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Eric A. Hanushek & Ludger Woessmann, *Knowledge Capital of Nations: Education and the Economics of Growth*, MIT Press, 2015, 280 pp. \$28 Hardcover

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Book Review

This book helps set the world on the right path on an important topic. This book is the culmination of a decades-long research project and should clear up once and for all one of the most damaging confusions in all of economics, and particularly development economics.

That damaging confusion is the widespread practice of treating “schooling” and “education” as synonymous.

Contrast the statement in the United Nation’s 1948 Declaration of Human Rights that “Everyone has the right to education” (Article 26(1)) with the UN’s Millennium Development Goal Target 2.A, “Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling.” It is not as if people changed their mind that “education” was the goal, it is just that the latter formulation of the goal assumes that meeting a target for “years of schooling” will achieve the goal of education—which has to be defined not simply as “time served” but as knowledge, skills, values, dispositions actually acquired.

This books provides three big insights that should change the way the relationship of schooling, education and development are discussed, each of these three contributions of the book is worth the price of admission.

The first big insight is documenting the fact, which is recognized everywhere but in development discourse, that a year of schooling is not created equal. The authors construct an index of student achievement in a given country by aggregating all of the available tests of achievement of math and science into a single index for each country. While all aggregations of these type will suffer weaknesses, theirs is a plausible method. The results (presented graphically in Figures 2.3 and 2.4), while mainly an input into their next stage of analysis, are themselves worthy of note.

For instance, on their index, which is indexed so that the OECD average is 500 and the standard deviation across OECD students is 100, a typical OECD country, like Sweden, is at about 500, the high performing countries like Korea are near 540 and many developing countries are between 375 and 400 (e.g. Mexico, Tunisia,

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Turkish Economic Review

Indonesia) and really poor performers are near 300 or lower (e.g. South Africa, Peru).

There are three implications of these low levels and their distributions across students.

One, the typical student in their eighth or ninth or tenth year of schooling have enormously different skill sets. Assuming that the distributions of performance are (roughly) Gaussian Normal this implies that an average student in a country with a mean of 400 would be at the 16th percentile of OECD students and an average student in a country at 300 would be in the 2.5th percentile of OECD students.

Put another way, suppose students at the end of tenth grade are at a score of 500 got there through linear progress from a score of zero when they started school to the 500 at the end of grade 10 (and, to all psychometricians out there, yes, I know this isn't a good description of either assessment or how learning progresses necessarily but it is just an illustration). This implies they gained about 50 points on this assessment scale per year. This would imply they got to a score of 300 at the end of sixth grade. This implies that comparing years of schooling completed across countries is more or less meaningless. That is, saying here is the typical person who completed 10 years of schooling in Sweden and here is a person who completed 10 years of schooling in Peru reveals only time served not knowledge attained. In normalized units the child in Peru has the same skills as a Swedish sixth grader (again, on the assessed domains and under the assumptions of this illustration).

Two, the poorer performing students in poorer countries are learning next to nothing. One of the difficulties with comparing assessments across countries with a wide range of learning outcomes is that many students "bottom code." For instance, Himachal Pradesh and Tamil Nadu (believed by some to two of the more educationally advanced states of India) participated in PISA 2009+. The PISA 2009+ report (Walker 2011) says: "*Level 2 is considered a baseline level of proficiency at which students begin to demonstrate the reading skills that will enable them to participate effectively and productively in life.*" In the OECD 78 percent of children were above that level and hence the assessment could assess variations in their performance among those could read at a minimal level. However, in India only 11 percent in Himachal Pradesh and 17.4 were in this range of level 2 and above. Far and away the majority were in category 1 or below. Similarly on mathematics the bottom possible category was "below level 1" a category so low that included only 1.9 percent of Korean and 3.1 percent of Canadian students. On the other hand, 61.8 percent of children in Himachal Pradesh were in this bottom category. Over half the children in India still enrolled in school at age 15 had mathematical skills too low for PISA assessment to accurately detect. This is not surprising as the ASER national survey in 2013 found that 29.7 percent of students in grade 8 in rural India could neither do a simple subtraction or division even when presented in the most straightforward way.

Three, the low average scores imply that even the best students are not doing well on a global scale. If one calculated how many students are in the global top ten percent (roughly above 600 on a PISA or TIMSS like scale) then it is obvious that with the low mean scores of 300 or 400 and typical standard deviations almost no student in many countries is receiving an excellent education on a global standard. For instance, although obviously with a population of a billion there are Indians who do brilliantly by a global standard, the PISA 2009+ reveal that at level 4 or above on reading the average for the OECD is 28 percent it is only .2 percent in Himachal Pradesh and .7 percent in Tamil Nadu. The problem in many countries is not that "the poor" (say, bottom quintile) get a bad education and "the

Turkish Economic Review

rich” (say, top quintile) get a good education, the problem is that “the poor” get essentially no education at all (even if they went to school) and “the rich” get a bad education, often scoring below even “the poor” of rich countries.

So the first major contribution of this report is to add to the literature documenting that a year of schooling is not at all a comparable measure. It is as if one were comparing magnitudes of water across countries reported in “buckets” without ever mentioning that in some countries the buck was five gallons and in other it was just a gallon. While there are a number of objections one could raise to the way in which their measure of learning does not fully reflect the complex nature and goals of education, it is worth keeping in mind that the current alternatives are not use of existing assessments of math, science and reading against more sophisticated measures but rather the use of these assessments against just “time served”—which is proposed as a measure of just one other social phenomena.

The second major contribution of this book is to point out that the conventional wisdom is right about the impact of education on economic growth but wrong about the impact of schooling. That is, if there has been one element of conventional wisdom about what it would take for countries to develop (in all senses of the word)—and in particular to achieve high levels of economic productivity (measured crudely as GDP per worker)—it is that expanding education is key to development and economic growth.

Unfortunately, political leaders, policy makers, international donors, development economists, and the public at large made the easy and natural elision of “education” to “schooling” and set about to expand schooling, on the premise that expanding time spent in school will produce economic growth, prosperity, and development.

At the task of expanding schooling, the world has been phenomenally successful. In 1950, the average person in the developing world aged 15 to 64 had spent 2.1 years in school. By 2010 the average adult in a developing country had spent 7 years in school. In the 60 years from 1950 to 2010, schooling increased by more than twice as much as in all previous human history combined.

Moreover, this expansion was equal across categories of developing countries: schooling went up by about five years in democracies and autocracies, in corrupt countries and non-corrupt countries, and, remarkably, in developing countries that had rapid economic growth and in countries that had slow economic growth.

Consider Ghana and Thailand. From 1960 to 2010, Ghana expanded the schooling of its population by 6.7 years to reach an average of 7.75 years in the adult population, which seemed an amazing success. But GDP per capita in constant PPP (i.e., GDP converted to international dollars based on purchasing power parity) increased by barely 10 percent, from 2,107 to 2,354 which was disappointing stagnation. Thailand increased schooling by only 3.4 years to reach about the same level as Ghana, 7.5 years—so it accomplished less schooling expansion—but GDP per capita increased eightfold from 986 to 8,628.

The expansion of schooling around the world has led to some striking disconnects between the level of schooling and levels of income and productivity. As of 2010, the average adult in Haiti had 5.2 years of schooling. That is the same number of years as the average adult in France had in 1970. But France in 1970 was a fully developed country and economy by any measure, with GDP per capita in PPP of 14,500. Haiti in 2010 was not developed in any sense of the word, with GDP per capita in PPP of only 1490.

By at least the mid-2000s, it was clear that the assertion that rapid expansion of *schooling* would inevitably lead to higher rates of economic growth was demonstrably false. The association between the *percentage* rate of growth of

Turkish Economic Review

schooling years (or change in natural log years) of the labor force and economic growth conditional on the growth of measures of physical capital was *negative*. (As the book discusses, the literature on economic growth had taken to mostly avoiding the question of how the expansion of schooling affected growth by examining the association between economic growth and the lagged level of schooling, which had some formal rationale, but was always a decidedly odd and indirect way of estimating the impact on growth. Even in that empirical approach, the lagged level of schooling was not a robust or empirically important correlate of growth.)

This background is important for understanding the second major contribution of this book. One possible reaction to a book showing that “education is important for the economic growth of countries” is to say “yes, but we always knew that,” but that is clearly not the case. As the book introduction relates, this book was initially meant to be completed in 2006. At that time, the development community (countries and donors) was hopelessly confused about the connection (or non-connection) between schooling and education. What was being promoted and spent for and measured by countries and the development community was additional years of schooling. Yet it was obvious (and not just in the sophisticated econometric sense, but also in the more important “just look out the window” sense) that the massive ongoing expansion of schooling was not having the hoped-for impacts in many countries.

The authors show that, if one looks empirically at which variable better explains growth, education (proxied by their test scores) or schooling, the answer is *all* test scores. Not some mixture of test scores and schooling, but *all* test scores. Their results of regressing economic growth over the 40 years from 1960 to 2000 shows that if one excludes cognitive skills from the equation (as most previous researchers have done) then growth and the initial years of schooling in 1960 are correlated. But, once one includes the measure of country cognitive skills developed in chapter 2 then the impact of schooling per se disappears entirely. The authors put this basic result through the standard “robustness” paces across subsamples, different measures, interactions, and (in Chapter 4) standard (if widely disputed) ways of addressing causality and find the (partial) regression association of cognitive skills and growth is strong (large and statistically significant) and that, controlling for cognitive skills the association of years of schooling is very near zero.

Anyone saying anything about economic growth and education from now on needs to have Figures 3.1 and 3.2—which show the strong correlation of growth and cognitive skills and the lack of correlation of growth and years of schooling—in mind.

The third contribution of this book is to draw the policy implication of the connection between test scores and economic growth that improving learning has massive economic returns. They used their empirical results to show that the gains to productivity (GDP per worker) from raising cognitive skills are massive. In Table 7.3 they run the simulation of the impact of raising all children to the level of 400. For the lower performing OECD countries like Mexico or Turkey this increases GDP by more than 1000 percent.

But, emphasizing the work of the previous authors on what it would take to improve learning, this should not lead anyone into a new false elision between “learning” and “more spending” or “more inputs.” Reforms that are going to have strong and sustained effects on learning are going to be systemic (affecting the incentives of agents at all levels) and contextualized—and hence will be hard to implement and sustain. Now that the connection between learning and economic

Turkish Economic Review

progress is settled, the next generation of research has to focus on how to produce the learning gains where they are most needed.



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