



# The effects of changes in kindergarten entry age policies on educational achievement



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## ABSTRACT

This study explores the effects of state kindergarten-entry-age policies on students' outcomes by exploiting variation in the kindergarten entry cutoff dates enacted by states in the United States over the last 40 years. Using the state average and standard deviation in NAEP test scores in 4th, 8th and 12th grades, we estimate the impacts of state entry-age policies on educational achievement and test score dispersion in the state. The estimation results from the baseline state and time fixed effects model show that a one month earlier cutoff increases average state reading and math scores of 4th graders by 21.7 and 13.6 percent of a standard deviation, respectively. Eighth graders' average score increases in math and science are 12.4 and 24.3 percent of a standard deviation, respectively, while the effect on reading score significantly decreases. We find no effect of kindergarten entry date on educational outcomes in 12th grade. We also find that an earlier kindergarten entry date generally reduces the standard deviation of state test scores. Robustness checks support these findings and suggest no evidence of endogeneity of the policy changes. Our findings provide novel evidence that early school start cutoffs have improved state-level achievement measures over the past 40 years.

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## 1. Introduction

Is it a good policy for states to change their kindergarten-entry cutoff to an earlier date? Many states have moved their kindergarten-entry cutoff date earlier in the school year during the last 40 years. An earlier state kindergarten-entry cutoff date increases the minimum age of children as they start school in the state so that it can increase the average age of students at school entry, and therefore at the date of state achievement tests. If these ages are positively associated with educational achievement, an earlier school-entry cutoff may be able to increase educational achievement of students in the state. In addition, increased school or class average age also may enhance educational

achievement, as it can cause positive peer effects and make teachers use advanced teaching materials (Elder & Lubotsky, 2009). School accountability metrics may also be improved by an earlier cutoff date, and these factors may contribute to states' considering and adopting earlier kindergarten-entry cutoff dates. As an earlier kindergarten-entry cutoff can lead to greater childcare cost and later labor market entry of students, however, the policy that changes a kindergarten-entry cutoff date to an earlier date should have enough impacts on educational achievement to be justified. As a component of a larger attempt to evaluate the kindergarten-entry age policy, this study explores the effect of kindergarten-entry-cutoff date on educational achievement.

There is a large literature that investigates the effect of school-entry age on educational achievement. Most of the literature estimate the combined effect of age at school entry and age at test on educational performance among students in the same grade, as there is perfect collinearity among

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school-entry age, age-at-test and schooling. A common finding is that the combined effect is large and significant in the lower grades and weakens over time (e.g., [Bedard & Dhuey, 2006](#); [Crawford, Dearden, & Meghir, 2007](#); [Datar, 2006](#); [Elder & Lubotsky, 2009](#); [Kim, 2015](#); [McEwan & Shapiro, 2008](#)). Whether the effect is still persistent at college enrollment and in the labor market is not conclusive ([Bedard & Dhuey, 2006](#); [Black, Devereux, & Salvanes, 2011](#); [Dobkin & Ferreira, 2010](#); [Fredriksson & Öckert, 2005](#); [Kim, 2015](#)).<sup>1</sup> A smaller set of studies estimate average or relative age effects.<sup>2</sup> For example, [Fredriksson and Öckert \(2005\)](#) find that the relative age effect is positive but small and statistically insignificant for 9th graders in Sweden. [Crawford et al. \(2007\)](#) report that the relative age effect is small in England. [Elder and Lubotsky \(2009\)](#) find that the average age of the school-cohort is likely to affect educational achievement positively until 8th grade in the U.S.. This literature implies that the state entry cutoff can affect students' educational achievement through these channels. It also predicts that an earlier cutoff can have a positive effect on educational achievement, and it decreases over time. We test this prediction by directly estimating the overall impacts of the cutoff and discuss the policy implications of our findings.

To the best of our knowledge, this is the first study that explores the relationship between state kindergarten-entry-cutoff policies and state standardized test results. [Bedard and Dhuey \(2012\)](#) is the only paper that is directly related to this study in the sense that they explore the effect of kindergarten-cutoff date on human capital accumulation. Specifically, they estimate the overall impacts of state kindergarten-entry cutoff on wage and educational attainment and find that an earlier state kindergarten-entry-cutoff date increases the hourly wage of males and has no significant effect on (final) educational attainment. This study focuses on the effect of state kindergarten-entry date on educational achievement for students and how the effect changes as students advance through school. This study also investigates the possible problem of kindergarten-entry-cutoff changes that [Stipek \(2002\)](#) points out. She suggests that children from higher socioeconomic families can accumulate more human capital outside of school so that an earlier cutoff date can increase the educational achievement gap across students. We indirectly evaluate this point by estimating the effect of kindergarten-cutoff date on the *standard deviation* of students' test scores in the state.

We use state NAEP scores for 4th and 8th graders and ACT and SAT results for high school students for this study. We

<sup>1</sup> It is important to estimate school-entry age effect separately for evaluating the kindergarten-entry age policy. There are a few studies that separate the impacts of age-at-testing and school-entry age and find that the effect of age-at-testing is more important ([Black et al., 2011](#); [Crawford et al., 2007](#)). These findings may have significant implications, as it is possible that the significant combined effect of school entry age and age-at-testing in the previous literature may not be driven by school entry age, thus having an earlier cutoff itself may not be effective for improving educational achievement of children.

<sup>2</sup> In some cases, the term "average age effect" is mingled with the term "relative age effect". School (or class) average age is the mean age of students in school (class). Relative age can be thought of as the percentile rank in the age distribution ([Fredriksson & Öckert, 2005](#)) or the individual age relative to the school average age ([Elder & Lubotsky, 2009](#)).

exploit the variations in the state kindergarten cutoffs over the last 40 years to estimate the effect of an earlier cutoff date on the educational achievement of students. This allows us to use standard difference-in-differences estimation techniques. We provide several new findings to the evaluation of state-level entry age policies. First, a one month earlier entry cutoff increases the state average score of 4th grade NAEP by 21.7 and 13.6 percent of a standard deviation in reading and math, respectively. The estimation results for the standard deviations of test scores show that there is no evidence that an earlier entry cutoff increases the degree of dispersion of test scores in the state, rather it is more likely to reduce the degree of the dispersion. Second, we find some evidence of fade-out. A one month earlier cutoff increases state average score of 8th grade NAEP in math by 12.9 percent of a standard deviation and the effect on reading in 8th grade is 5.1 percent of a standard deviation. The earlier cutoff also decreases the standard deviations of test scores in math and science in 8th grade. Third, the effect of a one month earlier cutoff on ACT and SAT scores is small and statistically insignificant.

To check the validity of econometric assumptions used in this study, we indirectly test if the cutoff changes were endogenously determined. We find no evidence that state kindergarten cutoff changes are related to changes in demographic variables or economic conditions, which is consistent with the assumptions in the econometric model. We also conduct several robustness tests for the econometric model. First, we estimate the model using various specifications. Second, we estimate placebo tests. Third, we test the model using the sample that excludes states that have changed their cutoff by more than or less than one month. Fourth, we test the fade-out of cutoff date effect using a restricted sample that includes state-entry year cohort that took both 4th and 8th grade NAEP tests. Finally, we use alternative functional forms of the cutoff effect in the econometric model. In general, the estimation results from our baseline model are quite robust to these different models.

The rest of this paper consists of the following sections. [Section 2](#) explains the data and the trends of the state kindergarten-cutoff changes. The econometric model is described in [Section 3](#). [Section 4](#) reports the estimation results. [Section 5](#) discusses and concludes.

## 2. Background

This section briefly introduces the trends in the changes of state kindergarten-entry cutoff during the past 40 years. We then provide motivations for this study by showing that state kindergarten-entry cutoff can be related to educational achievement in the state.

[Fig. 1](#) depicts the time trend of the number of states by the kindergarten entry cutoff month from 1975 to 2008.<sup>3</sup> We can see that the secular trend of kindergarten cutoff changes to earlier dates of the school year. The number of states that have September or August cutoffs has increased while the number of states that have October, November, December or January cutoffs has decreased during the period. For example, 10 states had a September cutoff and 11 states had

<sup>3</sup> We do not include June, July and February cutoffs in the graph because only at most one state had any one of these cutoffs for each year.

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