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Article

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Is there an optimal school starting age?

It depends: older children perform better on standardized tests, but evidence of older school starting ages on long-term outcomes is mixed

Keywords: education, age, relative age, test score gap, redshirting

ELEVATOR PITCH

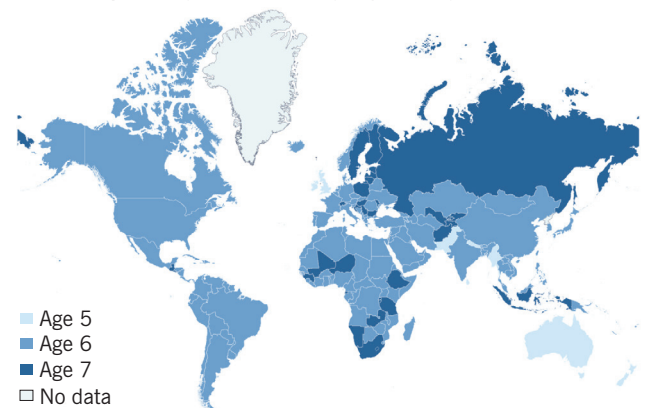
There is a widely held belief that older students, by virtue of being more mature and readier to learn at school entry, may have better academic, employment, and earnings outcomes compared to their younger counterparts. There are understated, albeit important, costs to starting school later, however. Compulsory school-attendance laws may allow these same older pupils to drop out of high school earlier, which could adversely impact their employment; entering the workforce later also has implications for lifetime earnings and remittances to governments. Overall, research suggests that school-age entry policies can improve student achievement in the short term, but the long-term impacts are currently not well-understood.

KEY FINDINGS

Pros

- + While most countries have been lowering school starting ages, an opposite trend has been occurring in the US.
- + Being the oldest student within a group has large positive effects on short-term outcomes such as test scores, special-needs diagnosis, and leadership.
- + Test score age gaps are of a similar magnitude across social/economic status, race/ethnicity, gender, deciles of birth weight, gestational age, and school quality.
- + Grade retention policies and the postponement of tracking may offset some of the disadvantages associated with younger school starting ages—especially among students with low-income backgrounds.

Children’s primary school entry ages vary worldwide, 2020



Source: Authors’ own based on data from: World Bank, “World Development Indicators.” Online at: <http://data.worldbank.org/indicator/SE.PRM.AGES> [Accessed July 1, 2021].

Cons

- The optimal school-entry age is unknown and likely to depend on contextual factors, such as access to high-quality early childhood education, compulsory schooling laws, grade retention policies, and tracking systems.
- More parents in the US are delaying their children’s school entry, despite mixed evidence of its benefits.
- Findings on the effects of being older within a student group are inconclusive with respect to longer-term outcomes like educational attainment, employment, and earnings.

AUTHOR’S MAIN MESSAGE

In many countries, the positive impact of older school-entry ages on standardized test scores and other school-related outcomes has been well-established. However, due to inconclusive evidence, it is currently unknown whether and how these benefits persist in the long term. As such, policymakers need to carefully consider their unique institutional context when determining students’ optimal school starting age and the best way to implement it. Four especially important institutional considerations include: the prevalence of high-quality early childhood education, early grade retention policies, tracking systems, and compulsory school-attendance laws.

MOTIVATION

While school-entry ages have been decreasing globally, an opposite trend has been occurring in the US, where it has seemingly become conventional wisdom that older students have an academic advantage over their younger counterparts. Indeed, before the start of each school year, there is no shortage of popular media articles debating the topic of whether school-eligible children should be held back an additional year.

Although governments often mandate the school-entry age, many jurisdictions offer some latitude to a particular child, regardless of the legislated age. If a child happens to be born in a month that would make them younger when entering school, some parents may choose to wait an additional year to enroll their children in primary school in an effort to improve school readiness and future labor market competitiveness. At the policy level, many US states are also moving school-entry age cut-off dates so that children are older when they begin school; only a small minority of states are starting children at younger ages. Such family- and state-level actions inevitably lead to the same question: Does school-entry age matter? And if so, how much?

DISCUSSION OF PROS AND CONS

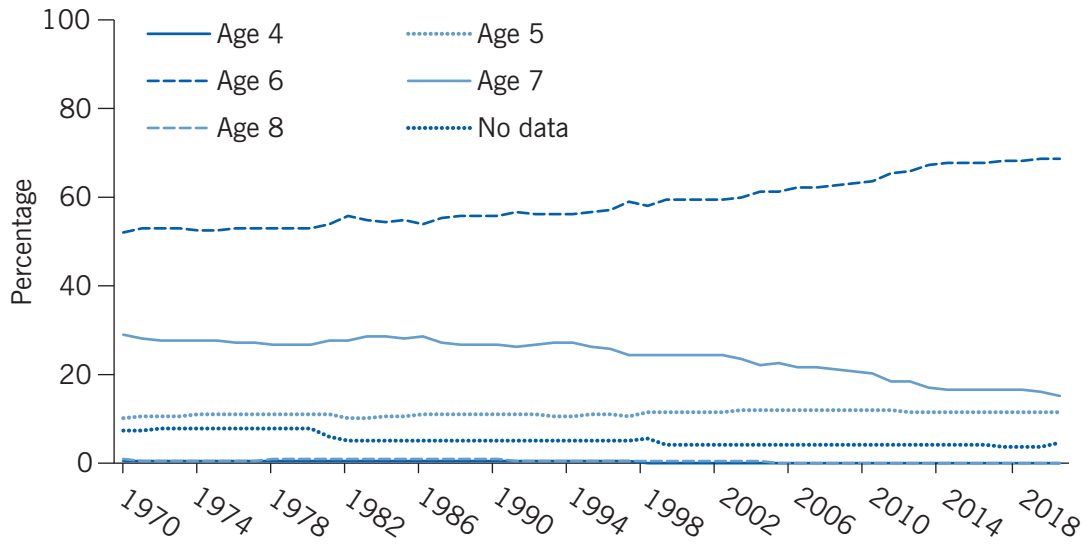
Establishing the school starting age cut-off

Most jurisdictions mandate a primary school starting age by legislating a school-entry cut-off date, which is the date by which children must reach a certain age to be eligible to start primary education. Some jurisdictions set a cut-off date by which children must turn a certain age in the school year (e.g. a student must turn six years old by September 1 of the relevant year), while others specify a school starting age in years (which is equivalent to having a school-entry cut-off date of January 1). If children are eligible for school in the year that they turn five, a January 1 cut-off implies a school-entry-age range of 56 to 67 months (4.7 to 5.6 years of age), while a September 1 cut-off implies an entry-age range of 60 to 71 months (5.0 to 5.9 years of age). The latter cut-off ensures that children are older when they begin school [1].

There is considerable variation across countries in school starting ages, as shown in the Illustration on p. 1. For example, in 2020, children in Finland began primary school at the age of seven, while those in Australia began at the age of five. Over the last 50 years, several countries have lowered their school-entry age from seven to six years old (Figure 1). As such, in the vast majority of countries, children begin school in the year they turn six. Despite substantial cross-national variation in absolute school eligibility ages, there are few studies investigating the optimal school starting age. In other words, it is not known whether a seven-year-old school-entry age produces better long-term outcomes than a five-year-old starting age.

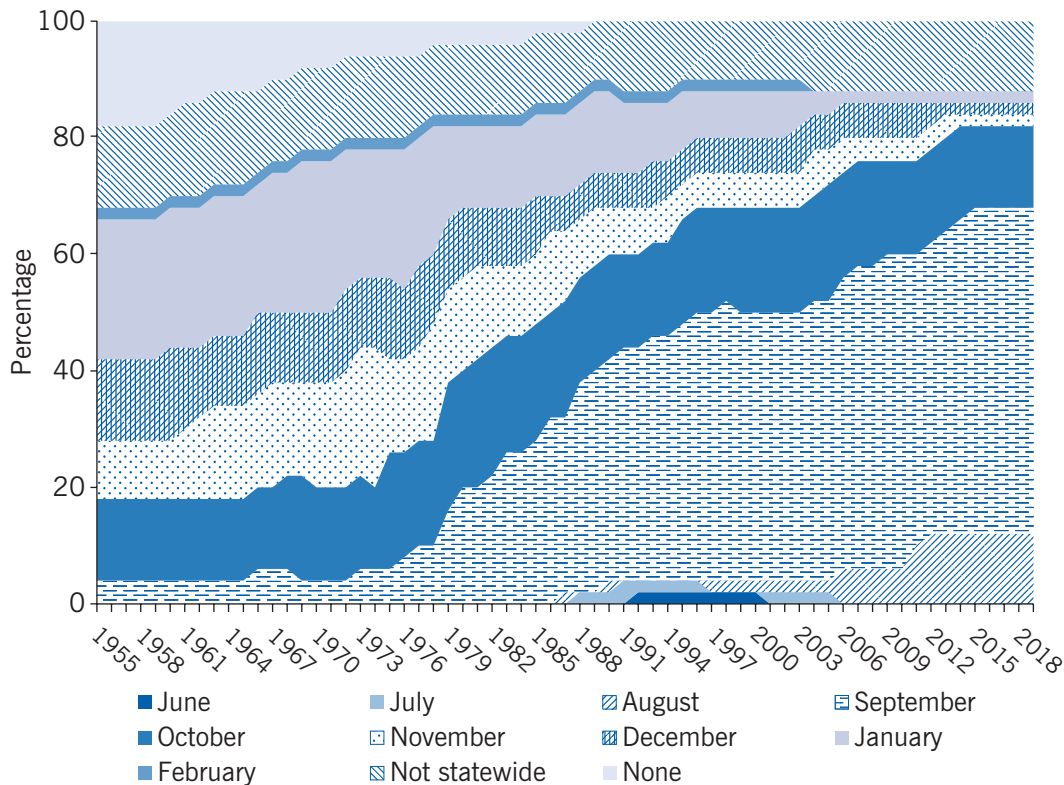
Contrary to the rest of the world, since the mid-1950s, state legislatures in the US have been increasing school eligibility ages by pushing back the month at which children are eligible for school from later (e.g. January) to earlier (e.g. September) in the school year (Figure 2) [1]. This has been occurring for three main reasons. First, when policymakers opt for an earlier cut-off date, this ensures that the student group entering primary school is, on average, older than they otherwise would have been, which may improve school readiness [1]. Second, and perhaps most important to policymakers, backing up

Figure 1. School-entry age by percentage of countries, 1970–2020



Source: Authors' own compilation based on data from: World Bank, "World Development Indicators." Online at: <http://data.worldbank.org/indicator/SE.PRM.AGES> [Accessed July 1, 2021].

Figure 2. School-entry cut-off dates across US states, 1955–2019



Note: "Not statewide" means the legislated school-entry age is not mandated across some states. In 2019, the school-entry cut-off date was not mandated statewide in 12% of US states.

Source: Authors' own compilation based on data compiled from state statutes and information collected from corresponding historical state session laws and regulations relating to the statutes. More information on the data can be found in Bedard, K., and E. Dhuey. "The persistence of early childhood maturity: International evidence of long-run age effects." *Quarterly Journal of Education* 121:4 (2006): 1437–1472 [2].

the cut-off date means that students are older when taking national and international assessments, which may improve relative test-score rankings. Finally, backing up the cut-off date reduces the incoming cohort class size, which can result in temporary savings for governments [1].

There is evidence that moving the school-entry cut-off date earlier in the year has positive long-term effects for impacted children. Using birth cohorts in the US from the 1960s and 1970s, one study estimates that moving the cut-off date one month earlier (i.e. from January 1 to December 1) increased male hourly earnings by approximately 0.6% on average but had no impact on female hourly earnings [1].

Measuring the effect of age at school entry

Measurement of the effect of age at school entry on short- and long-term outcomes is often a composite effect of the child's age when they start school (absolute age), the age of the child at testing (or outcomes being measured), and the age of the child relative to their peers in their cohort (relative age). Much of the literature estimates the entire composite effect by using quasi-random variation in children's birthdays around school-entry cut-off dates, which results in some children being a full year older than the youngest students in a cohort. This allows researchers to compare outcomes of children born just before and after the cut-off. Note that in using this methodology it is not possible to determine how much of the composite effect is due to the individual relative and absolute age components.

Short-term outcomes

Overall, the literature finds that children who are relatively older than their classmates at the beginning of primary school have many short- and medium-term advantages, such as scoring higher on standardized exams through primary and secondary school, enrolling more in pre-academic university-track programs and high-end universities and receiving fewer disability labels and special education services [2], [3].

A recent study using rich administrative data estimates that, in the US state of Florida, September-born children (oldest in class) score approximately 0.2 standard deviations higher in standardized tests than August-born children (youngest in class) [3]. This effect persists throughout grade school, with especially large test gaps in grade 3 and a slightly smaller, though still large, gap in grade 8. Importantly, the size of the test score age gap is stable across different levels of maternal education, income status, race/ethnicity, gender, deciles of birth weight, gestational age, and school quality [3]. These results suggest that, at least for test scores, the benefits of starting school older are not concentrated among children with certain sociodemographic characteristics.

In the same study, however, there is evidence of large age gaps in non-test score outcomes across sociodemographic groups. For instance, in terms of being identified with a disability and taking advanced placement courses, the age differential is smaller for higher-educated and higher-income families. In addition, for kindergarten readiness, the age gap in performance is substantially larger for children from low-income backgrounds [3]. These diverse age effects in non-test outcomes indicate that countervailing remediation

strategies may be necessary to offset the age disadvantage for younger students from underprivileged families [3].

Long-term outcomes

Early differences in maturity at school entry can enhance a student's knowledge and skill development throughout childhood, adolescence, and adulthood, which may have important long-term implications for productivity, employment, and earnings. Attempts to estimate the impact of age at school entry on several adult outcomes have led to mixed and sometimes inconclusive results. For instance, the long-term wage effects of being young at school entry are still unknown: there is some evidence that older children in Mexico earn higher wages [4], but other studies using data from Sweden and Norway find no long-term wage effects [5], [6]. In addition, some studies find that older children are less likely to drop out of high school in Florida [3], while other research suggests that the opposite is true for children in North Carolina [7].

These contrasting results may be partially due to the interaction between starting school later and dropping out of school earlier in countries where compulsory school-attendance laws are based on age instead of grade level. That is, a proportion of students who enter school late may drop out of secondary school in an earlier grade because they reach the end of their compulsory schooling. In addition, in the US, older children are more likely to commit a serious crime by the age of 19 [7]. However, in Denmark, where high-school withdrawal is based on grade completion (rather than age as in the US), older school starting ages reduce the likelihood of committing a crime [8]. These contrasting results suggest that the institutional context can exacerbate or ameliorate the effects of relative age on several long-term outcomes that are of particular concern to policymakers.

Parental practices: Increasing the school-starting age through “redshirting”

School-enrollment data shows that in the autumn of 1968, 96% of six-year-olds were enrolled in first grade or above in the US. In 2005, this proportion dropped to 84% [9]. Moreover, while the school-attendance rate remained steady, kindergarten classes consisted of a substantial share of six-year-olds who otherwise should have been entering first grade. Further analyses show that only 25% of these changes were due to adjustments in the school-entry cut-off dates—an astounding 75% was due to parents delaying their children's entry into school [9].

The practice of delaying a child's entry into school despite the child being eligible to attend is referred to as “redshirting.” The term was coined in reference to the red jerseys worn by students in their first year of university athletics to indicate that they were delaying their participation in a particular sport to lengthen their period of eligibility. Data suggest that approximately 4–6% of children in the US are redshirted. These children are more likely to be male, white, and from families of high socio-economic status [3], [10]. Parents redshirt their children for a variety of reasons, including believing that they are not developmentally ready for school or to give them a strategic advantage by allowing them to become older, bigger, taller, or to possess more social and cognitive skills than their younger classmates.

There is limited evidence that redshirting benefits children in the long term. While it is difficult to estimate the effects of redshirting because it is not possible to know how well a child would have done if he or she had not been redshirted, studies using external variation in students' ages through randomization and cross-state differences in school-entry cut-offs estimate that the positive effects of being older at the start of kindergarten do not persist over time. In fact, by high school, they are non-existent [10]. One potential explanation for this finding is that when parents redshirt their children, they alter the age distribution in the classroom as well as their child's peer group. As such, redshirting may have harmful consequences if older children have much younger classmates who are less mature and have had relatively less time to develop cognitive and social skills. This also suggests, however, that younger students may actually benefit from redshirting by being surrounded by older peers [10]. Note, however, that these effects only hold for current levels of redshirting; it is not possible to predict what would occur if more parents were to hold their children back.

Redshirting may also potentially generate adverse economic effects. It can cost a family an additional year of childcare or a year of forgone income for a caregiving parent. For some children, entering school later is associated with increased rates of dropping out of secondary school in jurisdictions where compulsory schooling laws are age based (like in the US). Additionally, redshirting delays workforce entry by a year, which might have negative consequences for lifetime earnings and may also generate costs to society if these individuals pay into pension plans, such as Social Security in the US, for one less year [9].

Although the research does not provide definitive evidence on whether redshirting is good or bad for children, the choice to delay school entry is highly context contingent and therefore must be determined on a per-family basis. Finances, marital status, parental labor supply, access to affordable childcare, and the presence of other children in the household are some of many factors that may potentially influence this decision. While there is no economic case for policymakers to ban redshirting, it should be kept in mind that not all families have the same ability or opportunity to redshirt their children and so its permissibility may exacerbate class or social differences, potentially leading to greater perceptions of unfairness among parents and within society.

Offsetting the age advantage: School remediation techniques

While recent literature suggests that school quality does not mediate the size of the age gap, there is some suggestive evidence that certain school practices may offset advantages stemming from school-entry cut-off dates [3]. For example, larger class sizes may increase the age gap in test scores [3]. Early grade retention may also mitigate age disadvantages: while children from higher-income households are more likely to be redshirted than those from lower-income households, the latter group is more likely to experience early grade retention [3]. This sociodemographic differential across remediation strategies may explain the large sociodemographic differences in kindergarten readiness age gaps, and the lack of sociodemographic differences in test score age gaps in later grades. In this sense, early-grade retention policies, which effectively eliminate age differences between redshirted and non-redshirted children in higher grades, hold considerable promise for improving the short-term outcomes of younger students—especially those from disadvantaged families [3].

School starting age policy concepts

Early grade retention: Requiring a student to repeat a particular grade during the early grades of primary education.

Tracking: Providing different education resources or placements to students according to their academic performance levels. Also, referred to as phasing or streaming.

Ability grouping: Grouping students by performance levels within a learning environment.

A study using administrative student records from Sweden reveals that postponing the age at which children are placed into tracking or ability groups also mitigates initial age advantages [5]. The fact that these two school-level policies—that is, early grade retention and the postponement of tracking—diminish the relative age advantage suggests that more causal evidence is necessary to understand the extent to which other school practices reduce age gaps.

LIMITATIONS AND GAPS

Despite the large literature on school-entry ages, the optimal starting age is still unknown, and many important questions remain unanswered. For example, the causal effects of various school practices are not well-understood. Cultural considerations are also important when comparing results across studies that use data from different countries, as the age gap may be larger in some jurisdictions because of particular social institutions that lead to considerably different educational systems and outcomes. Inconclusive evidence on the long-term effects of school starting ages also remains problematic.

It is critical to highlight that most of the existing literature on school-entry ages is unable to determine which of the following effects explains age gaps: age at testing, relative ages, and absolute ages. This is potentially problematic since children who start school at an older age may simply do better because they are being assessed when they are older. Alternatively, starting school at an older age could, in itself, be advantageous [11]. Due to data limitations, much of the literature estimates the entire composite effect of these three items, but a few recent studies have attempted to isolate them. These studies show that the age at testing accounts for most of the difference in academic outcomes between older and younger students, potentially suggesting the need to adjust school performance metrics according to the age composition of the cohort [11], [12]. More research is therefore necessary to understand the extent to which age at testing explains age differentials for other outcomes/contexts and whether they persist in the long term.

Finally, research investigating the mechanisms of relative-age effects on students' educational outcomes, how they propagate themselves across time, and over a variety of factors, would also be helpful for forming sound educational policy.

SUMMARY AND POLICY ADVICE

Is a late start a smart start? The results from empirical studies examining long-term outcomes are mixed. Nevertheless, in the US, a significant share of parents redshirt

their children at the beginning of each school year, and governments continue to change laws on age at school entry—all in an effort to improve student outcomes. While the evidence suggests that these practices may increase standardized test scores, it is crucial to recognize that other policies (or a lack thereof) also interact with a child's age and, in turn, influence the size of age gaps. For example, access to high-quality preschool programs likely matters a lot. In the US, five might be the optimal age to start school but in a country with a more comprehensive universal childcare system (like Norway) children could possibly begin school later because they are already receiving good quality early childhood education. In addition, there is suggestive evidence that early grade retention policies are important for mitigating socio-economic age advantages that stem from a greater ability to redshirt among high-income families. Other factors that policymakers should consider include: whether and how to address redshirting, ability grouping, special education, and compulsory school-attendance laws. It is unlikely that there is one single optimal school starting age; rather, it should be set in congruence with a deep understanding of the entire institutional context.

Acknowledgments

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Competing interests

The IZA World of Labor project is committed to the IZA Code of Conduct. The authors declare to have observed the principles outlined in the code.

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Further reading

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