ERAWATCH COUNTRY REPORTS 2010: Argentina

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Executive Summary

Argentina is a vast South-American country with a population of 40.1 million inhabitants in 2010 and a GDP per capita (in current prices) of €5,483 in 2009. R&D intensity in the country reached 0.52% in 2008, compared to the EU27 average of 1.91% in 2009. The private sector financed about 27% of GERD in 2008, compared to 68% financed by all levels of government. Although important budgetary increases were observed in the recent period (155% in euros between 2003 and 2008), the R&D intensity is far from reaching the 1% GDP goal to be met by 2010. Goals related with increased BERD have not been materialized yet. In terms of its regional importance, Argentina accounts for 7.3% of the total GDP of Latin America and the Caribbean, it is responsible for 6.4% of the region's R&D and has 22% of the total research personnel (head count) in 2008.

The science and technology system in the country experienced important changes in the recent years through modifications in the regulatory system and in its institutional set up. These shifts started in 1996, with the creation of the National Agency of Promotion of Science and Technology (ANPCYT). This new decentralised institution was conceived to separate the promotion of science and technology by introducing competitive funding from the execution of research as such, traditionally concentrated at the R&D centres of the National Council for Scientific and Technical Research (CONICET) and other thematically specialised research performers [Link to legislation: Decree 1660 (1996)]. Later on, the enacting of the Law 25,467 in 2001- National Science, Technology and Innovation Law (known as "Framework law" [see template] implied the creation of institutions representing the provinces and the different ministries of the federal government and their specialised R&D organisations in the processes of design and assessment of new policies and in the definition of national and regional research priorities.

In 2007 the upgrading of the Secretary of Science and Technology (i.e., the agency in charge of science and technology policies at the federal government level) into the current Ministry of Science, Technology, and Productive Innovation (MINCYT) represented a major institutional evolution and it is a proof to the priority that the government has placed on technological development. MINCYT also fostered a policy change from an exclusive emphasis on horizontal instruments towards more sectoral policies and the selection of strategic technologies to be supported via newly established promotion funds. Specifically, a combination of specific technologies (ICT, biotechnology and nanotechnology) and sectors (Health, Energy, Agro-Industry and Science for Social Inclusion) has been selected.

The knowledge triangle is not fully operative in the case of Argentina. Although some coordination instances (such as the Scientific and Technological Cabinet, GACTEC) have aimed at increasing the dialogue and cooperation between the different agencies, only limited success has been achieved. As a whole, the education and research parts are significantly better developed and achieve more progress than innovation.

Policy practice in the form of separate ministries has created own objectives and ways of intervention on the different component of the triangle. In particular, the practice of competitive and performance-based funding is becoming the standard intervention in the promotion of R&D and innovation (via MINCYT and ANPCYT); block funding is the norm in research that concerns university employees. Similarly, although current low numbers of Science, Technology, Engineering and Mathematics (STEM) professionals are a bottleneck and thus a boost of their numbers needs to be fostered, the education and training side has ignored the industry needs in the formulation of curricula at the higher education institutions.

Hence, in parallel to the increasing budgets and efforts of research and education (600% in Euros between 2003 and 2008), more emphasis is needed to create bridges and reinforce the triangle. Knowledge demand remains the weak factor, despite significant and generous incentives. Policy is emphasising this priority yet without visible changes in terms of outcomes and impacts.

Knowledge triangle

	Recent policy changes	**Assessment of strengths and weaknesses**
Research policy	• Establishment of MINCYT and operation of FONARSEC promoting selected sectors; • Work in progress for the elaboration of a new medium-term National Plan of R&D started, Continuous increases in federal budget.	• Creation and upgrading of knowledge broker capabilities; • Inadequate science-industry dialog.
Innovation policy	• Promotion of research in areas with important business applications or social needs; • Promotion of establishment of R&D groups in firms via the provision of post-doctoral fellowships; • Promotion of interactions between different types of agents; Newly created funding sources and instrument to promote the creation of technology based ventures.	• Focus on SMEs efforts. Not only limited to technological innovations but also to organisational and commercial; • Emphasis on a few horizontal technologies and specific industrial sectors; • Lack of adequate funding and instruments promoting the creation of intangible assets; • Infant venture capital industry and poor emphasis on academic spin-offs.
Education policy	• Establishment of undergraduate scholarships in STEM fields; • Continuous expansion of scholarships at the postgraduate level by CONICET.	• Decreasing levels of STEM enrolments and graduates; • A range of measures aiming to promote research as a potential career among students • Lack of adequate research performance-based incentives limit research and educational potential of both, private and public HEIs.
Other policies	Establishment of international calls for R&D by ANPCYT in specific sectors.	

European Research Area

Assessment of the national policies/measures which correspond to ERA objectives[1]

	ERA objectives	Main policy changes	Assessment of national strengths and weaknesses
1	Ensure an adequate supply of human resources for research and an open, attractive and competitive labour market for male and female researchers	• Establishment of undergraduate scholarships on STEM disciplines; • Continuous support for postgraduate scholarships by CONICET; • Establishment of postgraduate fellowship programmes in firms; • Attract Argentinean researchers abroad for short stays and repatriation.	• Decreasing proportion of enrolments and graduates on science, technology, engineering and mathematics (STEM) at the graduate and postgraduate levels; • Need to increase the attractiveness of a scientific career by providing high wages and equipment.
2	Increase public support for research	• Public budget for R&D increased 128% increase in local currency and 40% in Euros between 2006 and 2009 to reach €782 million (0.35% GDP); • R&D intensity in the country reached 0.52% in 2008, with the public sector financing 68%.	• Continuous significant increase in R&D expenditure; • R&D intensity is far from reaching the 1% GDP goal; • Loans and agreements with multilateral organisations secure a stable provision of funds in the form of competitive funding.
3	Increase coordination and integration of research funding	• No major changes. The government continues to actively support the Argentine participation in different European schemes (FP7, ALBAN, ALFA, @lis) • Establishment of a roadmap between Argentina and the EU	• Strong emphasis given to Argentinean participation in the EU initiatives.
4	Enhance research capacity	• Establishment of bi-national and/or regional research and training centres.	• Focus on priority technologies and sectors.
5	Develop world-class research infrastructures (including e-infrastructures) and ensure access to them	• FONCYT opened the first call for the Technology Platforms Projects (PPL). PPL supports the formation of excellence centres equipped with cutting edge technology and personnel dedicated to providing highly specialized products and advanced scientific and technological services in the areas of Genomics, Stem cells, New Materials and Bioinformatics; • Instruments aimed at improving R&D equipment and infrastructure.	• Need to concentrate disperse efforts and capabilities • Funding requires increases.
6	Strengthen research institutions, including notably universities	• No major changes	• Funding is mostly allocated in as block funding; • Competitive funding (via ANPCYT) is becoming established and growing
7	Improve framework conditions for private investment in R&D	• Increasing incentives to the business sector; • Promotion of research and development personnel in firms.	• Lack of adequate funding for investments in R&D (resources coming mostly from the firms).
8	Promote public-private	• Increased focus on the improvement	• Strong willingness of the

[1] Of course non-ERA countries do not strive to achieve ERA objectives. This part of the report is simply to allow a comparison with the activities of ERA countries on these issues

	ERA objectives	Main policy changes	Assessment of national strengths and weaknesses
	cooperation and knowledge transfer	of research-industry links and better knowledge transfer in the newly introduced sectoral funding schemes; • Revamp of the operation of intermediaries and their linkages	government to bridge the gap between academia and industry; • Weak interest of the enterprises in research activities in comparison to other innovation expenditures.
9	Enhance knowledge circulation	• Argentina is continuously increasing its participation in the EU initiatives; • National programmes are starting to promote foreign participation under bilateral schemes. Mostly focused on the MERCOSUR area	• Need to further promote opportunities for participation in international partnerships.
10	Strengthen international cooperation in science and technology	• Growth in the number of international cooperation agreements	• Cooperation is considered a priority area by MINCYT allowing to ease constraints and promote high quality research; • Need to strengthen RECYT and the MERCOSUR framework programme.
11	Jointly design and coordinate policies across policy levels and policy areas, notably within the knowledge triangle	• No major changes	• Further need to empower coordination via GACTEC and COFECYT.
12	Develop and sustain excellence and overall quality of research	• Strong priorisation of research areas by MINCYT; • Push towards concentration of disperse effort in transversal technologies (technology platforms).	• The government's strong willingness to develop adequate and focused policy framework; • Increasing emphasis on prioritisation of research orientation.
13	Promote structural change and specialisation towards a more knowledge - intensive economy	• Introduction of sectoral policies with specific priorities (in the form of call for projects) • Promotion of technology based firms and ventures • MINCYT have identified societal challenges – social inclusion, vaccines and research on stem cells, nanotechnology, biotechnology and energy.	• Strategic exercise in course is expected to emphasise research priorities; • Infant venture capital industry.
14	Mobilise research to address major societal challenges and contribute to sustainable development	• MINCYT have identified societal challenges – social inclusion, vaccines and research on stem cells, nanotechnology, biotechnology and energy. • Promotion of transferable and applicable research	• Promotion of research consortia (both with domestic and international partners); • Identification of infrastructure needs and concentration of efforts in selected centres (technological platforms)
15	Build mutual trust between science and society and strengthen scientific evidence for policy making	• Increased effort from MINCYT in the form of initiatives to sensitise the public on the topics such as S&T, research and innovation (information days, awareness campaigns, etc.) and research as career.	• Lack of evaluation culture creates unfavourable framework for evidence-based policy making; • Important role of multilateral institutions (IDB and WB) in performing assessments and establishing evaluation procedures and culture.

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1 Introduction

The main objective of the ERAWATCH International Analytical Country Reports 2010 is to characterise and assess the evolution of the national policy mixes for the non-EU countries in the perspective of the Lisbon goals and of the 2020 post-Lisbon Strategy, even though they do not pursue these policies themselves. The assessment will focus on the national R&D investments targets, the efficiency and effectiveness of national policies and investments into R&D, the articulation between research, education and innovation. In doing this, the 15 objectives of the ERA 2020 are articulated.

Given the latest developments, the 2010 Country Report has a stronger focus on the link between research and innovation, reflecting the increased focus of innovation in the policy agenda. The report is not aimed to cover innovation per se, but rather the 'interlinkage' between research and innovation, in terms of their wider governance and policy mix.

2 Performance of the national research and innovation system and assessment of recent policy changes

The aim of this chapter is to assess the performance of the national research system, the 'interlinkages' between research and innovation systems, in terms of their wider governance and policy as well as the most recent changes that have occurred in national policy mixes in the perspective of the Lisbon goals. Each section identifies the main societal challenges addressed by the national research and innovation system and assesses the policy measures that address these challenges. The relevant objectives derived from ERA 2020 Vision are articulated in the assessment for comparison reasons.

2.1 Structure of the national research and innovation system and its governance

This section gives the main characteristics of the structure of the national research and innovation systems, in terms of their wider governance.

Argentina is a vast South-American country with a population of 40.1 million inhabitants in 2010 and a GDP per capita (in current prices) of €5,483 in 2009. R&D intensity in the country reached 0.52% in 2008, compared to the EU27 average of 1.91% in 2009. The private sector financed about 27% of GERD in 2008, compared to 68% financed by all levels of government. Although important budgetary increases were observed in the recent period (155% in euros between 2003 and 2008), the R&D intensity is far from reaching the 1% GDP goal to be met by 2010. Goals related with increased BERD have not been materialized yet. In terms of its regional importance, Argentina accounts for 7.3% of the total GDP of Latin America and the Caribbean, it is responsible for 6.4% of the region's R&D and has 22% of the total research personnel (head count) in 2008.

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Main research performer groups

Gross domestic expenditure on R&D (GERD) in 2008 amounted to about €1.16b (current prices), while R&D intensity (GERD as a percentage of GDP) reached 0.52%. The business sector performs the most R&D in terms of expenditure (43% of total GERD in 2008), followed by the higher education sector (29%), public research organisations (27%).

The major research performers in Argentina include the R&D centres or joint centres with/at universities of the CONICET, universities, and thematically specialised public research organisations. The most important public research organisations attached to federal Ministries include: INTA (National Institute for Agro Technology, Ministry of Agriculture), INTI (National Institute for Industrial Technology, Ministry of Production), CNEA (National Commission of Atomic Energy, Ministry of Planning), CONAE (National Commission of Space Activities, Ministry of Foreign Affairs), INIDEP (National Institute of Fisheries, Ministry of Agriculture) and ANLIS (National Laboratories of Health Institutes Administration, Ministry of Health).

Main actors and institutions in the research and innovation system

Under the new government of Cristina Fernandez de Kirchner, on 10 December 2007 the Secretariat for Science, Technology and Innovation of Production (SECYT) was upgraded to the Ministry of Science, Technology and Innovation of Production (MINCYT). The first minister, Dr. José Lino Salvador Barañao, is an internationally recognised scientist and formerly, among others, president of the National Agency of Promotion of Science and Technology (ANPCYT). The upgrading of SECYT to full ministerial rank underlines the great importance attributed to knowledge and innovation for Argentina's future and represented a major overhaul to the system. Specifically, at the same time that the national policy towards science, technology and innovation received a major boost from this development, the new minister set out immediately to overhaul the previously fragmented S&T system in Argentina by putting greater emphasis on multidisciplinary and flagship initiatives that should mobilise all social actors (multi-stakeholder).

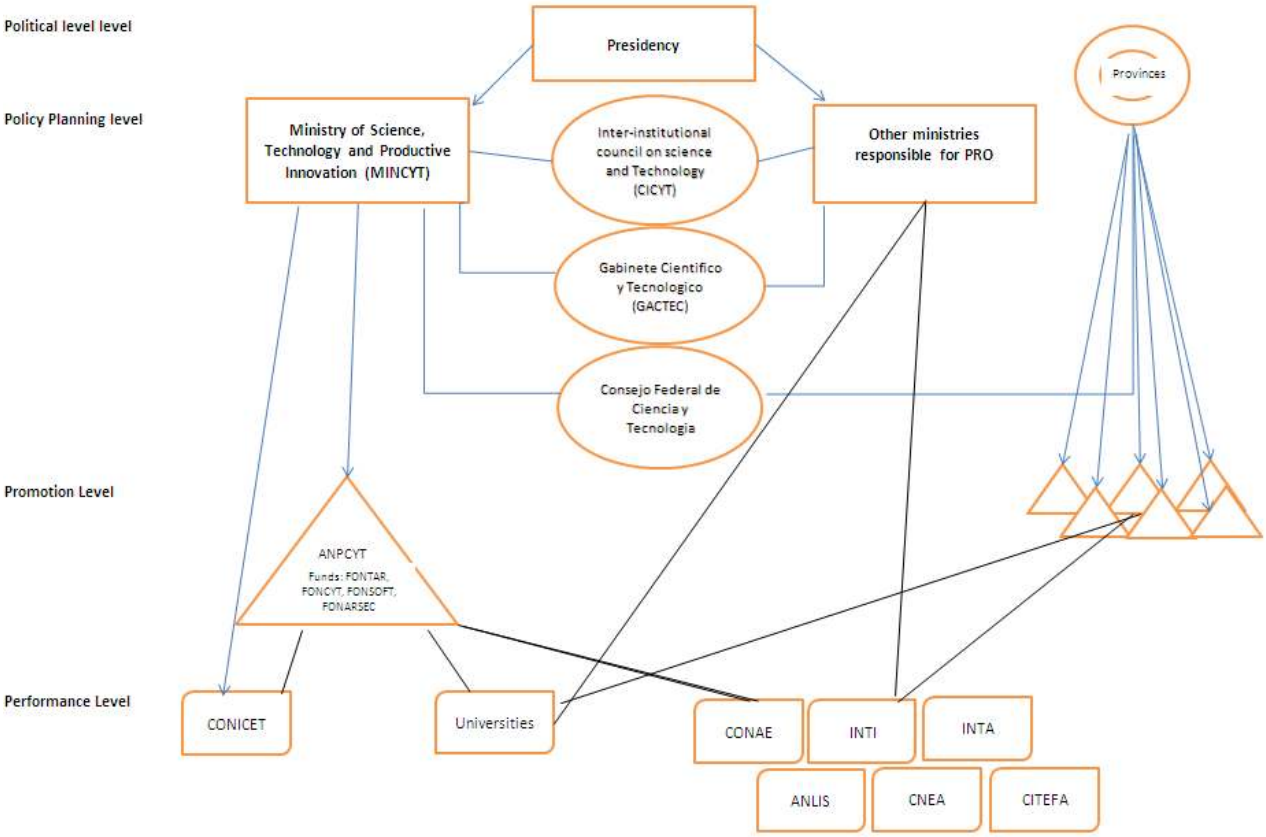
MINCYT is responsible for the policy design on R&D and innovation via the Secretariat for Planning and Policies. Specifically, it aims at strengthening strategic sectors; it coordinates the working groups that develop the National Plan for Science, Technology and Innovation and develops prospective studies to anticipate possible scenarios and carry out strategic planning.

Given the variety of ministries (such as defence, production, agriculture, national planning and infrastructure, foreign affairs) and public agencies that are responsible for public research organisations, inter-institutional coordination is required and provided through the Scientific and Technological Cabinet (GACTEC). At the same time, the federal nature of the country implies the need to consider regional specificities and requirements in the design of policies; the Federal Council on Science and Technology (COFECYT) is taking this task.

COFECYT is in charge of the coordination of the different levels of government (federal, provincial and local governments) in terms of policy coherence and regional equality. COFECYT [reference to Law]), created by the Law 25.467/2001 acts as an advisory board in matters related to the articulation between national and regional (sub-national) policies and priorities. It integrates representatives of the responsible authorities in science, technology and innovation from each of the provinces and the Autonomous City of Buenos Aires.

The Inter-institutional Council for Science and Technology, CICYT is the main advisory body where the key institutions in the Argentinean S&T landscape develop orientations and advice for national policy and its implementation as well as links to civil society and innovation processes and institutions. Created by the Law 25.467/2001 [see template] CICYT links together the public research institutions belonging to different ministries and the representatives of both public and private universities (National Inter-university Council, CIN, for public universities and CRUP, Council of Deans of Private Universities).

Figure 1: Overview of Argentina research system governance structure



The institutional role of regions in research and innovation governance

Constituted as a federal country (a federation of 23 provinces and one autonomous city), the powers of the State in science and technology are located on federal and regional (provincial) levels. While the system is dominated by public funding (68% of GERD), the federal government concentrates the main national policy-making bodies, direction and coordination, including the Ministry of Science, Technology and Productive Innovation (MINCYT). In the National Congress, the House of Senate and

the House of Representatives have committees on science and technology whose function is to provide a detailed analysis and suggestions on legislative measures that concern R&D and innovation. At the provincial level, although all governments have the same power, only some governments have their own agencies for the promotion and coordination of scientific and technological activities. The most relevant examples are the Ministry of Science and Technology of the Province of Cordoba and the Scientific Research Commission of the province of Buenos Aires (CIC). The existing provincial agencies (mostly to be found in the most developed provinces) contribute with small funding (€12m allocated in the 2011 budget in the case of CIC and €5m for 2010 in the case of Cordoba). In practice, both the policy design and the promotion responsibilities are mostly addressed by the federal government.

The Federal Council of Science, Technology and Innovation (COFECYT), created by the Law 25.467/2001 [reference to Law] acts as an advisory board in matters related with the articulation between national and regional (sub-national) policies and priorities. The members of this Council are the highest STI authorities in each of the provinces and the Autonomous City of Buenos Aires.

The Federalization of the National Program of Science, Technology and Innovation programme (PROFECYT) was created in 2004 under COFECYT to promote and safeguard the development and activities aimed at strengthening science, technology, innovation, and knowledge transfer to society in all provinces and regions of the country. With a budget of almost €7m in 2010 (increase of 6% compared to 2009) PROFECYT aims specifically at reducing the technology gap between the different provinces. In addition, every year COFECYT provides grants focused on local needs of provincial government agencies, industry and civil society. To ensure a fair and balanced funding, planned COFECYT amounts are equally distributed across the different provinces. The different programmes include: Tourism Sector Technology Support (ASETUR, created in 2008); Municipal Technological Development Projects (DETEM); Federal Productive Innovation Project (PFIP) and Federal Productive Innovation Project - Productive Linkages (PFIP - ESPRO).

2.2 Resource mobilisation

This section will assess the progress towards national R&D targets, with particular focus on private R&D and of recent policy measures and governance changes and the status of key existing measures, taking into account recent government budget data. The assessment will include also the human resources for R&D. Main assessment criteria are the degree of compliance with national targets and the coherence of policy objectives and policy instruments.

2.2.1 Resource provision for research activities

GERD increased by 37% in the recent period (2006-2009), mostly pushed by an increase in government spending in R&D (by 40% in Euros). This increase implied, in turn, an upward trend in the part of GERD that is financed from public money to 68%. In addition Higher Education Institutions tripled their participation (reaching in 2008 4.3% of GERD) in R&D expenditures. These trends are a by-product of a genuine expansion of the system and improvements of the wages of researchers combined with inflationary pressures in the economy.

Since 2005, several exercises of strategic planning were followed mostly conceived as an orientation for the subsequent yearly and multi-annual plans established by the

Law 25,467 [see template]. The current strategy (put forward in the "Basis for a Medium-term Strategic Plan in Science, Technology, and Innovation 2005-2015" [see template] and the "Bicentennial plan") identifies four challenges faced by the country and identifies four strategic objectives that science and technology should aim at contributing to overcome them. The table below presents them:

Challenges	**Strategic objectives of the research policy**
Increase the cohesion and social equity	Orientation of R&D towards societal problems, improving the quality of life and social development
Open development paths	Creation and application of knowledge for exploitation of natural resources while protecting the environment
Articulate the national innovation system and build a new production specialisation profile	Strengthening innovation, modernisation and technological linkages in industrial production and agriculture
Advance towards a knowledge society and economy	Increase the scientific base and technological capacity

Taking these objectives, the "Basis" established four targets to be reached by 2015:

(a) the number of researchers will increase from 1.6 to 3 full-time equivalent researchers per thousand members of the economically active population;

(b) the total investment in R&D will reach the equivalent of 1% of GDP;

(c) private investment in R&D will increase until it is on par with public investment;

(d) the 19 provinces with the lowest investments in R&D, which currently garner just 20% of the nation's R&D resources, will double their share of the national total.

The Bicentennial Plan, published in 2006, revised the targets referred to investments in GERD and BERD and setting them to be reached by 2010. In relation to the regional distribution of resources, the plan included the intermediate objective of reaching 30% of total investments by the most lagged provinces by 2010. These quantitative goals were not achieved.

The Federal Government finances the bulk of public spending on R&D. Specifically, the federal financing of S&T policy has two main channels: budgetary appropriations of sectoral ministries that fund higher education and research organisations; and budgetary appropriations of MINCYT and decentralised agencies (CONICET and ANPCYT). As a whole, the majority (89%, €780 million) is allocated via institutional funding. ANPCYT, with a budget of €85 million is the unique provider of competitive funding at the federal level. This budget in 2010, open for HEIs, PROs and the industry, represented an increase of 12.5% in Euros in relation to the previous year.

ANPCYT is responsible for administering the Fiscal Credit (CF) programme established by Law 23877 (1990). The objective of the CF is to provide financing for

R&D projects such as: technological modernisation projects, scientific research, pre-competitive technological research, adjustments and improvements. Instrumented through a public tender, owners of companies as individuals or legal entities producing goods and services are eligible to finance projects up to €500,000 (depending on the mechanism) and up to 50% of the total cost of the project, in the form of certificates for paying up the income tax. FONTAR allocated in 2010 AR $40m (equivalent to €7.5m) of tax credit to domestic companies for conducting research and development, technological upgrading and technological counselling training. These amounts were approved for a total of 122 projects, 70% of them by SMEs. In terms of sectors benefiting from these grants, the first place is occupied by chemicals and chemical products, followed by machinery and equipment, computer services and food and beverages.

The recent years have seen an increased effort from MINCYT in the form of initiatives to sensitise the public on the topics such as S&T, research and innovation (information days, awareness campaigns and expositions, etc.) and research as career.[2] Focused on reaching students at both primary and secondary school levels, the Ministry has put in place Science Clubs and Scientists go to Schools.

2.2.2 Evolution of national policy mix geared towards the national R&D investment targets

The business sector is responsible for approximately a quarter of GERD (26.7% in 2008). Between 2003-2008, its share declined by 1% on average annually. Most recent estimates indicate a BERD of 0.14 of GDP (2008). The target to increase private investment in R&D to be on par with public investment in 2010 is far from being achieved and it does not seem likely to be corrected by 2015.

According to the latest innovation survey providing data for the manufacturing sector up to 2005 (*Encuesta Nacional sobre Innovación y Conducta Tecnológica ENIT*, INDEC 2008), the majority of R&D expenditures by the manufacturing sector are intramural (92%).

Although total GERD financed by industry has increased as a whole in the recent period (138% in Euros in between 2003-2008), R&D activities have lost ground to other (non-R&D) innovation related expenditures. R&D represented in 2005 a small share of 16.6% of total innovation activities in comparison to 57% devoted to the acquisition of machinery and embedded technologies.

Extramural business R&D in Argentina is limited. Although 55% of the surveyed firms reported contacts with other companies or institutions, the main partners to these linkages are suppliers or customers (44%) and companies belonging to the same economic group (19%). INTI stands out as the most often contacted research institution (24%). However, most of these reported links aimed at exchanging information rather than active cooperation in R&D activities. In this sense, 92% of firms indicated that they did not have ties with dedicated research institutions, and just over 80% mentioned that they do not work in conjunction with universities. Indeed, when the share of HERD financed by industry is taken as an indication for

[2] In the same line, MINCYT has conducted the Second National Survey on the Perception of Science and Technology and has promoted studies related to the interest of science as a career for youngsters. See OEI (2009) for more information on the latter.

science-industry cooperation, only 0.66% was funded in 2007. The industrial share in GOVERD is equally negligible with 0.29% in 2007 (OECD- MSTI 2010).

R&D expenditures by the business enterprise sector are quite low in the country. According to the Innovation survey, the intensity of these expenditures in relation to firm turnover reaches only 0.2%. Small firms account for almost half of the R&D in the sector (46%), while medium and large sized firms obtain the remainder. Foreign firms are responsible for 35% of total R&D performed by firms in the country, while fully owned subsidiaries account for another 19%. As a general rule, R&D is financed mostly (73%) by its own funding sources (i.e., reinvestments of profits, partners or contributions from headquarters).

Two thirds of R&D performed in the private sector corresponds to experimental development, while 27% refers to applied research. Basic research only represents 7% of the R&D in the manufacturing sector. In terms of personnel, the business sector employs 10.5% of the total research personnel (FTE) (3,300 researchers).

The latest innovation survey shows that the main obstacle faced by firms to engage in innovation related activities is the lack of adequate funding (53% indicate this as a factor of high or medium importance). In fact, 75% of the total funds for these activities are firms' own resources. In the same line, BERD funded by industry share is responsible for 94.5% (2007). Other factors, as the high cost of training and shortcomings of the science and technology policies score high as restrictions to the firms' innovation activities. To partially address the lack of funds available to new firms and investments, MINCYT created in December 2010 a programme called PROFIET (Program of Support to the Entrepreneurial Investment in Technology) to encourage entrepreneurial investment in technology via a combination of fiscal credits, subsidies and loans .

In terms of the policy mix, information from FONTAR shows a predominant role of loans (74% in between 2002 and 2007) to firms in comparison to subsidies and fiscal credits. An important proportion of these credits are oriented towards investments in machinery. Fiscal credits for R&D on the other hand have decreased in importance. FONTAR allocated in 2010 €7.5m of tax credits to domestic companies for conducting research and development, technological upgrading and technological counselling training. These amounts were approved for a total of 122 projects, 70% of them by SMEs. In terms of sectors benefiting from these grants, the first place is occupied by chemicals and chemical products followed by machinery and equipment, computer services, and food and beverages.

It should be noted that the instruments varies with the size of the firm considered. Although subsidies is the most important means for all types of firms, it is more important with 74% of total funds for small and micro firms, followed by 62% for medium sized firms, and 48% in the case of large firms. 30% of the funds received by large firms are in the form of fiscal credits.

In relation to evaluations of the public support for innovation, different instruments from FONTAR have been evaluated, mostly in connection with the ending of loan operations for the IDB.[3] The first available evaluation of FONTAR consisted in the

[3] These evaluations however have several shortcomings: (a) partial assessment of specific instruments rather than the whole FONTAR; (b) too short time span after receiving the benefit to assess the long-term consequences of the benefit in both productivity and innovation and; (c) on a more technical note, the lack of adequate counterfactuals.

evaluation of the merits and impacts of the non-refundable contributions (NRC). This evaluation found that firms that received the non-refundable grant had a higher level of expenditures in innovation activities than those firms that did not receive the subsidy. This evaluation found that the subsidies had a positive impact on the total level of innovation expenditures of those firms, not finding crowding out effects. However, at the same time, evidence indicates that the benefit did not generate an additionallity effect, since it seemingly did not foster benefited firms to spend more money of their own on innovation activities.

The last evaluation (2009-1010) comprised five different instruments: the two NRC and NRC devoted to R&D activities, and CAE, PI-TEC and the NRC aimed at building capacities at research institutions and universities (ARAI). The criteria used in this evaluation aimed at shedding light whether FONTAR contributed to ease the financial constraints of the benefitting firms and if these instruments contributed to improve the firms' competitiveness by reducing costs, enabling access to new markets and/or the development of new products and/or processes. In relation to the impacts, the received funds allowed additionality and behavioural changes in the beneficiary firms. The grantees acknowledge that without those funds their modernization projects would have been delayed or suspended.

A high share of those firms receiving NRC achieved new products and/or processes. NRC-R&D contributed to the establishment of R&D groups inside the firms, and to the acquisition of new equipment and strengthening the capacities and number of the R&D devoted personnel. It is estimated that the social value of these instruments is higher than the social costs. Specifically, the NRC generated an estimated 153% social return, while for each unit of credit granted via the CAE instruments, 4.5 times of social value were generated. In all the evaluated instruments, the firms state that the funded projects contributed to a better overall performance, increasing their turnover and market share and improvements in the production process and the array of goods and services offered.

Although these evaluations show positive effects in the beneficiary firms, the support policies require to be strengthened and require to increase the number of firms (especially SMEs) that apply and access to funding. This lack of industry may be also one reason for the absence of public procurement policies to foster innovation among the country's portfolio of policies.

2.2.3 Providing qualified human resources

One of the strategic objectives of the country is to increase the number of researchers by 2015 (from 1.6 to 3 FTE per thousand of the economically active population in 2005-2015). Data for 2008 indicates that this ratio climbed already to 2.57. This is mainly due to the expansion of scholarship programmes and openings at the lower level of the researcher career at CONICET centres. Continuous support measures imply that this target will most likely be accomplished. However, it should be noted that that rapid expansion of the research labour force implied new demand in terms of infrastructure and equipment.

In 2008, researchers were mostly employed in the government sector (45%), followed by HEI institutions (43%). Enterprises employ 10.5% of total FTE researchers, with the remaining 1.7% are working at non-profit private organisations. The shares have decreased on annual average by 2% for the university sector during the past five years, while the public sector increased by 3.8%. Researchers in science and technology fields show a relative stable participation in research

personnel (46%). Agricultural sciences and social sciences are the two fields where some more growth of researchers can be seen.

In terms of tertiary education, the declining interest in Science, Technology, Engineering and Mathematics (STEM) disciplines is alarming. While STEM graduates still account for slightly above 18% of total tertiary graduates, the share of new enrolments at the university dropped to the lowest level in two decades (14.1%). While total new enrolments increased in 2003-2008 by 5% in relation to the previous five-year period, the new enrolments in STEM disciplines fell slightly more than 7%. At the masters' level, the total number of graduates increased by 22% between 2004-2008, while STEM graduates fell by almost 8% to 10.1% of total masters obtained.

The picture for new doctorate holders is brighter than for the lower levels, showing an increase in the number of new doctorate holders per 1,000 population aged 25-34 from 0.86 in 2006 to 1.56 in 2008. Although the number of new doctorate holders is low compared to other countries, it increased by 63% between 2004 and 2008 to reach 746. The doctorate holders in STEM fields increased by 91% in the same period to account for 49% of the total ISCED 6 level graduates.

At the undergraduate level, two different scholarship schemes (Becas Bicentenario and Becas TICs) aim at supporting low-income students, preferably coming from technical tracks at secondary schools, entering the tertiary education level in the fields of applied sciences, natural sciences and basic sciences (Bicentenario) and software (Becas TICs). These programmes provide up to 30,000 scholarships for an initial yearly amount of €1,000. The stipends are combined with tutoring and mentoring and efforts in upgrading the quality of the teaching programmes.

At the postgraduate and PhD level, CONICET provides scholarships to allow young college graduates from all regions to obtain doctoral degrees and postdoctoral training in different disciplines; in the case of PhDs mostly at national institutions. The scholarships are awarded as result of an annual open competition. The number of scholarships increased from 2,400 in 2003 to 8,000 in 2010. Around 10% of the total amount is granted for postdocs.

Also at the postgraduate level, the scholarship scheme of co-financing postdoctoral fellowships aims at promoting technology transfer and the establishment of formal research and development departments in companies. These fellowships have a maximum duration of 24 months; they are non-renewable. The granting of these categories of scholarship does not generate a working relationship with either party.

In relation to the attraction and repatriation of highly skilled professionals, MINCYT has in place the RAICES (Network of Argentinean Researchers and Scientists abroad) programme. RAICES is intended for strengthening the Argentinean Science and Technology capacity through linkages with Argentinean researchers working abroad, and for promoting the permanence of researchers in the country as well as the return of all those interested in developing new research or groups. The initiative was created in 2000 and re-launched in 2003. Based on the notion of "brain drain", the programme's main aim is to reduce the negative impact that the emigration of Argentinean researchers and technologists has on the country's scientific and technological capacities. In order to do so, the programme encourages the return and reintegration of those abroad into firms with technological bases, universities and research centres. The programme also promotes links between locally based researchers and professionals abroad through networks, encourages involvement in neglected areas of research, promotes Argentina's science and technology activities in other countries, and improves the quality of information in terms of the

characteristics of Argentinean researchers abroad. In these matters, RAICES managed to repatriate 714 scientists and researchers and provided 40 César Milstein subsidies aimed for short stays.

In March 2007, a group of technology-based businesses signed an agreement with the (then) Secretariat of Science and Technology and the Foreign Relations Ministry to offer technology-related jobs to Argentinean professionals residing abroad. The aim of this agreement was to expand the courses of action of the Raíces (Roots) programme, so that professionals abroad could return to the country and work at private firms. Volver a Trabajar (Back to Work) programme is based at the Foreign Relations Ministry (FR), which runs it in conjunction with MINCYT and the firms involved. Specifically, FR receives information electronically from the firms involved in the programme according to a pre-agreed methodology. This information is then given to the Consulate Network that places it on its web pages and publishes it on public bulletin boards in each consulate free of charge.

2.3 *Knowledge demand*

This section focuses on structure of knowledge demand drivers and analysis of recent policy changes.

2.3.1 Structure of knowledge demand drivers

The latest available economic information shows that manufacturing activities account for 21% of total GDP, followed by the production of agricultural production (10%). Inside manufacturing industry, the production of food and beverages is the most important activity (responsible for 35% of the total output), followed by the chemical industry (14%,) automobiles (5.1%) and the manufacturing of machinery (3%). In terms of sectoral composition of R&D, the production of foods and beverages is responsible for 13% of total innovation activities by the private sector, chemical products contributes with 12% and automobiles has a share of 9%. Metalworking activities and plastics are the most important contributors to innovation activities by manufacturing firms (16.7% and 16.5%, respectively) surpassing their output share. Firms with foreign participation represented 52% of total manufacturing sales in 2004 but accounted only for 36% of total R&D expenditures.

MINCYT, via ANPCYT, has initiated a move towards R&D promotion policy that adds to the original emphasis on horizontal instruments towards a growing role for specific technologies (ICT, biotechnology and nanotechnology) and sectors (Health, Energy, Agro-Industry, Science for Social Inclusion) considered strategic. This focus is materialised through the creation of sectoral funds administered by ANPCYT that includes FONSOFT (for software and communication technologies) and FONARSEC. FONARSEC aims at promoting capacity building, innovative projects in the agro-sector, health and energy and science for social inclusion and the application of nanotechnology, biotechnology and information and communication technologies.

The newly created sectoral funds (i.e., FONSOFT on software and FONARSEC aimed at Health, Energy, Agro-Industry, and Science for Social Inclusion) were responsible for financing 20% of the total number of grants allocated during 2009, representing 31% of the total funds granted by ANPCYT. This money accounts for slightly less than 10% of the federal budget granted as a whole for MINCYT, CONICET and ANPCYT combined. The Inter-American Bank agreed to provide a loan of US$100m (€75m) for the FONARSEC. FONARSEC is expected to disemburse €30m in between 2010 and 2014 for the promotion of research on

Health, Energy, Agro-Industry and Science for Social Inclusion and the application of nanotechnology, biotechnology and information and communication technologies.

The table below presents a comparison between the distributions of GBAORD by socio-economic objective in 2003 and 2008. As a whole, the R&D increased importantly in nominal terms in local currency. Agricultural Technology (5.1), Social relations (4), and Space (3.8) exhibit the highest percentage point increases in the period.

GBAORD BY SOCIO-ECONOMIC OBJECTIVE	2008	2003	Variation in nominal terms (in %)
Agricultural Technology (R&D)	27.0%	21.9%	334.1
Environment (R&D)	2.4%	3.5%	146.4
Other civil research (R&D)	1.9%	4.5%	47.1
Defence (R&D)	0.3%	0.5%	104.1
Energy (R&D)	4.5%	4.5%	255.8
Space (R&D)	7.6%	3.8%	597.4
Exploitation of the earth (R&D)	4.6%	3.9%	313.5
Industrial Technology (R&D)	14.8%	15.7%	231.1
Infrastructures (R&D)	0.6%	0.5%	297.5
Non-oriented Research (R&D)	13.6%	14.6%	226.6
Human Health (R&D)	11.5%	11.3%	257.2
Not specified (R&D)	--	--	-
Social Relationships (R&D)	5.5%	1.5%	1,155.5
Total (R&D)	100.0%	100.0%	251.0
R & D Financed by University Funds (R&D)	5.7%	13.8%	45.0

2.4 Knowledge production

The production of scientific and technological knowledge is the core function that a research system must fulfil. While different aspects may be included in the analysis of this function, the assessment provided in this section focuses on the following dimensions: quality of the knowledge production, the exploitability of the knowledge creation and policy measures aiming to improve the knowledge creation.

In the recent period there have been important increases in the inputs devoted to R&D and scientific activities without similar evolution on the output side. Triggered by continuous budgetary increases from the public sector (accounting for 68% of total Gross domestic expenditure on R&D, GERD) GERD in 2008 amounted to about €1.16b (current prices), while R&D intensity (GERD as a percentage of GDP) reached 0.52%. In between 2006 and 2008, GERD per capita increased from €21.5 to €29.1.

In line with the human resource target, research personnel reached 2.57 for each thousand people in the active population in 2008. In this context of the expansion of R&D personnel, the expenditure per researcher rose 30% reaching €31,000.

2.4.1 Quality and excellence of knowledge production

In terms of output, Argentina produced in 2008 a total of 7,618 papers in SCI representing a small share of 0.55% of the total production worldwide. Argentina's absolute number of SCI publications rose between 2006-2008 by 13% and its world share rose equally from 0.48%. In terms of the number of publications per 100 full time equivalent researcher, 18.3 were achieved in 2008 compared to 16.9 in 2006. However, the efficiency of the system decreased: in the same period, the number of papers per million US$ devoted to R&D fell from 5.6 to 4.48. High-quality groups, especially those as part of CONICET and those involved in research in the areas of genomics, stem cells, new materials and bioinformatics selected by the Technological Platforms Projects (PPL) (see section 2.5.2) have the opportunity to benefit from improvements in equipment and of formation of excellence centres equipped with cutting edge.

Patent statistics indicate that foreign patent offices are not important: In 2008, the country got 32 patents granted at the USPTO while 5582 patents were applied nationally. The statistics from the national patent office show that only 14% of the applications in 2008 were by residents; the majority was applied by non-residents. While the share of non-residents grew between 2003-2008 by 2% on average annually, the already much lower number of residents' applications declined by 11.4%.

To address these challenges FONTAR provides through ANR-PATENTES non-reimbursable contributions to SMEs aimed specifically at financing the preparation and filing of applications for patents and other intellectual property rights. The supported applications by SMEs might include non-profit public and private scientific institutions. Operated on an open window cycle, the programme resources cover up to 80% of the eligible costs, i.e., not to exceed €3,500 for preparation and filing of applications in Argentina, and up to €50,000 for filing in other (IDB member) countries. In 2010, only €100,000 was allocated to this programme.[4]

2.4.2 Policy aiming at improving the quality and excellence of knowledge production

One of the weaknesses noted in the STI institutional framework is the lack of a structured system, being capable and effective in monitoring and evaluating institutions and programmes. Although a number of capacities have been developed within ANPCYT, they focus only on monitoring and not on impact assessment. According to the latest evaluation by the IDB (IDB, 2010), the roles to be played in evaluation processes by the different hierarchical levels are not clearly defined. Lastly, in comparison to more advanced innovation systems, the country does not have an agency to conduct studies in the STI field to provide input to MINCYT for the planning, evaluation, and policy-making process. These shortcomings are obstacles

[4] It should be noted, though, that the intellectual property system is perceived as the least important obstacle for firms investing in innovation activities. Only 5% believes is a highly important factor (INDEC, 2008).

to the learning process and to ongoing improvement of STI policies. Evaluations are nevertheless carried out, albeit not systematically. There are programme evaluation, for example on the technological funds FONTAR and FONCYT, and CICYT has the mandate to assess the results of the policies and actions implemented and deliver these to GACTEC (Article 16, Law 25.467/2001).

Many of these assessments are available in form of official documents or policy documents. Concerning institutional evaluation, CICYT has launched a programme to assess the capacities and potential for the institutions devoted to R&D. The Institutional Assessment Programme (PEI) includes both internal and external evaluation of the institutions and aims at producing an improvement plan.

Competition for funding based on excellence criteria is limited to about the 10% of non-institutional funding largely available via ANPCYT of its annual budget of €85m (2010) is allocated via specific calls or open schemes. Proposals are peer reviewed both at the technical and financial level. The evaluation results are passed to an ad-hoc commission that proposes whether or not to fund the proposal to the board of directors of the ANPCYT. The calls provide the possibility of establishing a quality ranking of the approved projects in order to set funding priorities in case of budget restrictions.

A well-developed internal evaluation system has CONICET. Its 12,000 researchers work in 105 research institutes across the country. The organisation had a budget of €310m in 2010. Its performance assessment system covers recruitment and promotion aspects. The evaluation of projects (especially to be admitted to CONICET) is based on peer reviews, national or foreign persons of recognized scientific and / or technological impact that are issued on the quality and merit, without prejudice to other instances. The promotion of scientific and technological staff is based on objective criteria collected by the institution itself and updated through its system of electronic CVs (SIGEVA). According to the National Executive Power decree 1661/96, the assessment criteria should take into account peculiarities distinct from the scientific and technological activities, as well as the characteristics of each area of knowledge, keeping in all cases the quality as the main priority. The assessment for income and career development of Scientific and Technological-CIC - is founded on the opinion of the following academic juries: Disciplinary Advisory Committees and Board of Grading and Promotion. These procedures require the intervention of at least two peers, in an advisory capacity.

As a means to foster research production, the Ministry of Education provides wage supplements for the personnel of those higher education institutions involved in accredited research activities within the universities (Research Incentive Plan). These funds are allocated on top of the block funding that HEIs receive for research by the Ministry of Education (see section 3.3.1). In 2009, 30,729 applications were received for this accreditation, up from 23,540 in 2004. Currently, the programme has 32,000 faculty researchers categorized (65% of the members of the programme have full-time positions). The programme includes both a peer review assessment of both the project and individual performance. The assessment of the individual performance conducted every four years allows the ranking of researchers (currently into five categories) and pay the participants according to these categories. Additionally, each research project admitted should provide progress and final projects reports.

2.5 Knowledge circulation

This section provides an assessment of the actions at national level aiming to allow an efficient flow of knowledge between different R&D actors and across borders.

Tackling the challenges that societies faces in the 21st century will require a multi-disciplinary approach and coordinated efforts. Many debates and conferences, e.g. the Lund Declaration recognise that such complex issues cannot be solved by single institutions, technology sectors or MS acting alone. Hence strong interactions within the "knowledge triangle" (education, research and innovation) should be promoted at all levels. Moreover, in the context of increasing globalisation, cross-border flows of knowledge are becoming increasingly important. This section provides an assessment of the actions at national level aiming to allow an efficient flow of knowledge between different R&D actors and across borders.

Argentina's science-industry complex is not too much developed if the share of HERD funded by the business sector is taken as an indication. In 2007, only 0.66% of all HERD came from the business sector. The sector is also not funding much of governmental R&D with 0.29% (OECD MSTI 2010). These shares are much below most OECD countries and the EU-27 averages of 7.1% and 8.9%.

The creation of MINCYT (2007) and the setting up of FONARSEC in 2009 strengthen the role and importance given to knowledge transfer. The promotion of interactions between different stakeholders and joint research endeavours are one of the pillars of the current S&T policy. Specifically, recent calls by ANPCYT have emphasized the promotion of alliance-building and collaborative work among enterprises and universities and research centres. At the same time, the newly established sectoral funds specifically aim at facilitating the incubation of firms and providing bridge mechanisms between the research performers and the firms. Specific training and funding to create technological links go beyond previously established Technological Linkage Units (UVTs) that were aimed at supporting a market for technological consultants and specialists providing assistance for the application and preparation of funding applications.

International co-operation in S&T is conceived as fundamental component to achieve the objectives pursued by MINCYT. Specifically, international cooperation is understood as a tool that enables access to research networks and resources. The Argentinean government has a long tradition and history in subscribing bilateral and multinational agreements in S&T. Outside MERCOSUR, the European Union and its Member States are perceived as the most important partner for cooperation. Evidence of this is the fact that Argentina was the first Latin American country to subscribe a cooperation agreement with the EU.

2.5.1 Knowledge circulation between the universities, PROs and business sectors

The importance of circulation and exchange of knowledge produced by PRO and universities was explicitly acknowledged with the enacting of Law 23,877. This legal act was the basis for the Technological Linkage Units (UVTs) and enabled universities and public research organisations to form such entities. UVTs are institutions with the purpose of enabling the management, organization and administration or R&D projects. These institutions were constituted with the explicit intention of fostering technology transfer - linkages between research performers and the private sector, and to provide training and technical assistance. Taking into consideration the mandate that universities have on linking with the private sector

and their region, the Secretary of University Policies of the Ministry of Education and CIN constituted RedVITEC in 2001.[5] This network, formed by 38 public universities, six higher education institutes and CIN aims at sharing experiences and best practices of technology transfer, contributing to the development and professionalisation of the technology transfer areas of public universities and promoting the active participation of universities in the national science, technology and innovation policies.

Previous calls for the allocation of so-called Non-Reimbursable Contributions (ANR) by FONTAR granted funds for the development of technological clusters and technological poles. Also new instruments and funds by ANPCYT provided to knowledge circulation and exchange a prominent role.

Specifically, PI-TEC (Integrated Projects for Productive Conglomerates) finances - through competitive public processes- projects to encourage the development of clusters, by promoting alliance-building and collaborative work among enterprises and universities, provincial or local governments, and/or research centres. Given its integrating nature, PI-TEC seeks to improve coordination and synergies among the instruments available at FONCYT and FONTAR, in order to obtain a greater impact while favouring the convergence of interests and the establishment of a collective innovative dynamic. ANPCYT issues public calls for the submission of PI-TEC Project Ideas (PIs), to be presented by an ad-hoc association (AHA) including representatives of at least three key participants in the development of the productive cluster, such as representative business entities, technological entities, universities, provincial or municipal governments, or other organizations relevant to the productive cluster. Based on the recommendations issued by an assessment commission, the director of the agency selects the PIs it will support for presentation as PI-TEC projects. For the development of the project, including the drafting of a Competitive Enhancement Plan, the selected AHAs may receive support of up to €30,000.

In addition, the Argentinean Sectoral Fund FONARSEC (expected to disemburse €30m in between 2010 and 2014) provides incubators for high-tech firms at universities and provides newly created firms with managerial skills and personnel. Official documents state that the purpose of the fund is to develop critical capacities in areas with high potential impact and ongoing transfer to the productive sector, helping to increase competitiveness and troubleshoot problems diagnosed with a view to meeting the demands of society, companies, and the State. To achieve these goals, FONARSEC includes a variety of promotion instruments that bring the creation of knowledge-intensive firms to the centre of the stage (high-technology industries) and promote private-public alliances for R&D. These instruments include: the Technological Infrastructure and Equipment Projects (PRIETec) aimed at expanding the operational capacity of R&D institutions (adapting the existing infrastructure and acquiring scientific equipment) to facilitate business and/or technology-based companies incubation; Training Programme for Managers and Technological Linkers (GTec) aimed at supporting the training of managers and technological linkers, which enhance the innovation and technological development capacities at companies and scientific-technological institutions; EMPRETECNO – Technology-Based Companies (EMPRETECNO - TBC) in charge of promoting the development of technology-based companies in the different productive areas.

[5] The first plenary meeting of the network only happen in 2004.

2.5.2 Cross-border knowledge circulation

In terms of research facilities, the unit dealing with international cooperation of MINCYT advanced in the creation of the Bi-national Centre for Biotechnology for vaccines and drugs with Cuba, in signing of the Agreement for the establishment of the Bi-national Programme in Cell Therapy with Brazil and the signing of a letter of intent to study the cooperation with the US Cancer Institute. http://ec.europa.eu/research/iscp/pdf/argentina_roadmap_2010-2011.pdf#view=fit&pagemode=none

In relation to the realization of joint research projects and training, exchange of experts, and transfer of results to the national productive sector, the most important initiatives include:

1. Ibero-American Network for Local Knowledge and Practice on the Plant Environment (RISAPRET) within the framework of the CYTED Ibero-American Programme for Science, Technology and Development
2. BIOTECSUR is a biotechnology platform for the MERCOSUR countries originating in the BIOTECH - MERCOSUR – EU project for the development of specific R&D actions focused on regional priorities.
3. Argentinean-Brazilian Biotechnology Centre (Centro Argentino Brasilero de Biotecnología - CABBIO): A coordinating entity that includes a network or biotechnology research groups. Its objective is to promote interaction between science centres and the productive sector by means of two types of activities: The implementation of bi-national projects for research and the development and training of high-level human resources with courses at the Argentinean/Brazilian School of Biotechnology (Escuela Argentina Brasileña de Biotecnología - EABBIO).

4. Argentine-Brazilian Centre of Nanoscience and Nanotechnology (CABNN): Coordination body in which members of research groups, networks of nanoscience and nanotechnology, and companies from Argentina and Brazil support scientific and technological research in the area, and develop human resources and scientists from both countries. Their actions include: human resources training, exchanges of teachers and researchers, coordination of national networks of Nanoscience and Nanotechnology, establishment of joint working groups including companies to identify market niches, products and developments.
5. Italian-Argentinean Satellites System for Emergency Management: This is a joint initiative of Argentinean and Italian space agencies to prevent, mitigate and assess catastrophes, to preserve the environment and to improve agriculture. This is the first satellite system in the world designed specificially for this purpose.
6. Multinational System of Specialised Information on Biotechnology and Food Technology for Latin America and the Caribbean (SIMBIOSIS): A virtual network for connecting scientists, experts and research centres interested in biotechnology, food technology and biodiversity. The Member States and the OAS sponsor it. The SIMBIOSIS network provides information on existing research programmes, national institutions, development efforts and human capacity for STI.

Concerning the country's participation on international projects, one can note a positive development in terms of the country's participation in the EU Framework Programme for RTD since the 5th Framework Programme. In FP5 participation amounted to 29 contracts, in FP6 (2002-2006) 95 participations happened in 78 projects.[6] For the current FP7 (2007-2013), a total of 211 teams have applied as part of 158 project proposals until 2009. 8 participations in 21 projects were successful with a total project investment of almost €58m for a requested EC contribution of almost €44m.

In relation to the mobility of researchers, MINCYT has funded and secured during 2010 the mobility of 360 researchers to 17 countries involved in joint research projects. In addition, 17 calls (one per country) were opened for the mobility of researchers. In the same line, and aimed at promoting the circulation of knowledge and researchers, RAICES have provided 40 César Milstein subsidies for short stays to Argentinean scientists and researchers residing abroad (see section 2.3.2 for more information on repatriation policies). Argentina is also an active participant in several regional external relations cooperation programmes focused on education, science, technology and/or innovation. Among these ALFA, ALBAN and @lis should be mentioned.

ALFA is a programme promoting the capacities of individuals and higher education institutions through EU-Latin America cooperation. During the second phase of the programme, ALFA II (2000 to 2005), a total of fifty-eight Argentinean Higher Education Institutions participated in 147 out of the 225 supported projects. ALBAN is a EU programme for high-level scholarships for Latin America to further cooperation in the field of higher education. Between 2003 and 2008 and through five calls, a total of 314 Argentineans received scholarships (just under 10% of the total for all Latin America): 127 were for Master students, 169 for PhD students and 18 for specialisations. @lis, the regional programme aiming to bridge the digital divide and to use new information and communication technologies in Latin America has enabled the creation of the first Latin American network for education and research, Red Clara. Ten Argentinean institutions have participated in different activities of @lis.[7]

2.5.3 Main societal challenges

MINCYT have established a list of social challenges that differs a bit from those made by the EC. In this process, MINCYT clarified that the established challenges in the areas of health (especially vaccines and research on stem cells), nanotech, biotechnology and energy require the joint effort of different stakeholders both inside the country and abroad. Research and infrastructure calls in these areas require forming consortia. At the same time, the projects selected for funding are expected to receive substantially bigger funds and, as in the case of the Technological Platforms, to concentrate so far dispersed efforts. Different concerted efforts (see section 2.5.2) with Brazil are directed to address these social challenges.

[6] The total investment in these projects with Argentinean participation was €317m for an EC contribution of almost €218m. The investment of Argentinean teams was about €9.2m attracting an EC contribution of almost €7.6m.

[7] http://ec.europa.eu/europeaid/where/latin-america/regional-cooperation/documents/argentina.pdf

2.6 Overall assessment

The R&D goals in the country have been set on the two strategic planning exercises conducted in the mid-200s. Acknowledging the need to increase cohesion and social equity, contribute for a sustainable development path, further articulate the innovation system and induce a specialisation pattern in line with a knowledge society, the "Basis for a Medium-term Strategic Plan in Science, Technology, and Innovation 2005-2015" [see template] established 4 targets to be reached by 2015: (a) the number of researchers will increase from 1.6 to 3 full-time equivalent researchers per thousand members of the economically active population; (b) the total investment in R&D will reach the equivalent of 1% of GDP; (c) private investment in R&D will increase until it is on par with public investment; and (d) the 19 provinces with the lowest investments in R&D, which currently garner just 20% of the nation's R&D resources, will double their share of the national total. The Bicentennial Plan, published a year later in 2006, revised the targets referred to investments in GERD and BERD setting that these objectives should be reached by 2010.

Although there have been important improvements in the public budgets devoted to R&D and scientific and technological activities, the ability to mobilise monetary resources from the private section is still very limited and is explained mainly by the size and composition of the productive sector. As such, the objectives related to the private sector are far from realized. In this sense, the new efforts –via the introduction of sectoral funds and specific sectoral priorities- are oriented towards the fostering both the performance and diffusion of R&D on specific sectors.

However, it should be noted that the results and policies oriented to the increase of high-skilled S&E human resources, stimulated by the expansion of under- and post-graduate scholarships might contribute to stimulate demand for knowledge, but also to improve excellence in research.

It should be noted that the weaknesses noted in the lack of a structured system, being capable and effective in monitoring and evaluating institutions and programmes, weakens the efficiency of policy (re)design and impose barriers to a more collective process.

Table 1: Summary of main policy related opportunities and risks

Domain	Main policy opportunities	Main policy-related risks
Resource mobilisation	• Prioritisation of scientific activities via the creation of MINCYT • Increase in public budget for R&D • Increase in Human Resources	• Lack of effective monitoring and evaluation instances • Decreasing expenditure of the private sector; • Lack of interest in scientific careers and STEM disciplines
Resource mobilisation	• Prioritisation of scientific activities via the creation of MINCYT • Increase in public budget for R&D • Increase in Human Resources	• Lack of effective monitoring and evaluation instances • Decreasing expenditure of the private sector; • Lack of interest in scientific careers and STEM disciplines
Knowledge demand	• Future increase in S&E graduates	• Low demand for new knowledge, especially from the business sector

	• Raising awareness of SMEs to encourage their involvement in the R&D related activities	• Production structure and role of multinational firms
Knowledge production	• Increase in Human Resources • Need for improving university departments and research institutes' quality	• Bottlenecks in terms of infrastructure and equipment • Lack of interest might spur quality enclaves not necessary pertinent for the need of the private sector
Knowledge circulation	• Further emphasis on bridging the gap between the research and business communities • Bi-national and regional initiatives in R&D	• Lack of university-industry cooperation history and culture • Relatively small amounts of investment. Need of further identification of priority areas.

The creation of MINCYT (2007) represented a major institutional evolution and it is a testament to the priority that the government has placed on technological development. MINCYT also implied a change in focus in policy terms from an exclusive emphasis on horizontal instruments towards more sectoral policies. At the same time, the settings up of FONARSEC in 2009 strengthen the role and importance given to knowledge transfer. The promotion of interactions between different stakeholders and joint research endeavours are one of the pillars of the current S&T policy. Specifically, recent calls by ANPCYT have emphasized the promotion of alliance-building and collaborative work among enterprises and universities and research centres. At the same time, the newly established sectoral funds specifically aim at facilitating the incubation of firms and providing bridge mechanisms between the research performers and the firms.

A positive sign is a great emphasis on the internationalisation of research activities (bilateral and multilateral agreements, greater stimulation to participate in EU programmes, international collaboration) in the country. This may contribute successfully to strengthening the platform for higher R&D investments.

Table 2: Main barriers to R&D investments and respective policy opportunities and risks

Barriers to R&D investment	Opportunities and Risks generated by the policy mix
The structure of the productive system	• Many measures oriented to SMEs; • New focus on sectoral incentives and instruments; • Promotion of cluster policies; • Important presence of MNCs; • Limited stakeholders' involvement; New incentives do not mobilise sufficient business resources.
Lack of coordination and inadequate evaluation mechanisms that inhibit adopting evidence-based policies	• Creation of MINCYT; Role of multilateral organisations as evaluators of policy impacts.
Need of implementing a realistic strategy to secure long-term investments	• Important role of new strategic planning (multi-year) exercises; • Need for an inclusive and participatory setting of priorities; • Need of setting realistic goals and intermediate marks; Medium term resources committed via Federal Budget and Multilateral organisations.

3 National policies which correspond to ERA objectives

3.1 Labour market for researchers

3.1.1 Stocks and mobility flows of researchers

In relation to the mobility of researchers, MINCYT has focused on the repatriation of Argentinean researchers abroad through the RAICES (Network of Argentine Researchers and Scientists abroad) programme (see 2.2.3). The programme also promotes links between locally based researchers and professionals abroad through networks, encourages involvement in neglected areas of research and promotes Argentina's science and technology activities in other countries. RAICES have managed to repatriate 714 scientists and researchers and have provided 40 César Milstein subsidies aimed for short stays.

3.1.2 Providing attractive employment and working conditions

Since 2003, the Federal government has put in place different measures to increase the number of researchers and the attractiveness of research careers (see section 2.2.3). In line with the important increases in the inputs devoted to R&D and scientific activities, wages for full time university personnel increased 195% (expressed in Euros) between 2003-2009 to reach an equivalent of 4.3 times the country's income per capita. University wages increased -since 2001- twice as much as the average wage in the private sector.

Positions in universities are publicised and result of an open and public competition, granting renewable positions every 5-6 years. Between 2004 and 2009 the total number of university personnel increased by 24%. However, the full time model at the universities –associated with tenure and a higher likelihood to be involved in research activities- is the reality for only 10.5% of the personnel. In fact, in between 2004-2008, partial (semi-exclusive and shorter employment contracts) increased more that the average of the whole system.

At the same time, the federal government has tried to surmount the deficiencies observed in infrastructures and in equipment. Deficiencies in physical infrastructure and equipment at research centres are severely restricting the growth of Argentina's technological capacity. The failure to maintain existing infrastructure and the near-total failure to expand capacities have led to severe overcrowding problems and made it impossible to expand centres devoted to technical excellence (see section 3.2).

3.1.3 Open recruitment and portability of grants

Research grants are entitled to researchers working in private and public organizations in the country. Positions in universities are published and result in an open and public competition, granting the position for a period of 5-6 years. Positions in PROs and the public sector in general are less transparent. Portability of grants is very limited in the country, being the universities (and not the researchers) who are signatories of the contracts and agreements with the funding agencies (such as ANPCYT).

3.1.4 Meeting the social security and supplementary pension needs of mobile researchers

Argentina has recently opened bi-national calls on research that in some cases exceed the limits of MERCOSUR. Although the bloc has made some progress (see section 3.6.2) on the integration of their education systems and in the mobility of people, social security and pension systems are still nationally bounded.

3.1.5 Enhancing the training, skills and experience of researchers

Recent initiatives in the areas of biotechnology (BIOTECSUR, CABBIO and SIMBIOSIS) and Nanoscience and Nanotechnology (CABNN) (see section 2.5.2) have focused on the enhancing the training and skills of researchers in the region (mostly from Brazil and to a lesser extent other MERCOSUR countries).

3.2 Research infrastructures

Research infrastructures (RIs) are a key instrument in the creation of new knowledge and, by implication, innovation, in bringing together a wide diversity of stakeholders, helping to create a new research environment in which researchers have shared access to scientific facilities.

3.2.1 National Research Infrastructures roadmap

Although, there is not a roadmap for infrastructure in the country, MINCYT has been quite active in upgrading infrastructure for science and technology. In 2008, MINCYT launched the Federal Infrastructure Plan for Science and Technology 2008-2011 (PFI). This Plan will allocate a total of €70m for the improvement and expansion (up to 137,650 square meters in total) of 50 different CONICET centres and associated institutions devoted to R&D in 13 provinces. So far, 12 projects with a total contribution of €20m have been selected for funding.

In addition, FONCYT opened the first call for the Technology Platforms Projects (PPL). PPL supports the formation of excellence centres equipped with cutting edge technology and personnel dedicated to providing highly specialized products and advanced scientific and technological services in the areas of genomics, stem cells, new materials and bioinformatics. Selected projects will receive up to a maximum of €1.5 m, with a maximum contribution from ANPCYT of 66% of the total costs of the project.

Also ANPCYT offers different instruments aimed at improving R&D equipment and infrastructure. In 2009 alone FONCYT has approved 162 projects aimed at improvements in infrastructure (approximately for €6M) and FONARSEC has provided €20 million for 44 projects.

3.3 Strengthening research institutions

This section gives an overview of the main features of the national higher education system, assessing its research performance, the level of academic autonomy achieved so far, dominant governing and funding models.

3.3.1 Quality of National Higher Education System

The Argentinean university system is a complex system comprised of a variety of providers and regulations. Universities declare that their objectives include doing research, teaching and contributing to local development. The HEI sector in the country comprises of 47 National Universities, 46 Private Universities, 7 State University Institutes, 12 University Private Colleges, 1 Provincial University, 1 Foreign University and 1 International University. There are slightly more than 1.6m students (365,000 new enrolments). Around 100,000 students obtain undergraduate degrees per year. The public university complex accounts for 75% of this total. The majority of degrees are in social sciences and humanities while STEM disciplines account for around 17% of the graduates. In terms of postgraduate education, slightly more than 2,500 students obtain master degrees with only 10% of them in STEM disciplines. It should be noted that the majority of public universities are not only free of charges but do not have any admission requirements beyond holding a high school diploma. In some cases, admission exams are in place while others have an admission course (that is considered the first years of the studies). This situation is irrespective of the discipline.

Public universities are one of the cornerstones of basic research. The major public universities (Universidad de Buenos Aires, Universidad Nacional de la Plata and Universidad Nacional de Cordoba) account for the bulk of expenditures, personnel and publications. In a global perspective, the University of Buenos Aires (UBA) is the only university of the country in the Top 200 of the Shanghai university rankings (Academic ranking of World Universities, ARWU). According to the SCIMAGO Institutions Ranking (SCIMAGO, 2010) for the universities from the Ibero-American region, UBA produced 9,741 publications between 2003-2008, out of which 39% have been co-published with institutions from other countries.

As a whole, HEI account for almost 60% of the total S&T personnel (Head Count) and around 45% in full time equivalent. The existence of an important share of part-time researchers at the universities is a key challenge to overcome.[8] The private providers of higher education, although they constitute an important component of the system in terms of teaching, they are almost negligible in terms of research.

The National Inter-university Council (Consejo Interuniversitario Nacional, CIN) encompasses all the national public universities. CIN plays an important role in negotiating the overall block funding for the public universities as part of the budget law. In accordance with the Ministry of Education, CIN agrees on the formula that provides the distribution key of the budgets allocated to each university. In this formula the relative size (both of students and professorial body) is the main determining factor. The representative organ of the private universities is the Council of Rectors of Private Universities - CRUP (Consejo de Rectores de Universidades Privadas).

The National Commission for University Evaluation and Accreditation (CONEAU), established in 1995, carries out institutional evaluations of public and private management universities. CONEAU is a decentralized agency at arms length of the Ministry of Education, Science and Technology. It was created by the Federal Higher Education Law as an autonomous organization affiliated to the Ministry. [9] Its mission

[8] As an indication the ratio of FTE/HC researchers for the HEIs in 2008 was of only 0.43.

[9] Due to the autonomous status of the public universities, a few public universities including the University of Buenos Aires, the Universidad Nacional del Comahue and National University of Entre

is to ensure and enhance the quality of university degrees and institutions in the Argentinean university system through the evaluation and accreditation of the quality of the university programmes and degrees offered. CONEAU makes a "yes or no" decision within the passing process of both state-regulated undergraduate and graduate programmes projects. It issues recommendations about institutional projects of new state universities and about provisional functioning authorizations for private universities as well as their eventual recognition. Among its functions, CONEAU is also empowered to decide on the accreditation of private agencies for university evaluation and accreditation. Universities are entitled to perform self-assessments (as those promoted by the PEI in section 2.4.2). However, these exercises must be complemented by external evaluations (either by CONEAU or authorized private agencies) to be made at least every six years in the framework of the objectives defined by each institution.

3.3.2 Academic autonomy

Universities enjoy an important degree of autonomy, being able to decide on their own research agenda, hiring and firing personnel, teaching and long-term objectives. CONEAU (see above) is responsible for assessing the programmes. In budgetary terms, the bulk of funding is allocated via a formula that takes into account the size and characteristics of the institution (see 3.3.3). Particular contract-schemes such as the Research Incentive Plan (section 2.4.2) reward performing research activities, but they do not affect the direction of research as such.

In relation of the management and recruitment of their own authorities, most of the public institutions require the person to be either an active or former professor. As such, private firms or their representatives do not tend to be actively involved in the direction of public universities. Similarly, the business is almost absent from funding R&D at HEIs (0.66% in 2007).

3.3.3 Academic funding

The allocation of public funds to the public universities is based on a methodology agreed by the CIN which takes into account objective information for each university as number of enrolled students (newly enrolled and re-enrolled sorted by number of subjects passed the previous year), rate of re-enrolment, location and length of courses, distribution of the faculty by dedication and number of personnel as part of the wage incentive programme and the covered square meters.

3.4 Knowledge transfer

This section will assess the national policy efforts aimed to promote the national and trans-national public-private knowledge transfer.

Knowledge transfer is increasingly important in S&T policy in the country since a few years. Since the creation of MINCYT (2007) and the setting up of FONARSEC in 2009, the focus has been in supporting innovation and in promoting the interaction between the different stakeholders. Specifically, FONARSEC is to develop critical

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Rios presented habeas corpus to prevent to be governed by some aspects of the new legislation. In the case of UBA justice ruled that the university is exempted, inter alia, of the requirement to accrediting its careers before CONEAU. Although some faculties of the University of Buenos Aires regularly reject the actions of the Commission, others have voluntarily initiated the process of self-assessment and accreditation.

capacities in areas with high potential impact and ongoing transfer to the productive sector. Recently launched measures by ANPCYT focus specifically on the creation of knowledge intensive firms (EMPRETECNO – Technology-Based Companies (EMPRETECNO - TBC) and to facilitate business and/or technology-based companies incubation. In the same direction, ANPCYT has set up a programme aimed at supporting the training of managers and technological linkers. The first round of projects of EMPRETECNO is open until April 2011. ANPCYT has allocated €14 million for this round. Each project might request up to €500,000, for up to 75% of the total costs of the projects.

Another channel to transfer knowledge is via personal contacts. However, university managers and other authorities of public universities are required of being an active or former professor and such, the private sector representatives are excluded. Some highly reputed private universities do include individuals from the private sector in their advisory boards. Public research organisations have a limited tradition of including the private sector in their governance structures. While strategic planning exercises included private persons in focus groups and panels, this participation is far from being institutionalized.

3.4.1 Intellectual Property Policies

In the recent decade, public universities have advanced in the formulation of procedures and protocols concerning technology transfer, intellectual property rights and technical assistance to the private sector. However, while almost 70% of the public HEI have specific approved norms for theses matters, only half present specific previsions and regulations concerning intellectual property matters (RedVitec, 2006). Out of the 21 universities that tackle IPR matters in their regulations, 16 address matters of confidentiality, 11 refer to the patentability of results, and 9 regulate the distribution of benefits.

3.4.2 Other policy measures aiming to promote public-private knowledge transfer

Spin-offs

FONARSEC via Technology-Based Companies (EMPRETECNO - TBC) aims at promoting the development of technology-based companies in different productive areas. In a complementary line, and attempting to address the lack of funding for technology based start-ups, MINCYT created in December 2010 a programme called PROFIET (Programme of Support to the Entrepreneurial Investment in Technology) to encourage entrepreneurial investment in technology. The programme aims to attract investors and venture capital operators. Operators, meanwhile, will coordinate the implementation of the programme, administering the trust. The programme depends on the Administrative Coordination Secretariat of the MINCYT and is regulated by Ministerial Resolution 69/2010. Venture capital in the country had many false starts under different programmes. Research on the status of the venture capital market in Argentina showed that although approximately €50m were available for investment in 2008, less than 10% of this amount was invested. Although European funds and funds belonging to Multilateral Agencies (mainly the Inter-

American Development Bank) are available, venture capital funds were mobilised mostly from national sources.[10]

Inter-sectoral mobility

There is no quantitative data available on the inter-sectoral mobility of researchers but the overall impression is, that it is very limited. CONICET, PROs and, to a lesser extent, public universities offer tenured positions providing weak incentives to switch to the business sector. University professors have a right within some limitations to work in parallel for consultancies and research projects for the private sector organisations and enterprises. This actually may give a possibility to identify some needs of the industry and better align the research and educational work of the university with the specific needs of the business sector and the economy in general. However, an important share of the exchanges and activities performed by researchers for private sector entities aim at performing trials and quality certifications rather than joint research efforts.

Promoting research institutions - SME interactions

Linkages between research and academic institutions and the business sector are limited in the country. In fact, the business funding of R&D at HEIs only accounted for 0.66% in 2007. The government has recognised the problem and has introduced policy instruments aimed at promoting the formation of linkages and university-industry cooperation in two complementary dimensions: (a) the upgrading of the capabilities of individuals and institutions serving as knowledge brokers and (b) via the promotion of clusters. In relation to the first dimension, ANPCYT has set up a programme aimed at supporting the training of managers and technological linkers.

Secondly, PI-TEC (Integrated Projects for Productive Conglomerates) finances - through competitive public processes- projects to encourage the development of clusters, by promoting alliance-building and collaborative work among enterprises and universities, provincial or local governments, and/or research centres. Given its integrating nature, PI-TEC seeks to improve coordination and synergies among the instruments available at FONCYT and FONTAR. PI-TEC requires the participation of representatives of at least three key participants in the development of the productive cluster, such as representative business entities, technological entities, universities, provincial or municipal governments, or other organizations relevant to the productive cluster (see Section 2.5).

Cohesion policy

Since its creation in 1989 MERCORSUR has acknowledge the need to contribute to reduce the inequities and divergence between the member countries. Although the bloc made some progress in the establishment of a common market and in the direction of the free movement of people, MERCOSUR is still poorly institutionalized. The bloc's Fund for Structural Convergence of MERCOSUR (FOCEM) has not developed the same level of importance as in the EU. Interestingly, the MERCOSUR Framework Programme 2006-2010 - conceived to instrumentalise the MERCOSUR Science, Technology and Innovation Area and encouraging the consolidation of scientific and technological development of countries of the region- is evaluating to make use of FOCEM to secure stable funding. Although promising there is little evidence of results related to the Framework Programme and future steps in this direction.

[10] The most active high-tech venture capitalists are Aconcagua Ventures and Chrysalis Argentina.

3.5 Cooperation, coordination and opening up national research programmes with the EU

This section assesses the effectiveness of national policy efforts aiming to improve the coordination of policies and policy instruments across the EU.

International co-operation in S&T is conceived as a fundamental component to achieve the objectives pursed by MINCYT. Argentina has a long tradition of international cooperation, evident in the important number of cooperation agreements subscribed so far. New research calls include in many cases the requirement of forming an international consortium to benefit from joint funding by the countries involved. Although, less institutionalized and powerful than the process of European integration, recent initiatives by MERCOSUR, including movements towards a MERCOSUR research area and a common framework programme, are oriented towards the identification of topics for joint research and exchange among the member countries.

3.5.1 National participation in intergovernmental organisations and schemes

Research cooperation between the EU and Argentina dates back to the 3rd Research Framework Programme (1990-1994). In 1999 both parties signed a Science and Technology Cooperation Agreement in order to strengthen cooperation and extending it in areas of mutual interest. This agreement proposes facilitating Argentina's interaction with the European Research Area. Argentina also has bilateral S&T agreements with several EU Member States involving joint research, institutional cooperation, students and researcher's mobility, and initiatives for sharing the use of research infrastructures.

The fifth meeting of the EC-Argentina Steering Committee took place in July 2010 and produced a roadmap for the period 2010/2011 for the Scientific and Technological Cooperation between the EC and Argentina. Results on the country's participation in Framework Programmes confirm the encouraging upward trend since FP5. In addition, Argentina is also an active participant in several European regional external relations cooperation programmes focused on education, science, technology and/or innovation. Among these are ALFA, ALBAN and @lis.

Since 2005, when Argentina signed the S&T cooperation agreement with the EU, the European Union Liaison Bureau has assisted the Argentinean scientific community and has provided it with information regarding possibilities for cooperation through the EU Framework Programmes.

(see more info).

3.5.2 Bi- and multilateral RDI agreements with EU countries

Argentina has signed STI agreements with over 150 countries and stands out for the number of ongoing projects and cooperation programmes with Brazil, Chile, Mexico, the U.S., and Canada in America; France, Belgium, England, Germany, the Netherlands and Italy in Europe;, Israel, China and Japan in Asia, as well as South Africa in Africa. FONCYT has recently implemented calls for joint research projects with Israel, South Africa and Brazil. Outside the MERCOSUR region, the European Union and its Member States are perceived as the most important cooperation partners. This was demonstrated already in 1999, when Argentina was the first Latin American country to sign a cooperation agreement with the EU.

3.5.3 Other instruments of cooperation and coordination between national R&D programmes

Argentina as a member of the Common Market of the South (MERCOSUR) and is a participant in the Science and Technology Framework Program of Mercosur 2006-2010 established under the Specialized Meeting on Science and Technology of MERCOSUR (RECYT). The presidents of the member states suggested the creation of the RECYT during the second meeting of the Common Market Council (CMC) in 1992. RECYT aims at the promotion of scientific and technological development of Member Countries of MERCOSUR enabling them to modernise their economies, expanding the range and quality of goods and services produced. Its actions are structured in terms of increasing the productivity of the economies of MERCOSUR and increase the competitiveness of productive sectors of the MERCOSUR in third markets.

RECYT participates in negotiations, including those between MERCOSUR and the European Union on science and technology issues. At the Latin-American regional level, one of the main fields of activity of the RECYT is the promotion and encouragement of research at all levels, aiming to find solutions to problems common to countries of the region and contributing to the process of regional integration. The most important initiatives of RECYT include the yearly S&T Award MERCORSUR, the BIOTEC SUR platform, Digital Mercosur and the MERCOSUR Framework Programme 2006-2010.

The S&T Award MERCOSUR was established in 1997 with the aim to involve researchers, especially young people, finding solutions to specific problems of our societies. Previous competitions were focused on the areas of energy, biofuels, clean technologies, agroindustries and social inclusion. Plataforma BIOTECSUR is a biotechnology platform for the MERCOSUR originating in the BIOTECH - MERCOSUR – EU project for the development of specific R&D actions focused on regional priorities (see section 2.5.2).

Digital Mercosur aims to promote MERCOSUR-EU common policies and strategies in the area of Information Society and reducing asymmetries in the field of ICT. It promotes the harmonization of regulations, implementation of technical infrastructure, knowledge sharing and training disseminate the contents of information technologies, SMEs and issues of information society in general. Digital Mercosur is included in the regional strategy document of the European Commission, which provides for cooperation with MERCOSUR for the period 2007-2013, with the beneficiaries of four members-full of MERCOSUR Common Market Group (GMC). The total investment in this project is €9.6m (€7m provided by the European Commission).

The MERCOSUR Framework Programme 2006-2010 is conceived as an instrument to achieve the MERCOSUR Science, Technology and Innovation Area, encouraging the consolidation of scientific and technological development of countries of the region. In order to have a permanent funding mechanism that will be able to ensure the allocation of resources on a stable and continuous basis, member countries and MERCOSUR partners make efforts to identify multiple sources of promotion, and also evaluate the use of Fund Structural Convergence of MERCOSUR (FOCEM).

3.5.4 Opening up of national R&D programmes

National programmes are not currently open for third country researchers. The direction in this line has been the recent calls by FONCYT for joint research projects with Israel, South Africa and Brazil. At the same time, latest research calls in the areas of biotech and stem cells require the establishment of consortia between Brazilian and Argentinean research groups.

3.6 International science and technology cooperation

3.6.1 International cooperation (beyond EU)

International co-operation in S&T is conceived as fundamental component to achieve the objectives pursed by MINCYT. Specifically, international cooperation is understood as a tool that enables access to research networks and resources. The Argentinean government has a long tradition and history in subscribing bilateral and multinational agreements in S&T (see section 2.5). For specific information of cooperation with the EU see section 3.5.

3.6.2 Mobility schemes for researchers from third countries

MERCOSUR has advanced on the integration of education systems specifically at the lower levels of education. Educational courses at the primary or junior high level, provided that they do not entail technical studies, are recognized by other member states as being on the same level for all member nations. Specifically, Argentine legislation on higher education states that the same rules and rights applicable to Argentine citizens shall be applicable to those that are foreigners. MERCOSUR, Bolivia and Chile have agreed in 2002 to confer Residency and the right to work for all its citizens with no other requirement than proof of nationality and a negative criminal record. This residency right is not fully matching the right of a free movement of persons. Thus, researchers from the MERCOSUR and associated countries can move to Argentina. Other than that, there are no mobility schemes for third country researchers.

4 CONCLUSIONS

4.1 *Effectiveness of the knowledge triangle*

The knowledge triangle is not fully operative in the case of Argentina. Although some coordination instances (such as GACTEC) have aimed at increasing the dialogue and cooperation between the different agencies, only limited success has been achieved. As a whole, the education and research parts are significantly better developed and achieve more progress than innovation.

Policy practice in the form of separate ministries has created own objectives and ways of intervention on the different components of the triangle. In particular, the practice of competitive and performance-based funding is becoming the standard intervention in the promotion of R&D and innovation (via MINCYT and ANPCYT), while block funding is the standard funding mode of research and education that concerns the public universities. Similarly, although the promotion of highly skilled professionals in STEM has been noted as a bottleneck in sectoral fora and plans (see reports on sectoral panel available at the "Basis"), the education and training side has been slow to react to the industry needs in the formulation of curricula at the higher education institutions.

Hence, in parallel to the increasing budgets and efforts of research and education, more emphasis is needed to create bridges and reinforce the triangle. Knowledge demand remains the weak factor, despite significant and generous incentives. Policy is emphasising this priority yet without any visible change in terms of outcomes and impacts.

Table 3: Effectiveness of knowledge triangle policies

	Recent policy changes	**Assessment of strengths and weaknesses**
Research policy	• Establishment of MINCYT and operation of FONARSEC promoting selected sectors; • Work in progress for the elaboration of a new medium-term National Plan of R&D started, Continuous increases in federal budget.	• Creation and upgrading of knowledge broker capabilities; • Inadequate science-industry dialog.
Innovation policy	• Promotion of research in areas with important business applications or social needs; • Promotion of establishment of R&D groups in firms via the provision of post-doctoral fellowships; • Promotion of interactions between different types of agents; • Newly created funding sources and instrument to promote the creation of technology based ventures	• Focus on SMEs efforts. Not only limited to technological innovations but also to organisational and commercial; • Emphasis on a few horizontal technologies and specific industrial sectors; • Lack of adequate funding and instruments promoting the creation of intangible assets; • Infant venture capital industry and poor emphasis on academic spin-offs.

Education policy	• Establishment of undergraduate scholarships in STEM fields; • Continuous expansion of scholarships at the postgraduate level by CONICET.	• Decreasing levels of STEM enrolments and graduates; • A range of measures aiming to promote research as a potential career among students • Lack of adequate research performance-based incentives limit research and educational potential of both, private and public HEIs.
Other policies	• Establishment of international calls for R&D by ANPCYT in specific sectors.	

4.2 Comparison with ERA 2020 objectives - a summary

The government of Argentina has taken bold measures aiming at achieving a better performing research system capable of serving social needs and promote an upgrading in the specialisation pattern based on the application of nanotechnology, biotechnology and information and communication technologies (take FONARSEC as an example). At the same time it increased resources, expanded the research community and the associated infrastructure, it has established calls for joint research projects with other countries. However, it is still lagging behind in terms of excellent research infrastructures. At the same time, lack of appropriate evidence weakens the policy design and instrumentation.

Table 4: Assessment of the national policies/measures which correspond to ERA objectives

	ERA objectives	Main policy changes	Assessment of national strengths and weaknesses
1	Ensure an adequate supply of human resources for research and an open, attractive and competitive labour market for male and female researchers	• Establishment of undergraduate scholarships on STEM disciplines; • Continuous support for postgraduate scholarships by CONICET; • Establishment of postgraduate fellowship programmes in firms; • Attract Argentinean researchers abroad for short stays and repatriation.	• Decreasing proportion of enrolments and graduates on science, technology, engineering and mathematics (STEM) at the graduate and postgraduate levels; • Need to increase the attractiveness of a scientific career by providing high wages and equipment.
2	Increase public support for research	• Public budget for R&D increased 128% increase in local currency and 40% in Euros between 2006 and 2009 to reach €782 million (0.35% GDP); • R&D intensity in the country reached 0.52% in 2008, with the public sector financing 68%.	• Continuous significant increase in R&D expenditure; • R&D intensity is far from reaching the 1% GDP goal; • Loans and agreements with multilateral organisations as the IDB and WB secure a stable provision of funds in the form of competitive funding.
3	Increase coordination and integration of research funding	• No major changes. The government continues to actively support the Argentine participation in different European schemes (FP7, ALBAN, ALFA, @lis) • Establishment of a roadmap between Argentina and the EU	• Strong emphasis given to Argentinean participation in the EU initiatives.
4	Enhance research capacity	• Establishment of bi-national and/or regional research and training centres.	• Focus on priority technologies and sectors.

	ERA objectives	Main policy changes	Assessment of national strengths and weaknesses
5	Develop world-class research infrastructures (including e-infrastructures) and ensure access to them	• FONCYT opened the first call for the Technology Platforms Projects (PPL). PPL supports the formation of excellence centres equipped with cutting edge technology and personnel dedicated to providing highly specialized products and advanced scientific and technological services in the areas of Genomics, Stem cells, New Materials and Bioinformatics; • Instruments aimed at improving R&D equipment and infrastructure.	• Need to concentrate disperse efforts and capabilities • Funding requires increasing.
6	Strengthen research institutions, including notably universities	• No major changes	• Funding is mostly allocated in as block funding; • Competitive funding (via ANPCYT) is becoming established and growing
7	Improve framework conditions for private investment in R&D	• Increasing incentives to the business sector; • Promotion of research and development personnel in firms.	• Lack of adequate funding for investments in R&D (resources coming mostly from the firms).
8	Promote public-private cooperation and knowledge transfer	• Increased focus on the improvement of research-industry links and better knowledge transfer in the newly introduced sectoral funding schemes; • Revamp of the operation of intermediaries and their linkages	• Strong willingness of the government to bridge the gap between academia and industry; • Weak interest of the enterprises in research activities in comparison to other innovation expenditures.
9	Enhance knowledge circulation	• Argentina is continuously increasing its participation in the EU initiatives; • National programmes are starting to promote foreign participation under bilateral schemes. Mostly focused on the MERCOSUR area	• Need to further promote opportunities for participation in international partnerships.
10	Strengthen international cooperation in science and technology	• Growth in the number of international cooperation agreements	• Cooperation is considered a priority area by MINCYT allowing to ease constraints and promote high quality research; • Need to strengthen RECYT and the MERCOSUR framework programme.
11	Jointly design and coordinate policies across policy levels and policy areas, notably within the knowledge triangle	• No major changes	• Further need to empower coordination via GACTEC and COFECYT.
12	Develop and sustain excellence and overall quality of research	• Strong priorisation of research areas by MINCYT; • Push towards concentration of disperse effort in transversal technologies (technology platforms).	• The government's strong willingness to develop adequate and focused policy framework; • Increasing emphasis on prioritisation of research orientation.
13	Promote structural change and specialisation towards a more knowledge - intensive economy	• Introduction of sectoral policies with specific priorities (in the form of call for projects) • Promotion of technology based firms and ventures • MINCYT have identified societal	• Strategic exercise in course is expected to emphasise research priorities; • Infant venture capital industry.

	ERA objectives	Main policy changes	Assessment of national strengths and weaknesses
		challenges – social inclusion, vaccines and research on stem cells, nanotechnology, biotechnology and energy.	
14	Mobilise research to address major societal challenges and contribute to sustainable development	• MINCYT have identified societal challenges – social inclusion, vaccines and research on stem cells, nanotechnology, biotechnology and energy. • Promotion of transferable and applicable research	• Promotion of research consortia (both with domestic and international partners); • Identification of infrastructure needs and concentration of efforts in selected centres (technological platforms)
15	Build mutual trust between science and society and strengthen scientific evidence for policy making	• Increased effort from MINCYT in the form of initiatives to sensitise the public on the topics such as S&T, research and innovation (information days, awareness campaigns, etc.) and research as career.	• Lack of evaluation culture creates unfavourable framework for evidence-based policy making; • Important role of multilateral institutions (IDB and WB) in performing assessments and establishing evaluation procedures and culture.

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List of Abbreviations

ASETUR (Tourism Sector Technology Support): Programa de Apoyo al Sector Turismo.

ANPCYT (National Agency of Promotion of Science and Technology): Agencia Nacional de Promoción Científica y Tecnológica.

CICYT (Inter-institutional Council for Science and Technology): Consejo Interinstitucional de Ciencia y Tecnología.

CIC (Scientific Research Commission, province of Buenos Aires): Comisión de Investigaciones Cientificas, Provincia de Buenos Aires.

CIN (National Inter-university Council): Consejo Interuniversitario Nacional.

CITEFA (Institute of Technical and Scientific Research for Defence): Instituto de Investigaciones Científicas y Técnicas para la Defensa.

CNEA (National Atomic Energy Commission): Comisión Nacional de Energía Atómica.

COFECYT (Federal Council on Science and Technology): Consejo Federal de Ciencia y Tecnología.

CONAE (National Commission of Space Activities): Comisión Nacional de Actividades Espaciales.

CONEAU (National Commission for University Evaluation and Accreditation): Comision Nacional de Evaluación y Acreditación Universitaria.

CONICET (The National Council for Scientific and Technical Research): Consejo Nacional de Investigaciones Científicas y Técnicas.

CRUP (Council of Rectors of Private Universities): Consejo de Rectores de Universidades Privadas.

FONARSEC (Argentine Sectoral Fund): Fondo Argentino Sectorial.

FONCYT (National Science and Technology Fund): Fondo para la Investigación Científica y Tecnológica.

FONSOFT (Fiduciary Fund for the Promotion of Software Industry): Fondo Fiduciario para la Promoción de la Industria del Software.

FONTAR (Argentine Technological Fund): Fondo Tecnológico Argentino.

GACTEC (Scientific and Technological Cabinet): Gabinete Científico y Tecnológico.

GTec (Training Programme for Managers and Technological Linkers): Programa de Formación de Gerentes y Vinculadores Tecnológicos.

INTA (National Institute for Agricultural Technology): Instituto Nacional de Tecnología Agropecuaria.

INTI (National Institute of Industrial Technology): Instituto Nacional de Tecnología Industrial.

IDB: Inter-American Development Bank.

MERCOSUR (Common Market of the South): Mercado Común del Sur.

MINCYT (Ministry of Science, Technology, and Productive Innovation): Ministerio de Ciencia, Tecnología e Innovación Productiva.

PEI (Institutional Assessment Programme): Programa de Evaluación Institucional.

PFI (Federal Infrastructure Plan for Science and Technology), Plan Federal de Infraestructura para la Ciencia y la Tecnología 2008-2011.

PFIP (Federal Productive Innovation Project): Proyectos Federales de Innovación Productiva.

PI-TEC (Integrated Projects for Productive Conglomerates): Proyectos Integrados de Aglomerados Productivos.

PPL (Technology Platforms Projects): Proyectos de Plataformas Tecnológicas.

PRIETec (Technological Infrastructure and Equipment Projects): Proyectos de Infraestructura y Equipamiento Tecnológico

PROBITEC (Bi-national Program on Cellular Therapy): Programa Binacional de Terapia Celular.

PROFECYT (Federalization of the National Program of Science, Technology and Innovation): Programa Nacional de Federalización de la Ciencia, la Tecnología y la Innovación.

PROFIET (Program of Support the Entrepreneurial Investment in Technology): Programa de Fomento de Innovacion Emprendedora en Tecnología.

SECTel (State Secretary for Science, Technology and Innovation, province of Santa Fe): Secretaria de Estado para la Ciencia, Tecnología e Innovación.

WB: World Bank.