The Role of Higher Education in the Knowledge Economy in Uruguay

Rodrigo Arocena and Judith Sutz
University of the Republic, Uruguay

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Uruguay: Higher Education, National System of Innovation and Economic Development in a Small Peripheral Country

Rodrigo Arocena and Judith Sutz[1]
Universidad de la República, Uruguay

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Presentation

This paper aims to describe the general framework for the Uruguayan contribution to a comparative research project – in brief the UniDev Project -, initiated and coordinated by the Research Policy Institute of the University of Lund, concerning the role of Universities and other Academic Institutions in Development. The project was launched in June 2005; the bulk of our work will be carried on during 2006 and 2007. Thus, this is an initial paper, dedicated to the characterization of the Uruguayan context, our approach to the main issues to be considered in the UniDev Project, and the main lines for the future research. It has been organized following quite closely the general scheme proposed by our colleagues from Lund, in order to facilitate comparisons between the different national papers to be presented in the same occasion.

Section 1 summarizes the historical evolution and actual situation of Uruguay, a small peripheral country with comparatively high levels of Human Development. Section 2 focuses specifically in the Uruguayan National System of Innovation; it is the main section of this paper, because it organizes the empirical elements in a theoretical approach to the study of Systems of Innovation (SIs) by means of "constructive modules"; such approach is related in the same section with the model for SIs that is considered in the Swedish paper. Section 3 offers a preliminary mapping of the Uruguayan Academic System, where particular attention is paid to the University of the Republic (UR), by far the most important institution of Higher Education in the country, that will be the subject of the main case study of the Uruguayan contribution to the UniDev Project. Section 4 describes the current debate in Uruguay concerning Higher Education and its external relations. Section 5 sketches our projects for future research, connected with exploring the notion of Developmental University; the prospective dimension is stressed; some key issues are discussed; three concrete tasks are briefly described; the main purpose of the section is to motivate comments and suggestions from colleagues of other countries.

1. Introduction to the Uruguayan context

Uruguay is a small South American country, with a surface of 176.000 square kilometres and a population slightly over 3.200.000 inhabitants. It is also quite atypical in the Latin American context, as it follows from some of its basic features that are briefly recalled in this introduction.

During the second half of the 19th century Latin America began its integration in the "centre-periphery" system, as an exporter of primary products and importer of

[1] Paper prepared for the UniDev Project Workshop at Havana, February 2006. Some sections reproduce and/or extend parts of the presentation at the UniDev Project Workshop at Lund, June 2005 (Arocena and Sutz, 2005b)

industrialized goods. That was the main force during the so-called outward growth period (circa 1850-1930). Uruguay's peripheral insertion was early and quite successful. A main reason for that is that the country has been well placed in the "commodity lottery" (Bulmer-Thomas, 1994: 15): its main exports are based on cattle raising, and such products have quite significant linkages – stimulating industry and urbanization - as well as relatively high international income elasticities of demand. Those factors help to explain why Argentina and also Uruguay around 1900 were comparatively rich and growing quickly.

By that time the Uruguayan population was almost a million, having grown from around 150.000 in 1850; the small aboriginal population had been almost liquidated long before and a strong inmigration from Europe was taking place. Uruguay is perhaps the best Latin American example of what Darcy Ribeiro called a "transplanted people" – *un pueblo transplantado.*

Integration of immigrants was facilitated by the early extension of public, free, compulsory and laic elementary education. The system was created by a law in 1877 and high priority was assigned to it in the following decades. Illiteracy diminished quickly. After 1900 public secondary education was fostered, not only in Montevideo – the capital city, the main port and the economic, political and cultural centre, where more than 40% of the population lives - but also in the rest of the country. Tertiary public education also grew significantly, but it was and still is essentially concentrated in Montevideo. Uruguay has traditionally been proud of its educational system; that feeling is not without solid justifications, mainly related with elementary schooling, but most of them belong more to the past than to the present. And even in the past the system had several flaws; the main ones have been closely related with the low social and cultural valuation of manual work and technical activities, a main aspect of the Ibero American tradition. Technical education has always been the neglected component of Uruguayan education.

Nevertheless, a century ago the country was ready for success. Immigration was fostering some degree of technical progress and an early industrialisation. The introduction of well known techniques for cattle raising as well as innovations related with the transport of frozen meat led to an export boom. Peace in rural areas became essential for business. The long history of civil wars came to an end. Cattle was not labour demanding. Urbanisation advanced quickly, as well as public services, light industries and mass politics. A liberal democracy emerged. Immigrants brought not only technical know how but also trade-unionism. Even if mainly concentrated in Montevideo, a quite "modern" set of social relations emerged.

Such were the main basis of a phenomenon that deserves attention because, even if greatly transformed, it still dominates the Uruguayan political and ideological landscape: the *batllismo*. Originally, the word denominated the political movement related with José Batlle y Ordóñez, who was president in 1903-1907 and in 1911-1915. The second of the four Uruguayan presidents belonging to the same family, he was the main promoter of a pioneer welfare state, a remarkable Keynesian social democracy *avant la lettre*. It included advanced social legislation as well as an extended systems of public owned utilities and industrial firms. Such "batllista state" became the main original trait of the small peripheral country Uruguay; to consolidate and expand the characteristic functions of the batllista state was and is what the majority of the population demands from the political system; the ups and downs of the battlista way of governing characterize the contemporary history of Uruguay.

During the founding period – the first decades of the 20th century -, the economic performance of the "batllismo" was modest, but its social and political

achievements were really important (Finch, 2005: 27). In fact, something similar can be said of what happened after. Those achievements were economically based on the exports stemming from cattle production, which the batllismo was unable to improve. When external income diminished abruptly in the 1930s, the first batllismo came to an end, an important social and political turn took place, and the government became dictatorial for the first time in the century. At that time Latin America was starting a new stage in its economic history, an inward-led growth period based on the Industrialisation by Substitution of Imports (ISI). In Uruguay that type of growth had already a quite strong base; it acquired momentum in the 1940s, when the "commodity lottery" was becoming favourable once more, as it stayed up to the second half of the 1950s, mainly due to the external demand connected with the II World War and the Korean War. A "second batllismo" emerged, greatly expanding the state-owned productive sector and the Social Security System. Around 1950, Uruguay saw itself and was seen from abroad as a "model country": quite prosperous, pacific, and far less unequal than the Latin American average. Greatly idealised, that "model country" of yesterday is still highly influential today in the Uruguayan "collective imaginary".

The political history of Uruguay in the 20th century can be divided in two periods of roughly 50 years each (Filgueira et al, 2003): the first one is characterised by the systematic expansion of the social and economic role of the state, the second one by a conflictive and contradictory process of decreasing state intervention.

The limits to an inward industrialisation in a small country, the lack of technical progress in Uruguayan agrarian production and the decreasing international prices for primary products originated, in the late 1950s, an economic stagnation that lasted for around 15 years. During that period Uruguay changed from an immigration to an emigration country. Political changes and social unrest followed. The government turned to the right, leaving aside social democratic policies and adopting a repressive attitude; trade unions resisted that trend, the left became more important, guerrillas appeared. Step by step, a dictatorial government was built, culminating with the dissolution of Parliament in 1973; for more than ten years, Uruguay lived under a military regime, by then a common situation in the South of Latin America.

That regime started opening, deregulating and liberalising the economy; it aimed at an outward-led growth, based on diminishing salaries and social aids as well as on export-promotion. Important changes took place but, with the great debt crisis of the early 1980s, production fell abruptly and people below the line of poverty increased to 46%, an almost incredible figure in the Uruguayan context. Social opposition to the military increased; almost all the political spectrum demanded the end of the dictatorship; a difficult transition took place; on March 1985 a democratically elected government took office.

It can be said that in the last twenty years the main problem has been how to combine a restoration of the batllista welfare state – strongly demanded by the majority of the population – with the search of new sources of economic growth.

That combination showed some possibilities, at least up to the late 1990s[2]. In the decade following 1985, poverty and inequality diminished. By 1995, Chile was the success story of South America in economic terms and Uruguay in social terms. The material basis of such progress was mainly a favourable relation with the two big neighbours, Brazil and Argentina, and the easy access to international financing that characterized the period 1990-1997; raising public expenditures and persistent trade

[2] Concerning different aspects of the period 1985-2005, a good reference is the collective volume Caetano (2005).

deficit were managed by means of external indebtment. In 1991 the MERCOSUR treaty (Common Market of the South) was signed by Argentina, Brazil, Paraguay and Uruguay; some years later, more than half of the external trade of Uruguay took place with its neighbours, exports being fostered by the overvaluation of Brazilian and Argentinian currencies.

Meanwhile, Uruguayan governments tried to implement a somehow weakened version of the Washington Consensus policies. Opening and deregulating the economy was continued, but privatization was almost stopped: the first and comparatively timid attempt in that direction was submitted to a referendum, and 72% voted against it; the "Uruguay batllista" was as strong as ever.

The economic situation changed in the late 1990s. For Latin America as a whole, ECLAC asserted that 1998-2002 was a lost half decade. That was particularly true for Argentina and Uruguay. A great crisis took momentum in Uruguay in 2002, exactly 20 years after the last one; bankruptcy exploded, public indebtment soared, unemployment rose to 20%, production receded 20% in two years, external migration rose again.

The crisis accelerated a political change already underway. A broad coalition of left and centre-left political organisations, the *Frente Amplio* – the Wide Front – was founded during the agitated years that led to the military coup; it became the most active component of the political opposition to the dictatorship; its electoral support rose steadily since the return to democracy; while the traditional parties adopted a more or less neoliberal discourse, the Frente Amplio became increasingly identified with the batllista tradition. In 2004 it obtained 50,7% of the votes. In 2005, for the first time in history, a left wing government took office in Uruguay.

In that year, the GDP reached again the level of 1998. Economic recovery has been fuelled by international trends, particularly the rising prices of commodities. The "commodity-lottery" is again favourable for Uruguay: exports are increasing quickly; meat accounts for 25% of external sales, mainly to the very affluent market of the United States; other products have also good prospects, particularly wood and paper. In spite of the recent crisis, Uruguay has a high Human Development Index and is the less unequal country of South America. Nevertheless, unemployment is still around 12%, 30% of the population is below the poverty line, approximately 4% of GDP is dedicated to paying the interests of external debt, trade deficit looks solid again, and investment is scarcely over 15% of GDP.

This section aims to sketch the context for analysing the relations between knowledge production and economic development in Uruguay. A main empirical fact is that in the long term growth has been slow in Uruguay. It averaged in 1960-1998 in Uruguay 0.9% and in USA approximately 2%, so "between 1960 and 1998 Uruguay's per capita income fell from 28.3% of the US average to 19.0%. […] roughly speaking long run per capita growth has averaged about 1 percent which implies that the country has been growing less than the technological frontier over a long period of time." Low investment is evident; it averaged 15.4% for the "relatively benign decade of the 1990s". (Hausman et al, 2004: 7)

In fact, investment possibilities are not absent: meat, rice, soybeans, forestry, pulp and paper, ports, tourism, software, the export of business services, are seen as having large growth potential (Op. cit.: 4). Other sectors could also be mentioned, including some with high technological content and directly connected with the basic national production, like biotechnology for animal health.

To discuss if such potential can change the long term pattern, the key distinction between economic growth and economic development must be recalled. Strangely, this

well known distinction is often overlooked, at least in Latin America. In his "Theory of Economic Development", originally written in 1911, Schumpeter made the distinction between the mere growth of the economy, that reflects material and demographic growth, and [economic] development, that only exists when new combinations of productive means take place (Schumpeter, 1957: 74-76). Such new combinations, or innovations, increase the knowledge content and the value added in the production of goods and services; this is the core of economic development.

A related and fundamental assertion is that: "As has been repeatedly observed over the last few centuries, the common problem faced by all catch-up economies is that the shift to higher value-added activities, which constitutes the key to the process of economic development, does not happen 'naturally'." (Chang, 2002: 126)

Economic growth has been slow in Uruguay because investment has been low and because economic development has been very weak. Bértola and Bittencourt (2005) characterise the last two decades as "twenty years of democracy without economic development".

A new start is taking place in Uruguay, politically and perhaps also economically. The new government has its own parliamentary majority and a wide public support; it has promised important reforms. Changes can be seen in the insertion in the world economy. Alternative strategies are hotly debated. It can be said that a "third batllismo" is being shaped. A fundamental question is if it will be have only the weak basis of a commodity-exporting economy or if it will have the stronger support stemming from a gradual turn towards a more knowledge-based and innovation-driven economy.

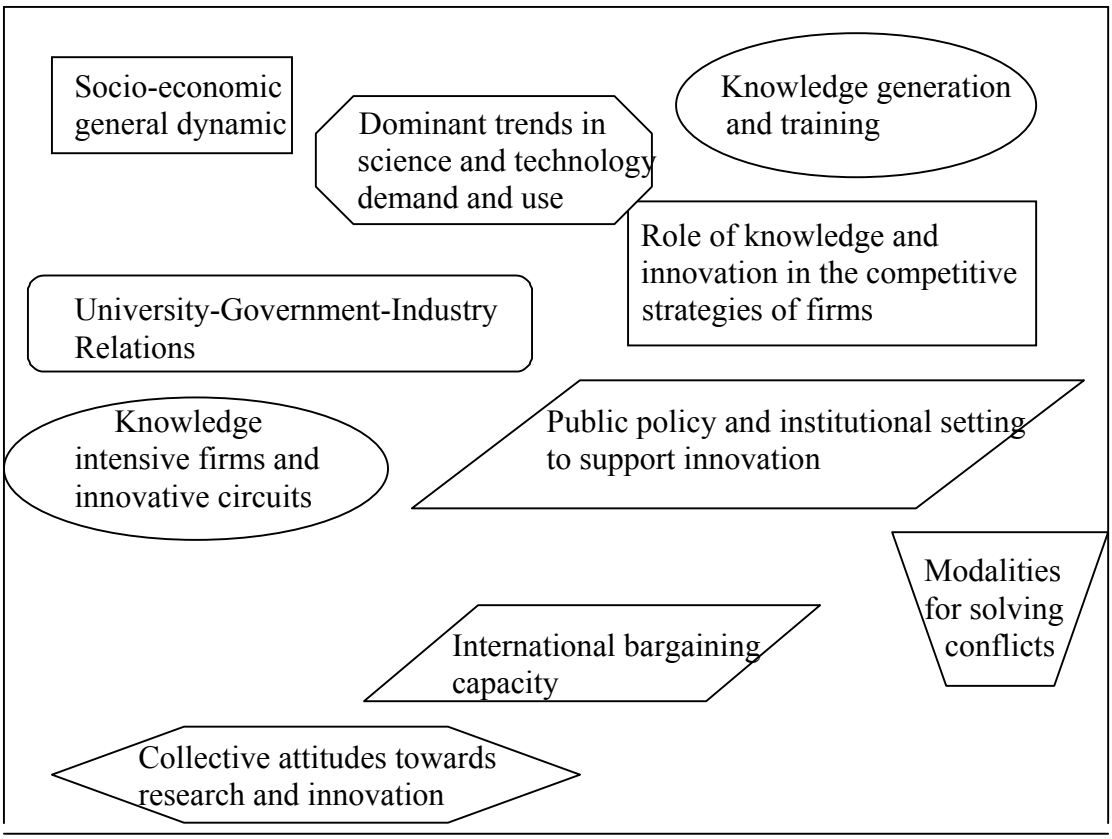
2. The Uruguayan National System of Innovation

(2.a) A characterisation of the Uruguayan NSI by means of constructive modules

National Systems of Innovation (NSI) are not static; it can be said that they are "endlessly in the making". To give account of the dynamic of a NSI two factors at least are important: variety and linkages. Variety refers to the fact that new actors, new functions and new interrelations are always appearing and changing; linkages refer to the co-evolution of the former, that is at the very centre of the dynamics of transformation. Moreover, a useful characterisation of a NSI needs to fulfil two requisites: first, to allow national specificities to be accurately taken into account, and second, to allow meaningful comparisons with other NSI. A methodological procedure to achieve this is to construct a "picture" of NSI by means of constructive modules, each of which helps understanding a key factor or situation; the combination of the different modules approaches the variety of the NSI. (Arocena and Sutz, 2000) The assessment of the linkages between the different modules completes the construction of the picture by showing to what extent we have an integrated picture or a set of more or less isolated parts. National specificities are reflected in the choice of the constructive modules; international comparisons can be built "bottom-up", from comparisons between the constructive modules that are common to any characterisation.

In the Uruguayan case, ten constructive modules were selected; they are very briefly described in what follows and sketched in Figure 1.

Figure 1.- Constructive modules to characterize the Uruguayan NSI



1) Socio-economic general dynamics. Uruguay in the last two decades can be very succinctly characterized as a country with fairly low levels of productive investment and a not too high macroeconomic stability, two probably interrelated features that frame a weak situation for entrepreneurship and innovation. Exports continue to be based mainly on the endowment of natural resources, with a particularly strong expression in the meat industry and the dairy industry as well; surprisingly enough, the software sector shows a healthy development of its exports, even in absolute numbers. In general terms, Uruguay has shown little efforts towards overcoming its "price-taking", natural resources based production with little intellectual value added. There is no "flag-ship" in innovation terms, that is, a recognized and prized set of firms that lead economic performance mainly due to their innovative behaviour; neither the business sector nor the government have put much emphasis in the use of knowledge as a competitive tool. On the other hand, Uruguay has received traditionally little Foreign Direct Investment (FDI, a feature that seems to be changing rapidly around the forestry industry, given the big current announced investment on cellulose mills. In any case, there is little participation in global productive chains: a small country, with salaries that are comparatively not so low and without much high specialization has not too much to offer to such chains.

A new government took power in 2005, and changes to the current situation might be expected. Some indicators are: a) innovation has been put, at discourse level, at the same height as very significant issues like social policies and State reform, for instance; b) the former imbalance against workers and their organizations has already been reversed to a good extent, which might evolve towards a more rational use of

human resources; c) the market fundamentalism of former administrations seems to be tempered, and the need for some type of active policies to build a "productive country" has been recognized. To what extent these trends will lead to rapid changes in the socio-economic general dynamics is not easy to forecast. As already mentioned, Uruguay has an extremely high external debt, and the political decision to honour it entirely leaves little room to public investment, a rapid way of affecting current dynamics, marked by the historically low private investment.

2) Dominant trends in science and technology demand and use. Uruguay, as the vast majority of Latin American countries, invests a tiny proportion of the wealth it creates in knowledge production and use: GERD represents around 0.25% of GDP in the last measure available, corresponding to 2003 (RICYT, 2005). But even more worrisome are the trends related to the employment of researchers and qualified human resources. The distribution of researchers between sectors of activity is heavily biased towards the academic realm: 85% of them work on the higher education sector and only 1% is absorbed by business firms (Ibid). The latter absorb very few university graduates as well: only 3,6% of all industrial firms declared having employees with such background in the last innovation survey, corresponding to the period 2001-2003; one third of these employees corresponds mainly to graduates from social sciences and to a lesser extent from the humanities. The structure of the demand for human resources in industry is marked by traditional professions: two thirds of all scientific and technical graduates employed in industry come from industrial and mechanical engineering and chemistry; 1% of all graduates belongs to biology or biochemistry, even though agro-industry represents a very important part of all industry. The following table shows that the general situation has not improved in the last twenty years.

Table 1.- Proportion of firms without university trained technical staff,1986 and 2003

	All industry	**> 100 employees**	**51-100 employees**	**20-50 employees**
% of business firms without engineers (1986)	45	21.9	50.3	73.8
% of business firms without computer analysts or programmers (1986)		47.2	66.1	81.9
% of business firms without university graduates in science or technology careers (1986)		45.9	68.4	80.7
	All industry	**> 100 employees**	**20-100 employees**	**< 20 employees**
% of business firms without engineers and other university graduates in science or technology careers (2003)	77.9	22.5	63.2	87.4

Source: Argenti, Filgueira and Sutz, 1988; Bianchi and Gras, 2005. It must be taken into account that the last survey included the smallest firms, under 20 employees.

Another trend that deserves to be emphasized relates to technological public procurement, a source of S&T endogenous demand dynamism widely used in developed countries. This type of demand has been seldom present in Uruguay, being clearly below the country's scientific and technological capabilities. When it was used, for instance, for the digitalisation of the telex telecommunication network, in the late seventies, significant achievements were reached. In spite of this and some other

successful examples, the rule has been to import turn key solutions, many of which proved inadequate.

A main problem in Uruguay is the mismatch between capabilities and opportunities to apply them to productive endeavours; the systemic approach needed to redress such mismatch has not been tackled seriously; one of the consequences has been, and continues to be, a heavy brain drain phenomenon. Only very recently the latter is being considered a severe flaw that deserve public intervention. However, one thing is to address the problem of those already abroad and quite another to tackle the issue of the lack of opportunities offered to highly qualified people that want to stay and found no ways to do it.

The general situation described above looks different when a specific sector is studied: agriculture. To just mention one feature: contrasting to the meagre 0.25% of general GERD/GDP, this figure rises to around 1,5% for the agriculture sector, the best endowed research direction of the country. This differentiation can also be seen in terms of the linkages between productive units and the research system, as well as in the institutional setting for research. It can be suggested that NSI is a too broad expression to cover the differences in the Uruguayan innovative panorama: a differentiation between the NSI of the agrarian sector and the NSI of the industrial sector could be needed to better grasp the national situation.

3) Knowledge generation and training. Uruguay shows a very concentrated structure of knowledge generation and training: more than 60% of all the research made in the country and over 80% of higher education belong to the only public university, the University of the Republic (UR). Besides UR, only two other institutions perform research as its main mandate: the Institute of Biological Research "Clemente Estable", particularly strong in neurosciences and the Institute of Agriculture Research, the former being a public institution and the latter a sort of public-private partnership, mainly financed by taxes paid by rural producers and by international loans contracted by the government.

Some main characteristics of the Uruguayan knowledge system have changed significantly in the twenty years elapsed since the democratic recovery. For instance, in 1986 only 13% of all researchers hold a postgraduate title (Argenti, Filgueira, Sutz, 1988), a situation that greatly changed afterwards by the combination of local postgraduate programs, specially strong in basic sciences, and diverse schemes of fellowships that allowed unprecedented levels of people going abroad to study. Just to give one indicator: 80% of all the research groups in UR have at least one member with a culminated postgraduate title or following postgraduate studies (Unidad Académica de CSIC, 2003); this level of postgraduate members also holds for the other two institutions referred above.

Other characteristics continue over time, for instance the strong bias towards the life sciences exhibited by the academic system. In 1986, around 45% of all the research effort in the country, measured by number of research units, research projects and researchers, belonged to the basic sciences: 62% of such effort was concentrated in biology. Adding the fundamental research, agrarian research and biomedical research, life sciences accounted for 45,4% of all the national research activities. (Argenti, Filgueira, Sutz, 1988) In 2003, 41,7% of all research groups in UR were devoted to life sciences, to which should be added the activities performed by the Institute of Biological Research and the INIA, most of them devoted as well to life sciences.

Research groups are a particularly good unit of analysis for knowledge generation and training, because research is a collective endeavour and, moreover,

because learning to do research is a social process that takes place collectively, precisely in research groups. There are few academic papers on research groups, mainly because in the anglo-saxon tradition of organizing research the operating groups are rather transient, with people in their postgraduate or post-doctoral stages entering and leaving groups all the time; this situation seems to be different in the European Latin countries and for sure in Latin America, where research groups show a more fixed composition. (Laredo, 2001) The following figure shows the evolution of the UR research groups formation in Uruguay; the positive effect of the democratic recovery since 1985 is clearly seen, as well as the early nineties boost, due in part to the massive repatriation of researchers, to a very successful national program to foster the development of basic sciences and to the creation of two new schools at UR: the Faculty of Social Sciences and the Faculty of Exact and Natural Sciences. [3]

Figure 2.- Creation of research groups at UR

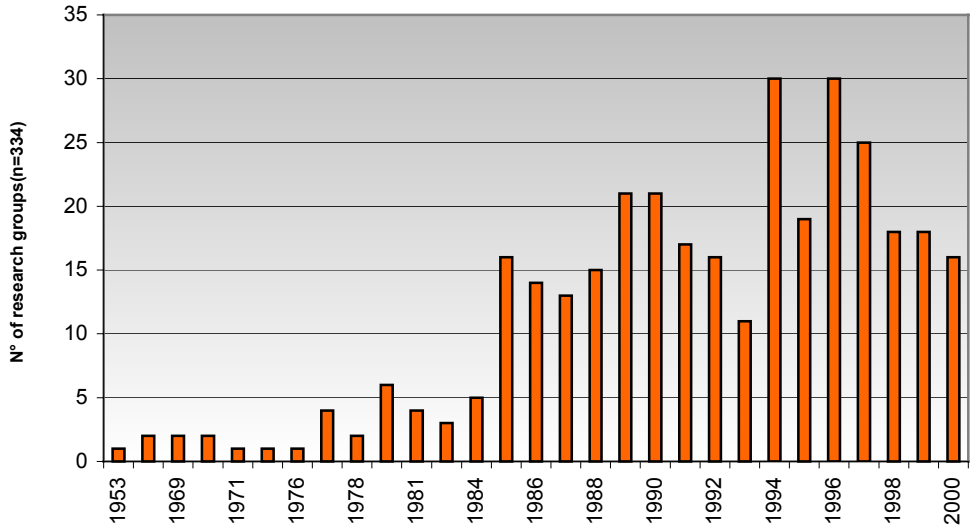


Table 2 shows the academic linkages maintained by the UR research groups: regional and international linkages are part of the current life of a fair proportion of such groups. Besides these important international relations, Uruguayan universities cannot be seen as playing an important role in the insertion of the country in the globalisation process.

Table 2.-Proportion of UR research groups with regular academic linkages by institution or geographic zone of the partner

Institution or geographic zone of the partner	% of research group with academic linkages
UR	40,1
Rest of Uruguay	22,6
Common Market of the South (MERCOSUR)	58,8
Rest of Latin America	25,1

[3] Uruguay had historically a very peculiar training and research organization at the public university: social sciences, like sociology, were cultivated at the professional Faculty of Law, and basic sciences like mathematics and physics were mainly cultivated at the professional Faculty of Engineering; the same held for basic biology and the Faculty of Medicine. This situation changed in the early nineties with the creation of two new Faculties, of Social Sciences and of Natural and Exact Sciences.

US and Canada	27,6
Europe	57,1
Rest of the world	6,7

Source: Based on Unidad Académica de CSIC 2003: 56.

As a last remark, Table 3 gives a comparative idea of the Uruguayan R&D situation in the international arena, including only small and medium countries:

Table 3.- Some indicators of research in selected countries

	Researchers/million	GERD/GDP	GERD/capita
Argentina 2003	715	0,39	44,0
Bolivia 2002	118	0,28	6,9
Chile 2001	419	0,54	51,9
Colombia 2002	81	0,17	10,5
Uruguay 2002	370	0,26	20,6
Venezuela 2002	222	0,38	20,7
New Zealand 2001	2.593	1,18	246,1
Singapore 2002	4.352	2,19	525,7
Denmark 2003	4.822	2,51	777,6
Sweden 2001	5.171	4,27	1082,5
Finland 2002	7.431	3,46	905,2
Norway 2003	4.442	1,67	612,2
Netherlands 2001	2.826	1,89	536,6
Ireland 2003	2.471	1,14	369,2
Portugal 2003	1.842	0,93	170,2

Source: OECD 2005; RICYT, 2005.

4) University-Government-Industry relations. The relations between UR and the national government have been historically conflictive. A starting point of these conflicts was related to the university budget, always extremely tight, but they had a more broader political nature. The autonomy of the university, that is, its self-governed structure, was conquered in 1958 after long fights. The declining economic situation of the country in the following decades, accompanied with social unrest and trade-unions repression, found the UR clearly enrolled in the workers and social movements side. The university was heavily attacked during that time, a process that reached it climax with the military intervention in 1973, three months after the instauration of the dictatorial rule, followed by massive researchers and teachers firings, as well as exile for many of them. After 1985 the situation changed for the better, but conflictive relations with the new democratic governments persisted, mainly due to their characterization as neo-liberal and as working against the broader national interest. The relations with the new leftist government remains an open question, even if UR have been ruled by leftist people during the last twenty years.

The relations of the university with the productive sector cannot be characterized as a whole, given the differences between the agrarian sector and the industrial sector. In the former case, the relationships are quite strong, probably due to the idiosyncratic nature of the problems related with local conditions, that discourage the automatic transfer of solutions obtained elsewhere. In the second case, as already mentioned, the weak knowledge demand stemming from the industrial sector is a major factor in the weakness of relationships. As an example, it can be mentioned that over the years, the demand to a program developed by the University Research Council to support joint projects between university teams and productive firms –in which both parts, the

university and the firm, put money to finance the research- comes in its major part from the Faculty of Agronomical Sciences. On the other hand, the following comment, made by the leader of a research group belonging to the Faculty of Engineers, illustrates the mood in which "industrial" academic researchers usually are: "(a main obstacle for the consolidation of our research group) is the difficulty to establish linkages with the productive sector to allow the diagnosis of specific problems for which we can find a solution as well as to apply results already obtained. Related to that, it can be mentioned the scarce interests of the productive sector in performing and applying local research for their own benefit" (Unidad Académica de CSIC, 2003: 121).

There are, nevertheless, important examples of university-industry relations established with research purposes showing excellent results, in almost all fields of knowledge, including basic science.[4]

From an institutional point of view the UR has undergone many changes to favor stronger and more fluid relationships with productive units. Formal contractual arrangements with firms that pay to obtain a determined research service from a university team; the possibility for researchers to get a plus over their salary for participating in such arrangements; authorization to researchers belonging to a promotion scheme for full time dedication to participate under certain conditions in consultancy work; the creation of a special commission to deal with problems related to IPR in joint projects with industry; the possibility to incubate firms in faculty laboratories; the creation of special offices in some faculties to encourage and facilitate the links between research teams and business firms. Moreover, the old academic antagonisms against business firms –that was never strong, though, in the agrarian field, perhaps due to the existence of an important cooperative organization of rural production- has weakened in the last decade. Besides a posible change in ideological perceptions, the difficulties to retain the best researchers in the academic milieu due to the extremely low university salaries have made the search of external sources of financing an unavoidable strategy for survival.

Summing-up, university-industry relations are stronger that in the past, institutional innovations were put in place to facilitate these relations, researchers are generally willing to participate in research commanded by business firms, the ideological suspicions that these practices used to rose have been eroded and even substituted, in some discourses, by an enthusiastic praise. However, the relations between university and industry continue to be weak: the university change of mood has not been accompanied by a definite willingness of industry to rely on the university expertise.

5) Role of knowledge and innovation in the competitive strategies of firms. An "aerial" view of this issue can be approximated by innovation surveys. Table 4 gives such a picture for Uruguay, issued from the last innovation survey, performed in2004.

[4] The firms that established this kind of successful relationships include the fields of bioengineering, wool production, veterinarian vaccines, pharmaceutical products, industrial controls for several processes in rice production, to just mention a few of them.

Table 4.- Cluster analysis around innovative behaviour of Uruguayan firms, derived from the Industry Innovation Survey covering the period 2001-2003

Innovative cluster definition	% of cases
Firms with low or inexistent innovative intensity	75,2
Firms with innovative activities oriented towards the acquisition of capital goods and with low employment of scientific and technology professionals	8,62
Heterogeneous composition of firms characterized by a low participation of all the innovative cluster defining variables	5,95
Young SME oriented towards investment in computer hardware and software and with high employment of technicians	5,45
Big and medium firms with high propensity to export goods with fair levels of novelty	1,16
Big and medium firms, with more than 20 years of activity and high innovative experience	0,84
Innovative SME with medium endogenous capacities and high participation of the metal-mechanic sector	0,63
Innovative SME with high endogenous capacities and high participation of the chemistry industry	2,11

Source: Bianchi and Gras, 2005

From Table 4 it can be concluded that around 90% of Uruguayan industrial firms do not count on innovation, at least internally conducted innovation, as a competitive tool. But what about linkages with knowledge producers and other posible innovation providers? Linkages with universities or the use of universities as sources of information for innovation are weak, but this is not distinctive of the Uruguayan situation, because this pattern is consistently present in all the innovation surveys, in developed and developing countries alike, big and small. However, as we have already mentioned, the university is not used in the same way as in the developed countries, that is, as a source of highly trained employees. Table 5 shows the structure of the linkages related to knowledge and innovative activities in the Uruguayan industry.

Table 5.- Linkages with the NSI in the Uruguayan industry 2001-2003

Linkages with the NSI related to	**% of *firms declaring innovation* having linkages**(1)	**% of *firms without innovation* having linkages**
R&D	10.4	1,3
Other innovation activities (2)	61,6	24,4
Training	37,2	8,0
Financing	25,4	21,3

Source: Based on Bianchi and Gras. (1) 36,6% of all firms in the Industrial Innovation Survey 2001-2003 declared to have introduced innovations during the period; (2) Other innovation activities include consultancy in organizational change, tests, technical assistance and design.

Note: Institutions of the NSI include universities, technological centres, institutions for technical training, clients, other enterprises, consultants, suppliers, financing entities, governmental agencies related to S&T.

Table 5 uses a too aggregate description of the institutions belonging to the NSI to give an accurate picture of linkages, but nevertheless it is interesting to note that firms declaring innovation and those not declaring innovation show a different relational behavior. The most important innovation activity indicated by firms that declared innovations during the surveyed period, by far, was the acquisition of machinery and equipment, which explains why activities like testing and technical assistance, probably conducted by providers, occupies such a prominent place.

This module confirms the general weakness of the country's innovative landscape, but precisely because its general nature it adds little focused information. The latter is very important, though, because the identification and detailed analysis of the firms that are truly innovative, use knowledge as a productive tool and strengthen their cognitive base by hiring and training highly qualified personnel can be a key vector of innovation for the whole economy. To this point relates the next module.

6) Knowledge intensive firms and innovative circuits. A recent survey on knowledge intensive firms including chemicals, biotechnology and software (Pittaluga et al, 2005) shows that they have a particularly dense relationship with the academic system as well as with technical institutions that conduct certified quality controls. A case study of the professional electronic industry (Snoeck, Sutz, Vigorito, 1992) showed the strategic role of a qualified internal demand to foster innovation. It showed as well the role of high-tech firms in the export capacity of the country: main private clients of the electronic industry were big exporters that needed ad-hoc solutions to improve their competitiveness or to fulfill external requirements. This led to the idea that, differently from what happens in many developed countries, where high-tech industries are an important part of the direct exports, high-tech firms in developing countries can play a role as "indirect exporters", that is, they can contribute to the efficient solution of problems that help the traditional exporting sectors of the country to do it better. The meat industry and the locally designed biotechnological vaccines against cattle diseases that hamper exports are one example of this; another example is the automation of the wool washing industry, that gained in efficiency and in exports through local electronic innovation. In Uruguay, an exception that confirms the rule is the software sector, where the firms export much more than their "demand side". The picture can be clearly seen in Table 6, were "supply" corresponds to the knowledge-based firms and "demand" corresponds to the clients of such firms.

Table 6.- Exports by knowledge-based firms and by their clients, 2000 (%)

	Supply (knowledge-based firms)	Demand (clients of knowledge-based firms)
Software	82,1	2,5
Biotechnology	6,1	43,2
Entrepreneurial engineering services	-	37,8
Environment	0,6	16,4
Pharmaceutical	11,2	-
Total exports by category	100	100
% of total exports in the sample	**8,5**	**91,5**

Source: based on Pittaluga et al, 2005: 213.

"Innovative circuits" are situations where (1) pressing problems of production are solved by the encounter of actors having the problem with "knowledge" actors, be

they faculty teams, public laboratories or high-tech firms, and (2) the learning process lead to research on related problems. These situations, studied at micro level, are very instructive concerning the reasons why these type of encounters take place, the type of difficulties that appear once the dialogues began, the ways in which they were mastered and, particularly, how the diffusion processes of the related innovations occur -if they occur at all. Innovative circuits provide a different approach to the identification of knowledge linkages and to the diffusion of innovations. Even if they belong to the "case studies" species, if systematically searched they can provide a wealth of information on how innovation really occur in globally weak innovation landscape. One feature that appeared while studying innovation circuits in diverse sectors and around different subjects in Uruguay was that the presence of university trained people on the demand side was almost a requisite to start the interactions. Table 7, based on the Pittaluga et al survey of knowledge intensive firms, confirms the importance of the university for linkages, through the provision of well trained people.

Table 7.- Average percentage of qualified personnel in total occupation of knowledge-based firms and their clients

	Supply (knowledge-based firms)	Demand (clients of knowledge-based firms)
% of professionals 1998	35	11
% of professionals 2002	39	15

Source: Pittaluga et al, 2005: 210

It is worth noting the contrast between the situation depicted in Table 7 and the general situation of industry stemming from the last global innovation survey, where only 3,6% of firms have professionals.

7) Public policy and institutional setting to support innovation. It is a shared understanding in Uruguay that public policies devoted to support innovation have been historically weak. The main idea about competitiveness has been that getting the macroeconomic parameters "right" was a necessary but also a sufficient condition to induce the best economic behavior. This idea is being challenged now, when innovation has been taken as a specific goal by the new government. However, the time elapsed since March 2005 is too short to allow for evaluation; in what follows we shall refer to the inherited situation, that has shown little variance during the last decade. [5] The institutional setting can be characterized by the functions that are fulfilled -some times only formally- and those that are not covered at all. Table 8 indicates both situations.

[5] A thorough analysis of the recent institutional setting for knowledge production and innovation can be found in Bertola et al, 2005.

Table 8.- The Uruguayan NSI: provided and non provided functions

Provided functions (number of institutions devoted to the function)	Non provided functions
Design and execution of policies (4)	Industrial extensionism
Technical assistance, certification and control (5)	Government technology procurement
Inter-entrepreneurial coordination, information and promotion (5)	Commercialisation of research results
Basic and applied research (3)	Effective incentives for innovation at firm level
Human resources formation and training (7)	Specialised research centres for specific industrial sectors
Knowledge-based incubators (2, after 2003)	Support for linkages between industry and national technology suppliers
	Systematic statistics and studies on science, technology and innovation

Source: based on Sutz, 1999.

Very schematically, other characteristics of the general institutional framework for innovation are:

i) the "youth" of institutions, 45% of which were created after 1990;

ii) the heavy dependence on external sources to support the core activities of the institutions; over 75% of all the existing institutions operate based on external funds; a particularly notorious case is the Program for Technological Development, dependent of the Ministry of Education and Culture, financed by the Inter-American Development Bank loans for S&T;

iii) the rather weak connectivity between the institutions of the system: 50% of all institutions declare having connections with at most three others; the UR is one of the two more connected institutions, with linkages with the whole lot; the self-perception that institutions have about their connectivity is definitely weak: 13% of them declared in 1997 that they were very little connected with the other institutions in the system and 68% that they were scarcely connected.

Finally, it must be stressed that the institutional density of the "agrarian system of innovation" is much greater than the "industrial" one. The Institute of Agrarian Research, a very well endowed institution with over 150 researchers at PhD levels, has no parallel in industry. The Ministry of Agriculture, Mining and Fishery has several sectors devoted in various ways to knowledge production and diffusion as well as sectors devoted to searching and promoting best technological practices among producers, which do not exist in the Ministry of Industry and Energy. Technology extensionism is present in various ways, from a specific technical option in vocational training to an organization of professionals –the Federative Agrarian Cooperatives- deeply entrenched with producers.

8) International bargaining capacity. This is a subject that usually does not appear as belonging to the innovation framework, but it is indeed important, particularly for peripheral countries. Just to mention one issue: the actual discussion in WTO about the liberalisation of public procurements can become a new expression of "kicking away the ladders" (Chang, 2002), a characteristic of the evolution of international rules

made by those that achieved development using these same ladders. The fight against bio-piracy, the capacity to discuss if a phytosanitary barrier is justified or not, the immense issue of IPR, as well as, in the positive side, participation in global forums that set parts of the agenda of international research, like the WHO, are all issues directly directed to innovation capacity building. The case of Costa Rica putting forward the "environmental taxation" and changing external debt by its environmental services is a good example of how international bargaining capacity may foster endogenous innovation.

This aspect of the innovation framework has not received yet much attention in Uruguay, but it can be expected that changes could occur in the near future.

9) Modalities for solving conflicts. The relation of this issue with innovation is not straightforward, but it is indeed a factor that can heavily shape the direction, scope and diffusion of innovations. In a recent study comparing the pattern of diffusion of totally chlorine free pulp bleaching technologies in the US and in Sweden, importance is attributed to the modality of conflicts resolution:

> The awareness of the dioxin pollution problem together with different fundamental social values dominating in the two societies shaped regulatory strategies in the US and in Sweden. Policy in Sweden is dominated by a corporatist culture. There is a long tradition to solve conflicts between competing social groups by co-operation and negotiation, where the idea to find a compromise which suits all involved parties dominates. This involves also the general acceptance of interference in business affairs, if it is perceived to be for the common good. (Reinstaller, 2005: 1378)

This cannot be said of Uruguay. The fight for the redistribution of wealth has been characteristic of the country, giving good results in terms of income equality when compared with the rest of Latin America. But this type of equality has been mainly reactive (Arocena and Sutz, 2003), that is, it has not fostered innovation; in some occasions it could have even hampered innovation. On the other hand, institutions and forums where widely public discussions can be held, with concrete consequences on matters related to science, technology, innovation and development, do not exist for the moment. Neither exists an institution where local technology-based firms can complain if discriminated in public procurements, an issue with potentially strong consequences.

This situation will probably begin to change: even if not yet fully defined, there is the intention to promote a widely participatory elaboration of a National Plan on Science, Technology and Innovation, starting in 2006. An institution that could be created as part of the Plan is a Technological Court of Appeal, to manage conflicts between local technology firms and the State.

In general, a good evolution of this issue would imply a boost in the pursuit of a proactive type of equality, that promotes innovation and a more equal and democratic society as well.

10) Collective attitudes towards research and innovation. NSI, as well as innovations, develop in a cultural milieu. Porter (1990) has forcefully explained how long term cultural biases influence the direction of technical change by highlighting features that people value. In a perhaps more diffused way, but by no means less influential, what people think about science and technology sets the scenery where different efforts towards innovation take place. Several key attitudes can be traced back to public perception on science and technology. The willingness of the youth to pursue scientific and technical careers, the importance attributed by businessmen to hiring

highly competent personnel, the drive of young professionals towards starting their own knowledge based firms, are a few examples of such attitudes. (Arocena and Sutz, 2005d)

An approach to this issue was made in 1996 and repeated in 2003 (Arocena, 2003). Two interesting results of the first public opinion survey on S&T are the following:

i) A majority believes that research widens the dependency of the country from abroad; analysing age, educational level, place of residence, the following conclusion was reached: those persons who are only slightly acquainted with the small but important research effort that has been carried on in Uruguay since the end of the dictatorship, in 1985, answer the question thinking primarily of "foreign science", and so they assume that it widens the dependence of the country; on the contrary, more informed people think in terms of "national science" and so have a different opinion.

ii) People were also asked to choose between three "policy alternatives": (a) Uruguay can and must do research with public funds, because benefits will be greater than costs; (b) Uruguay can do successful research but must not do it, because costs will be greater; (c) Uruguay cannot do successful research; 55% of the population chose the first alternative. This last question was repeated in 2003, when the country was in a quite different situation than in 1996, in the middle of the most severe economic crisis in twenty years; 51% of the population still chose the first alternative. This says that a fair proportion of the population truly sees research as a tool for national development that deserves public support, a result that should be kept in mind. Table 9 shows opinions about the use of knowledge by different institutions and about the degree of innovativeness of different social and economic spaces.

Table 9.- Opinions about the use of knowledge and the degree of innovativeness

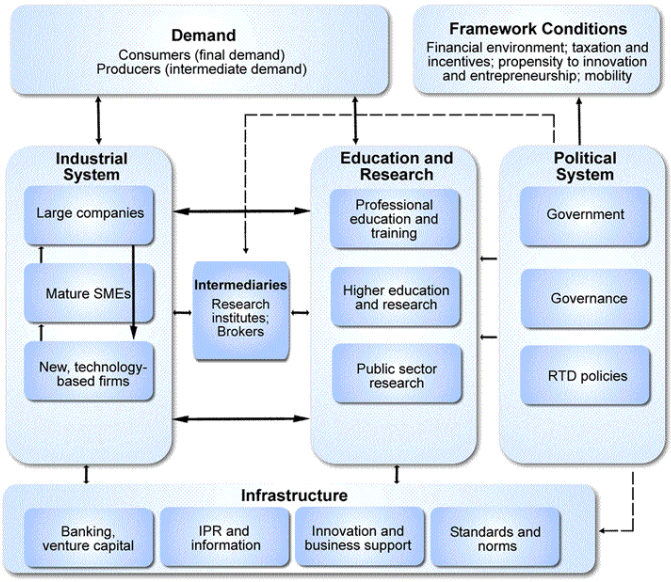
The following institutions make a high use of knowledge	(% of opinions)	The following spaces exhibit a high capacity for innovation	(% of opinions)
Government	7,3	Culture	51,4
Sports	20,7	Associative forms	22,7
Justice	13,3	Technical-productive	15,4
University	53,3	Education	18,7
Business firms	31,1	Economy	10,7
		Institutional	8,0

Source: Arocena, 2003.

It is striking to see how little appreciation people have about the use of knowledge in government and the innovative capacity within institutions: much effort will be needed to give reasons to change such perceptions.

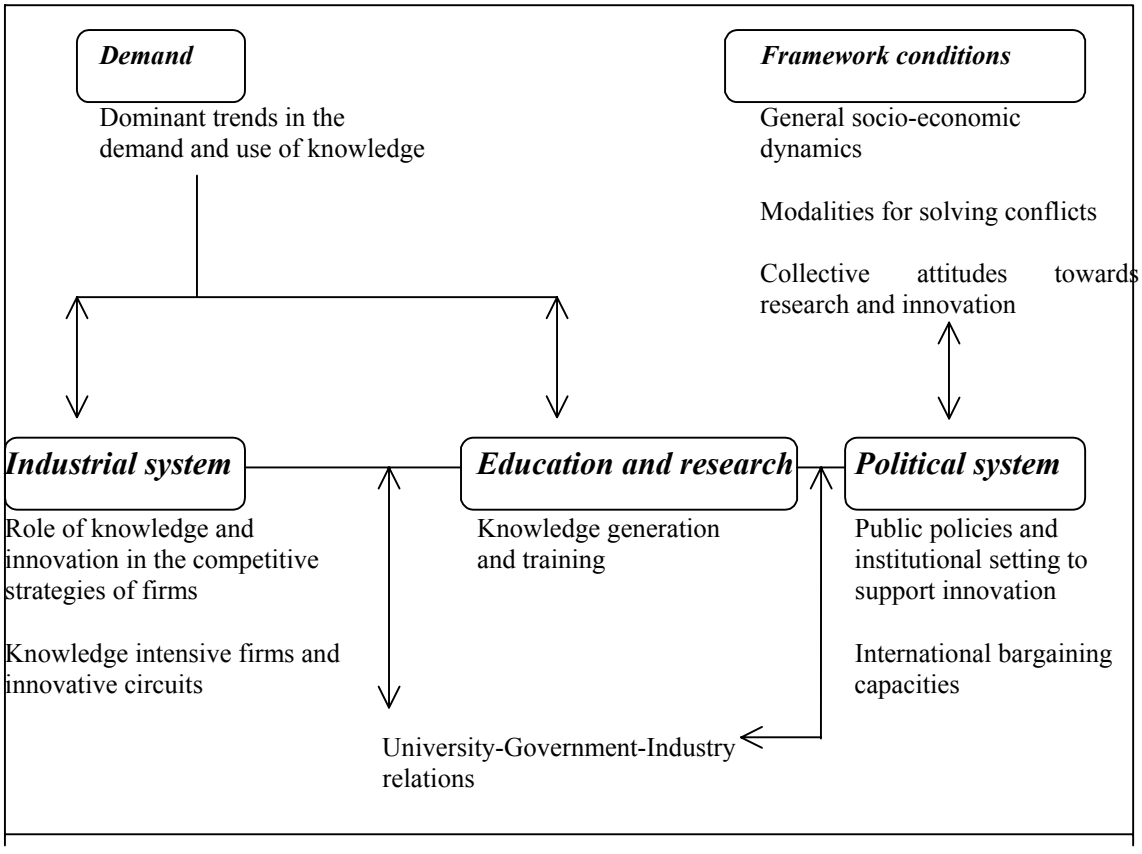
(2.b) Connecting the characterisation with the model used in the Swedish paper

The Lund team uses the following model for describing the Innovation System.



Given the different methodology used to organize the description of the NSI in the Swedish and the Uruguayan case, it is remarkable how easily the constructive modules used in the latter fit in the general scheme of the former. This can be seen by means of the following figure.

Figure 3.- The Uruguayan NSI constructive modules incorporated to the Swedish Innovation System Scheme



3. Mapping the Academic System in Uruguay: a preliminary approach

The only public university of Uruguay, the UR, is by far the most important Academic Institution in the country. The UR is a typical product of the Latin American Reform Movement which created a specific type of university in Latin America, with a strong but untypical influence in society (Arocena and Sutz, 2005a).

There exist some other tertiary institutes, including four private universities. The last have started operating after 1985; their contribution to teaching and research is small but has been increasing and has not been studied in the context of a National System of Innovation approach.

Tertiary enrolment is around 27%. UR has more than 70 thousands students (above 80% of the total). According to a recent study (Boado, 2005), the joint enrolment of the four private universities is approximately 7.000 students.

Concerning the whole Uruguayan population, some data related with education are quite telling. For example, 80% of unemployed are young people who have not finished Secondary Education. In 1996 - when the last general Population Census took place - less than 9% of those above the age of 24 years had some type of tertiary education, while those who had completed some type of university were less than 5% (Boado, 2005).

In 2004 the total new inscriptions at the UR was 17.744, 11.490 women and 6.254 men (The information given in this paragraph stems from Universidad de la República, 2004). That overstates the number of new students, because (i) the same person is counted double if registered in two different careers, a frequent situation, and (ii) many persons don't start effectively their studies after inscription. It can be estimated that in the last decade the UR received on average 14.000 new students each year; an increasing trend is evident: from 1995 to 2004 new enrolment increased approximately 35%.

Concerning areas, in 2004 45,6% of the new inscriptions corresponded to Human and Social Sciences, 28,4% to Health Sciences, 18,9% to Science and Technology, 3,6% to Arts and 3,5% to Agrarian Sciences.

During the period 1999-2003, on average 3.742 students graduated each year; 43,7% corresponded to Human and Social Sciences, 32,6% to Health Sciences, 17,4% to Science and Technology, 0,7% to Arts and 5,6% to Agrarian Sciences.

At the graduate level, during the period 2000-2003, on average 894 persons started studies each year and 573 finished them. It is worthwhile noting that the corresponding numbers for graduate specialisation in Medicine were 401 and 336, respectively. In the UR, less than 30 persons obtain a Ph.D. type title each year, almost all of them in the Natural Sciences.

In the last census in UR, 2918 persons qualified themselves as researchers. A recent study asserts that 1850 researchers belong to research groups. As said, research is on average very weak in private universities.

In UR, at an undergraduate level, gender is not really an issue: in 2003 women enrollment doubled men enrollment; in 2002 women graduating doubled men. However, the proportion of women in high academic positions is notoriously weak; concerning research the proportion of women in the special full-time regime is 40%. There is no supporting scheme for children care available for university staff.

Concerning social aspects, 60% of UR students work and study at the same time and 62% come from public high-schools. Almost 6% of UR students receive a small fellowship because of their low socio-economic situation.

Concerning ethnicity, although 6% of the Uruguayan population is of Afro-American descent, their presence in Higher Education is almost non existent.

UR is highly affected by endemic budgetary restrictions, by the absence up to now of national innovation policies, by a traditional separation from government that now is being modified, and by its own internal difficulties to change, being a big, complicated and rigid institution.

The legal mandate of the public university has not changed, but internally and externally it is expected that relations with the productive sector will continue increasing. Many cooperation agreements have been settled in the last twenty years, with firms, public institutions and international partners. The University Research Council was established in the early 1990s; it has been important in promoting research; it has fostered joint research projects with external partners. In the University, different projects for setting incubators have been discussed and a "technologic pole" is being developed. Cooperation with external actors has become a main source of funding for some faculties. Management structures have been changing slowly, incorporating well known institutional devices for the "industrialization of knowledge".

Norms related with intellectual property rights have only recently been established in the UR and they point to assigning IPR to the university when the institution contributes with its own funds in joint projects with industry, allowing for rewards for the participant researchers and establishing licenses agreements with their partners.

UR has tried to connect research with society taking context into account. Two calls for projects can be mentioned as examples:

(i) *Program for connecting with production*: every discipline, with every productive actor, investing money of the UR, taking into account possible applications which up to now don't have effective demand.

(ii) *Social emergency program*: identification of social problems stemming from the effects of the 2002-2003 crisis, identification of the missing knowledge needed to tackle them, strategies for generating such knowledge, requisites for effective application of research results, identification of social actors that should be involved and strategies for involving them.

4. The Current Debate

Key questions driving public debate on the Higher Education system are related with levels of investment, low salaries, limits to access and payment, brain drain, relations between public and private institutions, and the social use of knowledge.

Educational investment in Uruguay, in relation with GDP, has been comparatively quite low in recent times. On average, public spending in education has been around 3% of GDP and 0,7% in Higher Education. The new government asserts that it will be increased up to 4,5% of GDP by the year 2009, with more than 1% of GDP dedicated to Higher Education.

Salaries in Higher Education are usually considered low in an international comparison and even in a regional one. Such comparisons are not easy to make due to quick changes of the local currency, a great devaluation in 2002 and an important revaluation during the last year; thus, salaries estimated in US dollars have changed much more than their local purchasing power. In order to give a rough idea, the actual salary of a top senior full time position, with a special complement for research

activities, is around 1.100 U$S, while the lowest position, a teaching assistant that also cooperates with research activities, if he/she works on the whole 20 hours each week, the salary is around 100 U$S. Real increases averaging 8% are expected for this year.

Public education is free of charge in Uruguay, including the tertiary level. This issue has been much discussed. Some years ago the Parliament passed a law that authorises the University of the Republic to establish tuition fees, but the University decided not to do it. Tuition are seen by a majority of university authorities, and particularly by the organizations of students and teachers, as something that harms educational rights and that would diminish the access to higher education, thus weakening the knowledge potential of the country. Those who back tuitions say that they should be paid only by those who can afford it. This is not easy, particularly because a rent tax does not exist in Uruguay, although a project in that direction is being elaborated by the new government.

Nevertheless, a "solidarity tax" was established by law, meaning that graduates from UR have to pay an annual fixed tax, the amount of which is spent in bourses for students with low income. Preliminary estimations suggest that the system has a quite positive impact. Critics stress that the contribution is almost not related with incomes.

Discussions about merits and flaws of free public Higher Education are connected with international migrations. Should foreign students benefit from such system? For example, that has been the situation during many years for students coming from Chile, where access to Higher Education is neither free nor easy. When this issue is raised, it is also remembered that many Uruguayans now working in Uruguay – including a large number of researchers – have been able to study without charge in many countries, including Mexico, Venezuela, Brazil, Sweden and others, particularly when they were not able to do so in Uruguay during the military government and also after.

Not less relevant is the "converse problem", stemming from accelerating brain drain. Many capable graduates and some postgraduates from the University of the Republic migrate, particularly to the US. In some sense, a small and comparatively poor country is subsidizing the advanced training of the working population of a very rich and powerful country. Is that a good use for scarce public monies? Addressing the problem does not seem at all easy.

Moreover, the brain drain poses a substantial challenge for a "paying after" system of tuitions, that is, for a contribution of graduates to their university, proportional to the incomes stemming from professional activities. In a country without graduate migration and with an efficient estimation of incomes, that could be a quite just solution for helping the financing of Higher Education without discouraging those without a substantial family support.

Tuitions are only one aspect of the general issue of free access. In Uruguay, every person who has completed secondary education may enter the university; in almost every discipline there is neither a *numerus clausus* nor any kind of exam at entrance. Both type of requisites existed when the University of the Republic was governed by authorities appointed by the military government. The elimination of such requisites was an important claim of the democratic opposition, that was immediately implemented when the usual and autonomic governance of the University was restored.

The systems poses important problems of "massification" in several cases; they are particularly acute in the Faculty of Medicine. On the one hand, Uruguay and particularly Montevideo have a high proportion of medical doctors, often only partially employed; on the other hand, the conditions for teaching a large quantity of medical students are far from good. Although, as said, free access is a highly valuated tradition

in Uruguay, the union of medical doctors – *Sindicato Médico del Uruguay* – demands that only a fixed quota of new students should be enrolled each year in the Faculty of Medicine; the union of medical students is strongly against. In recent years, some sectors of the medical profession have obtained remarkable increases in their incomes: should such possibility, given by public free education, be restricted to a fixed number of students?

The context of many of those problems has been changing with the expansion of private tertiary education. As said before, this is a comparatively new and slowly evolving phenomenon in Uruguay. Nevertheless, important changes are under way; probably the most important one is the opening of the first private Faculty of Medicine, scheduled for March 2006. Its enrollment will be limited; tuitions are estimated around 4.000 U$S a year; it proposes a six years program of studies, while the title awarded by the public Faculty of Medicine requires not less than eight years and a half. In the long term, comparisons will be telling. The creation of this new Faculty has been discussed and even criticized. Some stress that a more modern and efficient alternative will become a reality. Others are afraid that this new possibility for those who can afford it will push the public Faculty towards offering "a poor education for poor people". Now, the debate has been a marginal one compared to what would have happened 10 years ago or, moreover, 20 years ago.

The brain drain phenomenon is directly related with the scarce opportunities for working in highly knowledge-demanding contexts. In fact, the key problem regarding the knowledge-production system in Uruguay is to stimulate existing capabilities by expanding the economic and social demand addressed to such capabilities. This is not the usual approach in the current debate about relations between academic institutions and production, where the emphasis usually goes to the need for universities to become closer to firms. Nevertheless, it is slowly recognized that relations between academia and production is (i) a complex and interactive process, where (ii) the level of knowledge demand stemming from production is at least as important as the knowledge supply, while (iii) universities contribute to the latter in several direct and indirect ways, and *last but not least* (iv) those relations require an active role of the state, particularly in underdeveloped countries.

The last remark is especially relevant for Uruguay, where it is widely expected that the new government will consolidate a diversified and positive cooperation with academia. What happens in this realm will have a great influence on the public debate about the future of Higher Education.

5. Conclusions: the research ahead

Here we outline the general approach and the concrete tasks for future work. As said before, the main purpose is to motivate comments from the UniDev Project Team.

(5.a) General approach: New Development and Developmental Universities

Our major concern is Underdevelopment, a main source of many of the most acute problems in the world of today and the most relevant aspect of inequality. Underdevelopment is a dynamic phenomenon that combines continuity and changes. Some of the most important changes are related with the new role of knowledge in the economic realm and in society at large. Such increasing role of knowledge creates new divides - the "learning divides" - that widen inequality between geographic regions and

between social groups. The learning divide between North and South stems from the fact that, generally speaking, underdeveloped countries are weak in advanced *capabilities* - which are mainly obtained by learning at high-level institutions - as well as in *opportunities* for using such capabilities in knowledge-demanding contexts, thus learning by using, solving and interacting.

So in the context of the global but very asymmetric Knowledge Economy, a New Development is needed. For addressing the issue of *capabilities and opportunities,* in such a way that the quality of life is improved, a New Development must include two main aspects:

(A) Socially led innovation and productive upgrading, the expansion of knowledge and innovation capabilities in every productive activity, (including the so called traditional sectors, in order to improve competitiveness), particularly those related to the attention of social needs.

(B) Advancing towards a learning society, based on the generalisation of permanent Higher Education, closely connected with the world of work (necessary in particular to "recover" those who have abandoned education).

Both are needed to diminish inequality by expanding individual and collective capabilities so inequality can be further diminished in the future; that is *proactive equality*: equality that generates more equality. (Arocena and Sutz, 2003)

This perspective highlights the role of Higher Education in development processes; it is clearly connected with discussions about the "third role" of universities, and it leads naturally to the notion of developmental university.

The *developmental university* can be briefly defined by commitment to development as its third role. "Now, a more precise characterisation can be proposed. […] the Humboldtian project is not exactly defined by the adoption of research as a second role of universities, but by the joint practice of the fundamental missions of teaching and research. As suggested by [empirical evidence…], performing those missions is essential for the contribution of universities to innovative activities. The conceptual reference is an actors-centred approach to development, directly connected with the Innovation Systems framework. Thus, the developmental university is characterised, in a neo Humboldtian perspective, by the joint practice of three missions: teaching, research and cooperation for development with other institutions and collective actors. That means that developmental universities can only exist as active partners in Innovation Systems." (Arocena and Sutz, 2005c)

In order to know if this notion can be useful - for research as well as for policy making - several issues must be explored. Some are briefly discussed in the sequel.

(5.b) Key issues for research

For studying the role of Academic Institutions in the Knowledge Economy and in development processes, the most relevant issues include the following ones.

** Possibilities for studying at an advanced level in qualified teaching contexts*

"In connection with this issue, at least three aspects deserve close examination:

a) how universities co-operate with other organisms to set a wide and diversified system of tertiary education that offers learning possibilities to the majority of the population;

b) what efforts are being made, at practical and theoretical levels, to cope with the fundamental challenge, posed by life-long education, of offering advanced education to people of different ages and backgrounds;

c) to what extent tertiary education employs the human and material resources available in the best sites of socially useful production." (Arocena and Sutz, 2005c)

** Evolution of the Humboldtian project*

This has to do with old and new ways of connecting teaching and research, because today it is even more true than when the Berlin University was created that such connection is beneficial for both activities. More generally, connecting studying with problem-solving is key for preparing creative people, able to cope with the quickly changing problems and opportunities raised by the Knowledge Economy.

** Academic co-operation with solving social and productive problems*

Several questions should be posed concerning this issue. For example: What is the actual participation of academic groups in the solution of specific problems of productive sectors and those derived from the social situation? What is the priority given to such problems in research agendas? To what extent and how do universities and related institutions help students and graduates to get acquainted with said problems, and foster their participation in the search of solutions? In particular, how do they cooperate with external actors in expanding capabilities by means of new opportunities for using advanced knowledge?

** The evaluation system*

The academic reward system is one of the main factors that shape actual research agendas. It deserves thus special attention in order to gauge priorities and possibilities of academic institutions. Does such system promote a high quality research with a broad scope? Does it foster the attention to relevant cultural and scientific problems, pressing social needs, economic development? Which types of external relations does it promote?

(5.c) Next steps

We intend to examine those issues in the Uruguayan case by combining the following three tasks:

(i) Preparing a first Working Paper on a scarcely researched issue, *Private Higher Education in Uruguay.*

As said, the public Universidad de la República is Uruguay's main "knowledge producer", in any reasonable sense of this expression. But the situation is not static; some private universities have privileged connections with business sectors; new institutions and relations are emerging, as the first private Faculty of Medicine or a business incubator jointly promoted by a private university and a public technological laboratory. From a prospective point of view, this process deserves attention, because it may alter significantly the mainly public Uruguayan Academic System. It is well known that the expansion of private Higher Education is a strong trend at international scale; in particular, its effects are already relevant in most Latin American countries.

(ii) Organising the *National Workshop of the UniDev Project with the Bureau of Planning and Budget, combined with a "mini Delfos" type foresight exercise: Academic Institutions, Regional Integration and Development.*

The Workshop and the associated foresight exercise will be oriented to map the current debate ("Who says what?") and, more specifically, the main visions of the future, including (but hopefully not mixing) projects and forecasts.

(iii) Preparing a second Working Paper, *A Developmental University? The University of the Republic as the main case study.*

What has already been said shows that this is a natural choice for a research on the role of academic institutions in Uruguay. It is also a reasonable choice for a comparative study, since the UR is considered one of the set of approximately fifty big public Latin American universities, which share a similar tradition, show important common features, and as a whole constitutes the main knowledge producer of Latin America, while each of them has an outstanding influence in the Higher Education system of the respective country (Arocena and Sutz, 2005a).

Consequently, the UR is also a good example for comparing a real case with the notion of Developmental University, as well as to discuss if this notion is useful from an empirical point of view - what is really happening today? -, from a prospective point of view - which are the main possible futures? - and from a policy oriented point of view - what should be done?[6] As a working conjecture - for which we expect strong corroboration or refutation from the UniDev project - we assume that the notion of Developmental University is useful in relation to the third question, quite probably concerning the second one, and perhaps also for giving partial answers to the first.

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