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Economics of education

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Program Report

Economics of Education

Caroline M. Hoxby*

The NBER's Economics of Education Program has just celebrated its first anniversary, having started officially in September 2001. However, the program was created to recognize the large and rapidly growing body of economic research on education. It was felt that education, as a topic, needed a home of its own, partly to encourage progress and partly to encourage rigor. Progress happens faster when economists researching the same topic talk to one another, instead of each presenting research to his own field audience. Education topics force researchers to draw upon several economic fields, so rigor is enhanced when public economists ensure that their fellow researchers get the public economics right, macroeconomists ensure that the macroeconomics is right, and so on. Members of The Economics of Education Program are drawn from labor economics, public economics, macroeconomics and growth, industrial organization and contracts, development economics, and urban economics. Every field makes its special contribution. For instance, macroeconomics emphasizes the intergenerational consequences of education investment; development economists offer up evaluations of striking policy experiments that would be too daring for most developed countries. The necessarily brief coverage of a program report lends itself to describing empirical work, rather than theoretical work. However, many of the important contributions to the Program have been made by theorists, whose Working Papers and presentations have been crucial to moving the economics of education forward.

In its first year, the Economics of Education Program held two program meetings and two conferences. Members wrote 60-some Working Papers on education. In addition, program members interested in higher education attended two Higher Education Working Group meetings, organized by Charles T. Clotfelter. The program has thus far spawned two volumes: *The Economics of School Choice* (ESC), which will be published in early 2003 by University of Chicago Press; and *College Decisions: New Economic Research on Higher Education* (CD), which will be published about a year later. Although most program members are drawn from economics or similar departments, some are economists at graduate

* *Hoxby is the Director of the NBER's Program on Economics of Education and a Professor of economics at Harvard University.* *Most of the numbers in brackets throughout this report refer to NBER Working Papers. A complete list of NBER Education Working Papers can be found at http://papers.nber.org/papersbyprog//ED.html*

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schools of education who help the program stay in touch with that world of research. The conferences have included policymakers and administrators, as well as program members.

What is the operating environment of the Economics of Education Program? Recent years have seen a host of policy developments for economists of education to master, and these will be described later. However, the most important development is probably not a policy one, but the now-almost-ubiquitous realization that U.S. comparative advantage and economic growth are highly dependent on skill-intensive industries [9071, 8337, 7288, 6881]. Americans, from "men on the street" to legislators, have concluded that the economic future depends on the supply of skilled workers, and this realization has given urgency to education reform. There is, of course, a correspondingly urgent need for education research.

With so much research going on, this report must be far more selective than I would like. Rather than attempting to discuss all the work, I focus on some recent policy changes that are driving research and a few themes that appear and reappear in Program members' work.

K-12 Policy Developments that have been Stimulating Research

Several policy developments in elementary and secondary ("K-12") education are stimulating research. The most obvious is the school choice movement, which naturally draws economists because it raises interesting questions about incentives, market structure, public financing, housing choice, and intergenerational investments in human capital. The recent Supreme Court decision in Zelman *versus* Simmons-Harris (the Ohio voucher case) is sure to provide a fillip to research, as it will unleash a new wave of reforms. Owing to the Court's advice, many of the reforms will be "mixed" (blending vouchers, charter schools, magnet schools, intra-district choice, and open enrollment among districts). Program members are eager to analyze such mixed reforms: their research already suggests that different choice plans generate different incentives.

For instance, empirical work suggests that magnet schools keep the more affluent and education-oriented in central city districts (though not, of course, in the same schools as most central city children.) [See Julie Berry Cullen, Brian A. Jacob, and Steven Levitt, "Does School Choice Attract Students to Urban Public Schools? Evidence from over 1,000 Randomized

Lotteries," July 2002; 7888]. Other work demonstrates that a district that enacts intra-district choice will lose its most education-oriented families, and part of its tax base with them [ESC, 7850]. Vouchers work differently when they are based on a child's *own* household income, the incomes of a *district's* children, or the failure of the child's school [ESC, 7956, 7239]. Although competition from both charter schools and vouchers seems to raise the achievement of students in both choice schools and local public schools, the achievement effect depends on the parameters of the program [8873, 8343].

The 2002 No Child Left Behind (NCLB) act may provoke some intra-district choice action, but NCLB is mainly an *accountability* policy. Accountability is the second major policy movement stimulating research. Partly because of Goals 2000 (which advocated accountability) but mainly because of state legislatures' frustration with schools that had not improved despite increased state funding, 49 states created accountability systems during the 1990s. The systems vary widely, but generally include statewide testing, school report cards, and some guidance to schools about the curriculum for which they will be held responsible. NCLB will regularize and give greater permanence to these systems.

The accountability movement has stimulated research for two reasons. First, it has unleashed a flood of data that has made analysis of many topics more feasible. More than half of the recent NBER Working Papers on education could not have been written without data generated by accountability systems. [Studies that reveal the richness of the data now available include 8916, 8918, 8599, 8502, 8156, and 7867.] Second, accountability systems are inherently interesting: they pose fascinating questions of incentive design.

Program members have been quick to point out the flaws in the incentives generated by the first generation of states' accountability systems. For instance, accountability systems that focus on year-to-year gains in achievement (as opposed to achievement levels, or some combination of gains and levels) tend to over-reward and over-penalize small schools, which are more likely to display unusually large or small gains, simply because noisy measures of students' achievement are less likely to average out [8156]. Systems that have only one cut-off (such as pass-fail) or a few cut-offs tend to focus schools' effort on the group of students whose performance is just below the cut-off [8968, 7875]. Cut-offs also can have unintended effects on house prices, property tax bases, and ultimately school budgets; house prices in the attendance areas of schools that just fail to meet a cut-off can fall substantially relative to those in areas that just meet it [8019, 9054]. Systems in which tests are unproctored and in which there is no turnover of test items invite cheating. Lest all the research sound like carping, it is nice to note that it has been constructive. Some of the evidence described has influenced the provisions and implemention of the NCLB act. Moreover, another study demonstrates that sophisticated accountability systems cost only trivially more than the simplest ones [8855].

School finance reforms, which change the ways in which states raise revenue for schools and redistribute among them, provide the impetus for important work on school finance — not just empirical analysis of American data, but also innovative theoretical work and analysis of the distinctive systems used in other countries. Recent school finance reforms that have attracted attention include those of New York, Michigan, Texas, and Massachusetts. Analyzing such reforms has proved to be a classic problem that demonstrates the challenges and promises of the economics of education. Researchers have found that it is essential to know the institutions; but applying public economics and urban economics is equally necessary for progress [8355, 8269]. School finance reforms have been shown to interact with property tax limitations, and there is increasing evidence that suggests that school finance reforms and property tax limitations are not independent (reforms cause limitation and vice versa).

Working out the implications of school finance for economic growth and income inequality has proven to be a fascinating, complex problem for macroeconomists and calibrators [8588, 8377, 8101, 7986, 7450, 7132]. It is difficult to draw simple implications from this literature because much depends on the degree to which ability is inherited and whether peer effects are important. A splendid development in this literature is the incorporation of political economy, so that the parameters of the school finance system arise endogenously in recent models [ESC]. Another development worth highlighting is the increasingly close relationship between school finance and school choice research. For instance, calibration suggests that income-equalizing vouchers are a school finance method that raises growth and reduces inequality relative to other currently available systems [ESC]. (Intuitively, vouchers can be better targeted because they are individual-specific; also, with vouchers, greater redistribution is sustainable in a realistic political economy.)

College Policy Developments that have been Stimulating Research

The last several years have seen important changes in the *nature* of government intervention in higher education. The most obvious has been states' shifting toward merit scholarships and away from subsidizing tuition at public colleges (a policy that benefits all college-going students similarly, regardless of their need and merit). Many people know about Georgia's Hope Scholarship, which eliminates tuition at in-state public colleges and provides substantial scholarships to in-state private colleges for B+ students. However, similar programs exist in 12 other states and many other states have reallocated their higher education budgets towards meritorious students in other ways. Merit scholarships appear to be gaining sway because states are worried about being left behind by the "new" skilled-based economy. Not surprisingly, the shift toward merit scholarships has occurred disproportionately in areas

where this worry is greatest: the South, the Southwest, and the Rust Belt.

Recent research shows that state aid based on merit tends not to increase enrollment greatly but does induce students to attend public universities more often [CD, 7756]. Even California's Calgrants program, a generous scholarship based on both merit and need, raises enrollment only modestly [See Thomas Kane, "A Quasi-Experimental Estimate of the Impact of Financial Aid on College-Going," August 2002]. The limited effects on enrollment probably reflect the fact that the most meritorious students would have attended college in any case. Interestingly, there is also no evidence of significant reductions in attendance at out-of-state private universities, suggesting that students whose decisions are most affected by the aid were not likely to attend college out-of-state anyway. Other recent work explores the value of keeping meritorious students in-state [CD, 8555].

Many people are surprised to hear that the largest federal program for education is not the Pell Grant or Title I, but the tuition tax credits enacted in 1998. Called the Hope and Lifelong Learning Tax Credits, these programs are not only large now, but are likely to grow much larger as they become more familiar. Currently, only a small share of eligible taxpayers take the credits. Essentially, the tax credits are a middle class tax cut with unusual incidence (middle class because the credits cannot be used in conjunction with a Pell grant and because the phase outs exclude upper-income households). Research suggests that the credits have very limited effects of enrollment, leading only to some "upgrading" of college attendance [CD].

If there is any theme to the recent evidence on aid and college attendance, it is that less recent federal aid programs, including the GI Bill, raised enrollment [7452, 7655, 7422], but that credit constraints are no longer a serious problem for students who are prepared for college. So, aid tends to alter the college they choose, rather than whether they go to college at all [9228, 9055, 7761].

Saving for college is a tricky issue because savers are taxed implicitly by need-based aid [4032]. However, recent research suggests that college savings may be receiving a "shot in the arm" from three new tax-preferred college savings programs: Coverdell savings accounts; states' 529 college savings accounts; and states' pre-paid college savings plans [CD]. The Coverdell savings account is a Roth IRA designed for college saving: interest accumulates tax-free and qualified withdrawals are untaxed. The states' 529 accounts are similar, but are more generous: contribution limits are higher and some contributions are tax-deductible. States' pre-paid plans are the least flexible: account-holders are constrained to use them at certain colleges or lose most of the benefits.

Teachers

Teachers are attracting a great deal of attention, not because policies are changing much, but because researchers are overcoming obstacles that prevented them from assessing teachers' effectiveness. Newly released data have been essential in this area. There is increasing evidence that differences among teachers account for much of the variation in achievement associated with schools (as opposed to families or innate ability). However, the evidence is not what one might expect. It suggests that a teacher's effect, though important and separately identifiable, is unrelated to her credentials and even in-service training [6691, 8916, but see 6781, 8432, and 7866]. Other work shows that teachers, perhaps because pay is so compressed, decide where to teach mainly on the basis of convenient location and students' sociodemographics. A teacher may accept a pay cut to get a job closer to her home and with more affluent students [See Donald Boyd, Hamilton Lankford, Susanna Loeb, and James Wyckoff, "The Joint Decisions of Teachers and Schools: How Teachers Sort on Initial Job Matches," August 2002; 8599; 7082]. Recent studies have added evidence to the longstanding suspicion that teacher quality has declined in the United States [9180, 8898, 8263]. Evidence from an Israeli experiment suggests that teachers respond constructively when offered monetary incentives to ensure that their students pass a college preparation exam [See Victor Lavy, "Rank Order Tournaments among Teachers as Performance Incentive Schemes: Experimental Evidence about Their Effect on Students Outcomes," August 2002].

Peer Effects

Peers effects are another important theme in recent research. (I am construing peer effects broadly to include all spillovers caused by the presence of a peer, regardless of the channel.) Peer effects arise frequently for several reasons. First, they are often the crucial element in models linking education and economic growth [8101]. Second, the market for higher education is almost impossible to explain coherently without postulating the presence of peer effects [CD]. Finally, many debates on school choice hinge on peer effects [ESC, 7854, 7850]. In all three cases, the *form* and not the mere existence of peer effects is key. As a rule, interesting theories require peer effects that are nonlinear, but require different nonlinearities that are mutually exclusive. For instance, growth models often posit that low achieving students benefit most from high achieving peers; higher education models posit the reverse. Fortunately, Program members recently have devised clever ways to identify peer effects empirically (a very difficult thing to do because, as a rule, people select their own peers). Randomly assigned roommates and other natural experiments have been used to study peer effects in college and graduate school [9025, 7469]. Researchers of K-12 education have exploited natural and policy experiments from population variation, desegregation, and housing mobility programs [9263, 8741, 8502, 8345, 7999, 7973, 7867, 7444]. Educational policies in developing countries sometimes shift peers substantially — these also have been exploited to identify peer effects. As a rule, the evidence suggests that peer effects exist, but their forms (especially non-linearities) are barely understood as yet.

Education Expansion in Developing Countries

Making primary education universal is a common goal for developing countries, but what are the effects of policies designed to greatly expand enrollment? Indonesia's experience is that an aggressive school building program raises enrollment but then depresses the return to education when the more educated cohorts hit the labor market [8710, 7860]. Incentives for school building can lead to an inefficient number of schools even though they raise enrollment [see Michael Kremer, Sylvie Moulin, and Robert Namunyu, "The Political Economy of School Finance in Kenya," August 2002]; and changes in school resources that seem incredibly cheap by American standards also raise enrollment substantially [8481, 7399]. If there is any theme in the evidence, it is that greater resources for schools in developing countries bring more children and *more marginal* children into school, so that researchers find it harder to identify improvements in achievement than to identify increases in enrollment.

Technology

So far, I have not mentioned "education production functions" (the attempt to estimate the relationship between school inputs and outputs) which once were the staple fare in the economics of education. Many of the studies described above have education production functions embedded in them, but recent work scarcely resembles the conventional linear regression of a test score on a series of school characteristics. This is not because researchers have gotten tired of class size or school spending, but because recent work tends to exploit interesting policy or natural experiments or carefully explores the foundations and implications of different education production functions [9054, 8918, 9040, 7820, 7656, 7349]. Technology is the one truly *new* school input. Program members have studied the effects of computers in the classroom [7424], of federal internet subsidies [9090], and even, in developing countries, of flip-charts [8018]. So far, the evidence seems to suggest that technology has at best weak effects on achievement. Undoubtedly, much more evidence will be forthcoming in this area as technology spreads and our measures of it improve.

In Conclusion

Education-related research is likely to remain a growth area in economics for some time, largely because of the importance of skills for understanding economic growth and income inequality. However, other conditions are favorable as well. Education is an excellent area for the arbitrage and elaboration of existing theory: many of the problems are inherently rich, amenable to analysis, and under-studied. It is also unusually easy to observe the behavior of key "actors" because they operate in a semi-public domain. (It is much easier to find out what a private college does than what a private firm does.) Data availability is improving continuously — partly because of technology, partly because of accountability, and partly because economists gain better access as they become ever more significant contributors to the field.

Research Summaries

New Drugs: Health and Economic Impacts

Frank R. Lichtenberg*

Many economists believe that new goods are at the heart of economic progress, and that innovative goods are better than older products because they provide more "product services" in relation to their cost of production. The pharmaceutical industry has among the highest propensities to generate new goods; it is one of the most R and D-intensive industries in the economy. Moreover, in part because of extensive FDA regulation, there is unusually good data about the launch and diffusion of new pharmaceutical goods. I have used these data to perform a number of econometric studies at the individual, disease, and country level, in order to assess the health and economic impacts of the development and use of new drugs.

Most of my studies are based on data covering all medical conditions (diseases) and all drugs. Therefore, they provide evidence about the health and economic impacts of new drugs *in*

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