ALTHOUGH MORE BRAZILIANS have had access to a college education in recent years, experts say there are still not enough college students to ensure the research and innovation needed for development, even though from 2002 to 2012, enrollment in undergraduate courses more than doubled, from 3.4 to 7 million, and enrollment in master’s and doctoral courses went from 106,000 to 203,700.

“More students are completing high school, but that increase has not been reflected in higher enrollment in undergraduate and graduate courses, although recently, the government Financing Fund for Higher Education Students (Fies) and its scholarship program (ProUni) have attracted more students to higher education, especially in science, technology, engineering, and mathematics—our main weakness,” observed Naércio Menezes, professor, Public Policy Center of the Institute of Education and Research (Insper).

The main deterrent to progress in tertiary education is the same as in the lower levels: the poor quality of previous education. Rodrigo Leandro de Moura, researcher at the Brazilian Institute of Economics (IBRE) says, “The Ministry of Education often takes away certification of courses in private universities due to poor teaching quality. To improve the quality of private universities it is necessary to increase competition by means of better teaching and better infrastructure for public universities. But it is also necessary to address the low quality of education in primary, middle, and high school. The student arrives at college unprepared.” De Moura argues for
increasing revenues of public universities by charging those who can afford it a monthly fee and providing scholarships for students who cannot.

Menezes says it is difficult to compare the quality of higher education in Brazil with other countries because there are not many international rankings — unlike basic education, the quality of which is measured by, among others, the Program for International Student Assessment (PISA). He also disagrees with De Moura in that he considers Brazilian higher education reasonably good. “In the United States and Europe, courses are more general in the first years of college and specialization is emphasized in graduate school. In Brazil there are specialized courses in the first few years of college. We need to look at the number of students who complete college, and also improve the first few years of college for poor students so we do not waste so much talent,” he says.

Leandro Tessler, professor at the University of Campinas (Unicamp), is more critical; he considers Brazilian higher education, especially graduate school, to be idiosyncratic: “The workload is excessive. We think that students only learn in the classroom, in contact with brilliant teachers, but this is not so worldwide. Elsewhere, more individual learning and independent activities are encouraged.”

The productivity implications
Governments and analysts are concerned with the shortage of skilled labor in some professional areas, which affects work force productivity, particularly for engineers and physicians. A new study by the Institute for Applied Economic Research (IPEA) has concluded that physicians earn more than other professionals because Brazil has a doctor shortage. Demand for medical education is nearly five times higher than for such courses as law, engineering, nursing, and dentistry. The lack of places in medical schools raises questions about how medical schools are regulated. Initiatives such as the More Doctors Program, the government’s proposal to expand the number of vacancies in medical schools by 11,447 by 2017, and the Fies should help to rectify the situation.

IBRE researcher Fernando Veloso believes that importing skilled labor is a good idea generally as a catalyst, especially in science, technology and engineering areas, but does not think it will relieve the situation much: “This is a very limited emergency program to remedy the shortage in specific certain regions. I do not see how it solves the education problem.”

The shortage of engineers is more complex but perhaps less widespread than might be thought. The IPEA study found a shortage in manufacturing and mineral extraction, utilities, construction, and public administration. In 2012, together they accounted for 65% of hours worked exclusively as engineers work and 42% of total hours worked in Brazil.

Demand for experienced engineers is particularly high. According to the IPEA study, those aged 35
to 54 are most sought after. That has not always been the case. Aguinaldo Maciente, one of the authors of the IPEA study, explained that, “In the past, engineering was discredited and badly remunerated, which discouraged people from studying engineering. Engineers who graduated in the 1980s and 1990s eventually migrated to other professions [such as economy and finance]. When the economy recovered, there were not enough engineering professionals available.” He added that currently most engineers are young and inexperienced, so that companies must spend more time training them.

However, because more students have been enrolling in engineering colleges since 2010, Maciente says, “By 2018 there will be more than proportional growth of professionals in areas related to science, technology, and engineering. But ... if the labor market cools down, something we have seen recently, we may again see too many engineers for the few vacancies.”

“Science Without Borders”

To simultaneously address the shortage of trained personnel and stimulate expansion of knowledge and innovation through international exchange of science and technology, the federal government in 2011 created the Science Without Borders Program. So far, 83,000 scholarships have been granted to Brazilian undergraduates and graduates to study in more than 30 other countries. In June, President Rousseff announced that starting in 2015 the second phase of the program will offer 100,000 scholarships.

But Unicamp’s Tessler has questions about what the government really expects from the program: “What was the outcome of the first phase of the program, does anyone know? We know how many scholarships were awarded, but what was the outcome? Is the program meeting its goals? What justifies continuing it?” Tessler supports sending people abroad to study, but he believes the effects of the program on the Brazilian educational system should be followed up. “I am not opposed to Science Without Borders,” he says. “It broke decades of isolation. However, there is no point sending 100,000 people abroad if our engineering courses, for example, remain the same—if graduate students come back and we do not incorporate the disciplines and the knowledge they acquire into the curriculum of engineering schools.”

“...To improve the quality of private universities it is necessary to increase competition by means of better teaching and better infrastructure for public universities. But it is also necessary to address the low quality of education in primary, middle, and high school. The student arrives at college unprepared.”

Leandro Rodrigo de Moura

Low on the Innovation Index

Today, despite the incentives in the Innovation Law for companies to carry out R&D, in the 2013 Global Innovation Index, which ranked 116 countries, Brazil it as 67th, below Paraguay, Venezuela, Uruguay, and Colombia. (The index is
One reason for the innovation gap is the distance between research institutions and business in Brazil, although that is being shortened. Insper’s Menezes points out that “We have increased the number of graduate students and the number of academic papers published by Brazilian students, but the volume is still small.” He also notes that Brazilians who come back from the Science Without Borders Program end up working in research institutions rather than the private sector.” He believes academics still disapprove of universities partnering in research with companies because it involves profits. He also believes that businesses in Brazil have become used to living on government favors. “Businesses are not that excited about pursuing innovation, competitiveness, and new concepts,” he says, “and that turns them away from research institutions.”

Sérgio Queiroz, research coordinator for innovation of the Foundation for Research Support of the State of São Paulo, disagrees with Menezes—at least so far as his own state is concerned. He says, “We have

An industry-university partnership

Former University of São Paulo professor Regina Scivoletto chairs the scientific committee of Cristália Lab. She is convinced that the company is pioneering innovation in the Brazilian pharmaceutical industry—something still a rarity in Brazil. Founded in 1972, Cristália Lab has since been granted 74 patents in pharmaceuticals. Dr. Ogari Pacheco, one of its founders and its current chairman, has been a the catalyst for the company’s drive for innovation. Scivoletto explains that “In the 1980s, Dr. Pacheco realized it was possible to separate the isomers of molecules [active ingredients in medicines] to enhance the beneficial effects of a drug and reduce its toxicity.”

Today, Cristália Lab has about 200 employees and invests 6% of annual revenues in research. In 2002, the company began to approach research universities, and in 2004, established a scientific committee, coordinated by Scivoletto, to evaluate the feasibility of new drug projects. Today there are 120 experiments underway, and the lab has 12 continuing R&D projects in partnership with nine research institutions.

Scivoletto describes the process: “We do a pre-contract with the researcher and draw together some experiments to confirm the expected outcomes of a project. If the preliminary experiments are fine we fund the idea.” She explains that it’s a two-way street: Universities come to the company to test a particular pharmaceutical and the company goes to universities to identify pharmaceuticals that could works in practice. “When I was teaching,” Scivoletto says, “I knew that pharmaceutical research was being carried out, but in most cases the results would be published essays, not products. So I decided to try to help bring together industry and research institutions.”
Breathing innovation

For most people, a particle accelerator that generates light beams sounds like science fiction. It is not. Such a facility—open to the public and for the use of academic and industrial entities—is the National Synchrotron Light Laboratory (LNLS), part of the National Center for Research in Energy and Materials in Campinas, São Paulo state. The synchrotron emits beams—electromagnetic radiation from infrared to X-rays—that are used in analysis of atomic and molecular structures. The lab is virtually an oasis of innovation in Brazil, where cutting-edge research is still rare.

José Roque, LNLS director, explains that the quality and viability of proposals to use the facility are evaluated by an internal committee. “In general, proposals come from researchers in academic institutions, but it is not unusual for researchers to be commissioned by companies,” he said. Research results are published, and so shared with society.

Currently, the laboratory is building Sirius, a fourth-generation synchrotron, at an estimated cost of RS$650 million, to be paid by the Ministry of Science and Technology and other funding agencies. The project should pave the way to new perspectives for research in such areas as nanotechnology, biotechnology, physics, and environmental sciences. It is expected to become operative in 2018.

Roque believes that the relationship between research institutions and companies has improved, but he warns, “Keep in mind economic conditions in this country. To compete internationally, it is not enough to have an innovative product. The ‘Brazil’ cost weighs in company decisions about exporting the product.”