Network on Early Childhood Education and Care

RESEARCH BRIEF ON THE IMPACT OF EARLY CHILDHOOD EDUCATION AND CARE (ECEC) ON ADULT EARNINGS

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Mr. Yagan has provided supplemental reading as background material for his presentation, and this document’s OLIS code is EDU/EDPC/ECEC/RD(2011)3.

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What is the impact of ECEC on adult earnings?

This brief provides estimates of the impact of three aspects of early childhood education – experienced teachers, class size, and the overall quality of the classroom environment – on students’ wage earnings later in life. It uses the following definitions.

**K-3**: An abbreviation for “Kindergarten through grade 3”, K-3 refers to the first four years of formal schooling.

**Teacher experience**: Teacher experience is the number of years a teacher has spent teaching.

**Class size**: For the purposes of this brief, small classes are classrooms with approximately 15 students. Large classes are classrooms with approximately 22 students.

**Overall quality of the classroom environment**: The overall quality of the classroom environment encompasses all aspects of a K-3 classroom that eventually affect students’ adult earnings. The overall quality of the classroom environment includes factors that are easy to measure like teacher experience and class size, as well as those that are hard to measure like teacher dedication and peer behavior.

**Adult wage earnings**: The educational experiment I discuss involved K-3 students. A student’s adult wage earnings is the total income earned from employment during a given year of the student’s adult life.

What is at stake?

**Economic growth**: A country’s GDP depends on the skills of its workforce. By improving early childhood education, a country can improve the skills of the next generation of workers and thereby raise GDP.

**Inequality**: Income inequality persists across generations: children of high-income parents usually grow up to be high-income adults, and children of low-income parents usually grow up to be low-income adults. If early childhood education has a large impact on adult earnings, then improving early childhood education for children of low-income parents can reduce income inequality in the long run.

How much does early childhood education matter?

This brief presents results from the only large-scale experimental study ever conducted that measures the causal effect of early childhood education on adult earnings. It is based on a randomized education experiment in the United States (see ANNEX A) in which 12 000 K-3 students and their teachers were randomly assigned to different classrooms within their public schools. Data from the experiment were linked to administrative tax records, allowing the study to follow the experiment’s participants into adulthood.

Because of the random assignment, the study measures the causal effect of early childhood education on adult earnings. The scientific validity of the results is similar to that of randomized medical trials.

Based on data through age 27, the study estimates that a one-standard-deviation better K-3 classroom environment caused the average child in our experiment to earn nearly 40 000 USD more over his or her

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lifetime. For a classroom of 20 students, this constitutes a present-value earnings gain of over 750,000 USD. Thus the stakes at play in early childhood education are enormous.

What matters most?

Teachers are extremely important

In the experiment, some kindergarten students were randomly assigned to experienced teachers. Other kindergarten students were randomly assigned to inexperienced teachers. Figure 1 shows that, 20 years later, the students who had been randomly assigned to experienced teachers earned 1,104 USD (6%) more than those who had been randomly assigned to inexperienced teachers. The impact emerges after the subjects have finished college.

![Figure 1: The Causal Effect of Kindergarten Teachers on Adult Wage Earnings](image)

The random assignment ensures that there were no systematic differences between the students assigned to experienced teachers and those assigned to inexperienced teachers. Thus Figure 1 is proof that experienced kindergarten teachers caused their students to earn substantially more as adults.

This result must be interpreted very carefully. The finding is not proof that experience improves teacher quality. The reason is that experienced teachers may be great teachers for reasons other than their experience – for example, they may be more dedicated to the teaching profession. The finding is simply proof that kindergarten teachers have an enormous causal impact on their students’ eventual adult earnings.

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2 The study is able to analyze the overall quality of the classroom environment because of the random assignment. See the paper for details.
Non-cognitive skills may be very important

Recent evidence has led many to believe that educational interventions do not have substantial long-term impacts. For example, in the experiment discussed here, the classroom environments that eventually raised students’ adult earnings had also raised students’ K-3 math and reading test scores, but they had not significantly raised subsequent math and reading scores. Thus many have feared that the effects of educational interventions “fade out” and do not impact long-term outcomes.

How could K-3 classroom environments (such as classrooms with experienced teachers) have a large impact on adult earnings without having a large impact on subsequent math and reading scores? The evidence is far from conclusive, but a leading theory is that K-3 education has a large and lasting impact on “non-cognitive” skills – such as attitude, effort, initiative, and the ability to get along well with others – and that these non-cognitive skills are relatively unimportant for subsequent math and reading tests but are very important for eventual labor market success. The experimental data lend some support to this theory: K-3 classroom environments did not have significant impacts on subsequent math and reading scores but did have significant impacts on subsequent non-cognitive scores. Thus early childhood education may affect adult earnings by imparting long-lasting non-cognitive skills. Other recent research supports this theory (e.g. Heckman, Stixrud and Urzua 2006).

No evidence that class size is important

In the experiment, some K-3 students were randomly assigned to small classes. Other K-3 students were randomly assigned to large classes. Figure 2 shows that, 20 years later, the K-3 students who had been randomly assigned to small classes earned exactly as much as those who had been randomly assigned to large classes.

Thus there is no evidence that small K-3 classes raise adult earnings. The effect is statistically imprecise so the true effect of small K-3 classes could be substantially positive or even negative.

This is a “disappointing” result because the experiment had been originally designed to measure the impact of small classes. And as in other studies, small classes in this experiment significantly raised
students’ K-3 test scores. Yet despite the test score gain, there is no evidence that small K-3 classes raise students’ later-life earnings.

What implications for policy?

Teachers

Do whatever it takes to hire and retain only the very best ECEC teachers – even if you have to pay them hundreds of thousands of dollars per year. If the study’s results apply broadly across the OECD, member countries should be willing to pay 320 000 USD per year to replace a below-average teacher with an above-average teacher. In particular, it is critical that member countries both (a) hire and retain outstanding teachers and (b) avoid hiring and retaining less outstanding teachers.

The research does not directly inform teacher personnel policy, but countries should experiment with personnel policies such as the following. The current teacher personnel model in many countries is to pay teachers a modest annual salary and to rarely push teachers out of the profession. Member countries should consider an alternative model: paying teachers a large salary while allowing only the best teachers to remain. The results presented here show that K-3 teaching is very high stakes: the difference between being taught by an above-average teacher and a below-average teacher is enormous. The private sector often follows the model of high pay and low retention in order to ensure that only outstanding employees remain in critically important positions. The process of selecting the best teachers will never be perfect, but if this alternative personnel policy substantially improves average teacher quality, it could provide a better future for millions of children. This kind of system is consistent with personnel policies toward low-performing teachers in the world’s best school systems (Barber and Moursched 2007) and the policy implications of recent economic analyses (e.g. Hanushek 2010, Staiger and Rockoff 2010).

Curriculum

Emphasize non-cognitive skills in ECEC curricula. Non-cognitive skills – such as a good attitude and the ability to get along well with others – may be the key channel through which early childhood education impacts adult earnings and may be more important than standard cognitive skills like math and reading.

Class size

Stop spending money to reduce ECEC class size. Reducing class size is very expensive, but there is currently no evidence that small K-3 classes raise later-life earnings. Member countries should therefore focus less on reducing class size and more on hiring and retaining only the very best teachers.

What is still unknown?

Key questions remain. Four of the most important are:

- How can schools recruit and retain only the best teachers?
- Are non-cognitive skills the main channel through which K-3 classrooms affect adult earnings?
- How large are the long-term impacts of early childhood peers?
- Do the long-term effects of ECEC differ across countries and demographic groups?
The study's authors use a unique randomized experiment to measure the long-term impacts of early childhood education. It analyzes the long-term impacts of Project STAR, one of the most widely studied education experiments in the United States. The Student/Teacher Achievement Ratio (STAR) experiment randomly assigned one cohort of 11,571 students and their teachers to different classrooms within their schools in kindergarten through grade 3. Some students were assigned to small classes (15 students on average) in grades K-3, while others were assigned to large classes (22 students on average). The experiment was implemented across 79 schools in the state of Tennessee from 1985 to 1989. Data from the experiment were linked to administrative tax records, allowing the study to follow 95% of STAR participants into adulthood. No other large-scale study links data on almost every participant of an early childhood education experiment to his or her adult earnings.
REFERENCES


