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A Looming Economic Threat

China and India are producing more holders of advanced degrees, a new study says, and that's the real challenge to American competitiveness

by Pete Engardio

As momentum builds on Capitol Hill to do something about the rising economic challenge from China and India, political support is coalescing around a pat remedy: boost America's long-term competitiveness by getting more U.S. youth to study science and engineering.

Unveiling the "America Competes Act" earlier this month, Senate Majority Leader Harry Reid (D-Nev.) called for hiking U.S. investment in basic research and to improve math and science education. The Innovation Agenda endorsed by the House Democrats calls for producing 100,000 new scientists, engineers, and mathematicians over four years.

No quarrel here. These are fine ideas at a time when China, India, and other nations are investing massively to increase their competitiveness in technology. But does increasing the number of engineering grads really get to the heart of America's competitiveness challenge? A new study from Duke University's Pratt School of Engineering and Center on Globalization, first published in *Issues in Science and Technology* (a publication of the National Academy of Sciences), raises some interesting questions. It concludes that the focus on undergraduate engineering numbers is misplaced. What U.S. policymakers really should worry about is what is happening at the master's and doctorate levels.

Mountain or Molehill?

Holders of advanced degrees, whether they be U.S.-born or immigrants, have been the real keys to America's decades-long domination of technological innovation. Yet China is now racing past the U.S. as a producer of this crucial talent. As multinationals and Chinese government agencies pour more resources into state-of-the-art research labs in the mainland, warns Duke's Vivek Wadhwa, a lead author of the study, America's leadership in science and technology could be in serious danger in three to seven years.

People familiar with Wadhwa, a frequent BusinessWeek.com contributor, may be surprised at his conclusions. He is best known for challenging oft-repeated claims that America is not producing enough engineers compared to China and India. Take the stats that China graduates 650,000 engineers a year and India 350,000, compared to 70,000 in the U.S. figures Senator Reid cited on Mar. 11. By visiting universities in both nations, interviewing officials, and sifting through reams of raw data, Wadhwa's team concluded that the figures for China and India are inflated by about half because of the way their officials count "engineers."

What's more, China's and India's superior numbers don't translate into greater competitiveness, he argues. America still graduates more than enough highly skilled engineers, while the poor quality of many Chinese and Indian schools mean most of their grads are less qualified (see BusinessWeek.com, 12/27/05, "Engineering: Is the U.S. Really Falling?").

Aim Higher

When it comes to the master's and doctorate levels, however, the study suggests U.S. worries are more legitimate. Much of the work often assigned to engineers right out of four-year programs is fairly straightforward and can be sent abroad where wages are lower. Advanced-degree holders in science and engineering are crucial for innovation. They remain in high demand in the U.S., and salary gaps with developing nations are less of an issue.

Based on sheer quantity, the U.S. still appears to be in good shape. The number of master's degree graduates in science and engineering rose from 43,000 in 1995 to 53,545 last year. The number of PhD degrees has also risen modestly, from 7,060 in 1995 to 7,720 last year.

So why worry? For one, 50% to 60% of U.S. university master's and doctoral students are foreign. That has been the case for a long time; immigrants have been a backbone of American R&D for decades. But now, fewer and fewer of these foreigners are staying in the U.S. because immigration rules have tightened considerably since the September 11 terrorist attacks and because opportunities and living standards back home in China, India, and other developing nations are improving rapidly.

The second reason for concern is that China is dramatically boosting its supply of advanced degrees in engineering and technology. China produced 12,873 master's degrees in 1995. In the 2004–05 academic year, according to the study, China surpassed the U.S. for the first time, awarding 63,514 master's degrees. The number of Chinese doctorates also has mushroomed over the past decade, from 1,784 to 9,427.

By remaining focused on K-12 and undergraduate education, Wadhwa warns, U.S. policymakers "are fixing the wrong problems." The real threat is that U.S. corporations will shift fundamental scientific and technological research to China to take advantage of its bigger talent pool, subsidized research labs, and low-cost environment for high-tech manufacturing. "Once we lose research and design, we lose the platform to innovate," he said in an interview. And while there is nothing wrong with sharply improving K-12 education, that will be no panacea. "By the time we fix that, it will be too late," he says.

Advantages Remain

A strong caveat is in order. China's numerical superiority in advanced science and tech degrees still doesn't mean it is destined to leapfrog the U.S. In fact, despite China's lavish science investments and breathtaking advances in high-tech manufacturing, its achievements in innovation are underwhelming. The mainland's lack of intellectual-property protections, the state's heavy intervention in key industries, and controls over information still hold the country back.

When it comes to forming new companies to bring the latest technologies to market, the U.S. still holds an overwhelming advantage. There is little sign that China will catch up soon as an entrepreneurial environment (see BusinessWeek.com, 3/31/06, "Blinding Science: China's Race to Innovate").

Still, the loss of leadership in advanced science and tech degrees means that one more pillar of American competitiveness is weakening. And the risk remains that China will solve the rest of the puzzle.

Green-lighting Green Cards

What should U.S. policymakers do? Boosting support for basic science research is important. The Chinese government subsidizes master's and PhD programs, Wadhwa says, in some cases even paying master's candidates to study. At very least, Washington could fund more scholarships for advanced degrees. The U.S. also needs to take another hard look at tax incentives, research grants, and other measures aimed at ensuring that corporations do not export real R&D.

Congress also needs to adjust its thinking on immigration. America still educates the world's best and brightest. But to keep them, it must grant more green cards to master's degree and doctorate holders once they graduate. Of the some 60,000 temporary H1-B visas given annually to guest workers—many of them working in tech fields—only 9,800 get green cards, Wadhwa says. That number also includes green cards given to their family members. The backlog of those awaiting permission to stay and work in the U.S. has grown to account for six years of applicants. "Scientists get frustrated and are leaving the U.S.," he says. "We are losing the foreigners who fueled our growth." (See BusinessWeek.com, 3/8/07, "Gates to Senate: More Visas.")

It's great that Congress is finally talking seriously about shoring up American competitiveness. Now it needs to make sure it's focusing on the right things.

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