University – Industry relations in Brazil

*by Carlos Henrique de Brito Cruz **

Brazilian policy for S&T development has been successful in many instances, even though research as an academic endeavour is relatively recent in this country. The first research university in Brazil, the University of São Paulo (USP), was founded in 1934. Through steady policies in the last 70 years, the country has developed competitive public universities with a strong graduate system, training 10,000 doctors per year. Brazilian scientists publish 17,000 scientific articles in international journals every year. Milestones in the state policy for S&T were the creation of the National Research Council (CNPq) and the Coordination for Training Higher Education Professors (CAPES), both in 1950; of the Foundation for the Support of Research in São Paulo (FAPESP) in 1962 and of Studies and Projects Funding Company (FINEP) in 1970. Two Brazilian universities appear in the 2007 THES ranking of the 200 best world universities: the University of São Paulo (USP) and the University of Campinas (Unicamp). In 2006, they trained 2,197 and 791 doctorate students respectively.

The development of this academic infrastructure did not have any parallel in industrial development. Although Brazil has become an industrialised country in the last 60 years, the strategy was mostly one of substituting imports through the acquisition of existing technology. It must be said that there are some highly technological and knowledge-based companies in Brazil. The point, however, is that the idea that an industrial strategy must include intense R&D is not widespread. Less than 25% of the scientists in Brazil work in industry, a percentage which is usually higher than 50% in developed countries.

Today, the main restriction to the intensification of university-industry cooperation in research is due to the weak industrial R&D performance. It is well known that collaborative R&D requires a dialogue between scientists from universities and those from industry. As the latter do not exist in sufficient numbers, industry in Brazil, often cannot even formulate its challenges in terms that will lead to a productive dialogue with academic scientists.

The lack of balance between academic and industrial scientists tends to create a special kind of tension in university-industry relations: industry expects to replace its non-existent scientists by those from universities. This strategy frequently ends in bitter disillusionment both for industry and for universities.

On the other hand, university-industry cooperation for research (as opposed to cooperation for technology development) has led to some very good results in Brazil. Telecommunications, both optical and by wire, were two of the premier cases which started in the mid-1970s. Deep sea oil extraction is another example: Petrobrás, the Brazilian state-owned oil company, developed competitive technology to drill at 2,000 metres under the sea with the help of a network of Brazilian universities. These and many other good results represent cases where the company had their own scientists and used universities to complement their capabilities. EMBRAER, the third largest aero plane manufacturer in the world was the product of the best engineering school in Brazil, the Aeronautics Technology Institute (ITA) and the competitiveness of Brazilian agriculture was built by graduates from Brazilian universities working for the state owned Company for Agricultural Research, EMBRAPA.

It must also be remembered that university-industry relations are multidimensional and joint R&D is only one of many achievements of this interaction. Universities educate those who make industry successful, industry poses challenges for academic curricula, industrial and academic scientists meet at conferences and workshops and read each other's articles and see each other's presentations.

The main change in the Brazilian strategy for science and technology policy in recent years started in 1999. After a long period of focusing almost exclusively on academia, the policy was changed to include industry as a relevant actor, not only as a user of knowledge, but also as a creator of knowledge. The Ministry of Science and Technology was careful to legitimate this change in policy through a National Conference on S&T&I (Science, Technology and Innovation). The addition of the word "Innovation" to the traditional term "S&T" reflected the trend for change. The Ministry was also intelligent enough to create new revenues to fund both academic and industrial R&D in the form of "Sectoral Funds". These are state revenues created through special legislation which taxes certain economic sectors, mostly those that were subject to privatisation by previously state-owned companies in the 1990s. The sectoral funds have become the most important instrument for delivering direct government support for innovation. There are currently 16 such funds in operation, which together total close to one billion dollars every year.

Following the National S&T&I Conference and the creation of the Sectoral Funds the Federal Government prepared a proposal for the Innovation Law, which was presented to Congress in 2002. Changes in Federal Government after the national elections delayed the processing of the Innovation Law by Congress, but it was finally approved by the end of 2004.

The Innovation Law (Law 10.973/2004) made possible the creation of important instruments to support industrial R&D, the main one being the economic subvention which

allows federal money to be invested in R&D projects of private companies as a subsidy to internal R&D. For federal universities, the Innovation Law made it possible to reach agreements with industry for joint R&D and share intellectual property. It is interesting to note that state universities in the State of São Paulo (USP, Unicamp and Unesp) already had access to this kind of relationship with industry because they have a special regime of academic and administrative autonomy that only the State of São Paulo grants to its universities.

On the academic side, one of the effects of the Innovation Law was to foster the discussion about the enhancement of academic intellectual property. The legislation mandates universities to organise IP offices and allows them to license and sell their IP, through publicity.

The opening of the Brazilian economy since the 1990s and the stabilization of the economy since 1994, the legislation offering fiscal incentives and subsidies and the recent tendency towards economic growth created the conditions for industry to intensify its R&D investments and leading to greater intensity of joint university-industry R&D. As an example, the Foundation for the Support of Research in the State of São Paulo (FAPESP) that has a programme for co-funding collaborative R&D between industry and academia received 41 proposals for university-industry joint R&D in 2007, a threefold increase compared to the yearly average for the previous 10 years which was 14. Themes for these projects include hydrolysis of lignocellulosic materials to produce ethanol, terabit per second optical communications, composite materials for aeronautics and software developments for learning and teaching. Qualitatively speaking there is another important evolution: the projects are more exploratory and related to basic science than they were five to ten years ago.

In conclusion, the Brazilian innovation system is going through important and positive changes that tend to associate the competitive academic base with industry's growing interest in advanced R&D. Universities are far more willing to collaborate with industry and industry understands far better what it can expect from universities, than was the case ten years ago. The challenge for universities is to keep high academic standards and relentlessly pursue their two track mission of education and advancement of knowledge.

Education and the advancement of knowledge can benefit from university-industry interactions as long as the university has a sense of purpose and a clear vision of its objectives and role in society. Industry can benefit from interactions with universities as long as they complement internal R&D capabilities that the companies have developed, which can internalise, create and stock knowledge and connect it to market-driven opportunities. There is a role for academic research in creating new ideas from apparently non-connected (what practical persons would call speculative, or non-focused) observations and a role for industrial research in solving immediate problems, much in tune with what Adam Smith wrote 230 years ago: "All the improvements in machinery, however, have by no means been the inventions of those who had the occasion to use the machines. Many improvements have been made by the ingenuity of the makers of the machines, when to make them became the business of a peculiar trade; and some by that of those who are called philosophers or men of speculation, whose trade it is not to do anything, but to observe everything; and who, upon that account, are often capable of combining together the powers of the most distant and dissimilar objects."

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The Role of Universities in Lithuania for the Economy in Transition

*by Rimantas Vaitkus **

Lithuania has become a country with a market economy and strong democratic institutions over the past 20 years. Higher education is also undergoing major changes. Teaching and research in universities are directed towards specific economic and social objectives, and in order to serve the needs of society, several cycles of study are already in place. Course content is oriented towards the market needs and student numbers are increasing rapidly (from 75,000 in 1990 to 200,000 in 2006).

Lithuania could well be considered a country with a growing economy (annual increase of GDP per capita ranges between 6 and 9 percent). The programmes offered by the universities contribute to providing a highly-skilled labour force which the local and national economy requires as a condition for its growth. As David Bridges said, "universities have an economic impact and an economic benefit, even when they are not trying to do so directly but are focusing on more traditional educational and research roles".

Should the university be an institution that only prepares specialists for our country: engineers, doctors, teachers, etc.? This so-called "specialist" approach was already in place before 1990, at a time when Lithuania was incorporated into the higher education system of the Soviet Empire.

Social responsibility of the economy is as important as development itself. Services already produce more than two thirds of our country's income. Universities are the institutions that are shaping the future of society. Accordingly, the objective of their further development is to serve society for its sustainable development.

continued on page 20