

1 LAW, ECONOMICS AND POLITICS OF UNIVERSITY-INDUSTRY TECHNOLOGY TRANSFER IN ARGENTINA

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ABSTRACT

This article reviews the *status quaestionis* of technology transfer in Argentina and the laws that regulate it. Further, it analyses their economic impact, enumerates the shortcomings of the system and provides recommendations for its improvement.

Keywords: *technology transfer, research and development, innovation, intellectual property, patents, licensing, public policy*

I. INTRODUCTION

In Argentina, like in many other developing countries, there is growing interest in taking full advantage of the economic potential of academic intellectual property.¹ Argentina has 47 national (i.e. publicly-funded) universities and other public research organizations (PROs)², amongst which the leading one is the National Scientific and Technical Research Council (Consejo Nacional de Investigaciones Científicas y Técnicas, or CONICET).³

A particular feature of Latin American countries is the fact that privately-funded research and development (*R & D*) is a rarity. Most of the research in Argentina and the region is conducted by publicly-funded institutions. When local industries are in need of an innovative solution, it is cost-effective for them to enter into an *R & D* agreement with a university or PRO instead of staffing their own *R & D* units. Innovative Argentine companies are outsourcing *R & D* activities to the public sector.⁴ Intellectual property (IP) legislation, universities, and CONICET's policies allow such a praxis, which is both legal and an economically sound practice in Argentina. A *Bayh-Dole* type of legislation to attribute ownership of publicly-funded *R & D* and intellectual property rights to universities is not required. Scholars have discussed whether a rule that attributes ownership to the university or PRO in question is more

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¹ The word 'academic' is used in this paper to refer both to public (national) universities as well as to other publicly-funded research organizations. Argentina has many private universities as well, some of them world-class and renowned abroad. Regrettably, the private universities do not have the financial resources to carry out scientific or technological *R & D*; only the Argentine Government, by pooling resources from taxpayers and foreign sources of funding (e.g. grants from the World Bank and the Inter-American Development Bank), can afford to do so. For this reason, private universities have been excluded from this analysis.

² The full list of official universities is available at the website of the Argentine Ministry of Education: http://www.me.gov.ar/spu/Servicios/Autoridades_Universitarias/autoridades_universitarias.html accessed on 27 September 2011.

³ CONICET, established in 1958, is the main *R & D* institution in Argentina; it has a staff of 6,500 researchers and 2,500 technicians. It is an autarchic governmental agency under the jurisdiction of the Ministry of Science, Technology and Productive Innovation.

⁴ The phenomenon is by no means widespread. Most SMEs are not even aware of the possibility of resorting to universities to negotiate an *R & D* agreement.

efficient than one that attributes ownership to scientists or university professors.⁵ In accordance with Article 10(a) of Argentina's Patent Act (No. 24.481), in the case of work-for-hire employment relationships ownership of intellectual property rights is granted *ab origine* to the employer, whether a public or private employer. Universities and PROs employ workers, i.e. professors and scientists, and as a consequence they own the intellectual property rights of their employees, which are created as a direct result of their professional duties.⁶ The Argentine legal system is flexible enough to allow universities and PROs to establish their own IP policies to incentivize their workers (i.e. *ad hoc* rules for the distribution of future revenue streams from the exploitation of intellectual property rights). Further, universities and PROs can, within statutory limitations, freely bargain with private companies with respect to *R & D* and collaboration agreements, which, in the absence of high transaction costs, may lead to Coasean-like efficient outcomes.⁷

Another peculiarity of the region is the low level of autochthonous patenting activity. The quantity of granted patents is a usual benchmark of innovation under a country's umbrella. The bulk of patenting in Argentina is carried out by foreign companies, in most cases pursuant to Article 4 of the Paris Convention, which relates to the right of priority. Out of a total of 1,354 patents granted in Argentina in 2009, 1,110 (82 per cent) were to non-residents and only 244 (18 per cent) to residents.⁸ Such a pattern is common in all Latin American countries.

II. DEFINING TECHNOLOGY TRANSFER

Technology transfer is an activity closely related to intellectual property rights. The Agreement on Trade-Related Intellectual Property Rights (TRIPS) recognizes that the transfer of technology is one of the purposes that justifies the existence of intellectual property rights (Article 7) and that countries can take appropriate actions to prevent restrictions to international transfer of technology. Furthermore, TRIPS also states that transfer of technology is a basic right of patent holders (Article 28.2), it can be affected by anti-competitive practices (Article 40), and is an obligation of developed nations towards less developed ones (Article 66.2).

Intellectual property rights are defined with varied degrees of precision in various multilateral treaties. Conversely, there is no internationally accepted legal definition of what constitutes technology transfer. Therefore, we resort to other sources for a workable meaning. The drawback is that definitions differ in terms of attention to the varying goals of the defining institutions.

For instance, MIT defines technology transfer as '[t]he ability to take a concept from outside the organization (typically from a government or university research programme) and

⁵ See B Godfar and M Henrekson, 'Bottom-Up versus Top-Down Policies towards the Commercialization of University Intellectual Property', (2003) *Research Policy* 32, pp. 639 to 658. It is interesting to recall that not long ago Germany changed the patent ownership rule from professor's ownership to university ownership, thus amending the *Gesetz über Arbeitnehmererfindungen* in an attempt to boost technology transfer activities.

⁶ Article 10 of Argentina's Patent Act also refers to other ownership situations in Clauses 'B' and 'C'.

⁷ See Ronald Coase, 'The Problem of Social Cost' (1960) 3(1) *Journal of Law and Economics* 44.

⁸ Ibero-American Network of Science and Technology Indicators (*Red Iberoamericana de Indicadores de Ciencia y Tecnología – RICYT*), available online at: [http://bd.ricyt.org/explorer.php/query/submit?excel=on&indicators\[\]=PATOTO&syear=1990&eyear=2009&](http://bd.ricyt.org/explorer.php/query/submit?excel=on&indicators[]=PATOTO&syear=1990&eyear=2009&) accessed 28 September 2011.

create a product from it'.⁹ A Canadian agency states that technology transfer is '[t]he process of moving research results from the laboratory to the marketplace'.¹⁰ According to WIPO, '[t]he dissemination and transfer of technology is a major pillar that supports the *raison d'être* of the patent system'.¹¹ Although there are many more definitions out there, for the sake of this article these will suffice to extract a few general ideas.

Primarily, transfer of technology is a dynamic activity or process. The final objective is the transfer of applied science (usually protected by an intellectual property right – patents, utility models, designs, trade secrets, plant breeder's rights, etc.). The technology is intended to arrive in the marketplace (commercialization) and the final beneficiary is the consumer. In order for the successful transfer of technology to occur from a laboratory to the market, a bridge is needed to connect the different mindsets, jargons, goals and incentive schemes. This bridge is technology transfer¹², which constitutes both a science and an art. Traditionally, technology transfer only referred to the sale or licensing of intellectual property rights; more recently this perception has been expanded to include the creation of spin-offs or start-up companies. The emphasis is on management and monetization of intellectual property rights, the legal protection being a prerequisite and not an end in itself.

Technology transfer is gaining momentum in developing countries. The reason is simple: in a knowledge-based and globalized economy, companies require a constant influx of innovation to add value and markup to their products and services. If they cannot afford to staff their own *R & D* departments, companies will look at universities and PROs to enhance their competitiveness.

Perceptions of intellectual property rights, particularly across the North-South axis, are fiercely antagonistic.¹³ Domestic university-industry technology transfer, i.e. within the borders of a country, is one of the rare areas of intellectual property in which there appears to be no antagonism or conflicting interest, allowing for complementarity and synergies to be forged. Domestic technology transfer appears, *prima facie*, like a win-win opportunity for all parties involved. On the one hand, private companies require, more than ever before, innovative

⁹ MIT Sloan School of Management, available online at: <http://ccs.mit.edu/21c/iokey.html> accessed 25 September 2011.

¹⁰ Interagency Advisory Panel on Research Ethics, available online at: <http://www.pre.ethics.gc.ca/english/tutorial/glossary.cfm> accessed 25 September 2011.

¹¹ 'Licensing and Technology Transfer', WIPO, available online at: <http://www.wipo.int/patent-law/en/developments/licensing.html> accessed 24 September 2011.

¹² In this paper, no distinction is made between technology and knowledge transfer. Knowledge transfer is sometimes associated, as regards IPRs, with copyright and neighboring rights. But it can also have a broader meaning that is inclusive of technology transfer. According to the European Commission:

Knowledge transfer consists of the range of activities which aim to capture and transmit knowledge (either explicit, such as in patents, or tacit such as know-how), skills and competence from those who generate them to those who will transform them into economic outcomes. It includes both commercial and non-commercial activities such as research collaborations, consultancy, licensing, spin-off creation, researcher mobility and publication.

European Commission, Press Release: 'Knowledge Transfer between Research Institutions and Industry – Frequently Asked Questions', Memo/07/127 (4 April 2007), available online at: <http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/07/127> accessed 13 February 2012.

¹³ For a fact-based research on the different perceptions of intellectual property rights, see Roya Ghafele, 'Perceptions of Intellectual Property: A Review', IP Institute (London 2008).

products and services to compete in both global and domestic markets. Particularly in developing countries, most small and medium-sized enterprises (SMEs) lack the financial resources to set up their own private *R & D* departments.¹⁴ To SMEs, universities and PROs represent a golden opportunity for outsourcing *R & D* and thus improving competitiveness.¹⁵ On the other hand, universities and PROs need, more than ever before, additional sources of funding, as public investment in education and *R & D* activities shrinks worldwide. The additional financial resources universities can obtain by engaging in technology transfer activities with the private sector may help reduce the income gap between privately-employed and publicly-employed scientists (which in turn may reduce inter-sector brain drain). In addition, collaboration with the private sector helps to anchor and focus the public *R & D* agenda towards real-world needs and demand-oriented solutions. Both sectors benefit from interacting with each other, generating synergy. Moreover, the collaboration between university and industry brings about positive externalities. Society as a whole benefits from the dissemination of new knowledge, modern technologies incorporated into products and services, job creation, and increased wealth.

A new model of university is emerging, the *entrepreneurial university*.¹⁶ The roles of universities have evolved over time. The functions performed by higher education institutions during the 20th century were three, namely, education, research and outreach activities. The 21st century calls for a fourth role: technology transfer and development of the regional economy. The entrepreneurial university model is no substitute for private industries or private companies; the core function of universities still remains the creation and dissemination of knowledge. However, as a consequence of the increased value of knowledge in contemporaneous society, the university is being called on to play a more active role. Technology transfer should be part of a bigger framework, a National Innovation System (NIS). According to the OECD: '[t]he concept of national innovation systems rests on the premise that understanding the linkages among the actors involved in innovation is key to improving technology performance'.¹⁷ Technology transfer, entrepreneurial universities and innovative SMEs only make sense within such a scheme. The knowledge economy requires each participant to perform its role. Academia, industry and government form the so-called *triple-helix*¹⁸ propelling economic growth.

III. REGULATION OF TECHNOLOGY TRANSFER IN ARGENTINA

Ab initio regulatory emphasis was put on international technology transfer in relation to international trade and foreign direct investment. International technology transfer generally occurs from developed to developing countries and takes the form of licensing agreements. In a pre-TRIPS era, most developing countries (then closed or more-closed-than-today economies) found these contracts threatening, because of the risk of currency flight and other strategic

¹⁴ There are some noteworthy exceptions.

¹⁵ Because the outsourcing is domestic (within the country) the usual negative connotations associated with off-shoring are absent.

¹⁶ See generally AA Gibb and P Hannon, 'Towards the Entrepreneurial University' (2006) *International Journal of Entrepreneurship Education* 4, pp. 73 to 110.

¹⁷ National Innovation Systems (OECD, 1997), available online at: <http://www.oecd.org/dataoecd/35/56/2101733.pdf> accessed 11 February 2012.

¹⁸ A concept attributed to H Etzkowitz and L Leydesdorff. See H Etzkowitz and L Leydesdorff, 'The Endless Transition: A 'Triple Helix' of University-Industry-Government Relations, Introduction to a Theme Issue' (1998) *Minerva* 36, pp. 203 to 208.

concerns. They therefore enacted legislation to oversee and limit the contents of those agreements. Argentina was no exception.

Argentina's Laws Nos. 19.231, 20.794 and 21.617 established a constitutive, registry-based system for technology transfer agreements between a foreign transferor of technology or other intellectual property rights and an Argentine transferee. To be valid in Argentina the contract had to be previously subject to a three-stage control by the enforcing authority: economic (not inconvenient or contrary to public interest¹⁹), technological (usefulness and value) and legal (certain clauses were *ab initio* illegal). In addition, some species of transactions were prohibited and presumptions about the validity or invalidity of a series of acts were created *ex lege*. Unregistered contracts were held invalid, and, as a consequence, the payment of royalties to a transferor abroad was forbidden, no tax deduction was possible for the Argentine transferee and, in some special cases, additional legal sanctions were applicable.

As is always the case when a governmental control supersedes market forces, serious problems arose: politicization of economic decisions, high transaction and administrative costs, and insufficient information.²⁰ In 1981, Law No. 22.425 was passed to remedy the shortcomings of the previous system. Like the old, the new legislation also subjected onerous technology transfer agreements (licences or assignments of patents, utility models, designs, trademarks and trade secrets) between a foreign person or company (transferor) and an Argentine person or company (transferee) to the approval of the enforcement authority (Article 2). A transaction would only be approved if the consideration had been deemed fair or balanced according to normal market practices. Unlike the previous system, however, where the enforcing authority did not approve the transaction, the consequence was not the outright invalidation of the agreement; governmental control was now merely informative. The legal sanction in question pertained to the applicable tax laws. The remuneration paid to the foreign transferor was considered net income *in totum* and no deduction was possible to the effect of alleviating the pressure of income tax. The payment of remuneration solely for the transfer of a foreign trademark was prohibited *ex lege*. More recently, during the process of liberalization of Argentina's economy, some dispositions of Law No. 22.425 were abrogated. Under the current legal regime, the registration of an international licensing agreement before the enforcement authority is not a requirement to have a legally binding instrument, but it does have healthy fiscal consequences: royalties paid abroad are deductible from the local transferee's income tax.

Argentina also regulates domestic technology transfer, *rectius*, it intends to foster technology transfer activities between local research institutions and industry. In 1990, the Law for the Advancement and Encouragement of Technological Innovation (Ley de Promoción y Fomento de la Innovación Tecnológica), No. 23.877, was passed.²¹ Article 1 clarifies its objective: to foster and to improve productive and commercial activities through the promotion of *R & D*, technology transfer and technological support activities.

To achieve its objectives, Law No. 23.877 creates a specific vehicle, the *Technology Transfer Unit* (*Unidad de Vinculación Tecnológica*, UVT), similar but not identical to US or

¹⁹ A concept difficult to define, if not impossible to quantify.

²⁰ Some economists think the market is a better mechanism to produce information than centralized bureaucratic agencies. See, *inter alia*, Friedrich Hayek 'The Use of Knowledge in Society', (1945).

²¹ Law No. 23.877 is completed by other norms, such as Decree No. 508/1992 (regulatory), Decree 1331/1996 (amendment), etc.

European technology transfer offices (TTOs).²² UVTs are non-government entities that require governmental approval to operate as such. Their purpose is the identification, selection and implementation of *R & D* programmes, technology transfer and technological support activities (Article 3). A UVT can be constituted as a civil corporation²³, business corporation, cooperative company or mixed company. In all cases they must have a unique object (as laid out in the aforementioned Article 1). UVTs can enter into agreements with the public and private sectors and must set up a revenue distribution (royalty sharing) scheme in advance.

Kababe highlights the dichotomy between the goals set up in Law No. 23.877 and the real effects it has had in practice.²⁴ She found that most of the activities of UVTs are administrative in nature and do not constitute actual technology transfer activities. *Voluntas legislatoris* is not sufficient in itself to bring about technological change, economic growth and development.

IV. ECONOMIC ANALYSIS OF TECHNOLOGY TRANSFER

‘Law and economics’ or the ‘economic analysis of law’ can be defined as ‘the application of economic theory – primarily microeconomics and the basic concepts of welfare economics – to examine the formation, structure, processes and economic impact of law and legal institutions’.²⁵ It is the main approach to the study of law in the United States and is gaining momentum in Europe and in developing countries. By examining the effects of legal institutions, it provides a useful tool for devising sound public policies. Although law and economics literature have studied intellectual property profusely²⁶, the area of technology transfer has received little attention. The following section will briefly review the major findings involved in the economics of technology transfer.²⁷

From an economic perspective, technology transfer offices mainly exist to build reputation.²⁸ In turn, reputation helps reduce asymmetric information between the contracting parties. Information asymmetry, i.e. one party to a transaction knowing much more than the other, can lead to a market failure: the absence of technology transfer activities. One of the consequences of information asymmetry is adverse selection, i.e. firms cannot determine *ex ante*

²² In particular, the Spanish model of Technology Transfer Office (*Oficina de Transferencia de Resultados de Investigación*, OTRI).

²³ This represents an oddity of Argentina's Law. The *Sociedad Civil* is not a partnership (that is, an *Asociación Civil*).

²⁴ Yamila Kababe, 'Las Unidades de Vinculación Tecnológica y la Articulación entre el Sector Científico Tecnológico y el Sector Empresario', (2010) 2 *SaberEs*. pp. 41 to 58.

²⁵ Nicholas Mercurio and Steven Medema, *Economics and the Law - From Posner to Post-Modernism* (Princeton University Press 1999).

²⁶ See, *inter alia*, William M Landes and Richard A Posner, *The Economic Structure of Intellectual Property Law* (Harvard University Press 2003); 'Indefinitely Renewable Copyright', available at SSRN eLibrary (2002); 'Trademark Law: An Economic Perspective' 30 (1987) *The Journal of Law and Economics*; *The Political Economics of Intellectual Property Law* (AEI-Brookings 2004); Francois Leveque and Yann Ménière, *The Economics of Patents and Copyright* (Berkeley Electronic Press July 2004).

²⁷ Ferran Vendrell Herrero and Pedro Ortín Angel, 'The Economic Analysis of University Technology Transfer Offices: A Theoretical Review and Empirical Implications', No. 200902, Working Papers, Basque Institute of Competitiveness, available online at: <http://econpapers.repec.org/RePEc:ivc:wpaper:200902> accessed 10 February 2012.

²⁸ I Macho-Stadler, et al., 'Licensing of University Innovations: The Role of the Technology Transfer Office', Mimeo, Universitat Autònoma de Barcelona and Katholieke Universiteit Leuven, Working Paper BBVA (2005).

which R & D , innovation or project is worthy. To remedy this failure an intermediary institution is necessary. For instance, UVTs (and TTOs in general) can build and catalyse reputation more easily than individual professors and scientists. A successful UVT has a signalling effect (it signals quality R & D projects) in the market for innovation.

In order to build reputation, TTOs need a critical size (i.e. sufficient to achieve their objectives).²⁹ As a corollary, not all universities or PROs need to set up a TTO. A TTO will only be successful in those institutions with a critical mass (both quantitatively and qualitatively) of R & D . The tendency of universities and PROs to set up a UVT regardless of a cost-benefit analysis may result in some cases in a waste of resources. It has been proven empirically that TTOs generate higher income both for universities and SMEs (than when no intermediary institution is present). A TTO will seek to maximize the difference between its costs (i.e. looking for a firm-transferee, C) and benefits (i.e. the expected utility from future royalty's streams, B). Coherently, a TTO will choose to transfer only those projects with potential to generate profits ($C - B = \geq 0$). Commercialization would not be possible if there was no form of compensation to the scientist and/or academic department³⁰ (e.g. royalty participation or equity). Consequently, the higher the percentage in the distribution of royalties or equity to university professors, the higher the quality of their R & D . Efficient UVTs, TTOs, and SMEs (i.e. those that better maximize their C - B ratio) generate a higher number of commercial transfer activities than the rest.³¹

Another issue analysed by economists is the decision to choose between licensing (or selling) the technology in question and creating a spin-off company. There are two sets of explanations proffered. One suggests that only lower-quality R & D projects may end up in a spin-off. Higher quality projects are transferred by licensing agreements, because the higher the quality of the project the lower the cost of finding a potential transferee. Consequently, only lower-quality projects will be transferred by spin-offs (those with higher costs of finding a potential transferee).³² The alternative explanation argues that spin-offs will be preferred when it is not possible to secure a patent.³³

Spin-offs also give rise to another economic problem related to information asymmetry – moral hazard – when a party to a transaction does not bear all the costs of its decision. Venture capitalists willing to invest in a spin-off cannot be insured against bad behavior (e.g. shirking) on the part of the scientists working on the project. To remedy this issue, economic literature suggests giving equity to the scientists involved.³⁴ Thus, the solution to the moral hazard problem is to make the scientists shareholders of the spin-off company. In some situations the spin-off is the best way to motivate a scientist.

²⁹ Ferran Vendrell Herrero and Pedro Ortín Angel, *ibid.*, page 11.

³⁰ Ferran Vendrell Herrero and Pedro Ortín Angel, *ibid.*, page 13.

³¹ Ferran Vendrell Herrero and Pedro Ortín Angel, *ibid.*, page 15.

³² C Chukumba and R Jensen, 'University Inventions, Entrepreneurship and Start-ups', NBER Working Paper No. W11475 (2005).

³³ A Lockett, et al., 'Technology Transfer and Universities' Spin-out Strategies' (2003) *Small Business Economics* 20, pp.185 to 200; S Shane and T Stuart, 'Organizational Endowment and Performance of University Start-up' (2002) *Management Science* 48, pp.154 to 170.

³⁴ I Macho-Stadler, et al., 'Designing Contracts for University Spin-offs', Working Paper presented at XXII Jornadas de Economía Industrial (2006), available online at: http://www.iese.edu/en/events/spsp/JEI_2006/Program/Program.asp#23107 accessed 10 February 2012.

V. AN ARGENTINE TECHNOLOGY TRANSFER TANGO

It is relatively simple to transplant legal norms from abroad; a far more difficult challenge is to transplant the social norms that make those legal norms successful in their place of origin. The challenges to successful domestic technology transfer in Argentina are many and of a varied nature. Let us group these challenges in sociological, economic and institutional categories.

Of a sociological nature: within the scientific community working at public universities and PROs, ideological biases against firms and markets remain strong. This ideological perspective traditionally opposes the 'propertization' of research findings (intellectual property rights) and favours the free/open science paradigm. The sociological dimension may be influenced by institutional design; alterations in institutional design may bring about changes in behaviour. In recent times, some scientists, perhaps as a reaction to insufficient funding and low stipends from the State, have begun to look at firms and markets as an alternative source of financing *R & D* activities. Furthermore, the different cultures involved in technology transfer activities (corporate, bureaucratic and academic) clash because their specialized jargon makes communicating in a common language challenging.

Of an economic nature: to economists, both public and private scientists are rational beings. But incentives differ in these sectors and this fact may explain attitudinal differences. For instance, a scientist employed by a university will have an incentive to publish papers but not to file patents (because, for instance, only the publication will count as an academic antecedent for promotion). The absence of the profit incentive (no bonuses on productivity), the peer-reviewed mechanism of publications, the cumulative nature of science and ambitious long-termed research objectives may also foster an anti-market predisposition. Ironically, however, sometimes market mechanisms are more useful to promote the public good than non-market alternatives.³⁵

To some analysts, an economic hurdle is the unsophisticated internal market. Most Argentine firms produce and sell commoditized and/or low-tech products. Local companies compete mostly in one dimension, price. Adding *R & D* costs to their mark-up would only put innovator companies out of the market. However, there are signs that this feature of the local market may be temporary and could change soon. Modifying consumer habits takes time and is both cultural and budget constrained. However, with economic stability and steady growth since 2002, the Argentine consumer has recovered acquisitive power and is becoming more sophisticated in his purchase decisions. In the near future, consumers may not only demand cheap prices but higher quality and more innovative products as well.

Another set of economic factors that may explain why UVTs are not often used by SMEs in Argentina are symmetric information and transaction costs. There appears to be great

³⁵ César Milstein, an Argentine scientist later nationalized British, discovered monoclonal antibodies in 1975 (with Georges J.F. Köhler). Both scientists succeeded in using cells to create antibody bio-factories. They were awarded the Nobel Prize, but they did not file a patent for their innovation, willingly. They preferred to share it with the world, for free. Hybritech, a California corporation, was the first to apply the findings of Milstein-Köhler to develop diagnostic kits. Hybritech did file a patent for the kits, and obtained it. With that patent Hybritech managed to obtain a monopoly over a very important line of Milstein and Köhler's research. This is just one of the many cases in which the subsequent exploitation of a scientific breakthrough was granted to a single firm which was not involved in the pioneering *R & D*. It might have been a better strategy for the common good had the scientists filed for a patent and granted non-exclusive free licences.

disparity in the performance of various UVTs.³⁶ Different UVT origins (public or private, university or corporate) imply different sets of values and cultures, which may lead to different outcomes. As a consequence, some UVTs are more (or less) successful than others. The problem is that the transfer of technology market in Argentina does not provide sufficient signals to enable a determination of which UVT falls under which category. A potential company looking for an innovation does not know *ex ante* which UVT is good or bad. One way to address this problem would be to have credible and complete information regarding UVT performance with, for instance, track records easily available. Inefficient UVTs have no incentives to disclose negative information. Government agencies and other institutions provide some UVT indicators, but these are insufficient for effective analysis. On the other hand, a ranking of UVTs, for instance, would help diminish the impact of asymmetric information in the technology transfer market.

Transaction costs associated with using UVTs are high. A local firm would only use a UVT to obtain an innovation when doing so is cheaper than obtaining the same innovation without the UVT. Because of the high transaction costs of negotiating with an UVT, in some situations it may be cheaper for companies to hire a scientist (for example by offering him a higher salary than the one paid by the university) than to use the UVT mechanism. Furthermore, if transactions costs are too high, in other words, higher than the expected utility of selling a product incorporating the sought-after innovation, the firm will simply do nothing. Therefore it is crucial to lower as much as possible the transaction costs of using UVTs. Promoting competition among UVTs may contribute towards this goal. However, it is unclear what sort of institutional mechanism should be used to that end.

Of an institutional nature: it should be noted that to the majority of SMEs, UVTs and technology transfer remain a mystery. An Argentine scholar stated: 'UVTs are the lesser known agents of the NIS'.³⁷ This statement is sad but true. There have been insufficient marketing and PPRR campaigns in relation to UVTs and almost no advertising of successful cases, even though such cases exist. This should be one of the first issues tackled. Another pertinent institutional dynamic is the dissimilar incentive schemes of private and public workers. Traditional neoclassical economics has suggested that private workers are more efficient than public ones. Four reasons sustain the assertion: the profit motivation is absent in public jobs; public institutions are usually monopolies, thus they face no competitive pressure to improve or lower costs; public workers vote (and politicians are aware of that); and public employers tend to substitute monetary wage increases (which is scandalous to non-public workers/voters) with other expensive, but subtler benefits, such as job security, longer holidays, earlier access to pension, etc. This line of argument should lead (and actually did lead at one stage in Argentina's history) to massive privatization of public companies and public jobs.

Richard Posner, a renowned intellectual associated with the Chicago School of Economics, recently wrote an extremely interesting post in which he empirically assessed the efficiency argument of private workers.³⁸ Using regression analysis, he tested in 27 countries the following hypothesis: whether a country with a large number of public employees is less efficient than other countries with a low percentage of its workforce in public jobs. The results

³⁶ Yamila Kababe, *ibid.*

³⁷ Speech by H Baccarini at the II Ibero-American Course on Management and Innovation, Instituto Tecnológico de Buenos Aires (8-19 August 2005).

³⁸ Richard Posner, 'Too Many Government Workers?' The Becker-Posner Blog, available online at: <http://www.becker-posner-blog.com/2011/09/too-many-government-workersposner.html> accessed 29 September 2011.

were puzzling, because the hypothesis was not proved. Sweden, an efficient economy with an elevated gross domestic product per capita, has the highest percentage of workers in public jobs (33.8 per cent). Singapore, another efficient economy with high gross domestic products per capita, has the lowest percentage of workers in public jobs (less than 10 per cent).

In conclusion, there is no correlation between the percentage of public jobs, overall economic efficiency and gross domestic product per capita. There must be other variables responsible for the wealth (and poverty) of nations such as culture, work ethic, corruption, unsound subsidies, efficient or inefficient laws and the type of public jobs. For instance, the predominance of public workers in education, the army, the police or other activities may have less impact than the same number of workers would have in a market-determined sector of the economy. From all this, however, emerges an important institutional lesson: the success of university-industry technology transfer does not depend on whether TTOs are privatized or nationalized.

Another consideration is that big numbers do not necessarily indicate success. This is the conclusion from the quantitative analysis of UVTs registered in Argentina. The official number of registered UVTs to date, according to the enforcement authority, is 239.³⁹ Given the usual delay in adding information to official databases, it is conceivable that there could be even more. In any case, this appears to be quite a high figure for a country having a comparatively low level of *R & D* expenditure (0.51 per cent of gross domestic product in 2007, while during the same year Sweden spent 3.61 per cent and Singapore 2.52 per cent⁴⁰) and that has, moreover, not traditionally championed intellectual property rights.⁴¹ Why then does Argentina have so many registered UVTs? There is no decisive explanation. Assuming there is a good basis for UVTs, there must also be other incentives (public funding, subsidies, fiscal incentives, etc.) that can justify their high numbers. The rate of increase has been exponential in some years. In 1992 four UVTs were registered: 162 in 2000, 223 in 2007 and 233 in 2009. Even if data are scarce, it would appear that the rate of technology transfer activities has not augmented at the same pace. This may signal a waste of resources in UVT creation and maintenance.

³⁹ National Agency of Technological Promotion (*Agencia Nacional de Promoción Tecnológica*) under the aegis of the Ministry of Science, Technology and Productive Innovation (Ministerio de Ciencia Tecnología e Innovación Productiva), available online at: http://www.agencia.gov.ar/spip.php?article41&pageNum_traerUVTs=0&provincia=&keyword= accessed 29 September 2011.

⁴⁰ World Bank, Data: Research and Development Expenditure: % of GDP, available online at: http://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS?order=wbapi_data_value_2008+wbapi_data_value+wbapi_data_value-last&sort=asc accessed 30 September 2011.

⁴¹ For instance, in the 2011 edition of *International Property Rights Index*, a project of the Property Rights Alliance led by Peruvian economist Hernando De Soto, Argentina scored 4.7 points (10 being best) and ranked 87 out of 129 countries surveyed. Argentina shares the same score and rank with the Philippines, Mozambique, Senegal, Honduras and Macedonia. The first country in the list, with a score of 8.5, is Sweden. The difficulty in effectively protecting IPRs in Argentina may be read as a co-adjutant factor to the low number of successful cases of domestic technology transfer. Companies may simply prefer other methods to preserve technological competitive advantages, such as lead-time and trade secrets. But this is pure speculation on the part of the author. *International Property Rights Index* available online at: http://www.internationalpropertyrightsindex.org/ATR_2011%20INDEX_Web.pdf accessed 29 September 2011.

Another contention is the geographical concentration of UVTs: 45 per cent of UVTs are located in the Buenos Aires area (province and autonomous city⁴²). Depending on how or from where we look at the geographic distribution of UVTs, it may or may not be problematic. On the one hand, Buenos Aires province and autonomous city concentrates almost half of the country's population in one area, as well as most of the wealth and productive activities. On the other hand, too many UVTs concentrated in one area do not lead to the harmonious and balanced development of all provinces *pari passu* (a constitutional objective in a federalist republic such as Argentina).

Last but not least, an institutional weakness I personally was able to observe while working with national UVTs is the insufficient number of staff and lack of specific skill sets. The majority of technology transfer professionals working in UVTs are lawyers, some of them with a graduate degree in IP law, few of them with specific training in technology transfer. To my knowledge, no university in Argentina provides systematic training in technology transfer. This lacuna must be filled through graduate or professional certification programmes that focus on the best practices and business skills necessary to run a successful TTO.⁴³ Additionally, no UVT I have visited uses specialized software (patent metrics, IP management and the like).⁴⁴ Efficiency and network externalities could be gained by promoting the use of specific technology transfer software and uniform valuation criteria among all NIS actors.

VI. INCREASING UNIVERSITY-INDUSTRY TECHNOLOGY TRANSFER

As suggested in my previous article, it is time for developing countries to shift the emphasis of intellectual property rights from the protection-exclusionary binomial to monetization and profit-making.⁴⁵ In countries such as Argentina, where most SMEs lack the financial capacity to carry out *R & D* activities, the cooperation with public universities and PROs is key to entering the knowledge economy. Efficient regulation and sound public policies are necessary to achieve that goal, as individuals left to their own devices may be affected by coordination problems and strategic behavior.

To change Law No. 23.877 would be, *prima facie*, unnecessary. The Law for the Advancement and Encouragement of Technological Innovation was enacted with good intentions and works well in some exceptional cases;⁴⁶ nevertheless, it can be improved and/or

⁴² Argentina has 23 provinces and one autonomous city.

⁴³ Education is a one of the main concerns of the United States. See Association of University Technology Transfer, available online at: <http://www.autm.net> accessed 16 February 2012. The European Union is working towards a *European Certification and Training Framework for Technology Transfer Management*; more information available online at: <http://www.ttt-manager.eu> accessed 9 February 2012. The *Licensing Executives Society* also offers training and certification programmes.

⁴⁴ There are many products in the market, both proprietary and open-source (such as EPO's *IPScore*®).

⁴⁵ Maximiliano Marzetti, 'IP Education – What Next? A View from the Southern Cone', *WIPO Magazine* 5/11., available online at: http://www.wipo.int/wipo_magazine/en/2011/05/article_0008.html accessed 29 September 2011.

⁴⁶ The National Institute of Agricultural Technology (*Instituto Nacional de Tecnología Agropecuaria*, INTA) created its own UVT in 1987. Between 2007 and May 2011 INTA obtained 103 plant breeder's rights, five patents, five copyrighted works, two trademarks and signed 106 technology transfer agreements. In addition, INTA developed a Digital Management System for Technology Transfer Agreements (SIGEC), a Normative Technology Transfer Policy and a Handbook of Technology Transfer Practices. INTA is active in five innovation parks and other *R & D* clusters in the country.

supplemented. Had Argentina no 'innovation' law in place it could be argued that TTOs (UVTs) would require approval by a governmental agency, which would only add red tape (i.e. transaction and administrative costs) and lead to rent-seeking behavior. With that objective in mind, in addition to the suggestions mentioned in previous paragraphs, the following are a few suggestions with low cost and high potential impact:

- (a) First and foremost, *divuligation*. Most SMEs are not aware they can enter into *R & D* agreements with universities, and most researchers do not know about intellectual property rights and how to benefit from them. It is necessary to raise awareness of the NIS, the UVTs and intellectual property rights in both the public and private sectors. Technical students at secondary and tertiary levels must be educated to take an active part in the knowledge economy. Publication in the media of successful cases of university-industry technology transfer would be desirable.
- (b) Secondly, *education*. It is necessary to educate HHRR in the specialized fields of IP protection, IP management, IP monetization, and technology transfer. It makes no sense to have TTOs without qualified technology transfer professionals staffing them. Apart from this, specialized courses, particularly addressing scientists and businessmen, are required to move innovation and technology from the laboratory to the assembly line.
- (c) Thirdly, *performance indicators*. As argued in previous sections, the market for technology transfer is affected by asymmetric information (adverse selection and moral hazard problems). Objective indicators, reliable information sources, iterated interactions, even brand names and government auditing are all suitable solutions to the challenge of information asymmetry.⁴⁷
- (d) Fourthly, *competition*. The transaction and administrative costs of using the UVT mechanism are high. There seem to be too many UVTs (from an economic standpoint, it may signal a waste of resources). Intra-UVT competition may lower costs and improve efficiency. Only the most efficient UVTs, i.e. those with a better track record of successful technology transfer activities, should receive public funding or other forms of government support. Creative destruction must take its toll.
- (e) Fifthly, *coordination*. There is low coordination across the NIS actors. A nation-wide, long-term and well-planned IP policy is imperative, in the same way that a ship needs a compass not to lose the way in a starless night. IP policy should identify the areas in which a country has competitive advantages. A national innovation charter needs to be articulated, not only across the NIS, but also across other sectors (involving the Ministries of Economics and Public Finance, Federal Planning, Public Investment and Services, Industry and Agriculture, Stockbreeding, Fishing and Food, etc.).

Moreover, income from royalties derived from IPRs licensed to the private sector has grown exponentially in recent years.

⁴⁷ G Akerlof, 'The Market for Lemons: Quality Uncertainty and the Market Mechanism' (1970) *The Quarterly Journal of Economics*, 84, pp. 488 to 500.

A final word about nirvanas: improving the IP system of a given country, boosting its innovation policy, strengthening interrelationships between university and industry, and lubricating the mechanisms of technology transfer are all actions that may contribute to the development of a knowledge economy, but, in isolation, are not enough. The Nirvana fallacy is a logical error – the belief that there is one easy theoretical way out of complex real problems. Tweaking one or two IP-related regulations may not be sufficient to transform a developing country into an innovative nation. The World Bank has identified four pillars that support a knowledge economy. Only one of these relates to intellectual property rights and technology transfer.⁴⁸ The moral of the story: to foster academic-industry technology transfer, IP legislation alone will not suffice. The approach must be holistic and, above all, realistic. Developing nations also need to tackle poverty, corruption, lack of infrastructure and access to capital, to name but a few endemic challenges. Only then can innovation be more than wishful thinking.

⁴⁸ The so-called four pillars, according to the World Bank, are: (1) education and training; (2) information infrastructure; (3) economic incentive and institutional regime; (4) innovation systems. Available online at: <http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/ECAEXT/EXTECAREGTOPKNOECO/0,contentMDK:20422383~menuPK:921081~pagePK:34004173~piPK:34003707~theSitePK:677607,00.html> accessed 29 September 2011.