

The Economic Cost of the Pandemic

STATE BY STATE

ERIC A. HANUSHEK

ABSTRACT

Data from the National Assessment of Educational Progress (NAEP) now show the significant impact of the pandemic on learning. The abstract nature of test score declines, however, often obscures the huge economic impact of these learning losses. NAEP results indicate large differences in learning losses across states, and this analysis provides state-by-state estimates of the economic impacts of the losses. Students on average face 2 to 9 percent lower lifetime income depending on the state in which they attended school. By virtue of the lower-skilled future workforce, the states themselves are estimated to face a gross domestic product (GDP) that is 0.6 to 2.9 percent lower each year for the remainder of the twenty-first century compared to the economic expectations derived from pre-pandemic years. The present value of future losses for states depends directly on the size of each state's economy. At the extreme, California is estimated to have lost \$1.3 trillion because of learning losses during the pandemic. These losses are permanent unless a state's schools can get better than their pre-pandemic levels.

• • •

Much of the discussion of the educational impact of the pandemic has been phrased in terms such as test score points or standard deviations that have little meaning to most people. But the abstract nature of the discussion belies both the seriousness of the problem and the certainty of economic harm that lies ahead. Without action, not only will individuals in the COVID cohort of students suffer long-term income losses, but also the individual states will see shrunken economic activity.

This analysis discusses the potential economic impact of the learning losses suffered during the pandemic. Two factors enter into this. First, there is now consistent, state-by-state data on how learning patterns have changed. Second, there is substantial economic analysis related to the US labor market that allows direct estimation of the impact of the pandemic.

Learning after March 2020

As the extent and seriousness of the COVID-19 problem became apparent in March 2020, the nation's K–12 schools closed to in-class instruction. Few schools were prepared for these closures, and there was a massive effort to find ways to continue schooling, if only in a



partial and temporary manner. In the subsequent school year there were varying responses ranging from full return to in-class instruction to full use of different ways to deliver remote instruction. A number of hybrid approaches that mixed some in-class with some remote instruction also emerged. In each case, the quality of schooling showed large variations due to the different choices made about technology, implementation strategy, and curricular integrity.

On top of the choices made by schools, there were significant differences in how families and students responded. Families were looking for the options that best served their demands, and families tended to become more personally involved in their children's education.

All of these factors played out unevenly, with some children faring much better than others. The success of pandemic education was by all accounts skewed against disadvantaged children, although again there was high variance.

Various researchers have attempted to sort out how the circumstances of schooling since March 2020 have affected students. They have investigated such aspects as whether early reopening was better or how access to internet services and technology influenced outcomes. These issues are not addressed here. The focus here is on the observed achievement of students and the implications for the affected cohorts and for the different states.

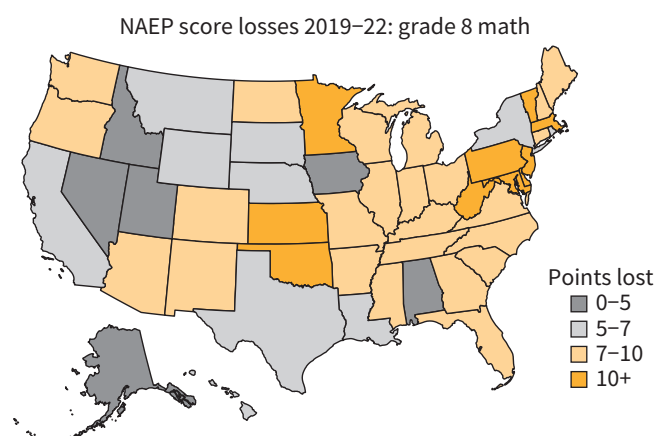
To assess the impact of the pandemic, we compare how the cohort of students in 2022 performed relative to the cohort of students in 2019. We call this comparison the "learning loss" from the pandemic. To be clear, individual students were not worse off. They just achieved less than what might be expected based on prior students' achievement. Moreover, the comparisons involve different cohorts of students that might differ in a variety of ways. Nonetheless, the test score comparisons provide an objective measure of the pandemic's impact, and there is no reason to believe that they are misleading about the learning differences.

Achievement Then and Now

The National Assessment of Educational Progress (NAEP) provides direct evidence on the learning losses that accrued through spring of 2022. In spring of 2019 and again in spring of 2020, NAEP tested fourth- and eighth-grade students in both math and reading.¹ The NAEP samples are large enough that reliable results of these tests are available not just for the nation but also for all of the states plus the District of Columbia.

This analysis considers just the eighth-grade performance. It does so because this performance links directly to the economic analyses that provide information on the future costs to individuals and the economy of the observed differences in student performance.

Figure 1. Size of COVID losses on NAEP for grade 8 math



Looking across the nation, the average score for eighth-grade math fell for every state, with a national average decline of eight NAEP scale score points (see figure 1). This was enough to erase all of the gains that had occurred since 2000. The pattern of losses can readily be seen in the map. While losses are somewhat larger in the eastern half of the country, there is no clear-cut pattern of losses. Reading losses were less, averaging a decline of three points across the states.

The averages, however, hide very large differences among the states. While Utah only lost 2.7 points in math, Oklahoma and Delaware each lost more than twelve points on average. For reading, Hawaii, Nevada, and Arkansas each had 2022 scores slightly above 2019 scores, while Maine students lost more than eight points.

The losses in reading and math were correlated across states: states losing less in math also tended to lose less in reading (see figure 2). There were, however, some exceptions. For example, Washington, DC; New Jersey; and Arizona students had relatively small learning losses in reading compared to large math losses.

It is also clear that the magnitude of learning loss was essentially unrelated to the level of scores in 2019. As seen in figure 3, while some low-scoring states also had large losses (e.g., New Mexico and Washington, DC), Alabama had relatively less loss. However, the three highest-scoring states in 2019 (Massachusetts, New Jersey, and Minnesota) had some of the largest losses.

Interpreting the Losses

While it is possible to see how new scores compare to scores in the past, it remains difficult to interpret the magnitude or significance of the observed losses. Does it matter that NAEP scores declined by eight points through the pandemic?



Figure 2. NAEP learning losses in reading and math between 2019 and 2022

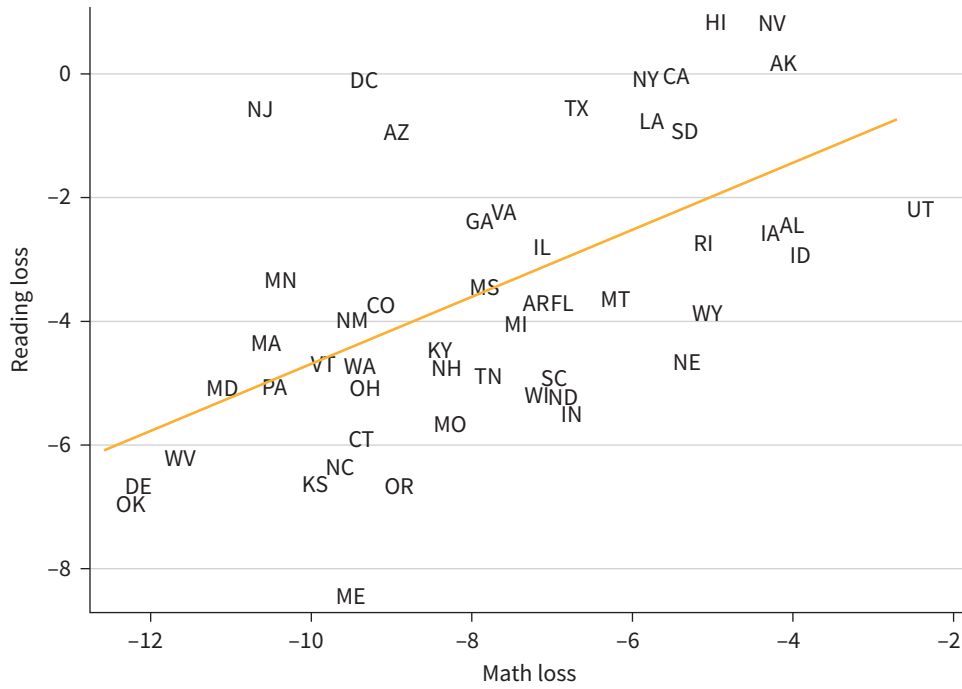
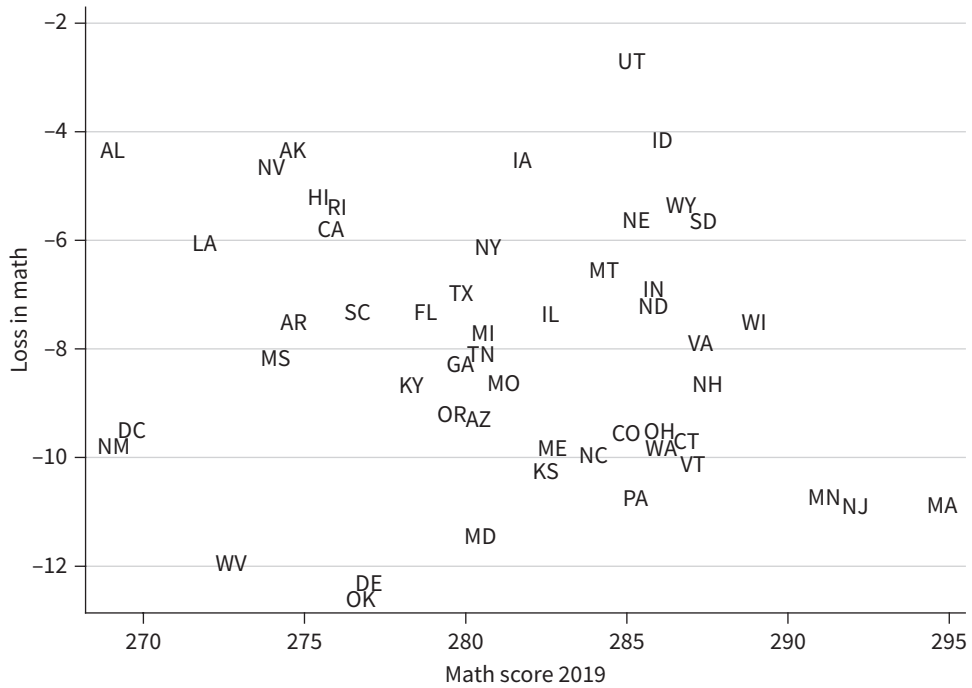


Figure 3. Learning losses in math compared to the level of math scores in 2019



One common presentation places the score declines in terms of standard deviations of the test, or in terms of how spread out the individual scores are. For math, the standard deviation of individual student scores is forty points. Thus, the national average loss of eight points is 0.20 standard deviations. While still not easily interpreted, this implies that the average eighth grader in 2022 would score in the forty-second percentile of eighth graders in 2019.

An alternative way to put these losses into perspective uses the rule of thumb that one standard deviation difference in test scores is roughly equivalent to three to four years of schooling. By this metric, the 0.20 standard deviation of losses would be equal to 0.6–0.8 years of schooling lost. While this calculation makes it clear that a common approach to dealing with the pandemic by adding school days or time is unlikely to make up for the learning losses, it distracts from the perspective that considering schooling quality, not quantity, is the most important policy response.

The learning drop, it turns out, has large significance for individuals and for states, because history suggests the very significant economic loss that is likely to be associated with this achievement drop. The following sections translate this loss into economic values and describe how the variation across states differentially affects economic outcomes.

Lost Earnings

Extensive research demonstrates a simple fact: those with higher achievement and greater cognitive skills earn more (Hanushek et al. 2015). The evidence suggests that the value of higher achievement persists across a student's entire work life.

The United States rewards skills more than almost all other developed countries. The high value of skills in the US simply reflects the dynamic, technologically driven economy where workers are continually adjusting to new jobs and new ways of doing things (Hanushek et al. 2017).

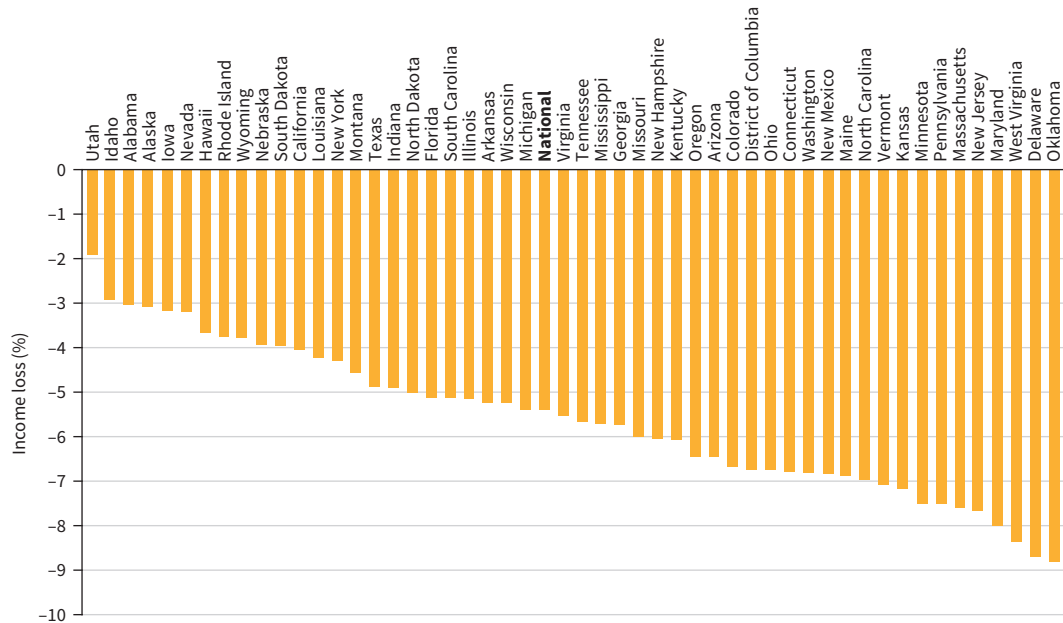
But the equivalent way of viewing the high rewards of skills is that the United States punishes those without skills more than other countries. In other words, those with lower achievement see larger negative impacts on their lifetime earnings than found elsewhere.

The evidence on the labor market value of skills implies that the average student during the pandemic will have 5.6 percent lower lifetime earnings. This figure compares the expected earnings given the eight-point loss in math achievement to what could have been expected without the pandemic.

The future-income impact of the pandemic also differs dramatically by which state the student was in during the pandemic. Figure 4 displays the percentage drop in income by



Figure 4. Expected loss in lifetime income from learning losses by state of schooling



state based on the varying learning losses seen in the NAEP scores. (These calculations consider just average state skill levels; they value skills the same across the country, reflecting the fact that many people move away from where they were educated.)

Students from Utah, where the average learning loss was least, can expect slightly less than a 2 percent loss of lifetime income. On the other hand, students from Delaware and Oklahoma can expect nearly a 9 percent loss in future income by virtue of impaired education during the pandemic.

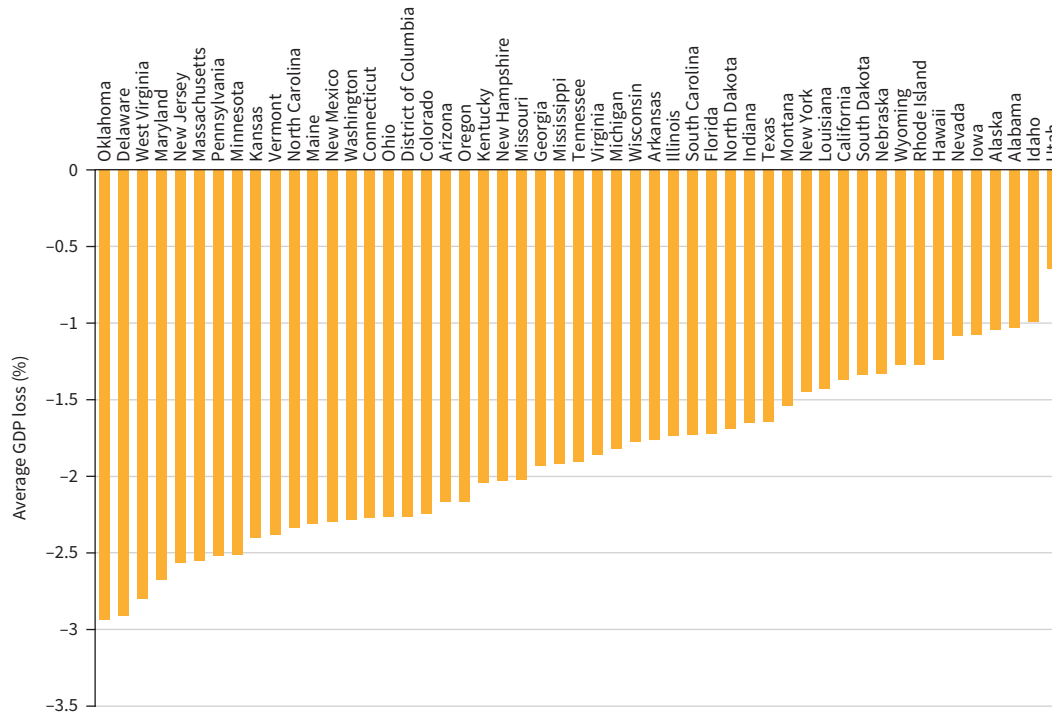
These average losses do obscure the large variation in losses to individuals. The existing data points to significantly larger impacts on disadvantaged students who tended to fare worse during the pandemic. The exact magnitude of this differential is, however, not known.

State-by-State Aggregate Impacts

Research also indicates that economic growth of states is highly dependent on the quality of the state's labor force (Hanushek, Ruhose, and Woessmann 2017a, 2017b). This research parallels international investigations that show national growth depends on the skills of the population, but it considers economic growth at the level of individual states.

The pandemic's effects imply that the future workforce will be less prepared to contribute to economic growth. Even if education returns to its pre-pandemic quality, there is a cohort of students that will move through the future labor force with lower skills and achievement

Figure 5. Expected average percent GDP loss over the twenty-first century



than those both before and after them. This lowered aggregate skill level will, by historical observations, lead to a slowdown in growth relative to what would have occurred without the pandemic.

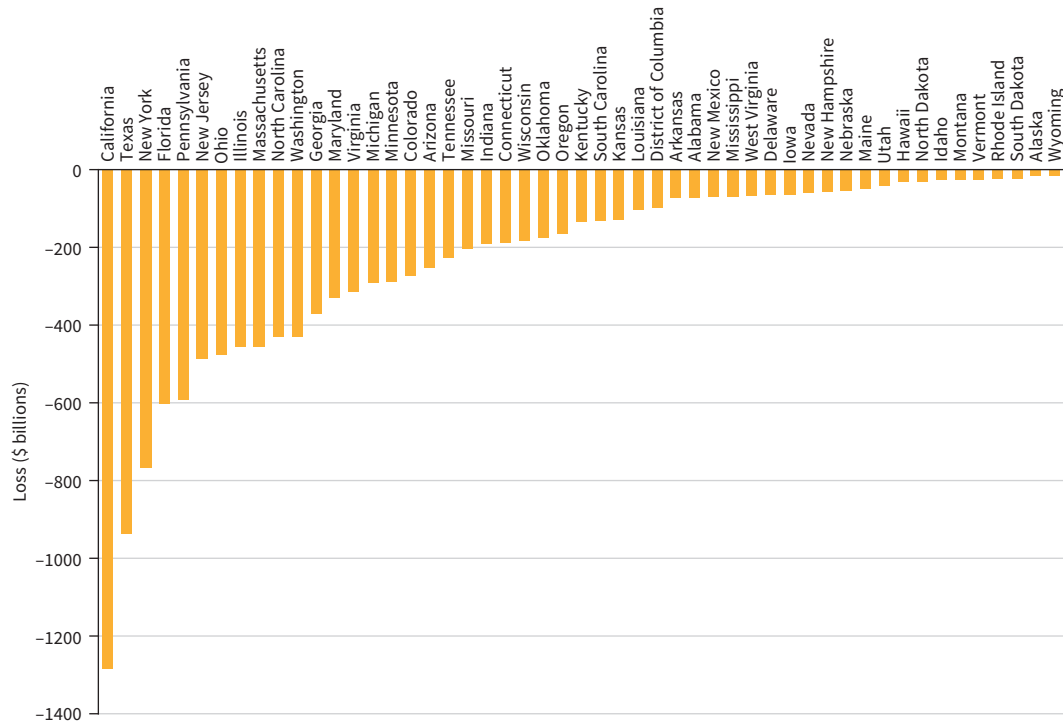
Because the affected students are in school and have yet to enter the labor force, the immediate impact on the states' economies is zero. And, because the impact is not felt until these students finish school, enter the labor force, and become a substantial part of the labor force, people are prone to ignore the real impact. That is a mistake, because the economic impact is truly significant.

It is possible to use the evidence about how skills affect state growth to estimate the financial impact of the pandemic that comes from learning losses in the COVID cohort.² Based on the assumption that learning returns to its previous pace during the current school year, the state-by-state impact on growth rates can be calculated. These can then be compared with what would have occurred in the absence of the pandemic (see figure 5).³

Across the states, gross domestic product (GDP) for the remainder of the twenty-first century will be lower by between 0.6 percent (Utah) and 2.9 percent (Oklahoma and Delaware). These losses average 1.9 percent across the states and directly follow the learning losses previously identified. In other words, even though the impact is not felt for a number of



Figure 6. Present value of total expected economic loss over the twenty-first century



years, there is a huge impact. Each year for the remainder of the century, state GDP will average almost two percent lower.

How large is this economic loss? The total revenue for schools pre-pandemic, although varying by state, averaged about 3.5 percent of state GDP. In other words, the continuing annual loss in GDP is over half of the annual school budgets, including all state, local, and federal funding.

The economic loss for each state depends on both the learning losses suffered by its students and the size of the state's economy. The lower skills of the state workforce lead to lower growth, and these costs accumulate over time. To summarize the total costs that come in the future, economists calculate the present value of future losses. This calculation discounts future costs to reflect not only the uncertainty of the future estimates but also the fact that it is not as painful to have losses that do not happen for a long time. The present value of losses can be thought of as how large of a bank account would be needed today to offset completely the future losses at the time they occur.⁴ The present value of losses allows direct comparison of the aggregate future costs of the pandemic with current income levels.

Because of its large economy, California will suffer the largest impacts, amounting to \$1.3 trillion (figure 6). The other large economies—Texas, New York, Florida, and

Pennsylvania—will suffer present value of losses of more than \$500 billion. The absolute size of loss is obviously smaller in states with smaller economies, but when compared with these states' normal economic activity, the loss remains very large.

Do These Losses Go Away?

The calculations of economic costs assumed that all schools have returned to their January 2020 level of performance and that the NAEP losses measured in spring of 2022 are permanent. Some argue, however, that either kids are resilient enough or parents and schools will adjust to make up for those losses.

The existing evidence, although largely international, suggests that just returning to the previous normal will leave the losses as permanent. Perhaps the best evidence comes from Germany, where the move to adjust the school calendar left a cohort of students with shortened school years. When the career history of these students is examined, the affected cohort stands out in terms of lower income throughout their work life (Cygan-Rehm 2022). Other evidence comes from the analyses of the impact of long teacher strikes. For example, schools in Argentina have historically been plagued by frequent and long-lasting teacher strikes, with the incidence of them varying significantly across provinces. Subsequent earnings at age thirty to forty for those who were primary-school students in provinces with the most strikes are significantly below earnings of those in less strike-prone provinces (Jaume and Willén 2019). Similar evidence is found elsewhere.⁵ Finally, other evidence comes from analyzing the impact of summer breaks on the pattern of learning gains in the United States (Kuhfeld et al. 2020). Interestingly, this latter research also shows that school breaks have a larger impact on math than reading—just what appears in the NAEP estimates of learning losses due to the pandemic.

In short, fully returning to prior schooling practices can halt increases in learning losses, but simply returning to these practices will leave this generation and the nation worse off.

Conclusions

The pandemic has had devastating effects in many areas, but none are as potentially severe as those on education. There is overwhelming evidence that students in school during the closure period and during the subsequent adjustments to the pandemic are achieving at significantly lower levels than would have been expected without the pandemic.

The losses cannot be pinned entirely on the schools, even if they contributed to them. But the responsibility for recovery from these losses necessarily falls on the schools.

Efforts to date have not been sufficient to arrest the losses. If the schools are not made better, there will be continuing economic impacts as individuals and the nation will suffer from



a society with lower skills. And, while some states have less learning loss to make up, none can avoid taking on the task of improving the schools.

ACKNOWLEDGMENTS

This analysis benefited from the excellent assistance of Danielle Handel and from prior work and discussion with Ludger Woessmann.

NOTES

1 All NAEP data can be found at <https://www.nationsreportcard.gov>. There are two different forms of NAEP testing: long-term trend (LTT) and main NAEP. This analysis focuses exclusively on the main NAEP results, which have been available nationally and for a majority of states since 1990. The LTT NAEP report has been available nationally since the 1970s and is designed to maintain the same testing framework. LTT NAEP has tested students at ages nine, thirteen, and seventeen during various years. Documentation of the national change in scores for students at age nine between 2020 and 2022 is available, and it provides results of losses that are consistent with the losses analyzed here.

2 The methodology for the projections follows that in Hanushek and Woessmann (2020), which estimated the immediate impact of school closures for the G20 countries. It uses the growth analysis for US states found in Hanushek, Ruhose, and Woessmann (2017a, 2017b).

3 Growth in state GDP in the absence of the pandemic is assumed to be at the national level of 1.5 percent per year.

4 For such calculations, it is common to discount future losses at 3 percent. This is the assumed interest rate that the bank pays on the account.

5 See Belot and Webbink (2010) on strikes of Belgium teachers and Baker (2013) on strikes of Canadian teachers.

REFERENCES

Baker, Michael. 2013. "Industrial Actions in Schools: Strikes and Student Achievement." *Canadian Journal of Economics* 46, no. 3:101436.

Belot, Michèle, and Dinand Webbink. 2010. "Do Teacher Strikes Harm Educational Attainment of Students?" *Labour* 24, no. 4:391406.

Cygan-Rehm, Kamila. 2022. "Lifetime Consequences of Lost Instructional Time in the Classroom: Evidence from Shortened School Years." CESifo Working Paper No. 9892. Munich: CESifo (August). <https://www.cesifo.org/en/publications/2022/working-paper/lifetime-consequences-lost-instructional-time-classroom-evidence>.

Hanushek, Eric A., Jens Ruhose, and Ludger Woessmann. 2017a. "Economic Gains from Educational Reform by US States." *Journal of Human Capital* 11, no. 4:44786.

———. 2017b. "Knowledge Capital and Aggregate Income Differences: Development Accounting for US States." *American Economic Journal: Macroeconomics* 9, no. 4:184224.

Hanushek, Eric A., Guido Schwerdt, Simon Wiederhold, and Ludger Woessmann. 2015. "Returns to Skills around the World: Evidence from PIAAC." *European Economic Review* 73 (January): 10330.

———. 2017. “Coping with Change: International Differences in the Returns to Skills.” *Economics Letters* 153:1519.

Hanushek, Eric A., and Ludger Woessmann. 2020. “The Economic Impacts of Learning Losses.” Paris: OECD (September). <https://www.oecd.org/education/The-economic-impacts-of-coronavirus-covid-19-learning-losses.pdf>.

Jaume, David, and Alexander Willén. 2019. “The Long-Run Effects of Teacher Strikes: Evidence from Argentina.” *Journal of Labor Economics* 37, no. 4:1097139.

Kuhfeld, Megan, James Soland, Beth Tarasawa, Angela Johnson, Erik Ruzek, and Jing Liu. 2020. “Projecting the Potential Impacts of COVID-19 School Closures on Academic Achievement.” EdWorkingPaper No. 20-226. Brown University: Annenberg (May). <https://www.edworkingpapers.com/sites/default/files/ai20-226-v2.pdf>.



The publisher has made this work available under a Creative Commons Attribution-NonCommercial 4.0 International license. To view a copy of this license, visit <https://creativecommons.org/licenses/by-nc/4.0>.

The views expressed in this essay are entirely those of the author and do not necessarily reflect the views of the staff, officers, or Board of Overseers of the Hoover Institution.

Copyright © 2023 by the Board of Trustees of the Leland Stanford Junior University

29 28 27 26 25 24 23 7 6 5 4 3 2 1



About the Author



ERIC A. HANUSHEK

Eric A. Hanushek, the Paul and Jean Hanna Senior Fellow at the Hoover Institution, Stanford University, is internationally recognized for his economic analysis of educational issues. He received the 2021 Yidan Prize for Education Research. He has authored or edited twenty-four books and hundreds of articles. A distinguished graduate of the US Air Force Academy, he has a PhD from MIT.

Hoover Education Success Initiative

With passage in 2015 of the Every Student Succeeds Act (ESSA), states are again in charge of American education policy. To support them in this undertaking, the Hoover Education Success Initiative (HESI), launched in 2019, seeks to provide state education leaders with policy recommendations that are based upon sound research and analysis.

HESI hosts workshops and policy symposia on high-impact areas related to the improvement and reinvention of the US education system. The findings and recommendations in each area are outlined in concise topical papers.

The leadership team at HESI engages with its Practitioner Council, composed of national policy leaders, and with interested state government leaders. HESI's ultimate goal is to contribute to the ongoing transformation of the nation's education landscape and to improve outcomes for our nation's children.

For more information about the Hoover Education Success Initiative, visit us online at hoover.org/hesi.