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FACULTAD DE QUIMICA
UNIVERSIDAD DE LA REPUBLICA
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# *Proactive Policies for the Promotion of Innovation in the Productive Sector and Entrepreneurship in Students & Alumni*

**CHEMRAWN XVI. Ottawa. August 2003**

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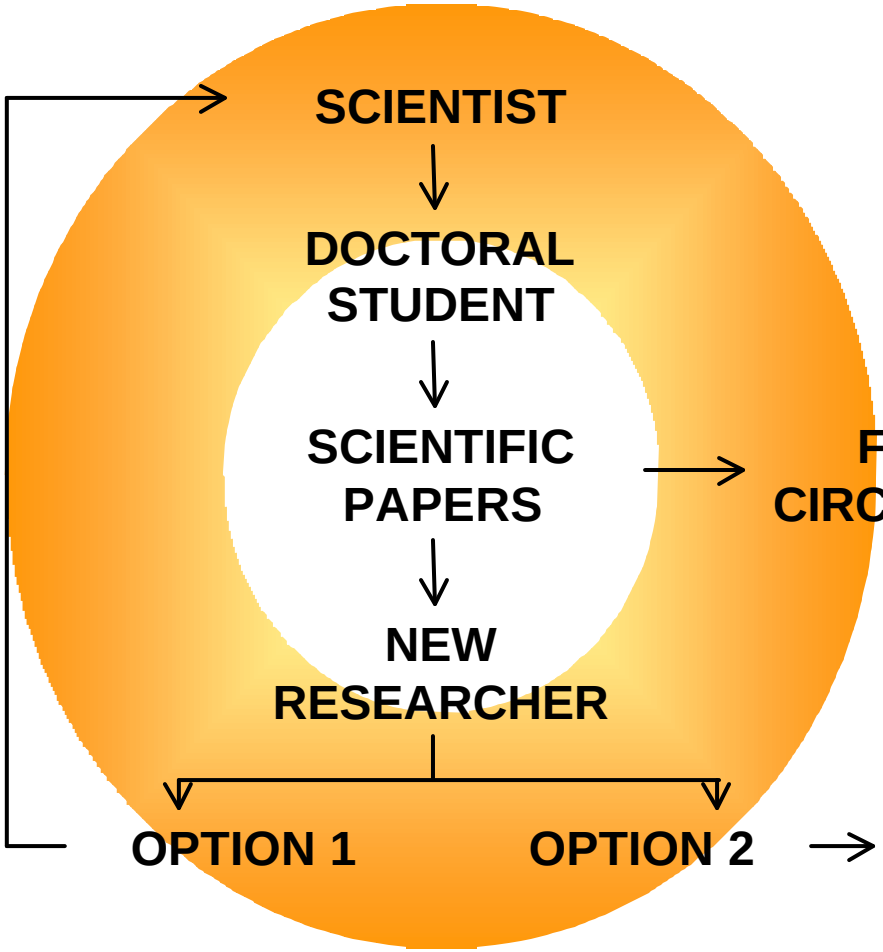


FREE CIRCULATIO N

Technology Development

New Products & Processes

***SCIENTIFIC RESEARCH GENERATES NOT ONLY PAPERS & PATENTS. ITS MAIN PRODUCT IS THE SUPPLY OF NEW RESEARCHERS THAT CAN BE NATIONALLY APPROPRIATED***

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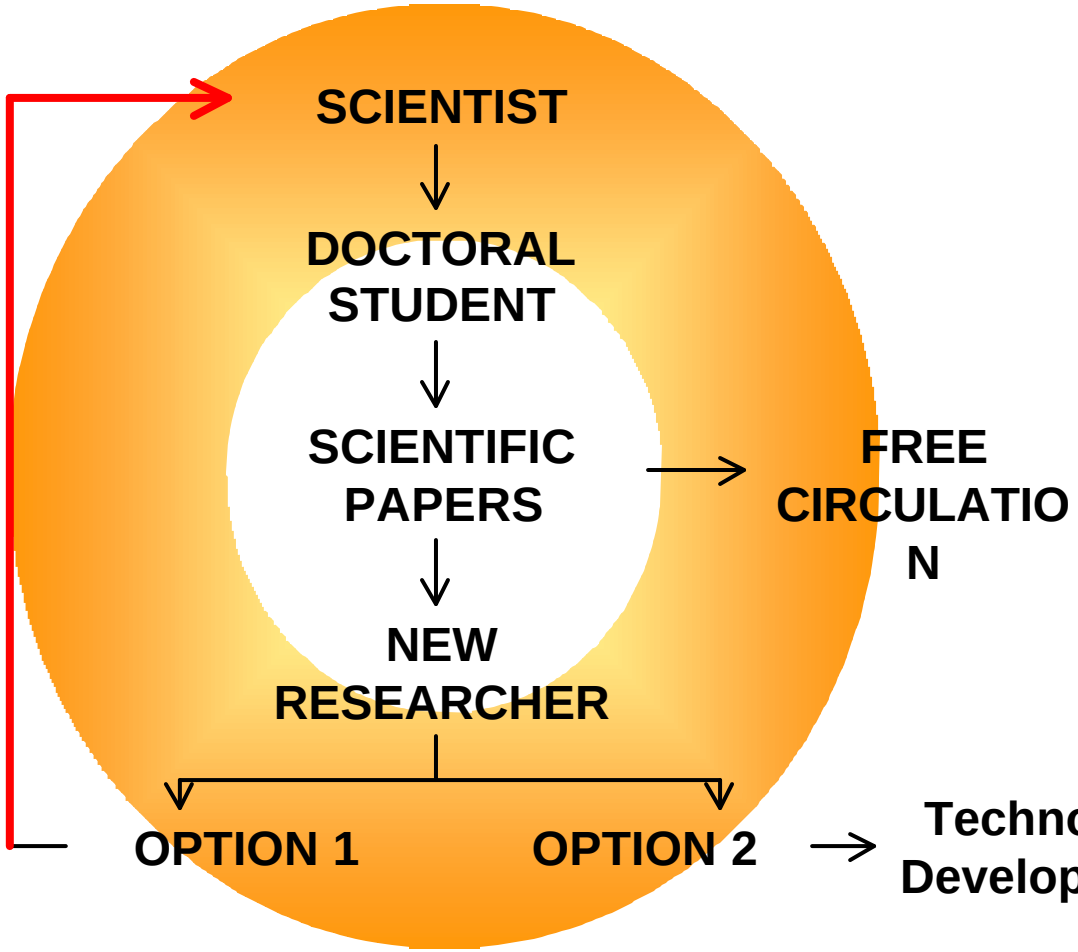


*In the mid '80s Uruguay (and the FQ) was coming out from 13 years military dictatorship. Teaching was the only activity at the College. Normal academic activities had to be initiated. A series of measures were taken to jump-start traditional SCIENTIFIC RESEARCH programs*

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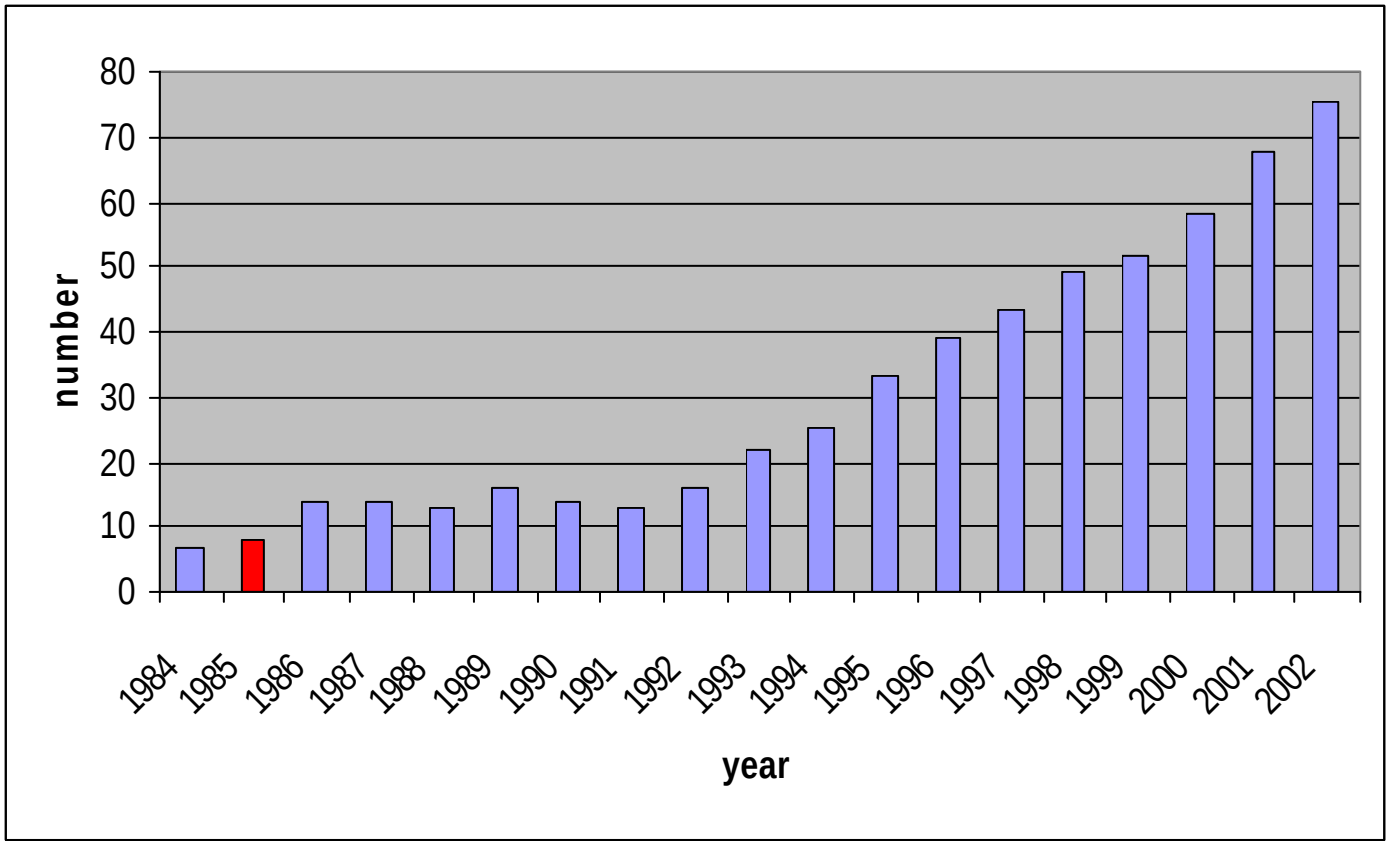
# Staff of Facultad de Quimica with Doctorates



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# SCHOOL OF CHEMISTRY - STAFF STRUCTURE 2001

| TEACHING STAFF | NUMBER OF MASTERS | NUMBER OF PhDs | NUMBER OF FULL TIME | TOTAL |
|---|---|---|---|---|
| JUNIOR LECTURERS | 6 (10%) | 31 (52%) | 24 (40%) | 60 (61% |
| LECTURERS | 0 | 14 (58%) | 10 (42%) | 24 (25% |
| PROFESSORS | 1 (7%) | 10 (71%) | 11 (79%) | 14 (14% |
| TOTAL | *7(7%)* | *55 (53%)* | *45 (45%)* | 98 |

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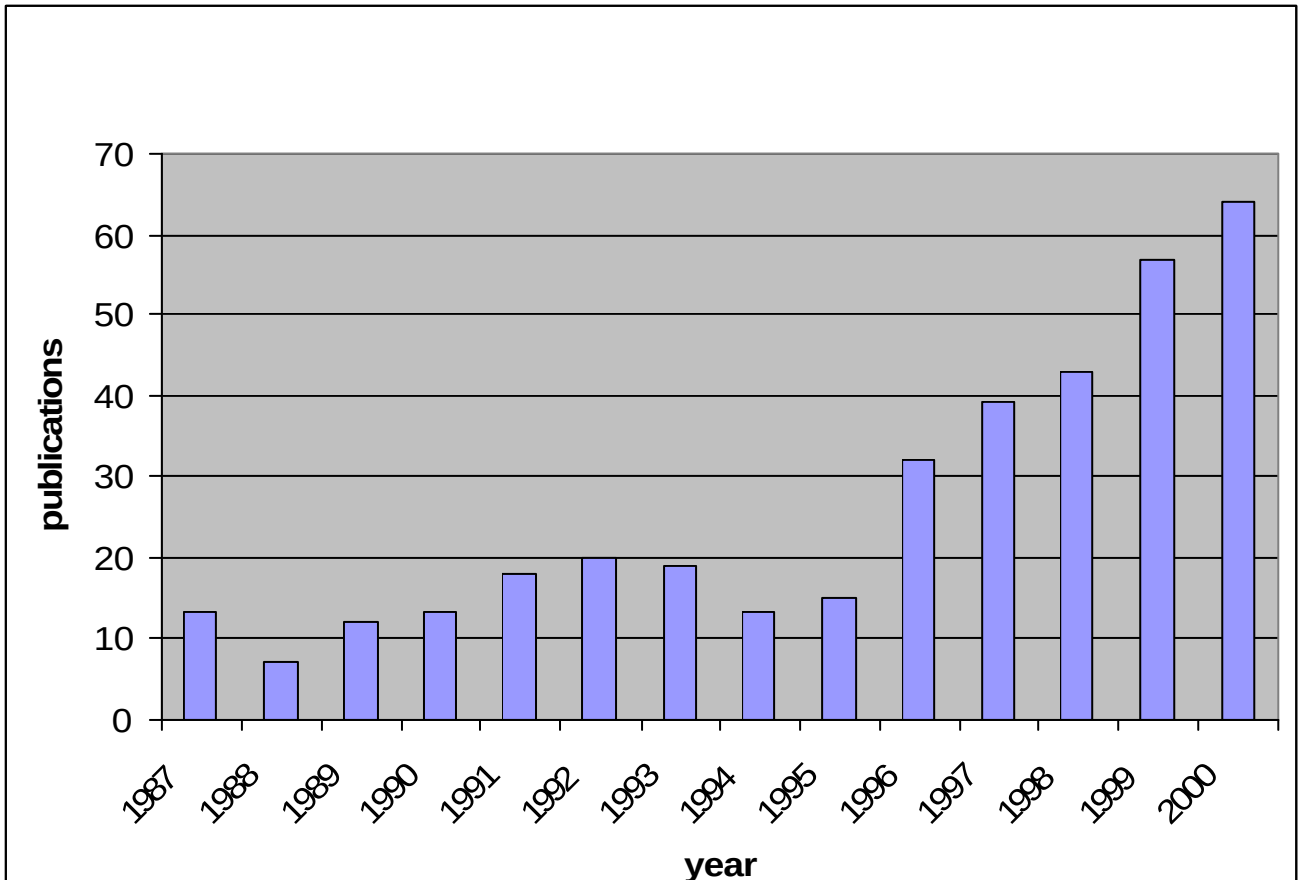
# Total publications from Facultad de Quimica in SCI(R)



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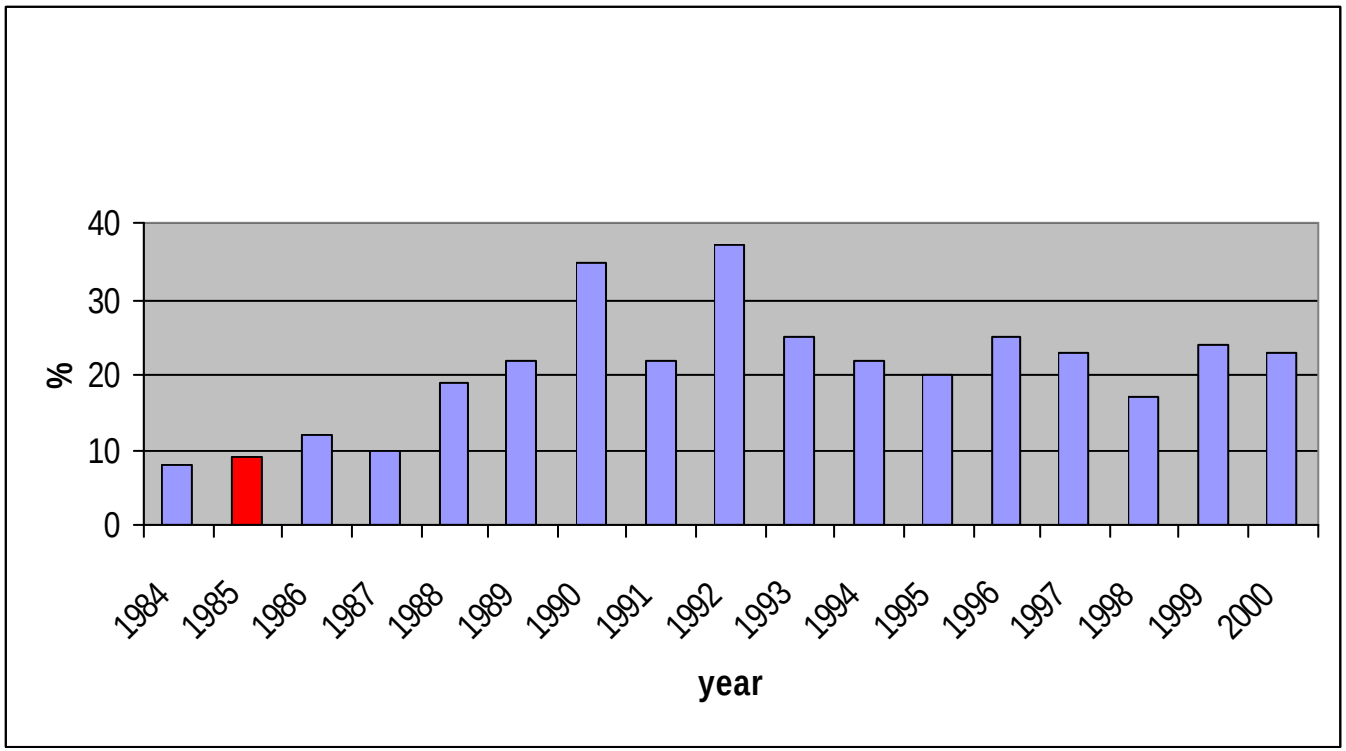
# Percentage of total Uruguayan scientific publications with origin Facultad de Quimica



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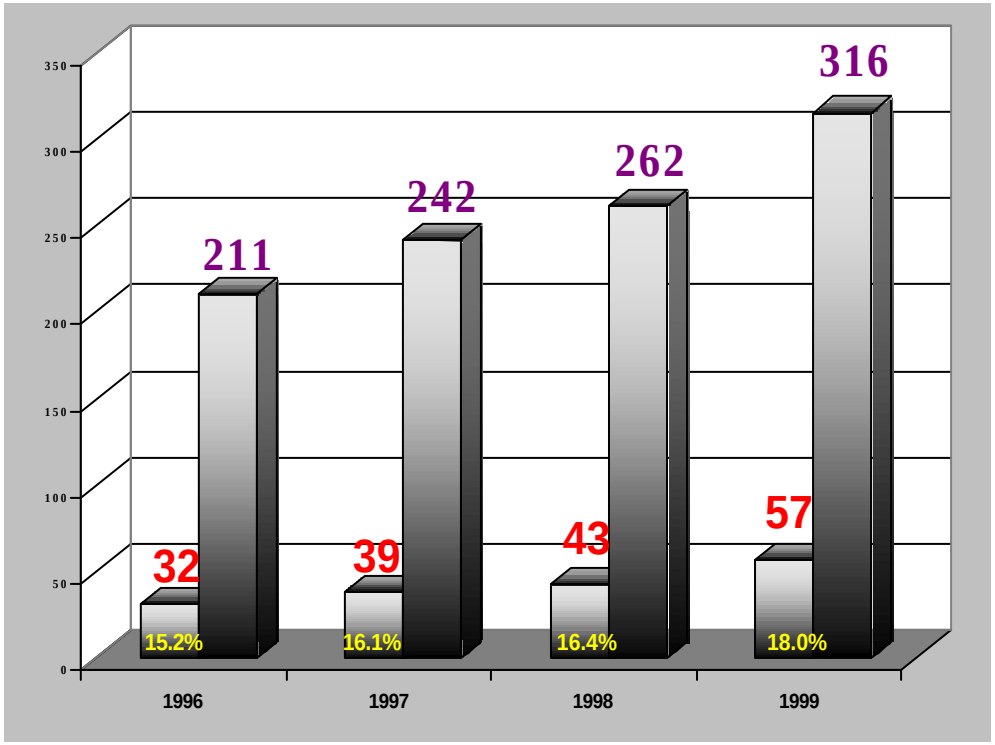
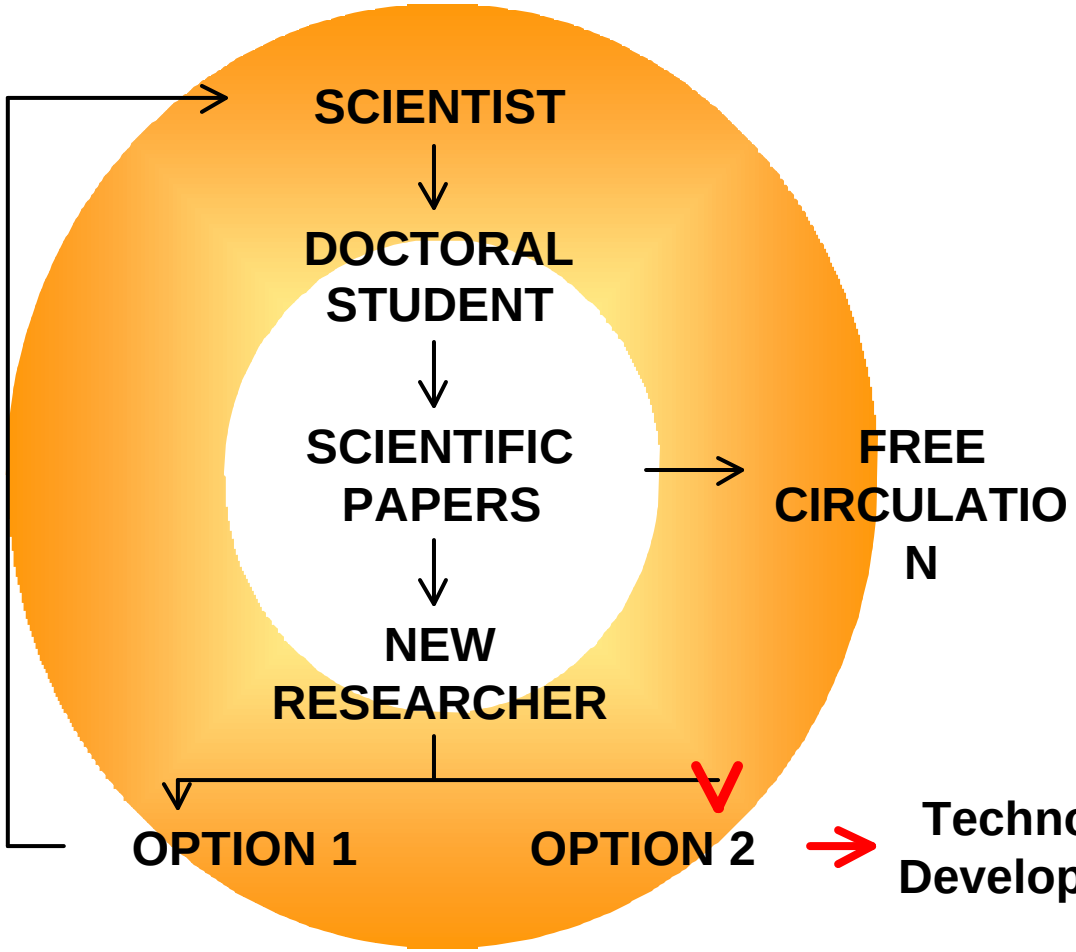
# FACULTAD DE QUIMICA: SCIENTIFIC PRODUCTION




*The School of Chemistry produces:*

- *One out of 5 Uruguayan scientific papers indexed in international data bases, with 3% of the University's budget.*
- *50% of the patent applications from the whole University*




*As staff progressed academically, the possibilities of further incorporations to the Facultad began to diminish quickly. The country is in a period of economic and financial turmoil. To keep the post-graduate system operating, other venues for highly trained personnel have to be opened.*

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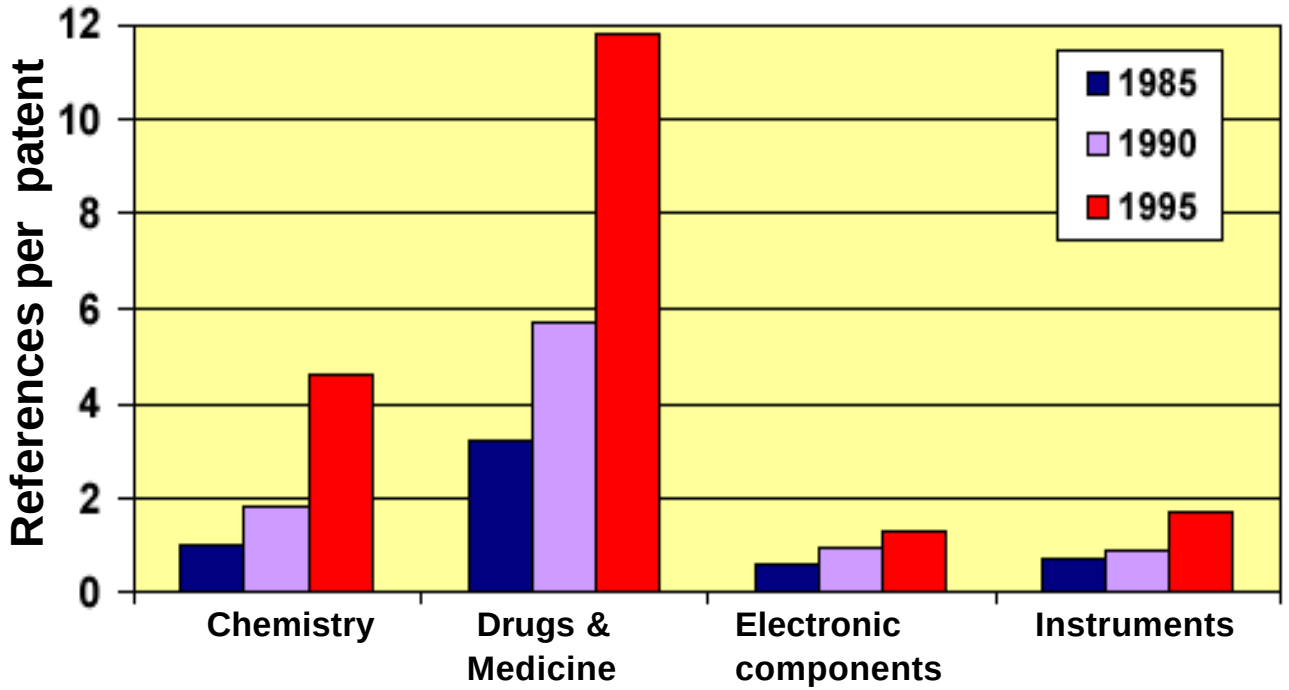
# Science: increasing role as base for Technology




Data from Narin et al., Res Policy 26, 317-330 (1997)

From C.H. Brito Cruz, conf-reg-C&T&I.ppt, 16/08/01.

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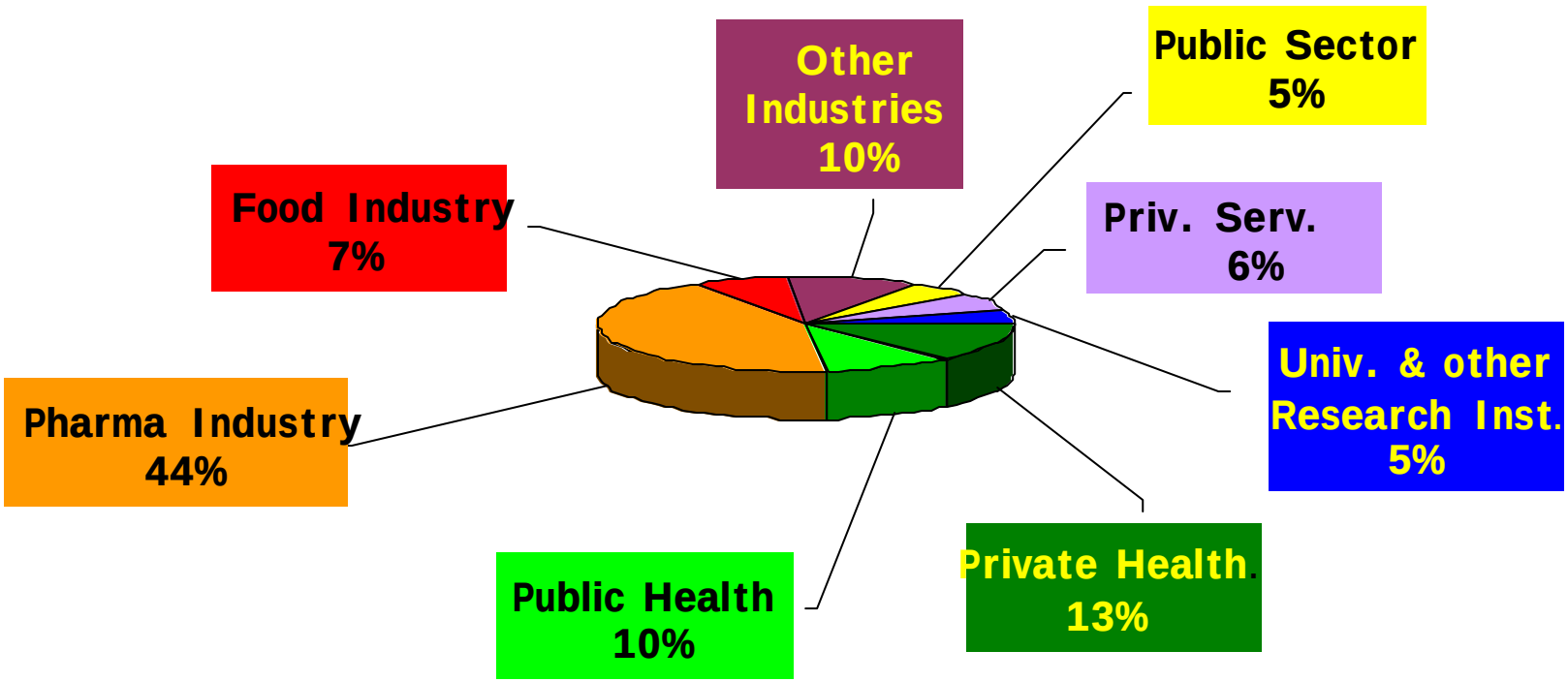
# SCHOOL OF CHEMISTRY: TECHNOLOGICAL ADVISORY SERVICES



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# SCHOOL OF CHEMISTRY - FUNDING

| CURRENCY | U$S |
|---|---|

| | | 1998 | 1999 | 2000 | TOTA |
|---|---|---|---|---|---|
| BASIC BUDGET | | 2.109.931 | 2.109.168 | 1.981.414 | 6.200.513 |
| **SUBTOTAL** | | **2.109.931** | **2.109.168** | **1.981.414** | **6.200.513** |
| EXTERNAL INCOME | ABROAD | 91.401 | 45.594 | 99.679 | 236.674 |
| | PRIVATE NAT. | 167.475 | 237.016 | 147.638 | 552.129 |
| | PUBLIC NAT. | 330.930 | 270.109 | 268.308 | 869.347 |
| **SUBTOTAL EXTERNAL INCOME** | | **589.806** | **552.719** | **515.625** | **1.658.150** |
| **TOTAL** | | **2.699.737** | **2.661.887** | **2.497.040** | **7.858.663** |
| | | **22%** | **21%** | **21%** | |

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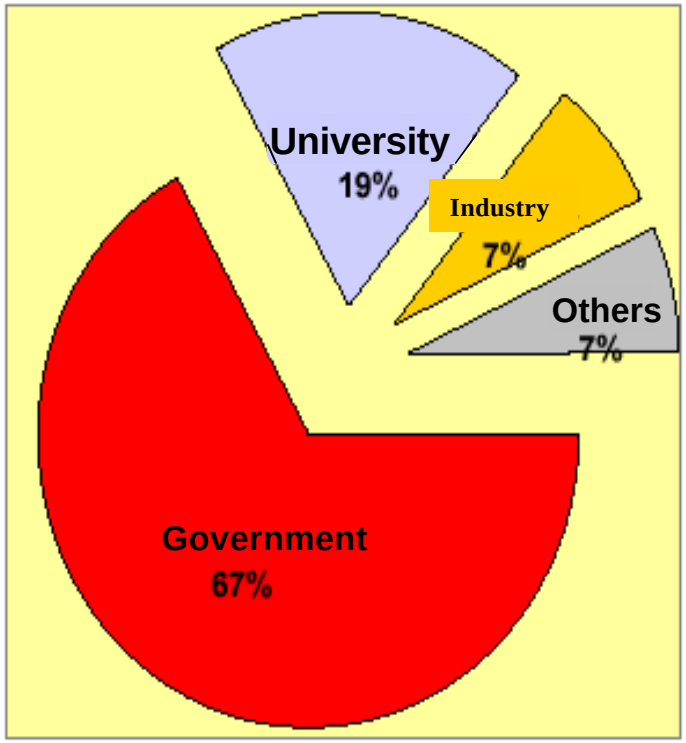
# US: R&D in Universities 1997




**Total: US$ 26,34bi**

- Government
- University
- Industry
- Others

Source: Science and Engineering Indicators 2000, Appendix Table 2-5



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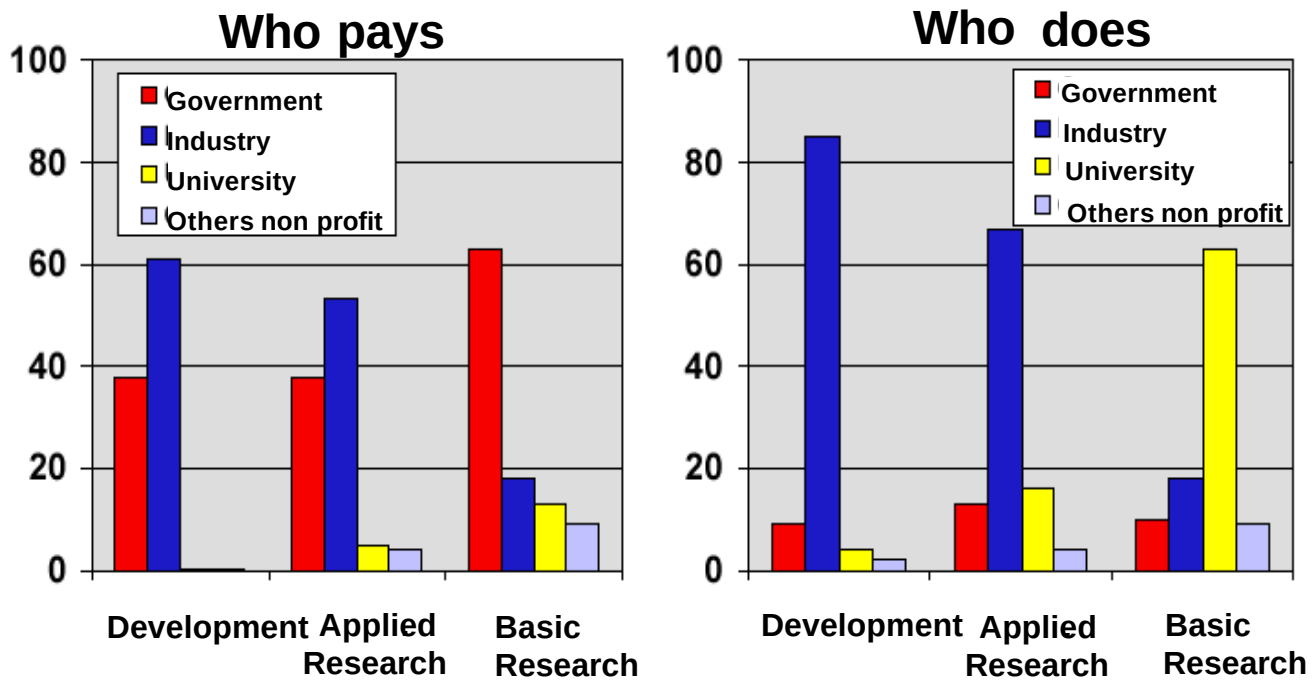
# United States: Who pays & Who does R&D




(Year base: 1994; Source:NSF)

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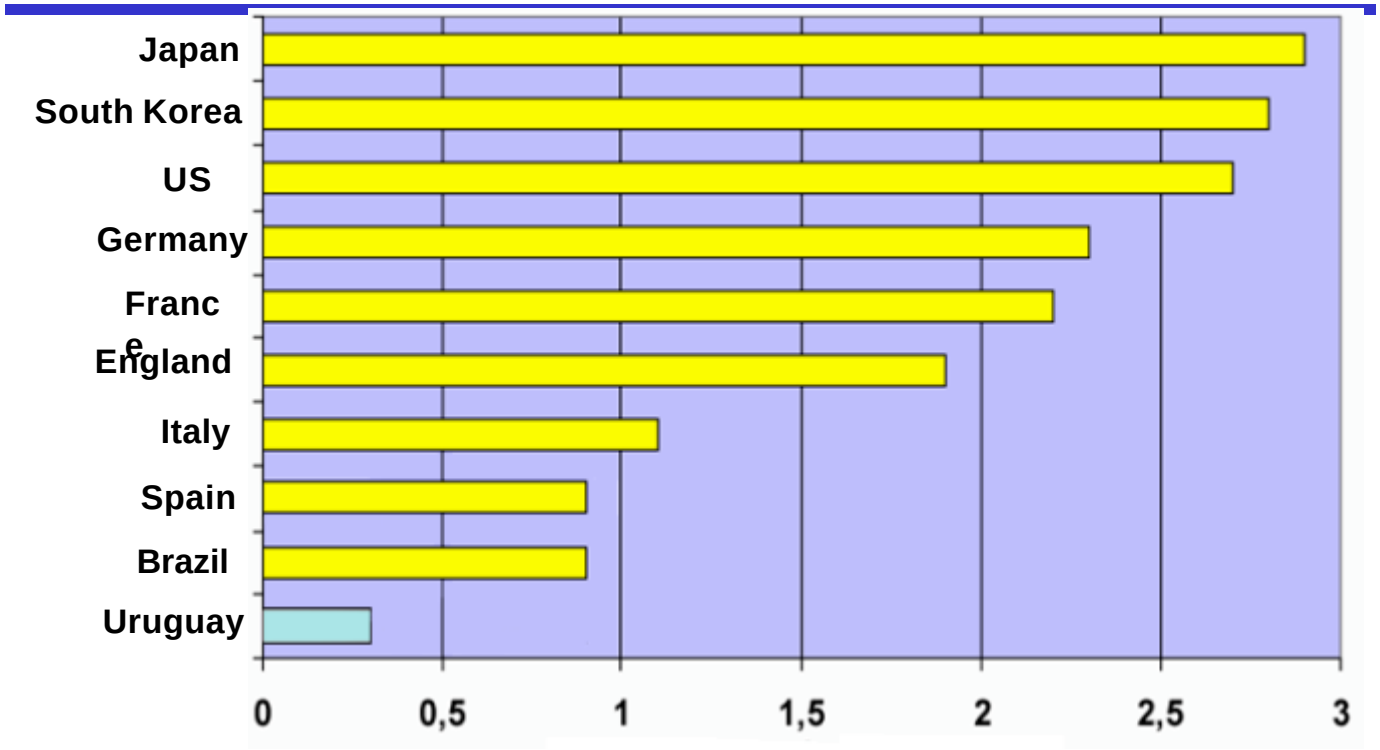
# Total Investment in R&D, 1997




Source: OECD Science, Technology and Industry Scoreboard 1999 and Indicators of S&T in SP 2001

From C.H. Brito Cruz, conf-reg-S&T&I. Ppt,16/08/91

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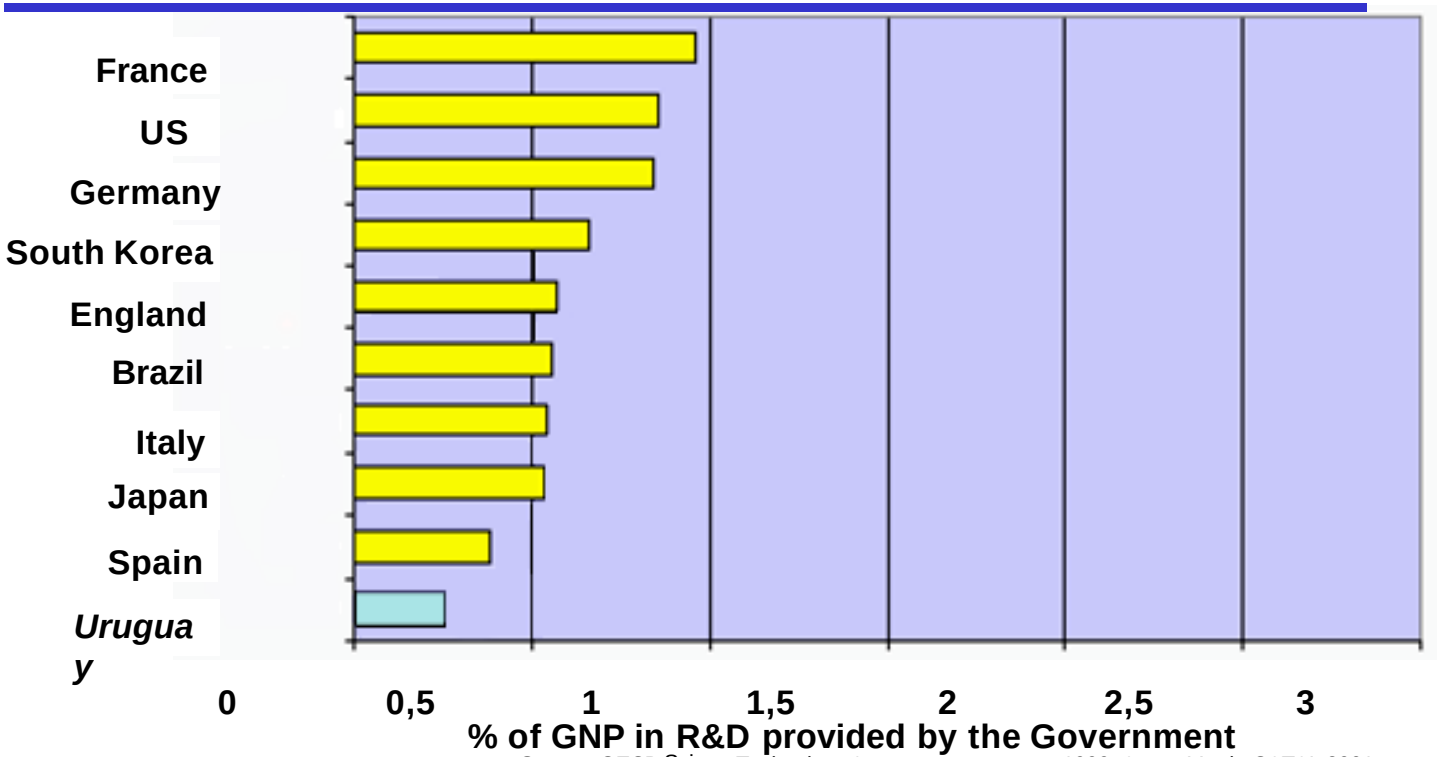
# Public Investment in R&D, 1997




Source: OECD Science, Technology & Industry Scoreboard 1999, & Livro Verde C&T&I, 2001

From C.H Brito Cruz, conf-reg-C&T&I ppt, 16/08/01.

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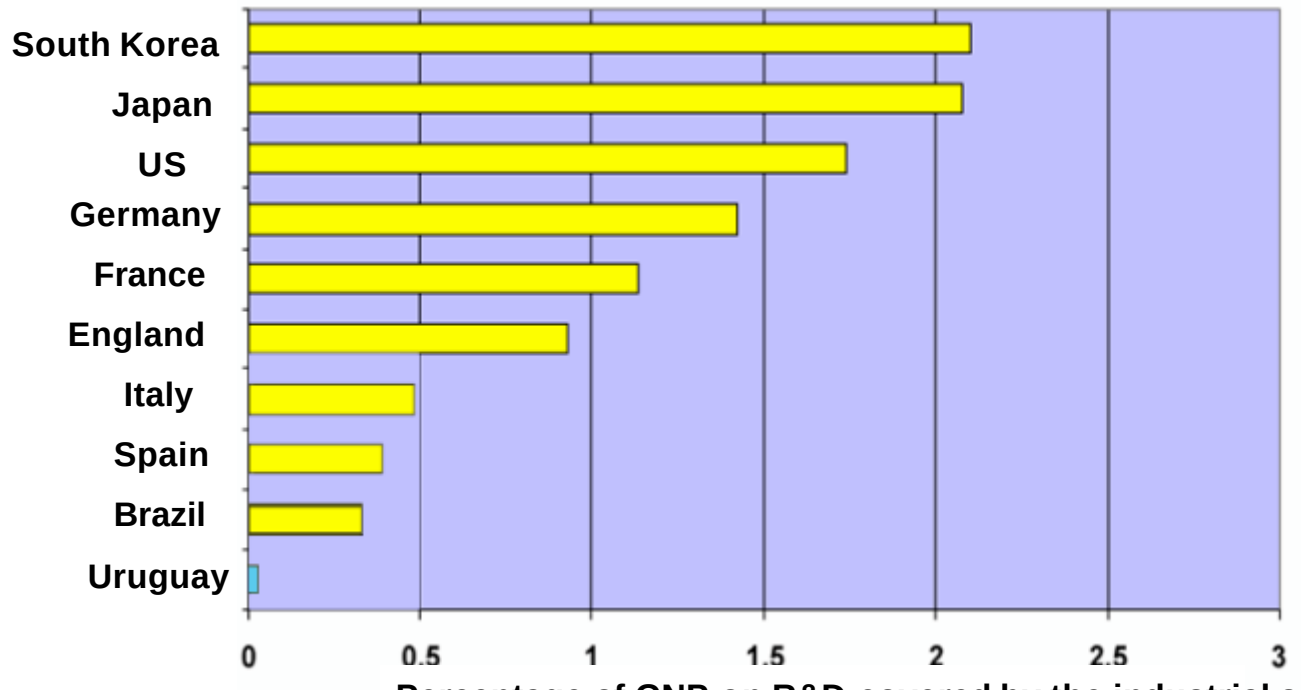
# Industrial Investment in R&D, 1997




Source: OECD Science, Technology and Industry Scoreboard 1999 & Livro Verde C&T&I, 2001



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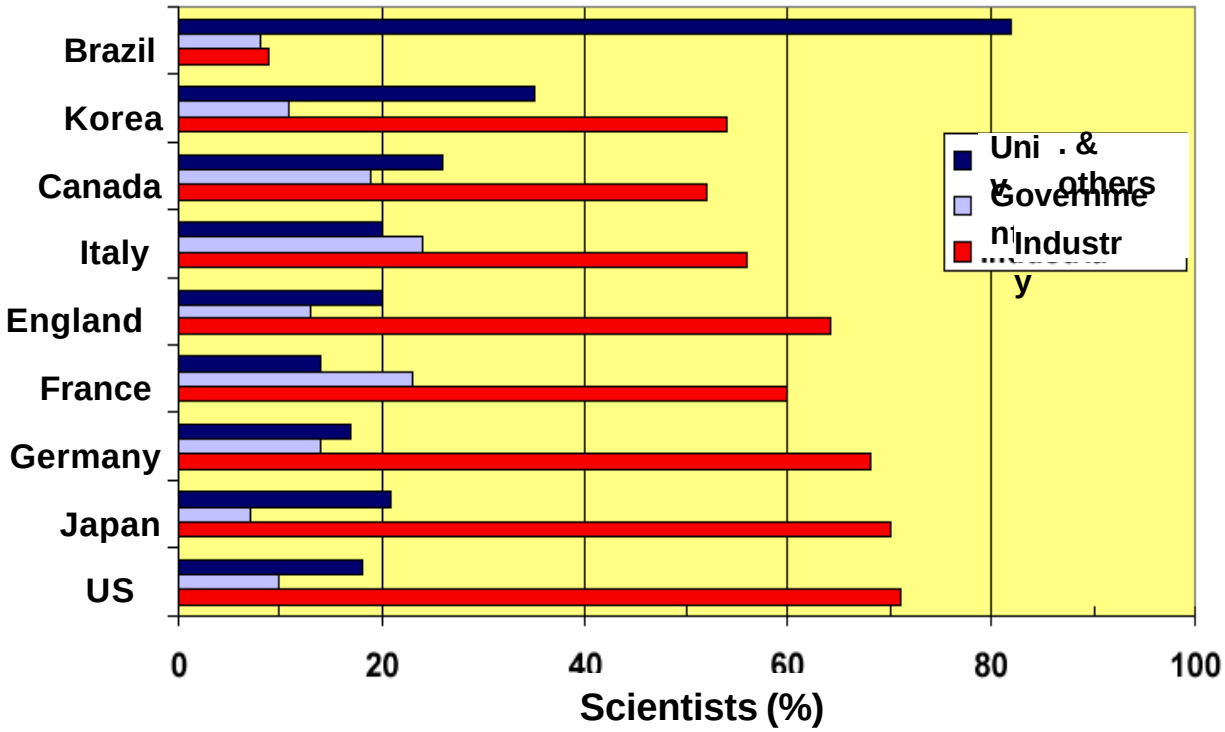
# Institutional distribution of R&D activities

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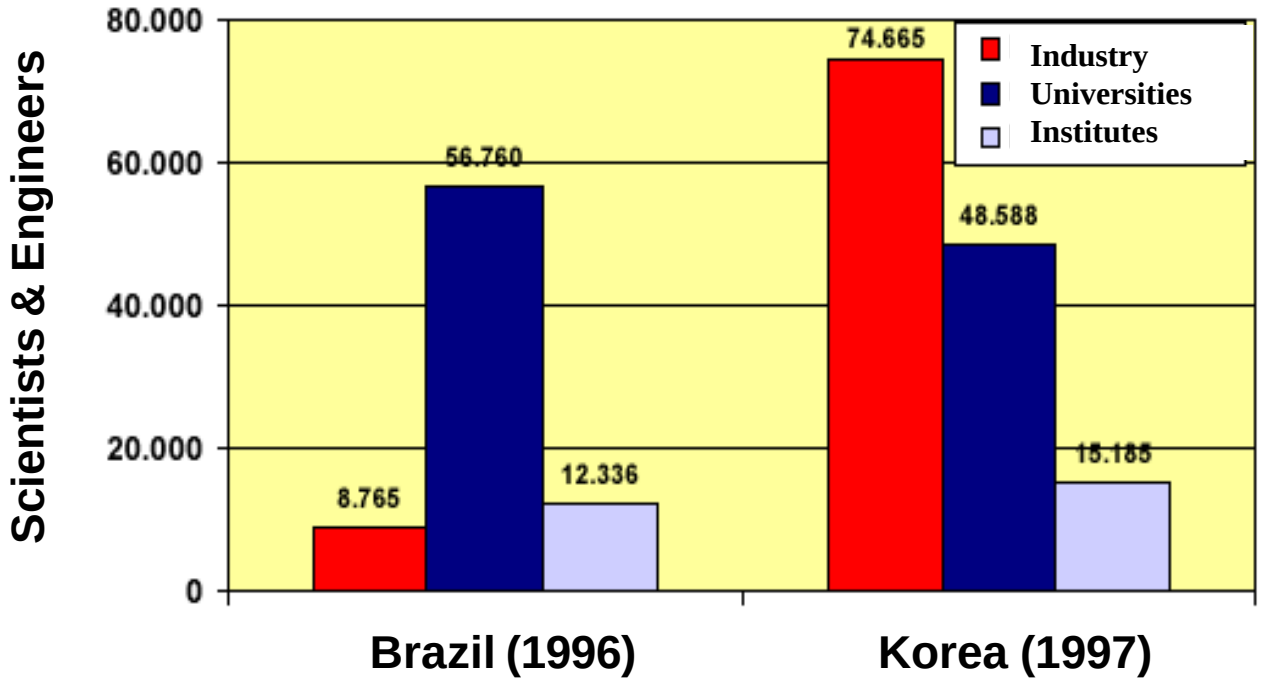
# Brazil & Korea: scientists and engineers

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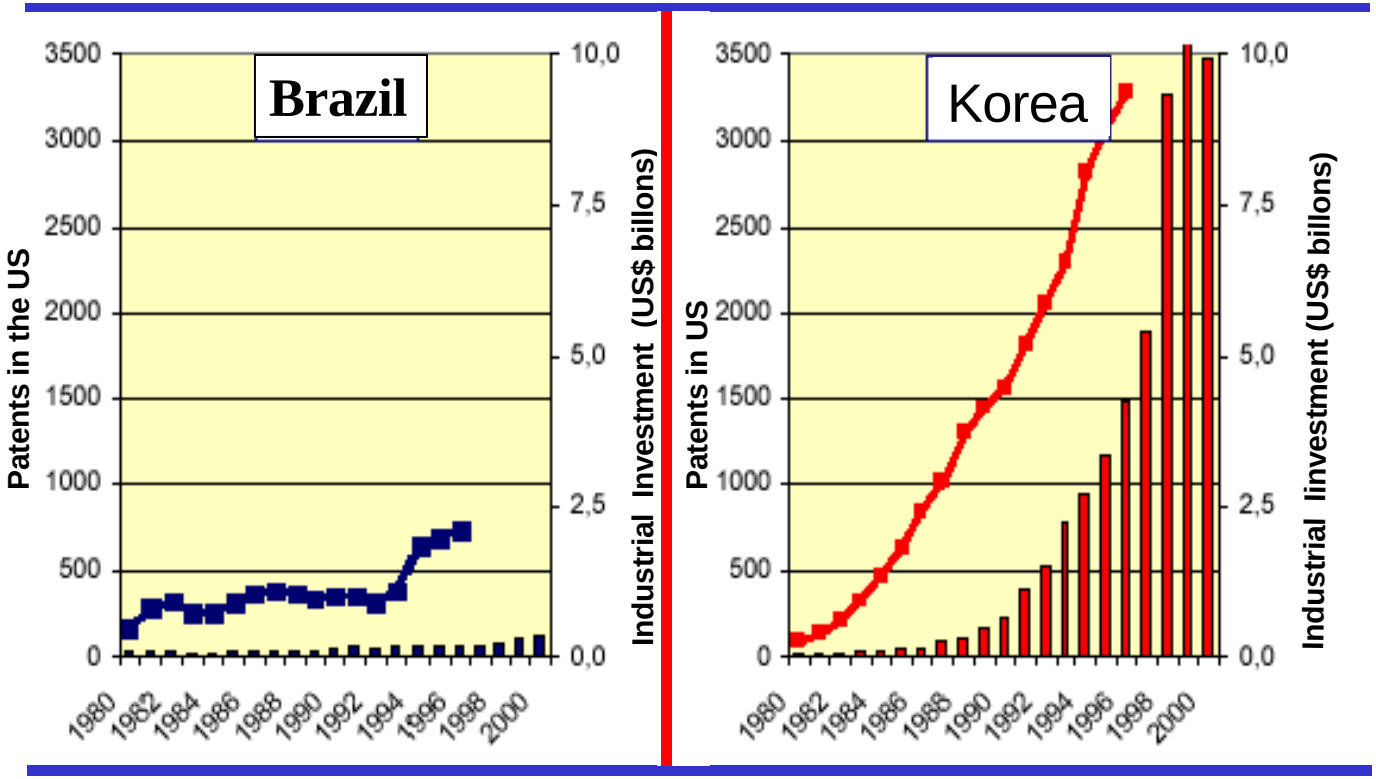
# Industrial Investment in R&D and patents: Brazil & Korea

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# REGIONAL & INTERNATIONAL CONTEXT

- **Structure of R&D investment** :

  Private Investment in Less Advanced Economies: *15% Argentina, 1 Brazil & 30% Chile*

  Private Investment in middle economies: *41% Portugal and 4 Spain*

  Private Investment in Developed Countries: *56% Canada and 64 USA*

- **Structure of R&D activities**:

  Chile: *18% private, 41% Government and 41% University*

  USA: *74,5% private, 10% Govenent and 15,5% University*
  *84% Applied res. and process develop., & 16% Basic*

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# *DEVELOPMENT and R&D FUNDING*

- Developed countries (DC) show a larger participation of private sector both in R&D funding and activities, as compared with Less Advanced (LA) countries

- In DCs the private demand for knowledge promotes the growth of R&D investment. In LAs this process is driven by the public R&D sector.

- In the era of import substitutions there was no private demand for knowledge in LAs. The protected markets were satisfied by introducing "mature" technologies from abroad.

- The recent opening of national markets (globalization) and the present accelerated obsolency of technologies has so far not pushed LA companies hard to include R&D in their business strategies

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# A specific proposal from the Facultad de Quimica of the Universidad de la República (Uruguay): The Promotion of Entrepreneurship and Technological Innovation.

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# GENERAL PROPOSAL

❖ In the *mid and long term* the educational system may promote new attitudes (entrepreneurship, risk assumption, cooperativity, trasparency, professionality) which may help create socially responsible modern businessmen.

❖ In the *short term* the University may play an active role by *proactively* facilitating the generation of private demand for knowledge through strategic associations with the private sector.

❖ Such University R&D policy may promote vitality of local industries, employment and improved quality of life among citizens, as well as an increased sustainability for University research activities and linked MSc & PhD programs.

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# SCHOOL OF CHEMISTRY NEW INITIATIVES YEARS 1998-2001

- CREATION of a SUPPORT FOUNDATION (FUNDAQUIM) to INTERPHASE with EXTERNAL ACTORS FROM A PRIVATE LEGAL BASE

- NEW CURRICULA INCLUDING BUSINESS & ENTERPRENEURSHIP COURSES for UNDERGRADUATES

- CREATION of a TECHNOLOGY POLE

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# *SCHOOL OF CHEMISTRY - PROMOTING ENTREPRENEURSHIP*

* In 1998 courses on "*Development of Entrepreneurship Ability*", given by Empretec Program.

* In 1999, courses on "*Introduction to Technology Projects*" and "*Intellectual Property and Patents*", given by the Office for Technology Management from the School of Chemistry.

* In 2000 and 2001, Workshops for "*Technology-based entrepreneurs*", given by the NGO Fundasol.

* In 2001 Entrepreneurship is included in the undergraduate curricula, through courses provided by Fundasol.

* In 2001 UNDP-funded workshop on "*R&D management for University scientists and managers from industry*", by a Spanish expert.

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# TECHNOLOGY POLE for Chemistry & Biotechnology

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# Technology Pole

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# STRUCTURE OF TECHNOLOGY POLE

- Technological Department of the School of Chemistry
- Business Incubator
- Center for Technological Services
- Consortium for Technological Strategy & Innovation (CESTI)
- CESTI
  - # Private management (Fundaquim & Urutec)
  - # External Advisory Board
  - # Executive Board (Exec.& Oper.Managers)

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# COMPOSITION OF THE ADVISORY BOARD

- 2 Members from Facultad de Quimica (Fundaquim)
- 1 Member from Technical Assistance Service (NGO Urutec)
- 2 Members from the chemical industries (resins and paper)
- 1 Member from the Pharmaceutical Industry
- 3 Members from Food Industries (dairy, beer and wine)
- 1 Member Financial Sector (Banking)

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# TECHNOLOGY POLE: STRATEGY

- *Strategic association between FQ Pole and company*
- FQ Pole*: Researchers & investment in equipment and installations. Administration.*
  *Network of international research contacts.*
  *Information and literature.*
- Company: *Professionals (plant+marketing) & running expenses*
- Consortium*: Joint definition of R&D Strategy & Business Plan*
  *Joint management and follow-up of R&D.*
  *Joint fund raising.*
  *Shared appropriation of R&D results*
- Goal: *To facilitate the introduction of independent R&D in industrial companies*

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# Fine Chemistry Laboratory

# Pharmaceutical Technology Laboratory

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# CONAPROLE & FUNDAQUIM CONSORTIUM

***An initiative to promote innovation in the dairy industry***

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# A bit of history....

- ***CONAPROLE was created as a cooperative effort of milk producers of Uruguay, aiming to integrate the complete chain from the farm to manufacturing, marketing and sales.***

***Objetives:***

*To assure milk producers the sale of their production.*
*To improve popular nutrition.*
*To assure the Health authorities a safe and healthy final* ***product.***

***At present is:***

***A cooperative with more than 3000 producers.***
***Exports to 20 countries around the world, being one of the major exporters of dairy products of Latin America.***
***The largest private company of Uruguay.***

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# CONAPROLE-FUNDAQUIM CONSORTIUM

***May 2001***

***A contract was signed between CONAPROLE and FUNDAQUIM. This contract created a Consortium between both parts aiming to:***

***" Provide technological services, specially those aiming to develop new products or processes related to the dairy industry. To achieve this, each of the actions that the parts agreed upon, FUNDAQUIM will provide research and development resources from the School of Chemistry and other competent technological actors, and CONAPROLE will provide the technical, economical and administrative support."***
***(Art. 4th of the contract )***

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# ACTION LINES

*Providing analytical services.*

*Projects of applied research.*

*Qualification and research training for CONAPROLE technical staff.*

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# SCHOOL OF CHEMISTRY – FUTURE ?

***Teaching impacts.*** *Graduates with adequate concepts for self-employment in chemical or biotechnological enterprises and with better stance vis-a-vis regional and globally oriented production.*

***Research impacts.*** *Improved scientific production, particularly in applied fields.*

*Larger volume of patents filed.*

*Improved and more stable financial support for general FQ activities.*

***Industrial impacts.*** *Formation of independent R&D groups in local industries.*

*Growth of the number of development-oriented chemical industries.*

*Improved and more extensive international connections for local industries and for the FQ.*

**A paper entitled: "AN INNOVATIVE APPROACH TO THE COOPERATION BETWEEN UNIVERSITY AND INDUSTRY IN AN EMERGENT ECONOMY: TECHNOLOGY POLE IN CHEMISTRY AND BIOTECHNOLOGY"**

Dr. Alberto Nieto, Dean of the School of Chemistry, Universidad de la República, Montevideo, Uruguay anieto@fq.edu.uy

**describes this strategy and has been published in the UNESCO Manual:**

# University-Industry-Government Cooperation. How to make it work?

Teaching/learning manual based on examples of good practice in research, teaching and management from chemistry and related disciplines.

Ljubljana (2001). Edited by Aleksandra Kornhauser. UNESCO-International Centre for Chemical Studies, University of Ljubljana, Slovenia (pag. 78-84)(ISBN 86-81449-13-3)

**An electronic version of this paper is available at IFS**