

Jackson, C. Kirabo

**Article**

## Education inputs and human capital production

NBER Reporter

**Provided in Cooperation with:**

National Bureau of Economic Research (NBER), Cambridge, Mass.

*Suggested Citation:* Jackson, C. Kirabo (2014) : Education inputs and human capital production, NBER Reporter, National Bureau of Economic Research (NBER), Cambridge, MA, Iss. 3, pp. 14-17

This Version is available at:

<https://hdl.handle.net/10419/113810>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

Depression,” NBER Working Paper No. 16561, November 2010, and forthcoming in *Journal of Economic History*.

[Return to text](#)

<sup>11</sup> T. C. Neumann, P. V. Fishback, and S. E. Kantor, “The Dynamics of Relief Spending and the Private Urban Labor Market During the New Deal,” NBER Working Paper No. 13692, December 2007, and *Journal of Economic History*, 70 (1), March 2010, pp. 195–220.

[Return to text](#)

<sup>12</sup> B. Depew, P. V. Fishback, and P. Rhode, “New Deal or No Deal in the Cotton South: The Effect of the AAA on the Agricultural Labor Structure,” *Explorations in Economic History*, 50 (4), October 2013, pp. 466–86.

[Return to text](#)

<sup>13</sup> P. V. Fishback, W. C. Horrace, S. E. Kantor, “Did New Deal Grant Programs Stimulate Local Economies? A Study of Federal Grants and Retail Sales during the Great Depression,” NBER Working Paper No. 8108, February 2001, and *The Journal of Economic History*, 65 (1), March 2005, pp. 36–71; P. V. Fishback, W. C. Horrace, S. E. Kantor, “The Impact of New Deal Expenditures

on Mobility During the Great Depression,” NBER Working Paper No. 8283, February 2001, and *Explorations in Economic History*, 43 (2), April 2006, pp. 179–222. [Return to text](#)

<sup>14</sup> P. V. Fishback, J. Rose, and K. Snowden, *Well Worth Saving: How the New Deal Safeguarded Home Ownership*, NBER Series on the Development of the American Economy, Chicago, Illinois: University of Chicago Press, 2013, (based in part on P. V. Fishback, A. Flores-Lagunes, W. C. Horrace, S. E. Kantor, J. Treber, “The Influence of the Home Owners’ Loan Corporation on Housing Markets During the 1930s,” NBER Working Paper No. 15824, March 2010. [Return to text](#)

<sup>15</sup> C. L. Harriss, *History and Policies of the Home Owners’ Loan Corporation*, New York, New York: National Bureau of Economic Research, 1951. [Return to text](#)

<sup>16</sup> For more in depth surveys of the entire recent literature, see P. V. Fishback, “U.S. Monetary and Fiscal Policy in the 1930s,” NBER Working Paper No. 16477, October 2010, and *Oxford Review of Economic Policy*, 26 (3): 2010, pp. 385–413; and P. V. Fishback and J.

J. Wallis, “What Was New About the New Deal?” NBER Working Paper No. 18271, August 2012, and *The Great Depression of the 1930s: Lessons for Today*, edited by N. Crafts and P. Fearon, Oxford, United Kingdom: Oxford University Press, 2013, pp. 290–327.

[Return to text](#)

<sup>17</sup> C. Kitchens and P. V. Fishback, “Flip the Switch: The Spatial Impact of the Rural Electrification Administration, 1935–1940,” NBER Working Paper No. 19743, December 2013.

[Return to text](#)

<sup>18</sup> T. C. Neumann, J. Taylor, and P. V. Fishback, “Comparisons of Weekly Hours Over the Past Century and the Importance of Work Sharing Policies in the 1930s,” NBER Working Paper No. 18816, February 2013, and *American Economic Review Papers and Proceedings*, 103 (3), May 2013, pp. 105–10. [Return to text](#)

<sup>19</sup> E. White, K. Snowden, and P. V. Fishback, *Housing and Mortgage Markets in Historical Perspective*, National Bureau of Economic Research Conference Volume, Chicago, Illinois: University of Chicago Press, 2014.

[Return to text](#)

## Education Inputs and Human Capital Production

### C. Kirabo Jackson \*

Economists have long studied the role of education spending, schools, and teachers in the production of human capital. The recent availability of detailed datasets and powerful computing has permitted researchers to present more

*\*C. Kirabo Jackson is a Research Associate in the NBER’s Program in the Economics of Education, and an Associate Professor in the Department of Human Development and Social Policy at Northwestern University. His profile appears later in this issue.*

conclusive evidence regarding these topics. In this summary, I describe my recent work on these issues. I first discuss my work on the basic question of whether increased resources for school districts improve students’ long-run outcomes. I then narrow down the unit of analysis and discuss the effect of individual schools and particular school policies. Finally, I look inside schools and discuss my research on the role of teachers in promoting student learning.

### The Importance of School Spending?

Since the Coleman Report<sup>1</sup> (1966) showed that variation in school resources was unrelated to variation in student outcomes, researchers have questioned whether increased school spending actually improves students’ short- and long-run outcomes. The existing evidence on the effect of school spending on student outcomes used test scores as the

main outcome and yielded mixed results. Moreover, because there is mounting evidence that focusing on test scores may miss important effects on longer-run outcomes, the effect of school spending on long-run outcomes was unknown. In recent work,<sup>2</sup> Rucker Johnson, Claudia Persico, and I revisit the basic question of “does money matter?” We compile a panel of high-frequency school spending data linked to detailed information on the passage of state school-finance reforms. We then link the spending and reform data to detailed, nationally representative data on children born between 1955 and 1985 and followed through 2011 to study the effect of the reform-induced changes in school spending on long-run adult outcomes. We use the timing of the passage of court-mandated reforms as an exogenous shifter of school spending across cohorts within the same district. We find that a 20 percent increase in per-pupil spending each year for all 12 years of public school for children from poor families leads to about 0.9 more completed years of education, 25 percent higher earnings, and a 20 percentage-point reduction in the annual incidence of adult poverty. In contrast, we find small effects for children from non-poor families. We present several patterns to support a causal interpretation of the estimates.

We reconcile our findings with the mixed results in the existing literature by showing that even with a rich set of controls, relying on potentially endogenous changes in school spending will lead one to infer incorrectly that there is no relationship between school spending and student outcomes. Using higher-quality data and an improved methodology, our findings provide new, compelling evidence that money does matter and that increased school spending can meaningfully improve the longer-run outcomes of affected children.

## Effective Schools and School Policies

Related to the question of whether school spending matters is the ques-

tion of what kinds of education spending matter. A natural way to determine this is to identify the kinds of schools and programs that improve student outcomes. However, because students and parents typically select to schools and neighborhoods, it is often difficult to attribute differences in outcomes across schools to the schools themselves.

In a series of papers, I employ data from Trinidad and Tobago to address these selection issues. At the end of primary school, students take an exam and submit an ordered list of four secondary school choices. The students’ scores and choices are used to assign them to secondary schools using a serial dictatorship algorithm. Specifically, the highest-scoring student is assigned to their top choice, the next-highest-scoring student is assigned to their top choice among remaining schools, and so on until all school slots are filled. This algorithm creates many test score cut-offs such that students who have the same set of school choices and very similar test scores are assigned to different schools solely because some scored just above a cut-off while the others did not. In these papers, I construct instrumental variables based on the discontinuities created by the assignment mechanism to address self-selection bias and identify the causal effects of attending certain kinds of schools.

In one paper,<sup>3</sup> I assess whether and to what extent students benefit from attending a more-selective school. I find that attending a more-selective school has large positive effects on examination performance and secondary-school completion. The effects are twice as large for girls as for boys. In a follow-up paper,<sup>4</sup> I explore the extent to which the benefits of attending such schools are due to differences in inputs across schools or can be directly attributed to the high achievement levels of the peers. I compare the marginal effect of higher-achieving peers obtained within schools (a direct peer effect) to that of the marginal effect of higher-achieving peers obtained across schools. I present a framework within which the ratio of these two quantities

yields the fraction of the school selectivity effect that can be directly attributed to selective schools providing higher-achieving peers. Making such comparisons, short-run (direct) peer quality accounts for approximately one-tenth of the school selectivity effect on average, but at least one-third among the most selective schools. Because practices and inputs may not account for a sizable share of the benefits of attending the most-selective schools, these findings underscore that to understand how to improve student outcomes we must not only know which schools are successful, but also must know why.

Another potentially important innovation is single-sex schooling. Proponents of single-sex education argue that (a) single-sex schools allow for instruction tailored to the needs of each sex, (b) the presence of the opposite sex is distracting, and (c) single-sex schooling decreases gendered course selection. If these hypotheses hold true, then simply re-shuffling students to achieve sex-segregation would increase overall educational attainment and increase the representation of females in math and science fields. In another study,<sup>5</sup> I investigate the effects of attending single-sex secondary schools. I limit the analysis to public schools that share the same curriculum and follow the same national regulations to isolate a single-sex schooling effect. While simple comparisons show much better outcomes for those at single-sex schools, instrumental-variables models show that most students perform no better at single-sex schools and that girls took no more science or math courses. However, I do find that females with strong expressed preferences for single-sex schools do benefit. The results highlight the importance of dealing with selection and accounting for treatment heterogeneity. More broadly, the findings highlight the fact that there is likely no single school type that is best for all students. Looking at school interventions in a separate set of papers, I analyze the Texas Advanced Placement Incentive Program (APIP). The APIP is a high school college-prep intervention that includes cash

incentives for both teachers and students for passing scores earned on AP exams, teacher training, and curricular oversight. The program is targeted to schools serving predominantly minority and low-income students with the aim of improving college readiness. As the APIP was adopted in different schools at different times, I identify the program effect by comparing the change in outcomes of cohorts within the same school, before and after APIP adoption, to the change in outcomes for cohorts in comparison schools over the same time period. Because adoption of the APIP was not random, I present a series of tests to support a causal interpretation. In the first study,<sup>6</sup> I find that exposed cohorts passed more AP or IB examinations, had higher SAT scores, and were more likely to matriculate in college. In follow-up work<sup>7</sup> I find that exposed cohorts were more likely to persist in college, earn more college credits, hold higher GPAs, earn a bachelor's degree, be employed, and earn higher wages. These benefits were most pronounced for Hispanic students. These findings indicate that high-quality programs can improve the long-run economic well-being of disadvantaged students who attend inner-city schools.

## The Importance of Teachers

Because students spend most of their time in school interacting with teachers, it is natural to seek to understand the role that teachers play in improving student outcomes, and how different policies affect teachers. These issues are investigated in a series of papers that employ rich administrative data from North Carolina linking students to teachers.

Policymakers, educators, parents, and researchers agree that teachers are one of the most important components of the schooling environment. This conclusion is based on the consistent finding that certain teachers tend to improve student test scores much more than others. While economists do not care about test scores per se, the focus on test scores occurs because they are often the best available measure of student skills.

However, the research on non-cognitive skills provides reason to suspect that teacher effects on test scores may fail to capture teachers' overall effects. In one paper,<sup>8</sup> I investigate the extent to which teachers improve students' longer-run outcomes in ways not captured by their effects on test scores but reflected in other student behaviors. I estimate the effects of 9th grade teachers on test scores, attendance, suspensions, course grades, and remaining in school. I then link these estimates to longer-run indicators (high school dropout/completion, SAT taking, and intentions to attend college). Because identification of teacher effects is more complicated in high school settings than elementary school settings, I follow my earlier work<sup>9</sup> and condition on students' academic track. I find that teachers have causal effects on skills not measured by testing, but reflected in absences, suspensions, grades, and on-time grade progression. Moreover, teacher effects on these non-test outcomes (a proxy for non-cognitive skills) predict effects on dropout, SAT-taking, and college plans above and beyond teachers' effects on test scores. The results show that test scores alone fail to identify many excellent teachers and may understate the long-run importance of teachers. More broadly the results underscore the importance of accounting for the effect of interventions on both cognitive and non-cognitive dimensions of skill.

Given the importance of teachers, from a policy perspective it is important to better understand the determinants of teacher effectiveness. Because the high-quality data required to credibly measure teacher effectiveness have only recently become readily available to researchers, there is little conclusive evidence on the determinants of teacher effectiveness. In two papers, I investigate the role of the schooling context. In one piece,<sup>10</sup> I investigate the importance of the match between teachers and schools for student achievement. If match effects are economically important, policymakers should consider what kinds of teacher/school pairings are most pro-

ductive and should consider the effect of policies on match quality. I show that teachers who switch schools are relatively more effective at improving student test scores after a move to a different school than before — suggesting that teachers tend to leave schools at which they are less effective. This result is not driven by temporary jumps or dips in productivity surrounding a move, non-random sorting of students to teachers, or teachers moving to better schools on average. I also estimate teacher-school match effects directly by decomposing the variability in test scores into portions that can be explained by individual teachers, individual schools, and the match between teachers and schools. When we control for match quality, the estimated effect of what is typically referred to as teacher quality declines by about one quarter. Moreover, the match-quality variable has about two-thirds as much explanatory power as the teacher-quality variable. These findings indicate that teacher quality is not a fixed quantity so that certain teachers are more effective in certain school environments than others. The findings also suggest that because teachers tend to leave “bad” matches, teacher turnover is not unambiguously negative and could be welfare-enhancing on average.

A teacher's colleagues are an important factor in the schooling environment. In related work<sup>11</sup> with Elias Bruegmann, we analyze the role that teachers play in the professional development of their colleagues. We observe the outcomes of the same teachers at the same schools over time, and document that a teacher's students have larger test-score gains when the effectiveness of the teacher's colleagues, as measured by both observable qualifications and historical performance in the classroom, improves. These spillovers are strongest for less-experienced teachers, persist over time, and can account for about 20 percent of a teacher's effectiveness in raising test scores, thereby suggesting a peer-learning interpretation. We rule out that the results are driven by teachers sorting to their peers, students sorting to teach-



ers, or unobserved school-specific shocks that might coincide with teacher turnover. This paper provides some of the first credible and quantifiable evidence of learning associated with one's peers in the workplace. Moreover, this is the first paper to show that a teacher's effectiveness at raising test scores is at least in part due to learned behavior associated with her colleagues.

As a whole, these studies shed new light on the policies, practices, and institutions that may best produce human capital. They highlight that adequate financial resources facilitate improved outcomes, and they point to identifiable school types, school practices, and teacher policies that promote student learning.

---

<sup>1</sup> J. S. Coleman, E. Campbell, C. Hobson, J. McPartland, A. M. Mood, F. Weinfeld, R. L. York, "Equality of Educational Opportunity," Washington, D.C.: U.S. Dept. of Health, Education, and Welfare, Office of Education, 1966. [Return to text](#)

<sup>2</sup> C. K. Jackson, R.C. Johnson, C. Persico, "The Effect of School Finance Reforms on the Distribution of Spending, Academic Achievement, and Adult Outcomes," NBER Working Paper No.

20118, May 2014. [Return to text](#)

<sup>3</sup> C. K. Jackson, "Ability-grouping and Academic Inequality: Evidence From Rule-based Student Assignments," NBER Working Paper No. 14911, April 2009; and "Do Students Benefit From Attending Better Schools? Evidence From Rule-based Student Assignments in Trinidad and Tobago," Economic Journal, 120 (549), December 2010, pp. 1399–429. [Return to text](#)

<sup>4</sup> C. K. Jackson, "Can Higher-Achieving Peers Explain the Benefits to Attending Selective Schools? Evidence from Trinidad and Tobago," NBER Working Paper No. 16598, December 2010, and Journal of Public Economics, 108 (C), 2013, pp. 63–77. [Return to text](#)

<sup>5</sup> C. K. Jackson, "Single-Sex Schools, Student Achievement, and Course Selection: Evidence from Rule-Based Student Assignments in Trinidad and Tobago," NBER Working Paper No. 16817, February 2011, and Journal of Public Economics, 96(1–2), 2012, pp. 173–87. [Return to text](#)

<sup>6</sup> C. K. Jackson, "A Little Now for a Lot Later: A Look at a Texas Advanced Placement Incentive Program," Journal of Human Resources, 45(3), 2010, pp. 591–639. [Return to text](#)

<sup>7</sup> C. K. Jackson, "Do College-Prep

Programs Improve Long-Term Outcomes?" NBER Working Paper No. 17859, February 2012, and Economic Inquiry, 52 (1), January 2014, pp. 72–99. [Return to text](#)

<sup>8</sup> C. K. Jackson, "Non-Cognitive Ability, Test Scores, and Teacher Quality: Evidence from 9th Grade Teachers in North Carolina," NBER Working Paper No. 18624, December 2012. [Return to text](#)

<sup>9</sup> C. K. Jackson, "Teacher Quality at the High-School Level: The Importance of Accounting for Tracks," NBER Working Paper No. 17722, January 2012, and Journal of Labor Economics, 32 (4), October 2014, pp. 645–84. [Return to text](#)

<sup>10</sup> C. K. Jackson, "Match Quality, Worker Productivity, and Worker Mobility: Direct Evidence From Teachers," NBER Working Paper No. 15990, May 2010, and Review of Economics and Statistics, 95 (4), October 2013, pp. 1096–116. [Return to text](#)

<sup>11</sup> C. K. Jackson, E. Bruegmann, "Teaching Students and Teaching Each Other: The Importance of Peer Learning for Teachers," NBER Working Paper No. 15202, August 2009, and American Economic Journal: Applied Economics, 1 (4), 2009, pp. 85–108. [Return to text](#)