entrants) if they are born after their state’s cutoff and enroll in 2006. We describe the prevalence of each of these behaviors within our nationally representative sample.

**Who Redshirts?** We provide basic descriptive statistics about the rates of redshirting across socio-economic and racial groups within the ECLS-B. We then use regression to estimate the relationship between observable child and family characteristics and kindergarten entry practices for children born in the three months before or after their state’s kindergarten entry cut-off. For each child we calculate the difference (in months) between the child's birth date and the kindergarten cut-off in their state (we call this difference  $D_i$ ).<sup>6</sup> We then fit logistic regression models of the form

$$\eta_i = \ln \left( \frac{\Pr(\text{Redshirt})}{1 - \Pr(\text{Redshirt})} \right) = \beta_0 + \beta_1 D_i + \beta_2 D_i^2 + \mathbf{X}_i \mathbf{B}$$

We fit one model for those who turned five before their state’s cutoff date in 2006; this model allows us to examine the prevalence of redshirting as a function of the distance between their birthdate and the cutoff date and a set of child and family covariates ( $\mathbf{X}_i$ ). We fit a separate, identical model, predicting greenshirting, for those who turned five after their state’s cutoff date in 2006.

While the ECLS-B allows us to examine child-level correlates of redshirting, we use the ECLS-K to estimate the association between school-level covariates and redshirting rates. We fit

a set of random-intercept logit models predicting redshirting based on schools' racial and socio-economic composition. In these models, we center school characteristics around their state averages, so that the coefficients correspond to average within-state associations between school characteristics and redshirting rates.

**Redshirting and the composition of kindergartener cohorts.** Finally, to provide some (admittedly crude) assessment of the extent to which redshirting impacts the range of developmental outcomes within schools, we use the ECLS-K data and fit school-level regression models predicting the range of school-entry cognitive scores (adjusted for each child's month of assessment) based on the rate of redshirting within the school.

## **Results**

### **The Extent of Redshirting**

Table 2 breaks down our sample into four categories based on kindergarten entry behaviors. The first column shows the percentage of children turn five in 2006 prior to the kindergarten cut-off in their state and who, in compliance with the law, begin kindergarten in 2006. The second column shows a second group of compliers who begin kindergarten in 2007 because their fifth birthday falls after the 2006 state cut-off. The final columns show two types of non-compliers. The first, shown in column 3, are the greenshirters: children born after the cut-off who enter in 2006 nonetheless. Redshirtingers, shown in column 4, are children who are age-eligible for kindergarten in 2006 but who delay and do not actually enroll until 2007.

The first row of the table shows that, on average, about 94 percent of children comply with kindergarten entry laws (70% who enroll on time in 2006 and 24 in 2007). Two percent fall in the "greenshirters" category.<sup>7</sup> On average, these children who enroll "early" have kindergarten experiences that are significantly different from "complier" children: 14 percent of

“greenshirters” are home schooled for kindergarten, 18 percent attend private schools, and 22 percent attend transitional classrooms (i.e. transitional kindergarten, two-year kindergarten, pre-first grade, etc.). The comparable figures among children who entered kindergarten the year they were age-eligible are 2, 11 and 2 percent, respectively.

We find that 4 percent of children redshirted in 2006, according to the ECLS-B data. This is lower rate than reported in other studies (Datar, 2006b; Lincove & Painter, 2006; Stipek, 2002; Zill et al., 1997). As a check on this estimate of the extent of redshirting, we estimate the percent of redshirter in fall 1998 using the ECLS-K data and the 2006 October Supplement of the Current Population Survey (CPS). Using ECLS-K data, we estimate that 5.5 percent of first time kindergarteners are redshirter. The CPS data show that in October, 2006, the year that the ECLS-B children turned five, 15 percent of six-year-olds were enrolled in kindergarten and an additional one percent was attending preschool or pre-kindergarten. Some six-year olds in kindergarten in October 2006 turned five after the 2005 kindergarten cutoff date in their state, however, and so enrolled on time in kindergarten in 2006. For instance, a child born on October 1<sup>st</sup>, 2000, in a state with a September 1<sup>st</sup> kindergarten cut-off, was not eligible for kindergarten until fall 2006, but would have been 6 at the time of the CPS survey. Based on the cutoff dates reported in Table 1, we estimate that eight percent of six year olds fall into this category,<sup>8,9</sup> such that we would expect to see eight percent of six year olds in kindergarten in October, based strictly on their states’ cut-off. In addition, the CPS indicates that three percent of six-year-olds are repeating kindergarten, and should not be considered redshirter, as they were five when they first entered kindergarten. After accounting for these kindergarten repeaters and compliers, we are left with approximately 5 percent of six-year-olds who should properly be classified as redshirter. This figure is well-aligned with the evidence from the ECLS-B. Thus, all three of

our sources suggest that redshirting rates are between 4 and 5.5 percent.

### **Who Redshirts?**

**Redshirting and child demographics.** The remainder of Table 2 highlights differences in school entry patterns across groups. Redshirting is twice as likely among boys as it is among girls. While 2.3 percent of children in the lowest SES quintile delay kindergarten entrance, the figure is 6.4 among children in the highest quintile. The differences across racial groups are particularly striking. Nearly 6 percent of white children are classified as redshirters. In contrast, less than 1 percent of black children delay entry. The figures for Hispanic and Asian children are only 2 and 2.7 percent, respectively. The patterns for greenshirting, or early entrance, are largely the reverse. Low-SES children and Black and Asian children are more likely than high-SES, white, and Hispanic children to start kindergarten before they are legally eligible.

Figure 1 expands on these findings graphically. It shows the relationships between kindergarten enrollment patterns and children's age at the kindergarten cut-off date, based on the logistic regression models. Nearly all children born five or more months before their state cut-off enter kindergarten in 2006. The likelihood of starting kindergarten in 2006 drops rapidly for children more proximate to the cut-off date and among children born in the month before the cut-off, about 80 percent actually enroll "on time." Figures 2-4 show the same information, broken down by gender, race and SES. The gaps in the likelihood of redshirting are substantial, particularly between low and high SES children.

Because the bulk of non-compliance behavior occurs in the months before and after the cut-off, we focus on children born within three months of their states' cut-off for the regression analyses examining the associations between child characteristics and redshirting behavior. The first two columns of Table 3 show results from a series of linear probability models predicting

kindergarten entry in 2006.<sup>10</sup> These models provide information about bivariate relationships between child characteristics and kindergarten entrance behaviors. Each model is numbered, and the results can be read horizontally. For instance, the first row shows the coefficients on “female” from the two models predicting redshirting and greenshirting. Among children who will turn 5 in the 3 months *before* their state’s kindergarten cut-off, boys are 6 percentage points more likely to redshirt. Among those who turn five in the 3 months after the state cutoff, gender is not significantly associated with early kindergarten entry. Associations between demographic characteristics and kindergarten entrance are consistent with the patterns in Table 2.

In the lower panel we present results from models that examine whether kindergarten entry decisions are also systematically related to measures of child development collected during the year ECLS-B children turned four. We might expect that parents of children with lower skills would be more likely to delay their child’s kindergarten entry, and similarly that children with stronger skills would enter early. In general, we do not observe these patterns. We find no relationship between redshirting or early entrance and children’s social skills as measured by either their parents or their teachers. Similarly, there is no relationship between entry behaviors and parents’ assessment of their children’s basic skills. We do observe a weak association between entrance behaviors and children’s direct mathematics and reading assessment: children with *higher* pre-literacy and –math scores are slightly more likely to redshirt than those with lower scores, though this relationship is only marginally significant ( $p < .10$ ).

Finally, children who had very low birth weights are more likely to delay kindergarten. In additional models, not shown, we find no relationship between kindergarten entry timing and their age four height, weight, or body mass index. We therefore posit that the significant relationship with low birth weight and kindergarten entrance may be capturing a host of

developmental outcomes rather than a simple measure of physical development. With the exception of very low birth weight and the “counterintuitive” (and only marginally significant) mathematics and reading results, our measures of child development are not significant predictors of redshirting or early entrance.

Columns 3 and 4 report the coefficients from multivariate regression models that include all the demographic and developmental variables within a single model. The gender, race, and socioeconomic differences in redshirting persist mostly unchanged in the multivariate models controlling for developmental characteristics. The results remain largely unchanged if we also account for family structure, poverty, and other family characteristics (results not shown). Once we account for SES and other demographic covariates, children’s math and reading ability are no longer related to their likelihood of starting kindergarten on time. We still observe that children with very low birth weight are more likely to delay kindergarten, however, no other measures of child development are related to the entry decision.<sup>11</sup>

**Redshirting and school context.** Next we explore whether there is local variation in redshirting rates. Recall that in order to do this we must turn to an earlier (fall 1998) cohort of kindergarteners. As noted above, we find that in 1998 approximately 5.5 percent of first-time kindergarteners redshirted. There is a great deal of local variation in redshirting, including schools with no redshirters and schools where over 25 percent of sampled children are classified as delayed kindergarten entrants. As shown in Table 4, school-level racial and family-income composition are strongly predictive of redshirting rates, with higher rates in schools serving greater proportions of high-income and white students. For instance, as shown in Figure 5, in schools serving students whose mean household income is \$20,000, median redshirting rates were approximately 4 percent compared to a median redshirting rate of 7 percent in schools



serving students with mean household income of \$100,000. One fifth of schools serving high-income students had redshirting rates of 15 percent or greater (if most redshirting students were born in the three months prior to the state cutoff date, this implies that as many as 60% of those born within three months of the cutoff date were redshirters).<sup>12</sup>

### **Implications for Cohort Composition**

In this final results section we discuss the implications of redshirting for the within-school distribution of age and cognitive ability at school entry. Using data from the ECLS-K, presented in Table 5, we find that redshirting substantially expands the age distribution of kindergarteners within a school: a 10 percentage point increase in the proportion of redshirters widens the 90<sup>th</sup>/10<sup>th</sup> percentile age range within a school by about three weeks. Somewhat surprisingly however, we find no evidence of an association between within-school redshirting patterns and the distribution of cognitive measures assessed at school entry. Our point estimates suggest that a 10 percentage point difference in the redshirting rate is associated with a roughly 0.001 difference in the within-school reading standard deviation of math or reading scores—a trivial, and statistically insignificant, association. Because these estimates are based on cross-sectional associations, however, they should not be interpreted as conclusive evidence that redshirting has no effect of the variation of test scores within school-based kindergarten cohorts.

### **Discussion**

Our investigation of delayed kindergarten entrance adds to the literature on school entry in several ways. First we leverage a large, nationally-representative dataset to provide a detailed exploration of families' decisions to delay kindergarten entry. Unlike previous studies that only observe children once they enter kindergarten or later in life, our study makes use of data on a full age-cohort of five year olds, some of whom do and do not enter kindergarten in 2006. In

addition, we have access to parent, care-giver and direct assessments of children's development *prior* to age five, so we can carefully examine whether parents decisions about kindergarten entry are related to observable measures of child development.

Our findings show that nationwide approximately 4 to 5.5 percent of children delay kindergarten, a lower rate than previously reported. We demonstrate that the likelihood of redshirting is much higher among children whose birthday falls in the months before the cut-off and that redshirting varies substantially across gender, race and SES. Poor families rarely delay kindergarten despite the fact that they are far more likely to indicate concerns about their children's school readiness at age four. The findings are consistent with our initial hypothesis that low-income families may view redshirting as prohibitively expensive. Giannarelli and Barsimantov (2000) report that, on average, low-income families spend 16 percent of their earnings on child-care. Within this context, the patterns we observe are not surprising.

We also examine whether rates of redshirting, as well as the gaps in these rates across groups, are explained in part by observable measures of child development including parent and teacher reports and direct assessments. We find little evidence that this is the case. In fact, children who redshirt tend to perform slightly *better* during pre-kindergarten than many of their similarly-aged complier peers, although these differences are eliminated if we account for SES. The absence of a relationship between nearly all of the developmental measures and the likelihood of delayed kindergarten entry suggests parents' decisions to red-shirt may be driven more by concerns about their child's relative age or relative physical development in their classroom than by their actual cognitive or behavioral development. The evidence on the impact of relative age on student learning trajectories is mixed, and recent research (Black, Devereux, & Salvanes, 2008; Deming & Dynarski, 2008; Dobkin & Ferreira, 2010) suggests benefits from

delayed school admission may be counteracted by losses associated with one less year in the labor force. Still, parents' desire to give their child an edge in what they perceive as a competitive environment may make it appealing for those who can afford it to give their child the "gift of time" (Gesell, 1940).

Given the differences in redshirting practices across groups, it seems plausible that redshirting would lead, mechanically, to exacerbated achievement gaps. In related analyses using the ECLS-B data we find that although redshirting substantially impacts an individual child's initial standing within a kindergarten cohort, it does not meaningfully widen achievement gaps (Bassok & Reardon, 2012). This is because, at the national level, the incidence of redshirting is low enough that its impact is not large. However, this does not imply that redshirting bestows benefits for selected individuals without causing any negative repercussions for others. It is plausible that in certain communities where redshirting levels are high there are meaningful implications for learning experiences as well as achievement.

The ECLS-K data allowed us to measure, first, to what extent redshirting rates vary locally and second whether within-school redshirting rates are related to differences in the composition of kindergarten cohorts. We find that indeed, redshirting rates vary substantially between schools and that the racial and socio-economic composition of schools is strongly related to redshirting. In future work it would be worthwhile to explore how school-level redshirting norms are formed, and to what extent kindergarten teachers (or preschool teachers in the communities surrounding these schools) transmit these norms to parents through their advice about school entry timing.

Finally, we find a strong relationship between schools' redshirting rates and the range of ages among the kindergarteners within a school, which in turn could translate to meaningful

differences in learning experiences. Unfortunately, we do not have data that allows us to explore that hypothesis. We do show, however, that at the school level, redshirting is not related to meaningful differences in the distribution of cognitive assessment scores at school entry. These admittedly crude results show that even at the school level, redshirting is not associated with meaningful changes in cohort composition, at least with respect to the assessment scores we considered. Taken together then, the findings suggest that the policy implications of current redshirting practices are more limited than media reports suggest.

It is worth noting that our study, and particularly the within-school analysis, does suffer from several data limitations. In particular, the within-school analysis does not measure the *effect* of redshirting on school level composition. Unlike the ECLS-B, which allows us to observe redshirters both in the year they were eligible for kindergarten and the year they enrolled, in the ECLS-K we observe a single snapshot of a kindergarten cohort. This means that although we can measure the association between schools' redshirting rates and various characteristics of their incoming kindergarten cohorts, we have no way to compare that to a counterfactual scenario in which redshirters started on time. Further, the children in the ECLS-K started kindergarten nearly 15 years ago, in a period that preceded large state preschool expansions as well as No Child Left Behind. While our analysis provides a detailed account of which types of children redshirt in more recent years, it is difficult to know whether similar patterns existed in 1998. Soon-to-be-released ECLS data from the 2010 will allow researchers to assess changes over time in within-school patterns of redshirting.

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Figure 1

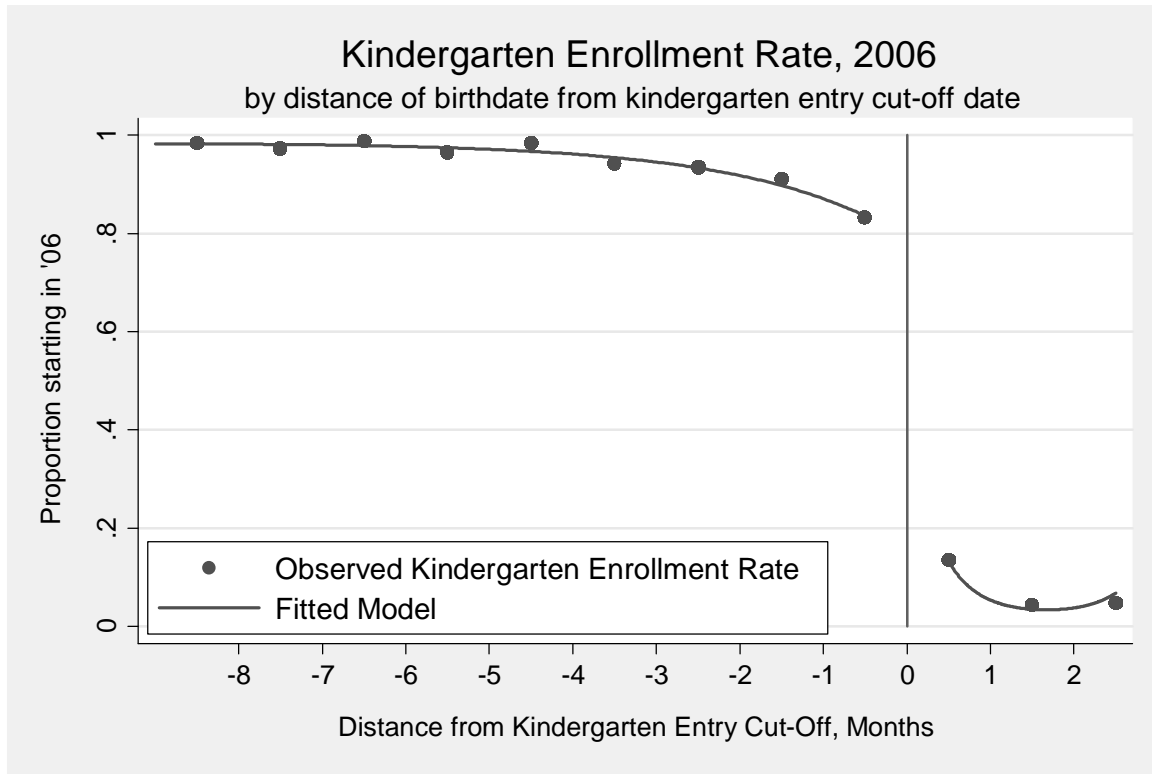


Figure 2

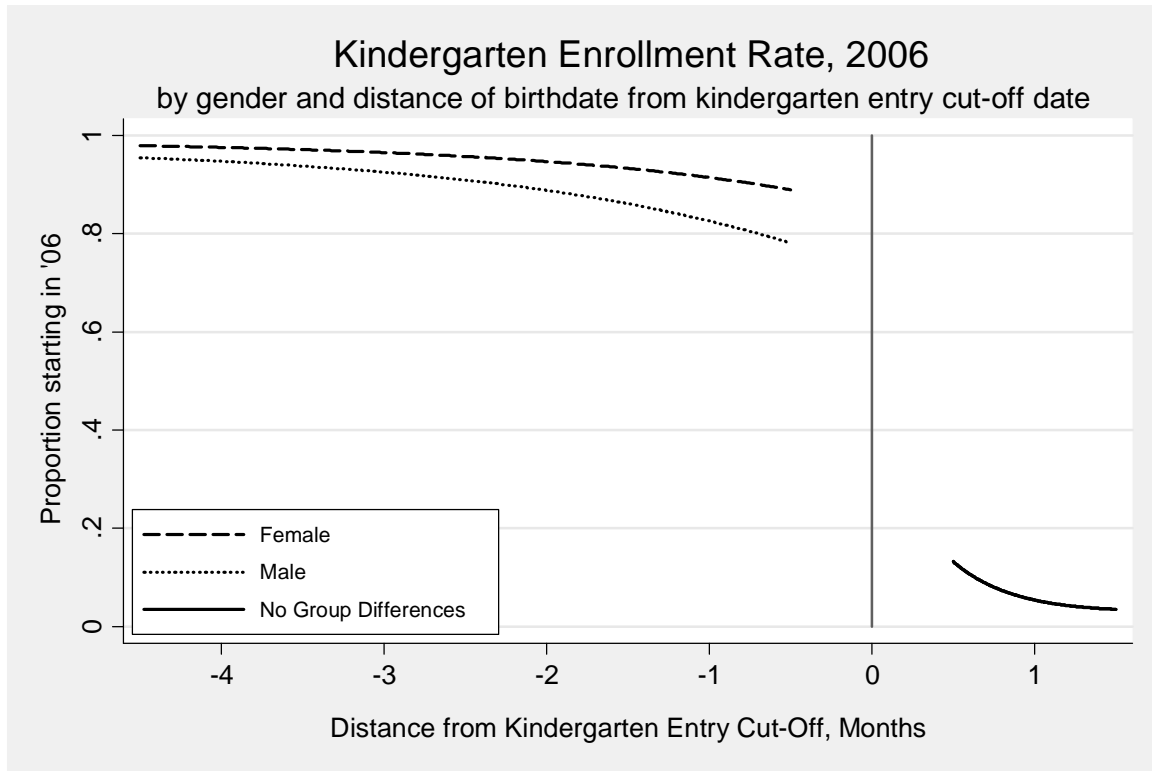




Figure 3

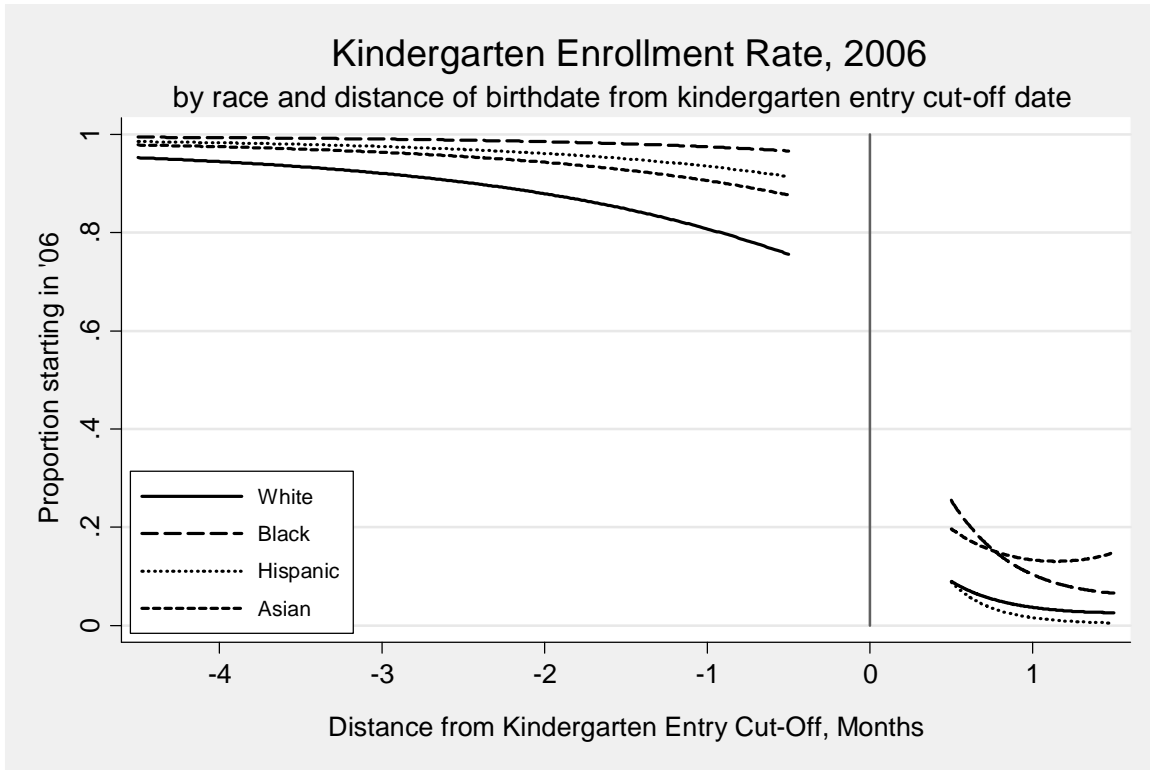


Figure 4

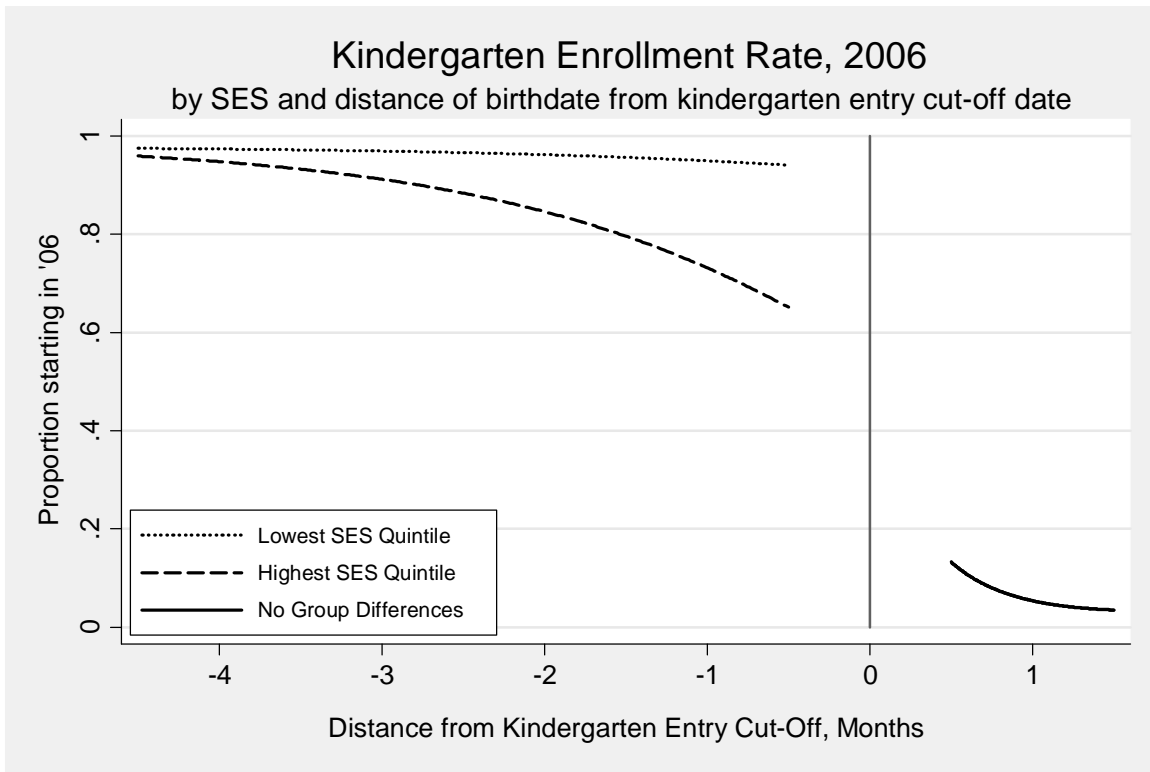


Figure 5

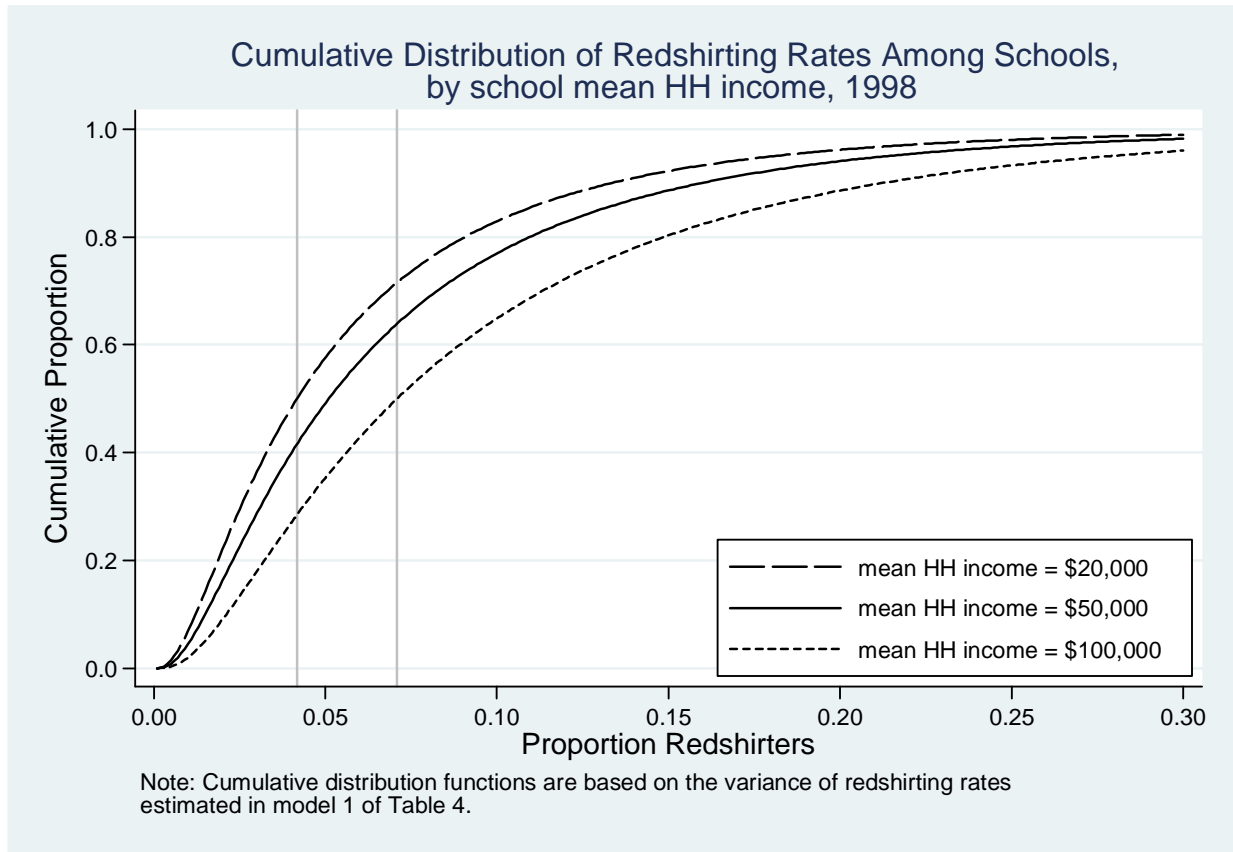


Table 1: State cut-offs for kindergarten entry, 2005

Cut-Off	State
July 1	IN
Aug 1	HI
Aug 15	AK
Aug 31	DE, KS, WA
Sept 1	AL, AZ, FL, GA, ID, IL, MD, MN, MS, ND, NM, OK, OR, RI, SC, SD, TX, WI, WV
Sept 2	UT
Sept 10	MT
Sept 15	AR, IA, WY
Sept 30	LA, NV, TN, VA
Oct 1	KY
Oct 15	ME, NE
Oct 16	NC
Dec 1	MI
Dec 2	CA
Dec 31	DC
Jan 1	CT
No State Cut-Off	CO, MA, MO, NH, NJ, NY, OH, PA, VT

Source: Education Commission of the States, <http://www.ecs.org/clearinghouse/58/28/5828.pdf>

**Table 2: Kindergarten Entry Decisions, by demographic characteristics**

	“On-Time” Kindergarten Entry Based on Child’s birthday		Early Entrants	Late Entrants	
	Started Kindergarten in 2006	Started Kindergarten in 2007	Greenshirt	Redshirt	~N
<b>Total</b>	70.1	24.0	2.0	3.9	5,550
<b>Gender</b>					
Male	68.7	24.4	1.6	5.2	2,800
Female	71.5*	23.6	2.3	2.5***	2,750
<b>SES Quintiles</b>					
First Quintile (LOWEST)	69.5	24.7	3.6	2.3	1,100
Second	68.5	26.4	1.6**	3.4	1,050
Third	73.8*	22.0	1.8**	2.4	1,100
Fourth	70.3	23.1	1.4***	5.2***	1,100
Fifth Quintile (HIGHEST)	68.4	23.8	1.4***	6.4***	1,250
<b>Race</b>					
White	69.1	24.1	1.1	5.8	2200
Black	67.1	27.7*	4.6***	0.6***	850
Hispanic	74.0***	22.4	1.7	2.0***	1,150
Asian	74.8	16.7*	5.8***	2.7	600
<b>Region</b>					
South	67.4	27.8	2.3	2.5	2,450
Midwest	63.4*	26.8	2.3	7.6***	1,200
West	77.5***	16.9***	1.5	4.1**	1,750

Note: Each cell is a row percentage. Stars indicate significant difference between the marked group and the top category within each group. + 0.10 \* 0.05 \*\* 0.01 \*\*\* 0.001

**Table 3: Differences in the likelihood of starting kindergarten in 2006, by demographic and developmental characteristics**

	Bivariate Models		Multivariate Models		
	Model #	Redshirt	Greenshirt	Redshirt	Greenshirt
Female	1	-0.060* (0.026)	0.032 (0.024)	-0.057* (0.026)	0.040+ (0.023)
Black	2	-0.136*** (0.026)	0.091* (0.041)	-0.096*** (0.023)	0.090* (0.044)
Hispanic		-0.129*** (0.028)	-0.017 (0.024)	-0.108*** (0.032)	-0.024 (0.022)
Asian		-0.114** (0.037)	0.175** (0.068)	-0.132** (0.044)	0.220** (0.076)
<i>p</i> (F-Test)		.000	.004	.000	.001
SES	3	0.069*** (0.018)	-0.010 (0.014)	0.058* (0.023)	-0.013 (0.016)
Midwest	4	0.069 (0.044)	0.067+ (0.037)	0.010 (0.046)	0.049 (0.035)
South		-0.059+ (0.030)	0.040 (0.027)	-0.063+ (0.035)	0.028 (0.025)
<i>p</i> (F-Test)		.001	.164	.048	.347
Social Skills (Parents)	5	-0.020 (0.015)	-0.010 (0.011)	-0.007 (0.015)	-0.013 (0.012)
Social Skills (Teacher)	6	-0.006 (0.019)	0.002 (0.010)	--	--
Basic Skills (Parent)	7	0.009 (0.013)	0.006 (0.016)	-0.008 (0.018)	0.019 (0.016)
Math	8	0.026+ (0.014)	0.018+ (0.010)	0.004 (0.022)	0.015 (0.015)
Reading	9	0.024+ (0.013)	0.011 (0.013)	-0.009 (0.018)	0.001 (0.023)
Low Birth Wgt	10	-0.035 (0.026)	0.025 (0.032)	-0.003 (0.027)	0.045 (0.033)
V. Low Birth Wgt.		0.084* (0.041)	-0.006 (0.031)	0.123** (0.040)	-0.024 (0.028)
<i>p</i> (F-Test)		.027	.698	.007	.205

Note: + 0.10 \* 0.05 \*\* 0.01 \*\*\* 0.001; Results shown in columns 1 and 2 are from 10 separate regression models (linear probability models). The first column shows the coefficient from the model predicting redshirting based on all those born within the three months prior to their state's cutoff date. The second shows the coefficient on the covariate from the model predicting greenshirting based on all those born within the three months after to their state's cutoff date. Each model includes a variable indicating the number of months between the child's birthday and the cut-off date. Excluded groups, by model, are: males, white children, none, and western states. The race model includes children who are multiple and other races, but due to small sample sizes, these groups are not shown. For similar reasons, results for the Northeastern region are not shown. Columns 3 and 4 show results from multivariate models. The teacher reported measure of social skills is excluded from these models because it is only available for children who experienced non-relative care at age four, and therefore leads to a substantial drop in sample size. However, models which include this variable provide very similar results. All analyses are weighted.

**Table 4: School-level predictors of redshirting practices, 1998 Kindergarten Cohort (ECLS-K)**

	1	2	3
Intercept	-3.273 *** (0.062)	-3.285 *** (0.063)	-3.290 *** (0.063)
School Mean HH Income (in 10 thousands)	0.071 ** (0.022)		0.047 + (0.027)
School Proportion Black		-0.477 (0.297)	-0.232 (0.330)
School Proportion Hispanic		-1.258 *** (0.360)	-0.951 * (0.401)
School Proportion Other Race		-1.216 + (0.626)	-1.219 + (0.630)
Between-School Variance of Intercepts	0.966	0.963	0.962
Number of Students	12100	12100	12100
Number of Schools	685	685	685

Note: Reported coefficients are log odds estimated using random-intercept logistic regression models. Sample restricted to public schools.

**Table 5: Redshirting and the standard deviation of school-level developmental outcomes at school entry. (ECLS-K)**

	Age Range (in years)		School Standard Deviation, Reading		School Standard Deviation, Math	
School Proportion Redshirting	0.577*** (0.107)	0.562*** (0.109)	0.009 (0.132)	-0.022 (0.132)	0.012 (0.118)	0.021 (0.120)
School Mean HH Income (in 10 thousands)		0 (0.003)		0.006 (0.004)		-0.002 (0.003)
School Prop. Black		-0.028 (0.032)		-0.031 (0.039)		-0.046 (0.036)
School Prop. Hispanic		-0.018 (0.036)		-0.049 (0.044)		-0.011 (0.040)
School Prop. Other Race		-0.048 (0.052)		0.159* (0.063)		0.083 (0.057)
Constant	0.767*** (0.008)	0.782*** (0.025)	0.865*** (0.010)	0.836*** (0.030)	0.867*** (0.009)	0.877*** (0.028)
N (Schools)	640	640	640	640	640	640

Note: Age range is defined as the difference between the 90<sup>th</sup> and 10<sup>th</sup> percentiles of birthdays. All models include state fixed effects and are restricted to public schools with 10 students or more.

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<sup>1</sup> Note that redshirting need not lead to an expansion of the age distribution. For instance, if all children in the bottom 10 percent of the age distribution redshirted, it would make the median age in the cohort older, but would not change the width of the age range.

<sup>2</sup> Nine states do not have a state-mandated kindergarten entry cut-off. These states, which typically allow individual districts to determine their own kindergarten entry policies, are omitted from most of our analyses. The sample for the bulk of our analysis includes approximately 5,300 children. This drop in sample size from the Wave 1 sample size of nearly 10,700 stems primarily from attrition over time. Approximately 6,550 children have data available at kindergarten entry as well as cognitive scores from Wave 3. We lose about 1,250 additional children by dropping children residing in states without a set kindergarten entry law in 2005.

<sup>3</sup> Because not all children have a regular non-parental care arrangement at Wave 3, this provider-reported measure of social development is only available for a subsample of the data (~3,350 children).

<sup>4</sup> For students living in a state that allows districts to determine cut-off dates, we use the kindergarten cut-off as reported by the school principal. If this data is unavailable, we classify children based on parent reports of delayed school entry.

<sup>5</sup> In practice, our definition of “kindergarten entry” in 2006 includes all children who were enrolled in kindergarten or higher, including children enrolled in traditional kindergarten programs, children who skip kindergarten and start school in first grade, children who start homeschooling in 2006, etc.

<sup>6</sup> Recall that the ECLS-B provides information on each child’s month of birth but not on their *day* of birth. Ideally, we would like to know each child’s actual day of birth to precisely calculate the distance between their exact age and their state’s kindergarten cut-off. Instead, we assign each child a birth date at the middle date of the month in which they were born. We then calculate the difference between the assigned birth date and the state cutoff date (in months). In states where the state cut-off is in the middle of the month, we drop children who were born during the cut-off month. For example, in North Carolina the kindergarten cut-off date is October 16<sup>th</sup>. We drop children from North Carolina born in October, because we cannot distinguish whether their birth date put them just below or just above their state cut-off.

<sup>7</sup> Note that at Wave 3 when the children were age four, approximately 2 percent of parents indicated that their children were already enrolled in Kindergarten. The bulk of these children (70 percent) were born in the first half of 2001, with 15 percent born in January. Despite this, at Wave 4, nearly all these children (86 percent) are coded as first time kindergarteners and only 5 children are coded as first graders.

<sup>8</sup> Calculations are available from authors upon request.

<sup>9</sup> We exclude states without a state cut-off from this calculation. In those states, approximately 14 percent of six year olds are enrolled in kindergarten or preschool.

<sup>10</sup> We present findings from OLS regressions for ease of interpretation. Findings from logit models are quite similar. Results are also robust to narrowing and expanding the distance from the cut-off.

<sup>11</sup> None of the multivariate results are sensitive to changes in model specification. For instance, it may be the case that the likelihood of redshirting (or early entrance) also differs depending on *when* the cut-off occurs. Accounting for cut-off month does not influence our estimates, however. We also run models that include state fixed effects. Estimates from these models describe within-state associations between child characteristics and entry practices. Including

the fixed effects ensures that our results are not driven by cross-state variations either in timing of the cut-off or in any other characteristics that differ across states and may influence kindergarten entry decisions. The same patterns persist in the “within-state” framework.

<sup>12</sup> In additional analyses (available upon request) we find that *within* schools, individual children’s family income is unassociated with redshirting suggesting that community norms may play a role in redshirting decisions. However, racial differences in delayed school kindergarten do persist even within schools.