UNIPUB project

Methodologies for the characterization of the publication output of higher education institutions using institutional databases

Country report: Spain

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UNIPUB PROJECT

INTRODUCTION

Institutional research repositories are becoming more and more diffused means for the analysis of the research performance of Universities, besides international databases, as the Web of Science and more recently the Elsevier database Scopus, which have been widely used as sources for assessing the scientific productivity and to produce international bibliometric rankings.

Institutional databases collect all academic outputs, which go beyond the traditional publications, such as articles in newspaper, exhibits, working papers, notes, letters, manuals, reports. So far, while international databases could be biased by a limited coverage of scientific products especially in some fields of science (i.e Social Sciences and Humanities), institutional datasets can provide a quite comprehensive insight into the scientific production of an academic institution and can be powerful sources to build indicators aiming at describing universities.

UNIPUB project aims at assessing the extent to which they can be used to produce simple indicators of publications at the level of whole higher education institutions and scientific fields. The team of the project is composed of three research groups: CERIS CNR in Italy, the University of Lugano in Switzerland, IEDCYT and University Carlos III of Madrid, Spain. UNIPUB was one of the projects on Science Technology and Innovation Indicators developed within the PRIME Network of Excellence, VI European Framework Programme (http://www.prime-noe.org).

The purpose is to methodologically exploit institutional databases, and to build profiles of research activities of the Universities, rather than to evaluate quality of research, coherently with the positioning indicators rationale and with a policy orientation promoting the differentiation of higher education institutions according to different missions and social and geographical spaces, rather than their competition along the unique dimension of the international academic reputation. Positioning indicators, in fact, describe the position of an academic institution in its complex, fragmented and multidimensional institutional space and the characteristics of the institutions themselves, in our case the HEIs, their competitive behaviors, and their collaborations and linkages with other actors considered as important elements of their performance.

So far the UNIPUB project, after a description of the institutional datasets of a sample of 5 universities in the partner countries (use, contents, bibliographic information and quality and updating procedures), has experimented the possibility to use them to develop and to test a set of five descriptors and three indicators that encompass scientific production differentiation, Universities mission, their regional, national and international orientation, collaborations and linkages with different actors and stakeholders.

This Report presents the results of the analysis developed in Spain for two Universities: Universidad Carlos III de Madrid and Universitat de Barcelona. The discussion is not intended to address the issue of productivity and research performance; instead, it is devoted to put into evidence opportunities and methodological constraints of the existing databases and to present ways for improving them.

A comparative analysis of the outcome in the three countries involved in the project is presented in the UNIPUB General Report, which also shows the results of a survey developed within the three countries involved, on the characteristics of the University institutional databases.

The Spanish Higher Education Sistem

Spain evolved from a strongly centralized organization during the previous regime to a highly decentralized one along the seventies. Presently Spain is organized in 17 autonomous communities. In 1985 begins the decentralization of the Higher Education System and the competitions are transferred to the autonomous communities (NUTS-2 regions). From then onwards an important increase in the number of universities takes place: in 1975 there were 28, 10 years

later 35 and 30 years later 73. The Spanish university system is now formed by 77 universities: 50 public and 27 private, with an average of 19,500 students per university.

The model of institutional evaluation that is used in the Spanish universities is one of self-regulation. This model consists in an internal evaluation followed by an external one. In both evaluations, after a systematic and detailed study on teaching, research and management (of a Degree or a Department), a series of points are defined to improve the quality of the system.

In order to evaluate the research activity one of the main sources are the CV of researchers. In Spain through a proposal of the National Agency of Evaluation and Prospective (ANEP) and of the Spanish Foundation for Science and Technology (FECYT) in 2005 the project "Standard Curriculum Vitae (CVN)" has been developed. CVN project defines a standardized digital format for CV that enables the updating of CV for researcher and institutions and facilitates scientific information interchange (*http://cv.normalizado.org/index.jsp*, *http://cv.normalizado.org/presentacion/entidades.jsp*). Using the CV the universities have developed different informatic tools to manage the personal information of the researchers and to collect data on scientific results.

Among the most used institutional databases are SICA –for the Andalucian universities-, UNIVERSITAS XXI –used in several universities from Castilla y Leon region and Madrid- and GREC –especially used in Catalonian institutions. In this study we present the principal characteristics of the two latter institutional databases.

1. CASE STUDY DESCRIPTION: UNIVERSIDAD CARLOS III DE MADRID AND UNIVERSITAT DE BARCELONA: INSTITUTIONAL INFORMATION

1.1. UNIVERSIDAD CARLOS III DE MADRID

The Universidad Carlos III de Madrid (UC3M) is a public university, some 20 years old, that began its activities in the academic course 1989-1990. Actually its activity is organized in three centres located at the metropolitan area of Madrid: the Faculty of Social and Legal Sciences in the Campus of Getafe and Colmenarejo, the Faculty of Humanities, Communication and Documentation in the Campus of Getafe and Colmenarejo, and the Polytechnic School in the Campus of Leganés and Colmenarejo.

At the university, the academic activities began with the Degree of Law during the course 1989-1990. In the following course the studies of Economy and Computer Science began, together with Humanities and Library Science. Around these first academic careers the different university departments were developed. Their structure has evolved both due to the critical mass of new professors and researchers, as by the needs derived from the creation of new degrees that required additional areas of knowledge.

The organizational structure of the university is made up of horizontal departments that have teaching in several degrees. At present, scientific activity is developed around 27 Departments and 24 Research Institutes. These university Institutes are oriented especially to the research activity and their members are professors of the UC3M University; therefore their personnel overlaps with that of the Departments.

Departments
-Business Administration
-Computer Science
-Continuum Mechanics and Structural Analysis
-Criminal Law, Procedural Law and History of Law
-Economic History and Institutions
-Economics
-Electrical Engineering
-Electronic Technology
-Humanities: Geography, Contemporary History and Art
-Humanities: Linguistics, Literature, History and Aesthetics
-International Law, Ecclesiastical Law and Philosophy of Law
-Journalism and Audiovisual Communication
-Library Science and Information Science
-Materials Science and Engineering and Chemical Engineering
-Mathematics
-Mechanical Engineering
-Physics
-Political Science and Sociology
-Private Law
-Private Social and International Law
-Public State Law
-Signal and Communications Theory
-Statistics
-Systems Engineering and Automation
-Telematic Engineering
-Thermal and Fluids Engineering

The educational organization of the Carlos III University, unlike the traditional Universities in which the degrees are organized exclusively in independent centres, is based on the departmental structure. The Departments are unique for all the University and teach in different degrees.

UC3M degree programmes

At the moment the University has academic coverage of 41 different degrees. In the following list the detail of degrees is shown. The studies of post-degree have also acquired great relevance, since 32 Masters and 13 PhD programs exist.

Degree Courses
-Audiovisual Communication
-Business Administration and Management
-Economics
-Humanities
-Journalism
-Law
-Sociology
-Actuarial and Financial Sciences
-Library & Information Science
-Labour Studies

-Political Sciences and Public Administration
-Statistical Sciences and Techniques
-Journalism / Audiovisual Communication
-Law / Business Administration and Management
-Law / Economics
-Business Administration and Management / Audiovisual Communication
-Computer Engineering / Documentation
-Economics / Journalism
-Law / Actuarial and Financial Sciences
-Law / Humanities
-Law / Journalism
-Law / Labour Studies
-Law / Political Sciences and Public Administration
-Statistical Sciences and Techniques / Actuarial and Financial Sciences

Diplomas
-Business Studies
-Labour Relations
-Library Science & Documentation
-Management and Public Administration
-Statistics
-Tourism
-Engineering
-Computer Engineering
-Industrial Engineering
-Telecommunications Engineering
-Technical Engineering
-Technical Engineering in Computer Management
-Technical Industrial Engineering: Electricity
-Technical Industrial Engineering: Industrial Electronics
-Technical Industrial Engineering: Mechanics
-Technical Telecommunication Engineering: Sound & Image
-Technical Telecommunication Engineering: Telecommunication Systems
-Technical Telecommunication Engineering: Telematics

Due to the relatively recent creation of the University, the number of students has increased notoriously from 1990 attaining in academic course 2005-2006 almost 19,000 (around 94% of first and second cycle and a 6% of third cycle: Masters and PhD). Similar situation happens with the staff, who at the moment is around 1700 professors (with different time dedication) and 685 employees of administration and service. From the UC3M starting point in 1989 to 2004, 3437 persons have entered the staff university, of which 990 (29%) women and 2447 (71%) men. Although the number of women in administration and services is higher than men, considering only the researchers, the proportion of women reaches 33%, almost 3 points below the average of the university teaching staff in Spain.

Considering professional category, the distribution of the 1698 present researchers (including PhD students), Lecturer professors predominate, they represent more than one third of the total (table

1). In the highest categories, the proportion of men is much greater than that of women, with a remarkable difference of gender in the case of Full professors.

TABLE 1. RESEARCHERS DISTRIBUTION BY PROFESSIONAL CATEGORY (UC3M)

Professional category	Full-professor	Tenured prof.	Assistant	Visitant	Contract	Lecturer	Total researchers
Total UC3M	109	385	336	103	86	679	1698
Percentages	6.42	22.67	19.79	6.07	5.06	39.99	100.00

When considering the researchers distribution by centre, the highest number of researchers is affiliated to the Polytechnic School and the Faculty of Social and Legal Sciences, whereas only 12% belong to the Faculty of Humanities (table 2).

TABLE 2. RESEARCHERS DISTRIBUTION BY CENTRE (UC3M)

Centre	N researchers	%
Polytechnic School	760	44.06
Faculty of Social & Legal Sciences	735	42.61
Faculty of Humanities, Comunication & Library Sci	203	11.96
Total	**1698**	**100.00**

At the Department level, those with the highest number of staff members (in absolute values) are Computer Science, Business Administration and Economics (table 3).

TABLE 3. RESEARCHER'S DISTRIBUTION BY DEPARTMENT (UC3M)

Department	N researchers	%
Business Administration	151	8.89
Computer Science	190	11.19
Continuum Mechanics and Structural Analysis	24	1.41
Criminal Law, Procedural Law and History of Law	38	2.24
Economic History and Institutions	18	1.06
Economics	143	8.42
Electrical Engineering	37	2.18
Electronic Technology	58	3.42
Humanities: Geography. Contemporary History and Art	22	1.30
Humanities: Linguistics. Literature. History and Aesthetics	27	1.59
International Law, Ecclesiastical Law and Philosophy of Law	40	2.36
Journalism and Audiovisual Communication	95	5.59
Library Science and Information	59	3.47
Materials Science and Engineering and Chemical Engineering	46	2.71
Mathematics	47	2.77
Mechanical Engineering	96	5.65
Physics	35	2.06
Political Science and Sociology	52	3.06
Private Law	73	4.30
Private Social and International Law	52	3.06
Public State Law	76	4.48
Signal and Communications Theory	77	4.53

Department	N researchers	%
Statistics	92	5.42
Systems Engineering and Automation	36	2.12
Telematic Engineering	69	4.06
Thermal and Fluids Engineering	45	2.65
Total	**1698**	**100.00**

** UC3M researchers at 31/12/2007 (all categories of researchers are included)*
Source: Economic Report UC3M 2007

1.2 UNIVERSITAT DE BARCELONA

The University of Barcelona (UB) is a public university with 559 years of history, implicitly linked to the history of Barcelona and Catalonia. It combines its historical dimension with its status as a leading, innovative educational institution. Its fundamental aim is to offer higher education as a public service through teaching, study and research. Its work contributes to the creation, transmission and diffusion of culture and of scientific, technical and professional knowledge, as well as promoting critical thought, freedom and pluralism.

The UB is an urban university with campuses situated throughout Barcelona and reflects the open and cosmopolitan character of the city. Thanks to its location, the university is a focus for the development of the surrounding areas and has become a centre for a wide range of cultural activities.

The UB research is carried out in 106 departments staffed by nearly 5,000 researchers (table 4), including teachers, technical staff and research assistants who carry out their work in research groups. Most of these groups have been evaluated and accredited by an external quality program. The UB conducts its research in its own institutes and centres, affiliated centres and other external research centres.

TABLE 4. PRINCIPAL DATA (UB)

Main figures (academic year 2007-2008)	Total
Students (all levels: includes Life Learning programmes)	90476
Students (only official programmes)	53463
Research and Teaching Staff (RTS)	4715
Administration and Services Staff	2177
Faculties and university schools	20
Departments	106

Nowadays its activity is organized in 20 centres located at the metropolitan area of Barcelona:

-Faculty of Biology
-Faculty of Chemistry
-Faculty of Dentistry
-Faculty of Economics and Business
-Faculty of Education

-Faculty of Fine Arts
-Faculty of Geography and History
-Faculty of Geology
-Faculty of Law
-Faculty of Library and Information Science
-Faculty of Mathematics
-Faculty of Medicine
-Faculty of Pharmacy
-Faculty of Philology
-Faculty of Philosophy
-Faculty of Physics
-Faculty of Psychology
-Faculty of Teacher Training
-University School of Nursing
-Educational Sciences Institute

The organizational structure of the university is made up of departments that teach in several degrees, but very focused each one in its Faculty. The educational organization of the Barcelona University is mainly organized in independent centres, with departments who teach in different Faculties, while others are very focused only in one faculty.

At present, scientific activity is developed in around 106 Departments and 29 Research Institutes. These university Institutes are oriented especially to the research activity and some of their members are professors of the UB University. The list of UB departments show us a model of organization focused in specific academic disciplines, sometimes narrow disciplines with some departments with few members:

- Accounting
- Administrative Law and Procedural Law
- Algebra and Geometry
- Analytical Chemistry
- Animal Biology
- Applied Mathematics and Analysis
- Applied Physics and Optics
- Astronomy and Meteorology
- Basic Psychology
- Biochemistry and Molecular Biology (Biology)
- Biochemistry and Molecular Biology (Pharmacy)
- Catalan
- Cell Biology
- Cell Biology, Immunology and Neurosciences
- Chemical Engineering
- Civil Law
- Clinical Sciences
- Constitutional Law and Political Science
- Contemporary History
- Criminal Law and Criminal Science
- Crystallography, Mineralogy and Mineral Deposits
- Cultural Anthropology and the History of America and Africa
- Dentistry and Stomatology
- Design and Image
- Developmental and Educational Psychology
- Drawing
- Ecology
- Econometrics, Statistics and Spanish Economy
- Economic History and Institutions
- Economic Policy and World Economic Structure
- Economic Theory
- Economics and Business Organization
- Electronics
- English and German
- Financial and Tax Law
- Fundamental Care and Medical-Surgical Nursing
- Fundamental Physics
- General Linguistics
- Genetics
- Geochemistry, Petrology and Geological Prospecting
- Geodynamics and Geophysics
- Greek

- Health Microbiology and Parasitology
- History of Art
- History of Law, Roman Law, State Ecclesiastical Law
- History of Philosophy, Aesthetics and Cultural Philosophy
- Human Geography
- Inorganic Chemistry
- International Law and Economics
- Latin
- Library and Information Science
- Logic, History and the Philosophy of Science
- Medicine
- Medieval History, Paleography and Diplomatics
- Mercantile Law, Labour Law and Social Security Law
- Methodology of the Behavioural Sciences
- Methods of Research and Diagnosis in Education
- Microbiology
- Modern History
- Materials Science and Metallurgical Engineering
- Mathematics for Economics, Finance and Actuarial Sciences
- Natural Products, Plant Biology and Soil Science
- Nutrition and Bromatology
- Obstetrics and Gynecology, Pediatrics, Radiology and Anatomy
- Organic Chemistry
- Painting
- Pathological Anatomy, Pharmacology and Microbiology
- Pathology and Experimental Therapy
- Personality, Evaluation and Psychological Treatment
- Pharmacology and Therapeutic Chemistry
- Pharmacy and Pharmaceutical Technology
- Physical Chemistry
- Physicochemistry
- Physical Geography and Regional Geographical Analysis
- Physiological Sciences I
- Physiological Sciences II
- Physiology (Biology)
- Physiology (Pharmacy)
- Plant Biology
- Podiatry
- Political Economy and the Public Treasury
- Prehistory, Ancient History and Archaeology
- Probability, Logic and Statistics
- Psychiatry and Clinical Psychobiology
- Public Health
- Public Health, Mental Health and Perinatal Nursing
- Romance Languages
- Sculpture
- Semitic Languages
- Social Psychology
- Social Work and Social Services
- Sociological Theory, Philosophy of Law and Methodology of the Social Sciences
- Sociology and Organizational Analysis
- Spanish
- Statistics
- Stratigraphy, Paleontology and Marine Geosciences
- Structure and Constituents of Matter
- Surgery and Surgical Specializations
- Teacher Training in Experimental Sciences and Mathematics
- Teacher Training in Language and Literature
- Teacher Training in Musical and Corporal Expression
- Teacher Training in Social Sciences
- Teacher Training in Visual and Plastic Arts
- Teaching and Learning and Educational Organization
- Theoretical and Practical Philosophy
- Theory and History of Education

UB DEGREE PROGRAMMES

For the next academic year (2009-2010), the University has academic coverage of 65 different degrees. The post-degree programmes are very relevant in a generalist research university as UB, since 130 Masters and 62 PhD programs exist. In the following list the detail of degrees (includes Diplomas, "Licenciaturas" and the new EHEA Bachelors Degrees) is shown:

- Actuarial Science and Finance
- Advertising and Public Relations
- Arabic and Hebrew Studies
- Art History
- Audiovisual Communication
- Basic Medical Sciences
- Biochemistry
- Biology
- Biomedical Sciences
- Biotechnology
- Business Administration and Management
- Catalan
- Chemical Engineering
- Chemistry
- Cinema and Audiovisual Media
- Classics
- Computer Engineering
- Criminology
- Dentistry
- Early Childhood Education
- Economics
- Education
- Electronic Engineering and Telecommunications
- English Studies
- Environmental Sciences
- Fine Arts
- Food Science and Technology
- Geography
- Geological Engineering
- Geology
- History
- Industrial Relations
- Information and Documentation
- Law
- Linguistics
- Literary Theory and Comparative Literature
- Market Research Techniques
- Materials Engineering
- Mathematics
- Mathematics + Computer Engineering
- Medicine
- Modern Language and Literature
- Nursing
- Pharmacy
- Philosophy
- Physical Activity and Sport Sciences
- Physics
- Physics + Mathematics
- Podiatry
- Political and Administrative Sciences
- Primary Education
- Private Investigation
- Psychology
- Psychopedagogy
- Public Management and Administration
- Real Estate and Construction Studies
- Romance Languages
- Social and Cultural Anthropology
- Social Education
- Social Work
- Sociology
- Spanish
- Statistics
- Taxes and Accounting
- Tourism

The number of students in the academic year 2007-2008 has attained almost 90.500 (around 54,39 % are students of Degree programmes, 4,70 % are students of official Masters and PhD programmes, and 40,91% for Masters "propios or non-official" and other programmes of Lifelong Learning).

The academic year 2007-2008 figures for academic staff amounted to 4715 teachers (3758,4 Full Time Equivalent teachers), of which 42,9% were women and 57,1% were men. In the same academic year, UB had 2177 employees of administration and service staff, of which 65% were women, and 35% men.

Considering the distribution by professional category in the academic year 2007-2008 of research and teaching staff (Table 5), the tenured professor predominates followed by associate lecturer teachers. It is also appraised that, in the highest categories, the proportion of men is much greater than that of women, with a remarkable difference by gender in the case of Full professors.

TABLE 5. RESEARCH AND TEACHING STAFF (RTS) BY PROFESSIONAL CATEGORY (ACADEMIC YEAR 2007-2008) (UB)

Categories	Full-Prof.	Tenured Prof.	Assistant Lecturer	Contracted non-tenured	Associate Lecturer	Others (visitant, emeritus)	Total RTS
Total UB	561	2040	131	263	1493	227	4715
Percentages	11,90	43,27	2,78	5,58	31,66	4,81	100,00
RTS FTE (Full Time Equivalent)	548,6	1997,8	32,8	263	835,8	80,5	3758,5

When considering the researchers distribution by centre (Table 6) the differences are very significant in the amount of RTS, as well as the distribution of RTS between the different typologies. There are special situations, as it happens in the Faculty of Medicine with a great number of teachers that works as practitioners' doctors in hospitals, with research and teaching activity shared with assistance work with patients.

TABLE 6. RESEARCH AND TEACHING STAFF DISTRIBUTION BY CENTRE (UB)

Centre	RTS	%
Faculty of Biology	319	6,77
Faculty of Chemistry	244	5,17
Faculty of Dentistry	198	4,20
Faculty of Economics and Business	561	11,90
Faculty of Education	203	4,31
Faculty of Fine Arts	168	3,56
Faculty of Geography and History	237	5,03
Faculty of Geology	94	1,99
Faculty of Law	339	7,19
Faculty of Library and Information Science	67	1,42
Faculty of Mathematics	105	2,23
Faculty of Medicine	596	12,64
Faculty of Pharmacy	327	6,94
Faculty of Philology	288	6,11
Faculty of Philosophy	64	1,36
Faculty of Physics	208	4,41
Faculty of Psychology	220	4,67
Faculty of Teacher Training	211	4,48
University School of Nursing	257	5,45
Educational Science Institute	9	0,19
Total	**4715**	**100.00**

At the Department level, the figures are very diverse, from departments with just 20-30 members with very few associate lecturers, to some departments with 100 members or more, with a great number of associate and other types of lecturers. In Table 7 we take the account of the RTS[1] for the 29 departments selected for this study case of GREC

TABLE 7. RTS DISTRIBUTION BY SELECTED DEPARTMENTS (FIGURES OF ALL TYPES OF RTS FOR THE 29 SELECTED DEPARTMENTS FOR THE CASE STUDY IN THE ACADEMIC YEAR 2008-2009) (UB)

Selected department	RTS
Biochemistry and Molecular Biology	73
Genetics	43
Pharmacology and Therapeutic Chemistry	69
Pharmacy and Pharmaceutical Technology	70
Clinical Sciences	133
Dentistry and Stomatology	162
Obstetrics and Gynecology, Pediatrics, Radiology and Anatomy	69
Medicine	114
Ecology	31
Organic Chemistry	43
Inorganic Chemistry	46
Structure and Constituents of Matter	44
Fundamental Physics	54
Astronomy and Meteorology	33
Electronics	59
Chemical Engineering	44
Applied Mathematics and Analysis	59
Painting	59
Prehistory, Ancient History and Archaeology	40
History of Philosophy, Aesthetics and Cultural Philosophy	27
Romance Languages	65
Library and Information Science	66
Personality, Evaluation and Psychological Treatment	52
Methods of Research and Diagnosis in Education	56
Political Economy and the Public Treasury	68
Econometrics, Statistics and Spanish Economy	66
Civil Law	45
Constitutional Law and Political Science	54
Sociological Theory, Philosophy of Law and Methodology of the Social Sciences	**46**

[1] The number of RTS differs from the other section because there we count the people involved during the years 2005 and 2006, with active teaching activity and full-time dedication to the university, so that all the associate lecturers are excluded

2. DATABASES DESCRIPTION

2.1 STRUCTURE AND ORGANIZATION OF THE DATABASE

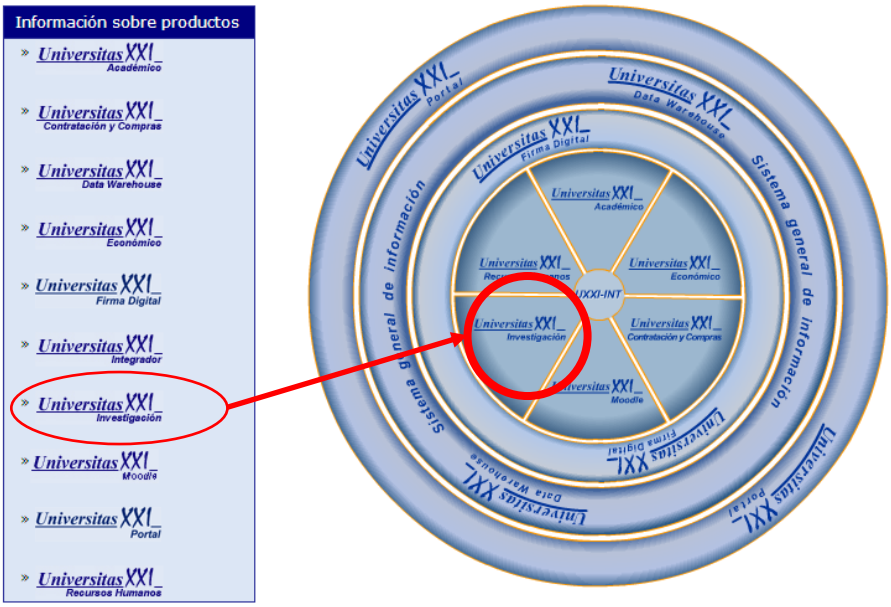
2.1.1. UNIVERSITAS XXI

UNIVERSITAS XXI is a platform used for the management of resources and activities. This tool has been developed by the Office of University Cooperation (OCU), a company belonging to 6 Spanish universities and one bank, to provide an effective management system for the universities. UNIVERSITAS XXI is structured around different modules for the academic management. This tool is developed in a Web system which facilitates the access to the application from any point. Its main characteristics are: integration with the other information systems of the university, the supply of decentralized information and according to each user profile (researcher, manager, etc.). UNIVERSITAS XXI consists of ten applications (figure 1) used for different management activities and it has been implemented in 28 Spanish universities.

One of its main modules is UNIVERSITAS XXI-Research, a system for scientific-technical and artistic information treatment of all researchers through their Curriculum Vitae data. This tool, in addition, automatically accomplishes the essential management processes (projects control, procedure of patents, contract management, diffusion of opportunities of public or private financing, registry of scholarships, management of research groups, etc). At the moment this module -that has developed a standard of communications for the management of CV designed by FECYT - is used by the following nine Spanish universities:

- Universidad de Alcalá de Henares
- Universidad de Burgos
- **Universidad Carlos III de Madrid**
- Universidad de La Rioja
- Universidad de León
- Universitat Oberta de Catalunya
- Universidad Rey Juan Carlos
- Universidad de Salamanca
- Universidad de Valladolid

FIGURE 1. *UNIVERSITAS XXI* MODULES



Source: Oficina de Cooperación Universitaria: *http://www.ocu.es/es/mad/productos/index.htm*

To analyze the characteristics of UNIVERSITAS XXI we will study the case of Carlos III University of Madrid (UC3M). This institution has been selected due to its being a multidisciplinary university (with research activity in experimental sciences, engineering and social sciences and humanities), what allows the analysis of the scientific behaviour in different fields of knowledge. The medium size of the university is another favourable factor that enables the study of the whole population of its researchers. The facilities to access the institutional databases, necessary for the study, have been another decisive factor to choose this institution.

UNIVERSITAS XXI presents different options to load and to visualize the information at the UC3M. The “researcher profile” is used by professors of the university to load the data of their own CV. This type of users has access to their own information but not to the data of other researchers. Each researcher is responsible for the data that he/she incorporates but the final information appears grouped by Departments. Therefore, the responsibility of the updating and validation of these data corresponds to each Department.

The “manager profile” has access to all the information loaded by the professors and can analyze this information through the computer application. This type of profile corresponds, generally, to the personnel of the OTRI (Office of Research Results Transfer).

The “administrator profile” can access all the information of the database and modify it or correct it. It can, also, elaborate analyses to obtain data combining different criteria. Generally, the “administrators” are the computer team or the Web masters. All these profiles have access from “Campus Global” that is the Intranet of the academic community of UC3M. It is necessary to be a user of the system, through an academic link with the university.

Finally, the "users" who do not have any contractual relation with the university (students, citizens) can access the data processed by the OTRI that are a compilation of the information contained in the database. This information is presented as an Annual Research Report and includes the main scientific activities carried out by the UC3M research staff. With the data of all researchers, the scientific information activity is presented structured by: Total of the university, Faculty and Department, as well as type of activity: publications, mobility, and other merits. Data can be obtained crossing both variables: department and document type.

2.1.2. GREC

GREC is an informatics tool for the management of research developed by the University of Barcelona (UB) and it includes some databases (Curriculum Vitae, projects, publications). Since 1987 when the first version was implemented, GREC has been evolving continuously, covering all the institutional needs. This evolution, carried out up to date, has produced a platform for the management and evaluation of research, which is currently used not only by the UB, but is implemented as well in several different universities, research institutes and R&D centres:

Institut Català d'Oncologia
Universitat de Girona
Universitat de les Illes Balears
Universitat de València
Universitat de Lleida
Universitat Ramon Llull
Universitat Rovira i Virgili

Thus, GREC can be considered as a platform for the management, follow-up, monitoring and evaluation of science & technology activities. It is constituted by different information systems and utilities that can be worked out both separately or as a whole, with the main goal of rationalizing the management and foresight of the university research.

To analyze the characteristics of GREC we will study the case of Universitat de Barcelona (UB). This institution has been selected because it is a multidisciplinary university (with research activity in all fields: biomedicine and health sciences, experimental sciences, engineering, social sciences and humanities), what allows the analysis of the scientific behaviour in different fields of knowledge. UB is one of the biggest universities in Spain, so that its size offers a different point of analysis in contrast with that of UC3M. The easy access to the institutional databases, necessary for the study, and the large period of time GREC has been operational are other criteria to choose this institution.

GREC, as most popular commercial and open source databases currently in use, is a relational database management system (RDBMS), in which data is stored in the form of tables and relationships among the data are also stored in the form of tables. The system can perform all kind of functions independently (no commercial databases are required) but, in order to facilitate the interchange of data with other systems, an Oracle database has been recently implemented.

Among other different utilities, GREC includes a web-based application which is used by professors and other research staff to fulfill and keep actualized their own CV, in a wide all-purpose format (Curricul@). In this level, each CV constitutes a personal database from which the scientist can manage the information, using it at his or her own convenience. A “research group CV” application imports/links selected data of the individual CV of the members of the group.

The content of all the CV included in GREC is processed separately to build the different tables of data, which in connection with the rest of the GREC systems data, constitute the main institutional database.

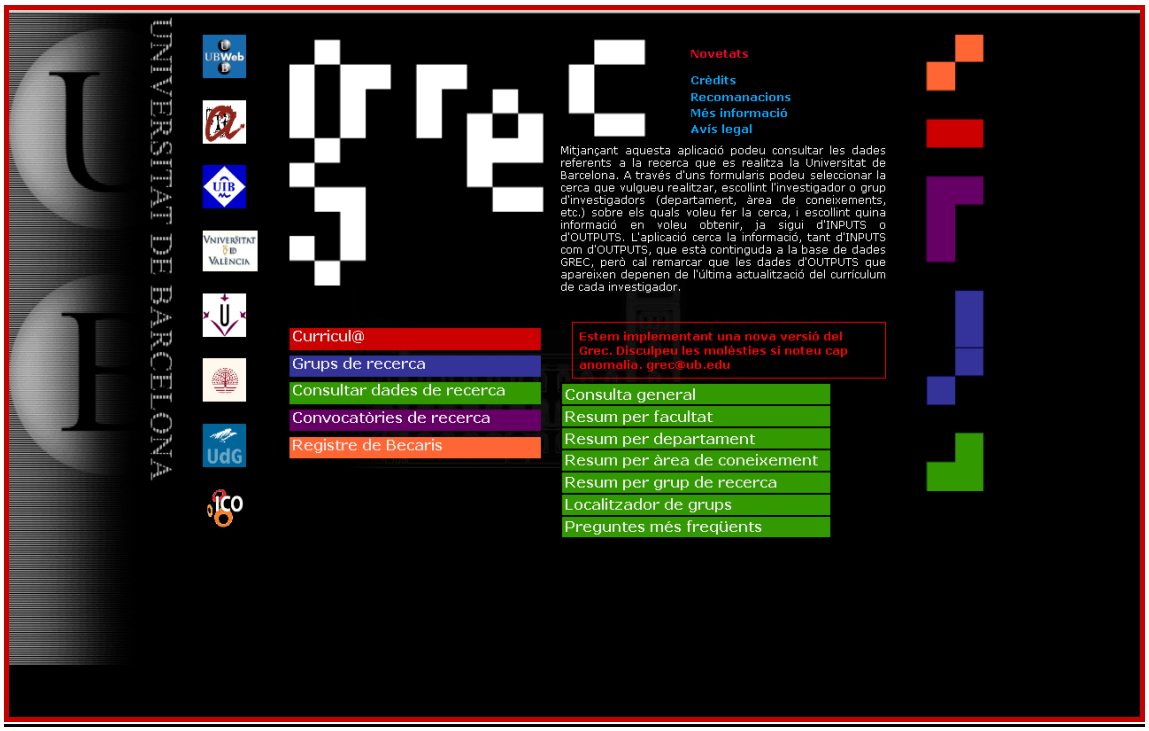
GREC presents different options to load and to visualize the information. The “researcher profile” (Figure 2) is used by professors of the university to load the data of their own CV. This type of users has access to edit their own information but not to the data of other researchers. Each researcher is responsible for some of the data that he/she incorporates, but the administrative units that have the duty of the management of the money allocated to those projects upload the inputs of research (for instance, financed projects in competitive calls). The responsibility of the updating and validation of these data are shared by each researcher and by the administrative central unit of research in the UB.

The “manager profile” has access to all the information loaded by the researchers and can analyze and exploit this information through the computer application with standard reports for evaluation, or creating ad hoc sets of data by combination of different tables and results of searches. This type of profile corresponds, generally, to the personnel of the Management of Research Office (MRO) and to some academic authorities (deputy rectors for research, deans, etc.). This profile can be customized as required by the type of duty or level of authority.

The “administrator profile” can access all the information of the database and modify it, or correct it. Also with this profile, people can elaborate analyses to obtain data combining different criteria. Generally, the “administrators” are the computer team or the Web masters.

Finally, the “users” who do not have any contractual relation with the university (students, citizens) can access the data in a public website (Figure 2), once the data are uploaded by the researcher to the database and validated by the Management of Research Office (MRO). Some other consolidated data by academic year are published in the Annual Report of the university, with the information on research activities structured by: total of the university, Faculty and Department, as well as type of activity: publications, mobility, and other merits.

FIGURE 2. HOME PAGE OF GREC PUBLIC WEBSITE FOR UB (***HTTPS://WEBGREC.UB.EDU/***)



2.2 DATABASE CONTENT: BIBLIOGRAPHIC INFORMATION

2.2.1. UNIVERSITAS XXI (UNIVERSIDAD CARLOS III DE MADRID)

The database offers data about different activities of the UC3M researchers. Each Department collects, in addition, different types of documents depending on its object of study and the public for which the results are aimed. The activities included in the CV of the researchers and collected in the database are the following:

- Book chapters
- Books
- Communications in congresses: national or international and type of presentation (oral, poster, plenary session)
- Diffusion activities: organization of scientific events, etc.
- Internal periodical publications (magazines of the department)
- International cooperation: research projects with foreign institutions
- Masters/Doctorates (given by professors of the university)
- Mobility (research stays in other centres or visits of external professors at UC3M)
- Other merits (academic position, prizes or mentions obtained)
- Participation in R&D committees: scientific and/or evaluating committees
- Patents
- Projects and contracts
- Scientific journal articles: including national and international publications
- Specialization courses (courses given by professors of the university)
- Teaching of degree (degree and diploma)
- Theses presented
- Working papers

Although all the detailed data in the previous table are included in the database, in some cases the criteria of the Departments to incorporate and update them is not very homogeneous. Therefore, before publishing the results of the research activities in the Annual Research Report, OTRI revises and validates certain types of activities: those that have complete and updated information. These validated and normalised activities are the following:

- Book chapters
- Books
- Diffusion activities
- Patents
- Scientific journal articles
- Theses presented
- Working papers

They all include basic bibliographic information (title, publication date, language, country). In table 8 the main fields are shown. Some document types include additional information. In the case of congresses, for example, data of the country and the city where the event took place and type of presentation (poster, communication. conference) are included. Journal articles include the scope of the publication (national or international) and the title of the article. Book chapters also include the publisher country, the publisher, national or international scope of the publication and title of the chapter. Patents include information on the granting date.

TABLE 8. DOCUMENT TYPE AND INFORMATION INCLUDED IN THE DATABASE (UC3M)

Documental tipe	Title 1	Title 2	Date	Lang.	Researchers name	Country	City	Type of presentation	Editorial	Scope (nat/inter)	Grant. date
Congresses	X		X	X	X	X	X	X			
J.Artícles	X	X	X	X	X	X				X	
Chapters in books	X	X	X	X	X	X			X	X	
Working paper	X		X		X						
Books	X		X		X	X			X		
Theses	X		X	X	X						
Patents	X		X		X						X

In all the document types mentioned the name of all the authors is included, but the centre is not registered when these authors are from institutions different to UC3M. Therefore, it is not possible to study scientific collaboration considering external authors. Crossing the name of the UC3M researchers with internal databases it is possible to obtain additional personal data: gender, age, academic category.

In all cases the information collected is only bibliographic, and it is not possible to have access to the full text of the documents. Nevertheless, the university is working in the development of an Institutional Repository that in the future will be related to UNIVERSITAS XXI.

2.2.2. GREC (UNIVERSITAT DE BARCELONA)

GREC offers data about different activities performed by researchers. GREC platform is able to establish relations and links between different UB databases (human resources, funded research projects, CV, etc.) The activities included in the CV of the researchers and collected in the database are the following:

General data
Curriculum texts
Academic training
Previous tasks
Journal publications
Other publications (books, book chapters, reports, working papers, etc.)
Patents and utility models
Stays abroad in research centres
Research interests
Techniques or specialties in which the researcher is trained (instruments and methods expertise)
Specialized equipments and systems used by the researcher
Thesis, minor thesis and students research or projects reports
Lectures
Participations in conferences
Research projects and contracts
Participation in Committees and Representations (Membership in committees and boards)
Organization of R&D activities
Management of R&D activities
Other achievements (merits, clarifications, etc. in free text form)

All data can be obtained and analyzed at the individual researcher level, as well by any of the different affiliation or labels in which they are grouped, such as research group, department, centre, institute, subject category, etc.

Although all the detailed data in the previous table are included in the database, in some cases the criteria of the teachers to incorporate and update them is not very homogeneous. Therefore, before uploading the data to the public database, GREC Team revises and validates certain types of activities, for instance in the “Projects of research” section, data from university administrative units, that manage money and the administrative handling to the funding institutions (like in national or European projects), have priority over the data fulfilled by the individual researcher.

For publication outputs, the data the researcher introduces include basic bibliographic information (title, publication date, language, country). In Table 9, the main fields are shown. Some document types include additional information. In the case of congresses, for example, data of the country and the city where the event took place and type of presentation (poster, communication, keynote speech, lecturer, etc) are included. Journal articles include the scope of the publication (national or international) and the title of the article. Book chapters also include the publisher country, the publisher, national or international scope of the publication and title of the chapter. Patents include information on the granting date.

TABLE 9. DOCUMENT TYPE AND INFORMATION INCLUDED IN THE DATABASE

Document type	Title 1	Title 2	Date	Lang.	Research. name	Country	City	Narrower specific type of published output	Editorial	Scope (nat/inter)	Grant. date
Congresses	X	X	X		X	X	X	X	X	X	
J.Articles	X	X	X		X	X		X		X	
Chapters in books	X	X	X		X	X	X	X	X	X	
Working paper	X		X		X						
Books	X		X		X	X	X	X	X	X	
Theses	X		X		X		X	X			
Patents	X		X		X	X					X

In all document types mentioned the name of all the authors is included, but the author affiliation is not registered (although there is an automatic link between each document the researcher introduces in CV with their personal data in the human resources database) but nothing is recorded when these authors are from institutions different to UB. Therefore, only with GREC data it is not possible to study scientific collaboration considering external authors. Crossing the name of the UB researchers with the standard GREC interface to the university human resources databases, it is possible to obtain additional personal data: gender, age, academic category.

In all cases the information collected is only referential-bibliographic, but when the document has a valid URL link, the researcher can add this data in html and the link can be followed from the public website of GREC. Nevertheless, the university is working in the development of a transparent interface between GREC and the Catalan Universities Research Repository called Recercat (*http://www.recercat.cat*).

2.3 COVERAGE OF THE DATABASE

2.3.1. UNIVERSITAS XXI (UNIVERSIDAD CARLOS III DE MADRID)

A recent evaluation of the contents of the database has shown that the most complete, trustworthy and sustainable data are those of the academic period 2004-2006, being this information the one to be analyzed in our future pilot study. The data regarding this period are presented grouped in natural years, what facilitates their analysis and understanding. The information validated by the Departments and included in the Annual Research Report covers: journal articles, communications in congresses, books, book chapters, working papers, thesis, patents and mobility.

2.3.2. GREC (UNIVERSITAT DE BARCELONA)

GREC application started in 1987, but previous data of the researchers can be included in the personal CV, and uploaded to the application.

Because some researchers up-date their CV with some delay, we can consider that the data from the years 2009 and 2008 are not very complete. So that for this case study we will use the period

2005-2006, as UC3M, being this information the one to be analyzed. The data regarding this period are presented grouped in natural years, what facilitates their analysis and understanding.

2.4. PROCEDURE FOR DATA COMPILATION (UPLOADING AND UPDATING OF INFORMATION)

2.4.1. UNIVERSITAS XXI (UNIVERSIDAD CARLOS III DE MADRID)

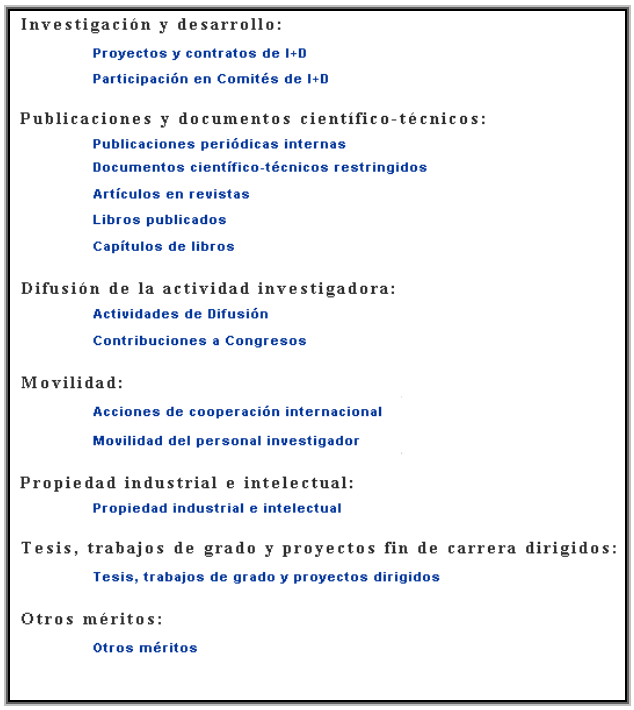
A. Load of data from the research profile

As previously mentioned, the introduction of the data begins with the load of the CV of the researchers, done by them. In order to introduce this information they use the informatic tool provided by UNIVERSITAS XXI. The application presents open fields to freely include data, and closed fields to introduce the information in a structured way. When entering each section an explanation of the data to be included in each item is offered as "help". The CV is completed according to the following categories:

1- Personal and academic data: name, date of birth, academic degree

2- Research activity and scientific output. This item is the most relevant both due to the volume of information that it concentrates and the variety of criteria that it includes. In order to complete it, it is necessary to incorporate all the data shown in Figure 3.

FIGURE 3. TYPE OF SCIENTIFIC ACTIVITY INCLUDED IN THE CV (UC3M)



TRASLATION OF SCREEN

Research & Development
R&D Projects & contracts
Participation in R&D committees

Scientific output
Periodical Internal Publications
Working papers
Journal articles
Books
Book chapters

Diffusion of scientific activities
Diffusion activities
Communications in congresses

Mobility
International cooperation actions
Scientific stays of researchers

Intellectual & Industrial property
Patents

Thesis, final degree projects
Thesis and degree final work

Other merits
Other merits

In order to incorporate each data, open fields exist in which the researchers write or copy the necessary information (title of the article, name of the congress, etc) and other closed fields. The different options appear as windows with the objective of certain normalization of the data and to avoid duplicates when retrieving the information. An example of open and closed fields is shown in figures 4 and 5 for journal articles and internal periodic publications. In the first case, the option "Journal" (revista) contains a window with the standard titles, the abbreviations corresponding to the publications and their impact factors. The possibility of introducing a new title not included in the normalized list always exists (figure 4). In the case of internal periodic publications, the window presents the different options for periodicity (Figure 5).

FIGURE 4. FORM TO COMPLETE DATA ON SCIENTIFIC JOURNAL ARTICLES (UC3M)

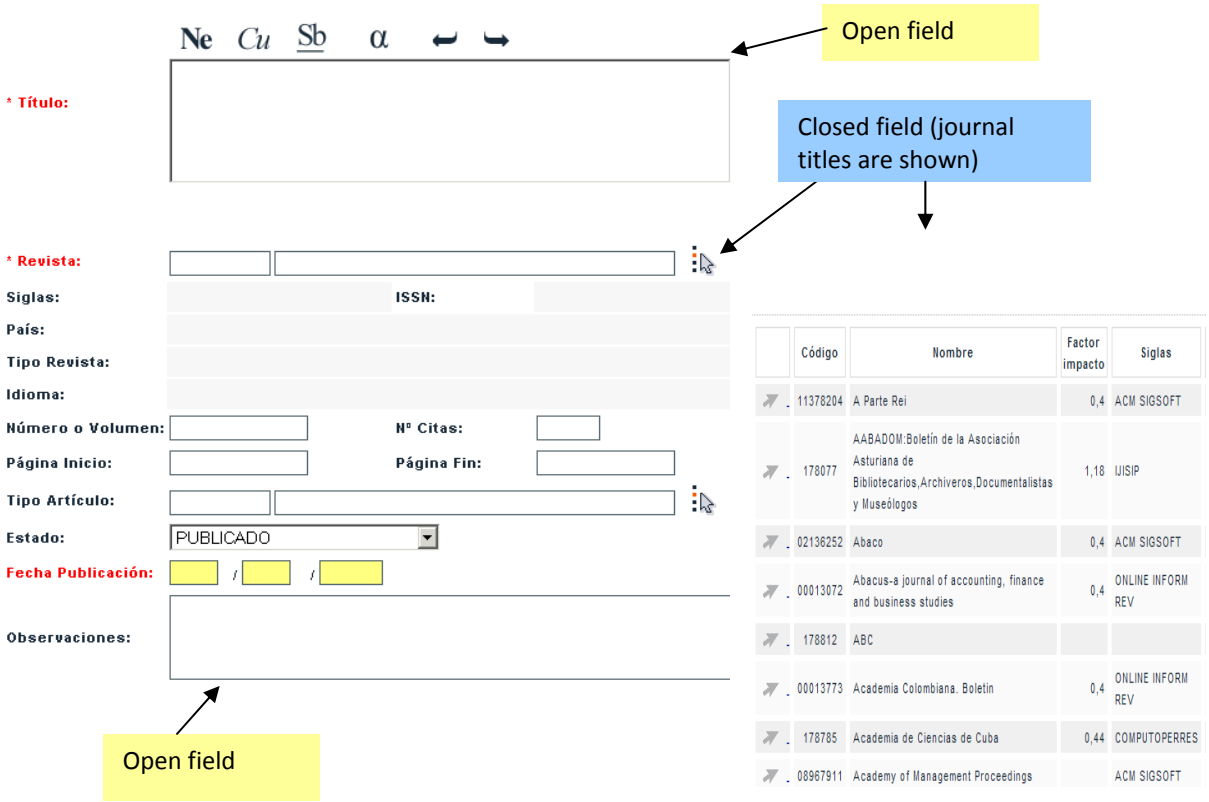
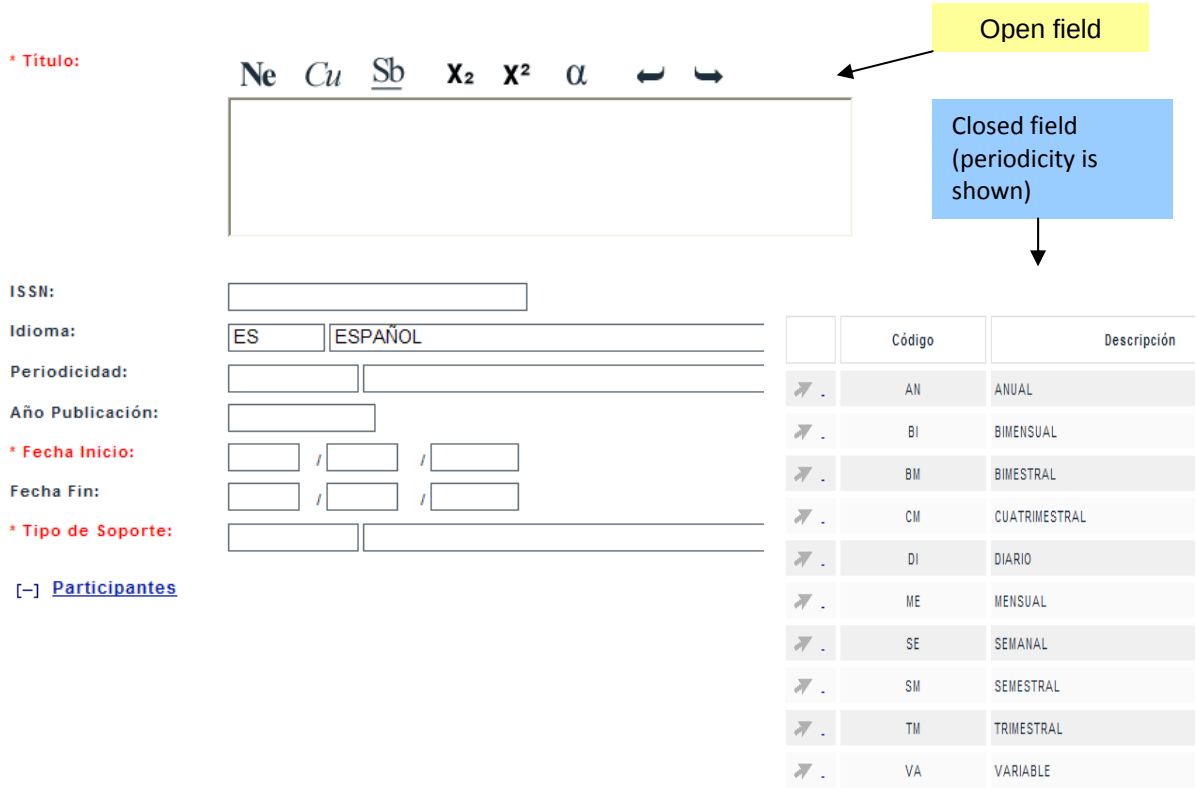


FIGURE 5. FORM TO COMPLETE DATA ON INTERNAL PERIODIC PUBLICATIONS (UC3M)



Once the researcher completes the information of each document type, a complete listing of his/her activities is shown in the screen. UNIVERSITAS XXI has a system to incorporate collective data in order not to duplicate the information contributed by several authors. In this sense, when an author of a collective publication includes his activity from his CV this result is automatically assigned to the other co-authors of the UC3M. Although this method facilitates the inclusion of data, it also requires a later validation on the part of the co-author, for the scientific result to be included finally in the CV.

When the load of all the data is finished, the system counts the total number of activities and registers them in the initial listing of activities.

Teaching activity: it covers data on different types of courses distributed in the different learning levels.

Research lines: each researcher must mention the thematic line in which his work is developed, being associated to the existing ones (through the search by key words) or creating new lines.

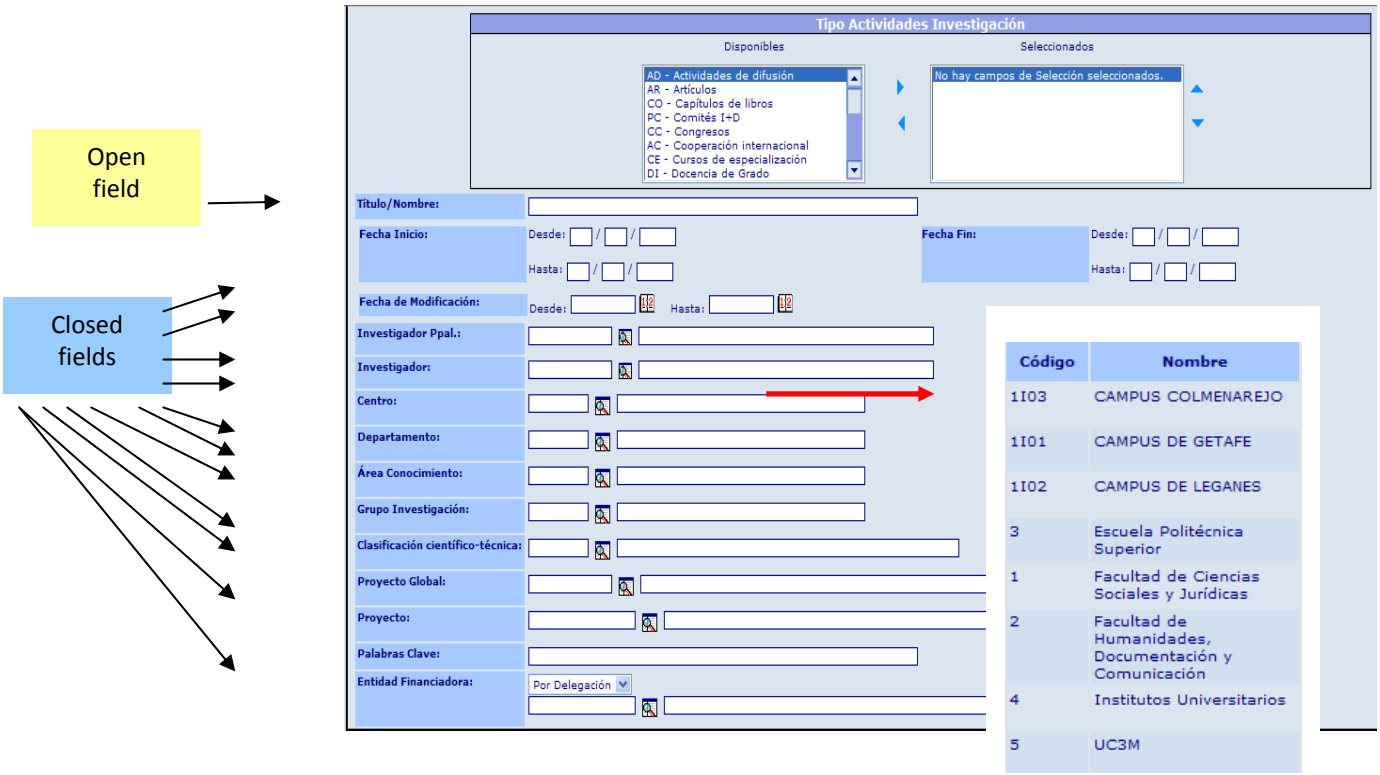
B. Analysis of the data from the “manager profile”

The profiles of “Administrator” and “Manager” can access the information once each researcher has completed the load of data. Neither the external professors nor users can access this part of

the system. Through the "manager profile" it is possible to retrieve type of activity and department in a certain period. Searches selecting some of the scientific activities or all of them are possible to delimit the search per date, name of the main researcher or participants, centres (Faculty), Department, area of knowledge and research team. As observed in figure 6, these last fields are closed since they include windows to select the correct option.

Through this type of analysis the OTRI personnel produces reports of results by Department that are revised by the people in charge of each department in order to validate, to complete or to correct the information. With the revised data, the OTRI elaborates the Annual Research Report that includes only the scientific activities with validated information (articles, congresses, book chapters, books, working papers, thesis, patents, mobility).

FIGURE 6. ANALYSIS OF ACTIVITIES FROM THE "MANAGER PROFILE" (UC3M)



2.4.2. GREC (UNIVERSITAT DE BARCELONA)

A. Load of data from the research profile

As previously mentioned, there are different sources of data. One of them is the introduction of data from the CV of the researchers, done by them. In order to introduce this information, researchers use an interactive web application with a CGI to the CV database.

FIGURE 7. TYPE OF SCIENTIFIC ACTIVITY INCLUDED IN THE CV (*CURRICUL@* APPLICATION) (UB)

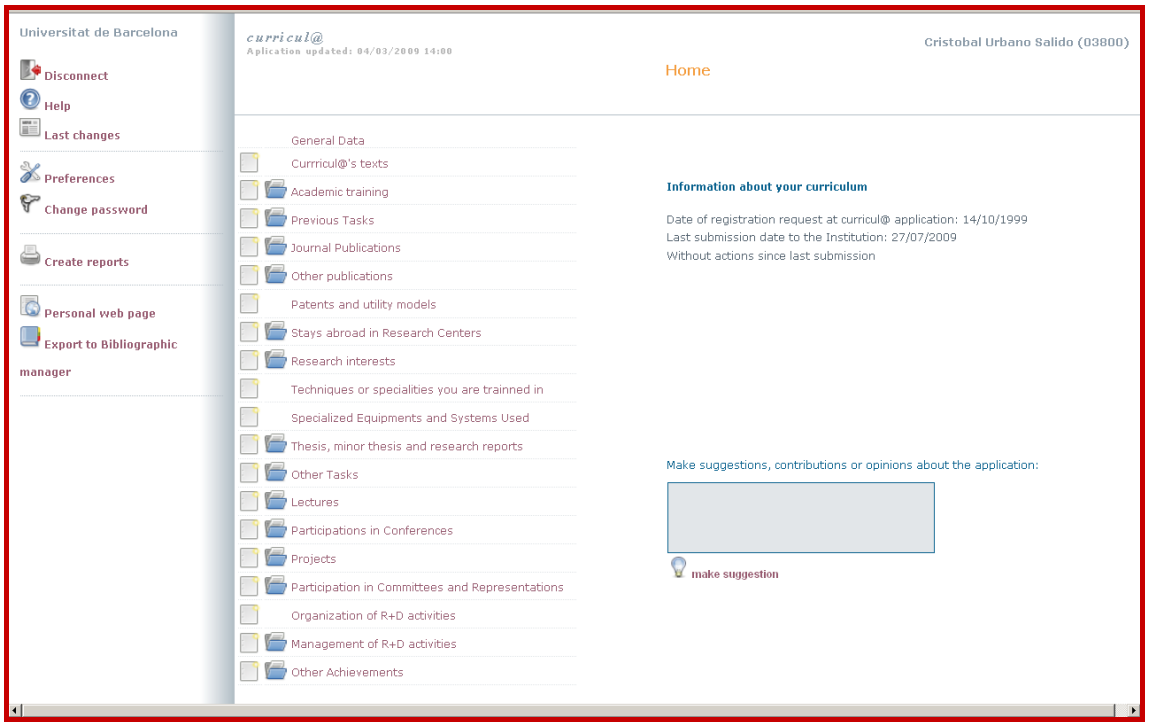
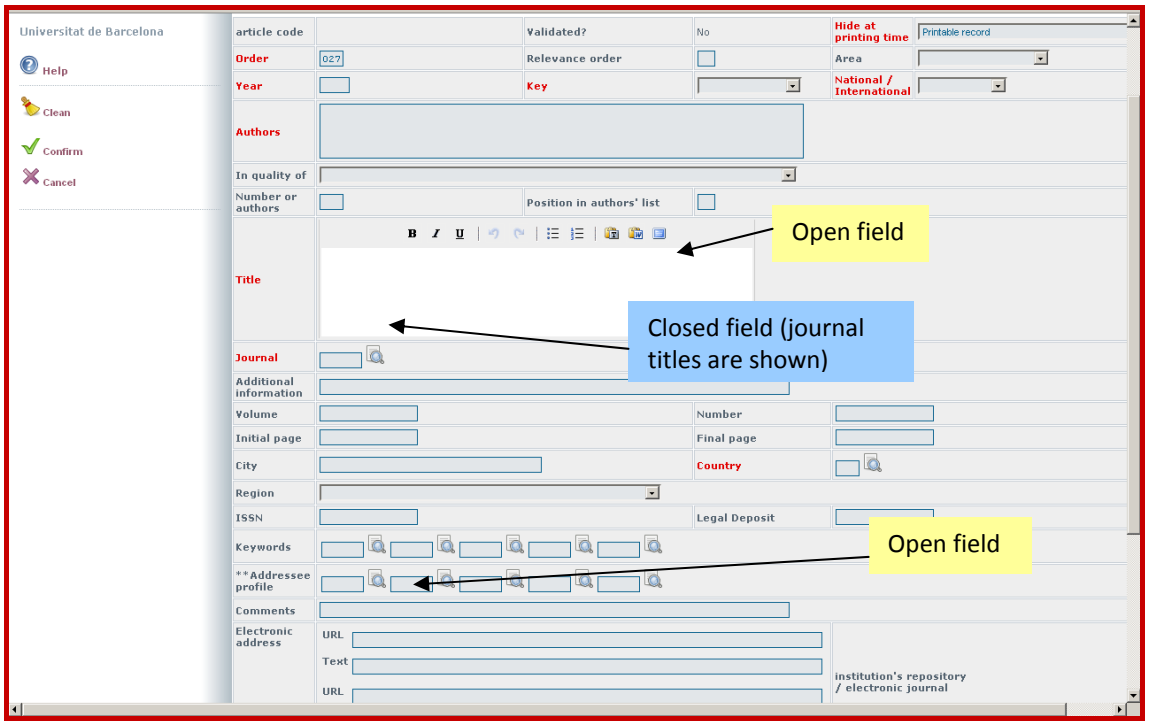


FIGURE 8. FORM TO COMPLETE DATA ON SCIENTIFIC JOURNAL ARTICLES (UB)



The CV is completed according to the categories that appear in Figure 7, the welcome page of the Curricul@ web application of GREC. The application presents a collection of web forms for the different items to be included in the CV, with open fields to include data freely, and validated-

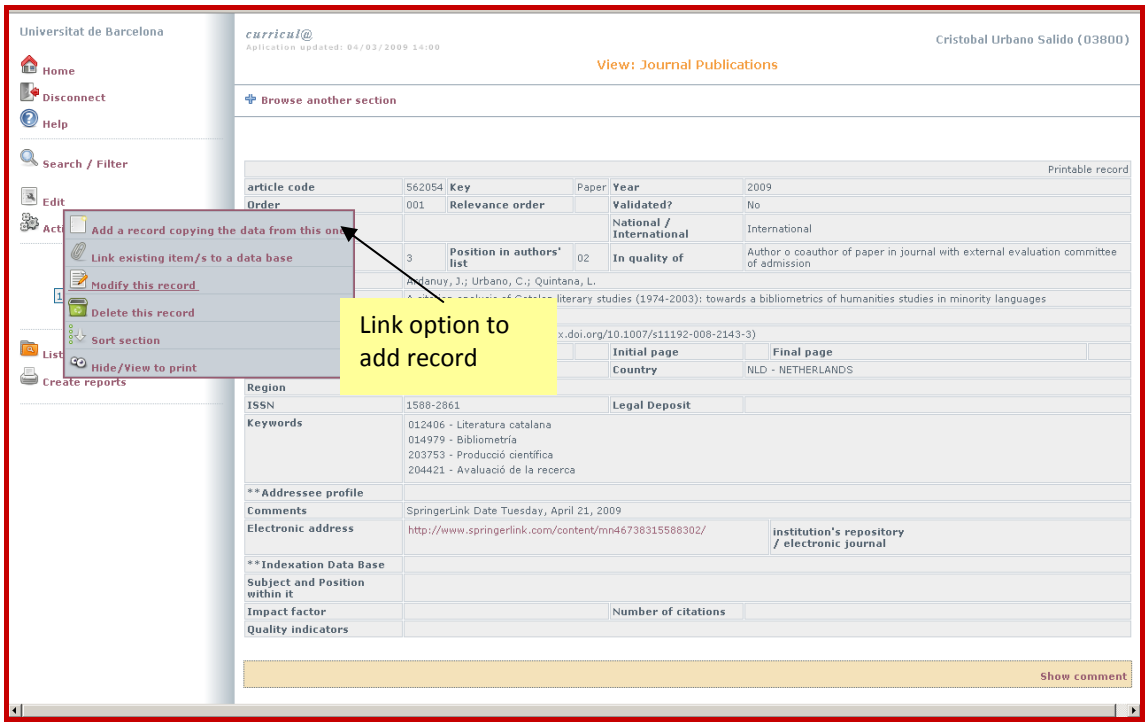
closed fields to import data from authoritative lists in a structured way. When entering each section, an explanation of the data to be included in each item is offered as “help”.

In order to incorporate data, open fields exist in which the researchers write or copy the necessary information (title of the article, name of the congress, etc) and other closed fields. The different options appear as windows with the objective of certain normalization of the data and to avoid duplicates when retrieving the information. An example of open and controlled fields is shown in Figure 8 for journal articles.

Once the researcher completes the information of each item fulfilled, a complete listing of his/her activities is shown in the screen. GREC has a system to incorporate collective data in order not to duplicate the information contributed by several authors. In this sense, an author of a collective publication must do first a search in the public GREC database because if it’s not yet included in GREC, the best way he/she should proceed is to link the item to their CV through the item number in GREC database (see option in Figure 9).

Once the researcher completes the information of each item fulfilled, a complete listing of his/her activities is shown in the screen. GREC has a system to incorporate collective data in order not to duplicate the information contributed by several authors. In this sense, an author of a collective publication must do first a search in the public GREC database because if it’s not yet included in GREC, the best way he/she should proceed is to link the item to their CV through the item number in GREC database (see option in Figure 10).

FIGURE 9. UTILITY TO LINK ARTICLE IN THE DATABASE TO THE PERSONAL CV (UB)



When the load of all the data is finished, the system counts the total number of activities and outputs updated or created, and asks the researcher if she/he wants to upload this new data from their CV to the platform, so that their CV will be closed during the period of verification that GREC team needs to verify the data. During this period of closing, the researcher cannot use the platform to generate print or electronic CV to apply to the different calls for research projects or exercises for tenure-track.

Teaching activities are outside GREC platform, but there are other applications for teaching activities in the university, and in the next steps of development of UB systems applications will be more strongly linked.

B. Analysis of the data from the “manager profile”

The profiles of “Administrator” and “Manager” can access the information once each researcher has completed the load of data. Neither the professors nor external users can access this part of the system. Through the “manager profile” it is possible to retrieve the type of activities and department in a certain period. In searches selecting some of the scientific activities, or all of them, it is possible to delimit the search per date, name of the main researcher or participants, centres (faculty), department, area of knowledge and research team.

FIGURE 10. MAIN MENU FOR ALL PROFILES OF MANAGEMENT AND EVALUATION (UB)

As observed in Figure 10, the range of operations is very complete, and although for a relational system the combinations of very diverse sets for ad hoc reports is possible, there are many standard reports for usual evaluation operations.

Through this type of analysis, the MRO and GREC team staff produce reports of results to be delivered to academic authorities, to internal/external boards that work in evaluation for resources allocation or strategic planning, or to publish annual accounts of the university life in paper or web form.

2.5 QUALITY CONTROL OF THE DATABASE

2.5.1. UNIVERSITAS XXI (UNIVERSIDAD CARLOS III DE MADRID)

The information included in the database is obtained periodically from the CV of the UC3M researchers. Professors can update their data at any time, but the information is compiled every two years for the elaboration of the Annual Research Report. This Research Report, nevertheless, contains differentiated information year by year.

The university keeps information on the scientific activity of its researchers from 1997. But a change of computer support required a migration and data processing that meant an analysis of the reliability of the information. The information from 2000 onwards was cleaned, and this is the only one that is available to public access.

2.5.2. GREC (UNIVERSITAT DE BARCELONA)

The information included in the databases is obtained periodically from the CV of the UB researchers and from MRO, or other administrative units of the university, operations. Professors and administrative units can update their data at any time, and after 24 or 72 hours, the data are uploaded in the public website database and in the internal system of evaluation and data exploitation.

2.6 USE OF DATABASE BY THE UNIVERSITY AND ACCESS

2.6.1. UNIVERSITAS XXI (UNIVERSIDAD CARLOS III DE MADRID)

UNIVERSITAS XXI is used by the UC3M to satisfy the following needs:

- **Aid to the management of the activity of the researchers**: this tool contributes to diminish the bureaucracy in the procedure of asking for projects by the researchers and it facilitates updating CV and its automatic generation in electronic format or paper, as well as the access to the information on different opportunities or calls to finance research activity, situation of their projects, research groups, etc.

- **Management of the R+D information**: it allows the university managers to act in all the areas related to management of the research activity: management of financing opportunities, economic monitoring of projects and contracts, commercialization of results and analysis of the information on the scientific and technological activity of all the university. This last one - specifically developed by the OTRI- also implies an analysis of the coherence and reliability of the data included by the researchers for the elaboration of the Annual Research Report.

- **Visibility of the UC3M**: the publication of the Annual Research Report is one way the university has to present its scientific and technological activities. This report is accessible for all the personnel of the university, as well as for the students and citizens in general, through the Web page of the institution: www.uc3m.es. Its access is free from any computer. The Annual Research Report collects the main scientific activity of the university organized in four sections: Financing, scientific publications, thesis and mobility. Financing refers to data obtained from economic sources, whereas the other three items are covered with data from UNIVERSITAS XXI. Within each section of scientific activity the results are presented in absolute values and in graphs, grouped by Department and year. All this information has been validated by the OTRI. As an example, in figure 11 the general access to the Annual Research Report and the windows corresponding to journal articles are shown. It is necessary to mention that, through general access, the scientific publication section includes only information on journal articles. However, when entering from the initial menu to each Department, it is possible have access to the other document types.

- **Scientific policy**: the data obtained through UNIVERSITAS XXI and managed by the OTRI, offer to the university authorities the basic tool for decision-making and the design of research related policies activity. With this information, scientific and technical capacities of the institution can be detected, as well as areas of possible development and others that need to be promoted.

FIGURE 11. SCREEN OF FREE ACCESS TO THE ANNUAL RESEARCH REPORT (UC3M)

	2004 / Nº Artíc.	2005 / Nº Artíc.	2006 / Nº Artíc.	Total / Nº Artíc.
Biblioteconomía y Documentación	12	2	10	24
Ciencia e Ingeniería de Materiales e Ingeniería Química	32	29	53	114
Ciencia Política y Sociología	7	4	6	17
Derecho Internacional, Eclesiástico y Filosofía del Derecho	3	3	5	11
Derecho Penal, Procesal e Historia del Derecho	1	2	2	5
Derecho Social e Internacional Privado	5	9	4	18
Derecho Privado	8	8	6	22
Derecho Público del Estado	6	9	1	16
Economía	31	31	35	97
Economía de la Empresa	26	30	33	89
Estadística	31	36	47	114
Física	23	31	24	78
Historia Económica e Instituciones	4	3	3	10
Humanidades	10	——	——	10
Humanidades: Filosofía, Lengua, Teoría de la Literatura, Estudios Cl	0	6	17	23
Humanidades: Geografía, Historia Contemporánea y Arte	3	3	3	9
Humanidades: Lingüística, Literatura, Historia y Estética	3	7	4	14
Informática	40	50	46	136
Ingeniería de Sistemas y Automática	2	6	10	18
Ingeniería Térmica y de Fluidos	9	12	13	34
Ingeniería Eléctrica	3	10	14	27

2.6.2. GREC (UNIVERSITAT DE BARCELONA)

GREC is used by UB to satisfy the following needs:

- Assistance to the management of the activity of the researchers: this tool contributes to diminish the bureaucracy in the procedure to apply for projects in competitive calls. It facilitates the researcher's work of updating CV and the automatic generation in electronic format or paper in a consistent way (structure and graphic aspect) with the requirements of each call. It offers as well the access to the information on different opportunities or calls to finance research activity, situation of their projects, research groups, etc. Nowadays, it's very important to save the researcher time, offering a complete range of CV formats because for a Spanish researcher the cumbersome process of applying to projects and tenure-track exercises require different CV formats. The next step for the future in this area should be the development of transparent interfaces to send data from GREC to the online forms each call or exercise requires, because nowadays only a paper or pdf CV is not valid: granting and accreditation institutions require electronic data item by item.

- Management of the R+D information: it allows the university managers to act in all the areas related to management of the research activity: management of financing opportunities, economic monitoring of projects and contracts, commercialization of results and analysis of the information on the scientific and technological activity of all the university. This last one -specifically developed by MRO and GREC Team- also implies an analysis of the coherence and reliability of the data included by the researchers for the elaboration of the diverse Annual Reports of UB.

- Visibility of the UB: the open web publication of GREC (*https://webgrec.ub.edu/*) data for inputs and outputs of the university at different levels (individual researcher, research group, department, faculty and knowledge area) is an outstanding tool to stimulate the researchers and their departments to maintain up-to-date their CV. Furthermore, it is a way the university has to present its scientific and technological activities and achievements. This website is accessible for all the personnel of the university, as well as for the students and citizens in general. This open website shows reports for each aggregation of researchers (faculties, departments and groups) in four sections: human resources, inputs, outputs and JCR data for output covered by Science Citation Index and Social Sciences Citation Index. The data is detailed year by year for the last ten years, and aggregated for the previous years and for all the years. Figure 12 and Figure 13 show the request form to query the database and an example for the department aggregation.

- Scientific policy: the data obtained through GREC and managed by the MRO and GREC Team, offers the university authorities the basic tool for decision-making and the design of research related policies activity (it is an important data source for the Five Year Research Strategic Plan).

With this information, scientific and technical capacities of the institution can be detected, as well as areas of possible development and others that need to be promoted.

FIGURE 12. SCREEN OF DATABASE QUERY FORM IN THE FREE ACCESS GREC WEBSITE (UB)

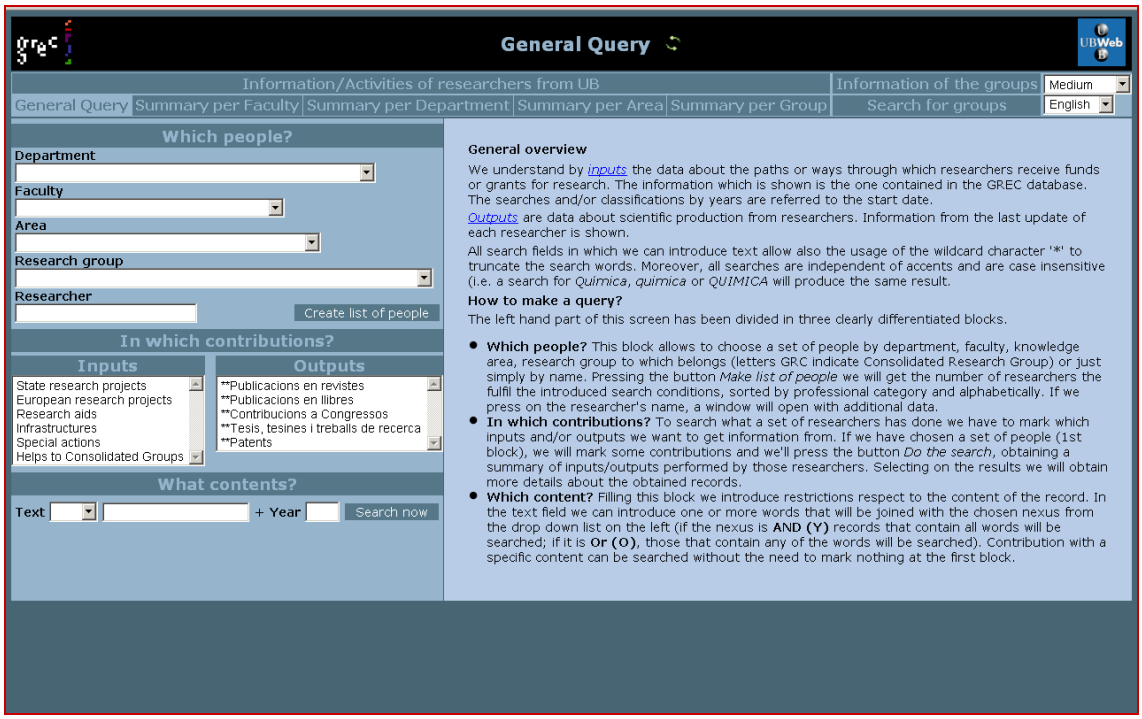
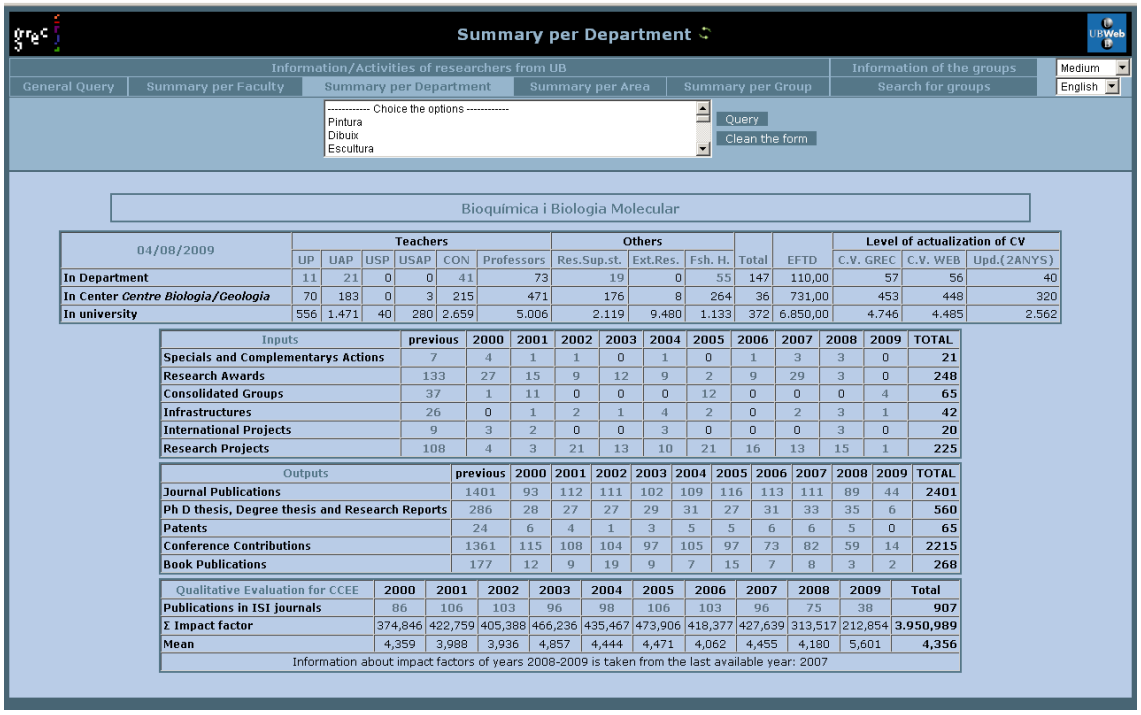


FIGURE 13. SCREEN OF A STANDARD GREC RESULTS FOR THE ACTIVITY OF A DEPARTMENT (UB)



04/08/2009	Teachers						Others					Level of actualization of CV		
	UP	UAP	USP	USAP	CON	Professors	Res.Sup.st.	Ext.Res.	Fsh. H.	Total	EFTD	C.V. GREC	C.V. WEB	Upd.(2ANYS)
In Department	11	21	0	0	41	73	19	0	55	147	110,00	57	56	40
In Center *Centre Biologia/Geologia*	70	183	0	3	215	471	176	8	264	36	731,00	453	448	320
In university	556	1.471	40	280	2.659	5.006	2.119	9.480	1.133	372	6.850,00	4.746	4.485	2.562

Inputs	previous	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	TOTAL
Specials and Complementarys Actions	7	4	1	1	0	1	0	1	3	3	0	21
Research Awards	133	27	15	9	12	9	2	9	29	3	0	248
Consolidated Groups	37	1	11	0	0	0	12	0	0	0	4	65
Infrastructures	26	0	1	2	1	4	2	0	2	3	1	42
International Projects	9	3	2	0	0	3	0	0	0	3	0	20
Research Projects	108	4	3	21	13	10	21	16	13	15	1	225

Outputs	previous	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	TOTAL
Journal Publications	1401	93	112	111	102	109	116	113	111	89	44	2401
Ph D thesis, Degree thesis and Research Reports	286	28	27	27	29	31	27	31	33	35	6	560
Patents	24	6	4	1	3	5	5	6	6	5	0	65
Conference Contributions	1361	115	108	104	97	105	97	73	82	59	14	2215
Book Publications	177	12	9	19	9	7	15	7	8	3	2	268

Qualitative Evaluation for CCEE	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
Publications in ISI Journals	86	106	103	96	98	106	103	96	75	38	907
Σ Impact factor	374,846	422,759	405,388	466,236	435,467	473,906	418,377	427,639	313,517	212,854	3.950,989
Mean	4,359	3,988	3,936	4,857	4,444	4,471	4,062	4,455	4,180	5,601	4,356

Information about impact factors of years 2008-2009 is taken from the last available year: 2007

3. METHODOLOGY

Some methodological assumptions guided the analysis of the datasets and allowed to outline descriptors and indicators described in paragraph 3.2. These assumptions can be summarized as follows:

- level of analysis: research units below Faculties level (Department in the Italian and Spanish case, Institutes and Laboratories in the Swiss case) represented the main level of analysis. Analysis was also carried out at University level and at scientific area level;
- scientific domain of publications was attributed through the research units affiliation of the authors;
- analysis at scientific area level was carried out grouping Departments according to the common classification proposed by the OST- Observatoire des Sciences et des Techniques[2];
- analysis per researcher was carried out considering the research staff according to different national rules (full time professors, associated professors and researchers according to head count criteria in the Italian and Spanish case, and with no distinction of different professional positions, considering FTEs and not headcounts in the Swiss case);
- scientific oputputs to be retained in the analysis, were those covered by authors copyright rules, thus not including patents or other products as reports;
- collaborative publications with authors affiliated to more departments and scientific sectors were counted according to different criteria considering specificities of Universities in the sample. Double counting of collaborative products was used in the Italian and Spanish case while fractional counting was preferred in the Swiss case.

3.1 SCIENTIFIC CLASSIFICATION OF THE UNIVERSITY DEPARTMENTS

The scientific domain of publications is not indicated in almost all databases analyzed for UNIPUB project. When provided, national rules and specifications are mainly used: as an example in the

2 The OST is responsible in France for conceiving and producing quantitative indicators on scientific and technological activities, as well as on innovation, and for participating through its work, to the strategic analyses of public policies for research, within the French and the European context. *http://www.obs-ost.fr/en.html*

Italian databases the scientific field(s) is attributed according to the classification provided by the Ministry of University and Research.

For the project purposes, in order to allow comparisons between homogeneous fields of science, a common scheme based on a small number of scientific domains was needed. The scientific classification provided by the OST, the Observatoire des Sciences et des Techniques, was agreed as the most suitable for the analysis as already used by the research teams, for the possibility to match it with the ISI subject fields and as compatible with the OECD classification and UNESCO classification, at least for fields of science at the more aggregated level.

The following table (table 10) summarizes the OST classification used in the analysis to attribute Departments (research units) to homogenous scientific fields.

TABLE 10. SCIENTIFIC DISCIPLINES IN OST CLASSIFICATION

DISC-9	DISC-10	DISC-31
1.Sciences de la Vie	1.Sciences de la Vie	13. Biochimie et biologie moléculaire
		14. Biologie cellulaire, biologie des organismes, sciences médicales & alimentation
		15. Aspects physico-chimiques de la pharmacologie
		16. Neurosciences
2. Recherche médicale	2. Recherche médicale	18. Médecine et odontologie
3. Biologie appliquée	3. Biologie appliquée	17. Biologie des populations et écologie
4. Chimie	4. Chimie	04. Chimie physique et chimie analytique
		05. Chimie moléculaire : synthèse, propriétés
		06. Chimie du solide, matériaux
5. Physique	5. Physique	02. Physique théorique, optique, physique des constituants élémentaires et physique des milieux dilués
		03. Physique des milieux denses, matériaux
6. Sciences de l'univers	6. Sciences de l'univers	11. Milieux naturels (terre, océans, atmosphère)
		12. Astronomie, astrophysique
7. Sciences pour l'ingénieur	7. Sciences pour l'ingénieur	07. Énergétique, mécanique des milieux fluides, génie des procédés
		10. Mécanique, génie des matériaux, génie civil
		08. Informatique, automatique, traitement du signal
		09. Électronique, photonique, optronique
8. Mathématiques	8. Mathématiques	01. Mathématiques et leurs applications
9. Sciences humaines et sociales	9. Sciences humaines et sociales	19. Anthropologie, ethnologie, préhistoire
		24. Histoire ancienne et médiévale
		25. Histoire moderne et contemporaine
		26. Langage et communication
		27. Langues et littératures
		28. Philosophie et arts
		29. Psychologie (uniquement enseignement supérieur)
		30. Sciences de l'éducation (uniquement enseignement supérieur)
		31. S&T des Activités Physiques et Sportives (STAPS ; uniquement enseignement supérieur)
	10. Sciences sociales	20. Sociologie, démographie
		21. Droit et sciences politiques
		22. Économie et gestion
		23. Géographie et aménagement

Source: OST classification- Fiche de nomenclature A4 - Les disciplines scientifiques [DISC]

As a too fine-grained classification could rise difficult issues of delimitation of domains, especially in an international comparison, the first level of disaggregation of scientific fields proposed by OST classification was used (DISC 9 and DISC 10) namely: applied biology and ecology; fundamental biology; chemistry; multidisciplinary; mathematics; physics; medical research; earth and space sciences; engineering; social sciences; humanities.

Table 11 and table 12 provide the correspondence between Universidad Carlos III de Madrid departments and Universitat de Barcelona department and the OST classification scientific fields.

TABLE 11. OST CLASSIFICATION OF UNIVERSIDAD CARLOS III DE MADRID DEPARTMENTS

OST classification*	UC3M Department
5-Physics	Physics
9-Humanities	Library Science and Information Science
	Journalism and Audiovisual Communication
	Humanities: Linguistics, Literature, History and Aesthetics
	Humanities: Geography, Contemporary History and Art
	Humanities, Philosophy, Language and literary Theory
7-Engineering	Systems Engineering and Automation
	Thermal and Fluids Engineering
	Computer Science
	Telematic Engineering
	Signal and Communications Theory
	Electrical Engineering
	Electronic Technology
	Mechanical Engineering
	Continuum Mechanics and Structural Analysis
	Materials Science and Engineering and Chemical Engineering
8-Mathematics	Mathematics
10-Social Sciences	Political Science and Sociology
	International Law, Ecclesiastical Law and Philosophy of Law
	Criminal Law, Procedural Law and History of Law
	Private Law
	Public State Law
	Private Social and International Law
	Economics
	Business Administration
	Statistics
	Economic History and Institutions

*NOTE. *Fields of science indicated by OST are translated in English. This scheme is used in all elaborations at scientific area level.*

TABLE 12. OST CLASSIFICATION OF UNIVERSITAT DE BARCELONA DEPARTMENTS

OST classification*	UB Department
1- Life Science	Biochemistry and Molecular Biology
	Genetics
2-Medical Research	Pharmacology and Therapeutic Chemistry
	Pharmacy and Pharmaceutical Technology
	Clinical Sciences

OST classification*	UB Department
	Dentistry and Stomatology
	Obstetrics and Gynecology, Pediatrics, Radiology and Anatomy
	Medicine
3-Applied Biology-Ecology	Ecology
4-Chemistry	Organic Chemistry
	Inorganic Chemistry
5-Physics	Structure and Constituents of Matter
	Fundamental Physics
6-Astronomy and Space Sciences	Astronomy and Meteorology
7-Engineering	Electronics
	Chemical Engineering
8-Mathematics	Applied Mathematics and Analysis
9-Humanities	Painting
	Prehistory, Ancient History and Archaeology
	History of Philosophy, Aesthetics and Cultural Philosophy
	Romance Languages
10-Social Sciences	Library and Information Science
	Personality, Evaluation and Psychological Treatment
	Methods of Research and Diagnosis in Education
	Political Economy and the Public Treasury
	Econometrics, Statistics and Spanish Economy
	Civil Law
	Constitutional Law and Political Science
	Sociological Theory, Philosophy of Law and Methodology of the Social Sciences

*NOTE *Fields of science indicated by OST are translated in English. This scheme is used in all elaborations at scientific area level.*

3.2 DESCRIPTORS AND INDICATORS

In this report a first test of descriptors and indicators produced by the UNIPUB project is described. Descriptors aim at describing some aspects of reality, without adding any interpretation. For instance, measures such as distribution of project proposals by country and counts of publications by institutions are just descriptive information on where proposals and publications come from, without any attempt to use them to track underlying phenomena. Indicators explicitly aim at building the connection between quantified information and non-observable properties. As an example citation statistics are indicators of research quality, patent statistics and R&D investment are indicators of innovation.

According to the availability of information about research outputs in the selected institutional databases five descriptors, described in paragraph 3.2.1, and three indicators, described in paragraph 3.2.2, have been produced.

3.2.1 DESCRIPTORS

DEPARTMENTS PUBLICATIONS PER RESEARCH STAFF

This descriptor aims at measuring the number of publications produced by the research staff. It is measured through the count of products per type and per research staff at Department and at scientific area level according to the OST classification, productivity of University not being considered. All products are considered in the analysis.

DIFFERENTIATION IN RESEARCH PRODUCTION

This descriptor aims at measuring the differentiation in scientific production and the propensity of scientific staff to produce some types of scientific outputs more than others. Different research outputs are counted and weighed on the whole research production, at Department and at scientific area level. All products are considered in the analysis grouped in five main categories: articles, books, chapters in books, communication to conferences (proceedings and papers), other products (editing, PhD thesis, working papers, multimedia products).

NATIONAL/INTERNATIONAL ORIENTATION

This descriptor refers to the national and international orientation of university scientific production. National and international orientation is measured through two criteria: the language of the publication and the relevance self attributed by authors. It is studied at Department and at scientific area level. All products, except for editing, PhD Thesis, working papers, classified in the analysis as “other products” are considered.

ARTICLES ON JOURNALS WITH IMPACT FACTOR OR WITHOUT

This descriptor aims at highlighting whether articles published by the Departments are mainly addressed to journals with or without Impact Factor. The analysis is realized at University level, Department level, scientific area level.

RESEARCH GROUPS COLLABORATIONS: MAGNITUDE OF RESEARCH GROUPS

Collaborations in research products can be detected through the average number of authors per type of publication. This allows measuring the magnitude of research groups collaborating in research outputs. The aim is then to use this descriptor as a proxy of the dimension of research collaborations.

This descriptor is analysed for all types of products, according to five main categories (articles, books, chapter in books, communication to congress, other products which include working papers, editing, PhD thesis and multimedia products when available). The distinction between University internal and external authors is not considered as this information is missing in almost all datasets. It is analyzed at Department and scientific area level.

3.2.2 INDICATORS

REFERENCE COMMUNITY AND AIM OF PUBLICATION

This indicator aims at representing the audience the University' scientific production is mainly addressed to. It also represents a tentative to highlight the main use and type of users of scientific outputs. For instance papers to conferences, working papers and articles on newspapers can be considered as scientific products more devoted to a broad community of people, the society as a whole, while articles on journals and books are considered more addressed to academic people and scientists.

A measure for the aim of publication and the reference community is then the number and type of publications assigned to two different categories of audience as follows:

-scientific/scholar community: articles, books, chapters of books, PhD thesis

-society/professional community: communication to congress (proceedings and conferences papers) working papers, other publications

This indicator is analysed at University level, Department level and scientific area level, considering percentage values and per researcher.

SCIENTIFIC CHARACTERIZATION: BASIC/APPLIED RESEARCH

The indicator tries to capture whether scientific production is mainly basic or applied. The basic or applied nature of scientific production is measured through the use of iPIQ classification, provided NSF (National Science Foundation), which assigns to SCI scientific journals a graduation from one to four (1 very applied, 4 very basic). Only articles published on journals classified in iPIQ have been counted.

The analysis is at University level, Department level and Scientific-area level, considering only hard sciences.

SCIENTIFIC CHARACTERIZATION: REFEREE, NOT REFEREE

This indicator considers only articles on journals and aims at analyzing the propensity to publish in refereed journals compared to non refereed ones. This can be considered a proxy of quality of scientific production. It is measured at University, Department and scientific area level.

4. RESULTS OF THE STUDY

4.1. DESCRIPTOR 1. DEPARTMENT PUBLICATIONS PER RESEARCH STAFF

4.1.1. UNIVERSIDAD CARLOS III DE MADRID

During the period of study 2005-2006 a total of 5946 documents were produced by 1038 UC3M professors. The average productivity was 2,86 publications/professor. Congresses predominate (1,46 congr/prof). Other includes Thesis (table 13).

TABLE 13. PRODUCTIVITY IN EACH DOCUMENT TYPE (UC3M)

UC3M	Articles	Chapters in books	Congresses	Books	Other	Total output 2005-2006	N prof
Total output	1642	761	3038	293	212	5946	1038
Productivity 2005-2006	1,58	0,73	2,93	0,28	0,20	5,73	
Annual average	**0,79**	**0,37**	**1,46**	**0,14**	**0,10**	**2,86**	

DEPARTMENT LEVEL

In table 14 and Figure 14 we see that the largest total output is that of the department of Computer Sciences. Considering the average productivity of UC3M departments-, the most relevant departments are Humanities: Linguistic, Humanities: Philosophy and Private Social and International Law, clearly over the university average.

TABLE 14. PRODUCTIVITY PER DEPARTMENT (UC3M)

Departments	Total output 2005-06	N prof	Pub/prof (annual average)	Productivity per type of document (Annual average)				
				J articles /Prof	Chapters/ Prof	Congress/ Prof	Books/ Prof	Others /Prof
Business Administration	316	66	2,39	0,57	0,13	1,45	0,04	0,21
Computer Sci.	473	119	1,99	0,39	0,09	1,36	0,08	0,07
Continu.Mechan.& Struct. Analysis	33	17	0,97	0,50	0,00	0,47	0,00	0,00
Criminal Law, procedural & Hist. law	104	24	2,17	0,63	0,38	0,65	0,50	0,02
Economy	234	63	1,86	0,60	0,11	0,86	0,02	0,27
Economic History	68	12	2,83	0,58	0,46	1,46	0,00	0,33
Electrical Engineering	70	25	1,40	0,54	0,02	0,80	0,02	0,02
Electronic Technology	187	52	1,80	0,26	0,03	1,44	0,05	0,02
Humanities: Geography & comtemp.hist.	78	18	2,17	0,75	0,58	0,47	0,36	0,00
Humanities: Linguistics, literature	217	19	5,71	1,00	1,29	3,05	0,34	0,03
Humanities: Philosophy	212	19	5,58	1,47	1,24	2,50	0,29	0,08
Internat. Law, Eclesiastic & Philosop.	214	34	3,15	0,56	0,85	1,26	0,38	0,09
Journalism & Audiovisual Communic.	227	46	2,47	0,80	0,38	1,13	0,13	0,02
Library Sci. & Inf. Sci	211	40	2,64	0,68	0,33	1,18	0,31	0,15
Mater. Sci. & Chem. Eng.	247	38	3,25	1,01	0,08	2,14	0,00	0,01
Mathematics	232	35	3,31	1,14	0,03	1,97	0,04	0,13

Departments	Total output 2005-06	N prof	Pub/prof (annual average)	Productivity per type of document (Annual average)				
				J articles /Prof	Chapters/ Prof	Congress/ Prof	Books/ Prof	Others /Prof
Mechanical Engineering	182	48	1,90	0,73	0,10	0,83	0,09	0,14
Physics	117	23	2,54	1,13	0,02	1,37	0,02	0,00
Polit. Sci. & sociology	196	31	3,16	0,53	0,79	1,44	0,39	0,02
Private Law	186	33	2,82	0,97	0,70	0,89	0,21	0,05
Private Social & International Law	241	24	5,02	1,73	1,77	1,23	0,25	0,04
Public State Law	206	39	2,64	0,64	0,78	0,88	0,23	0,10
Signal & Communication Theory	234	48	2,44	0,66	0,09	1,63	0,03	0,03
Statistics	256	61	2,10	0,77	0,07	1,11	0,02	0,12
Systems Engineering & Automation	114	29	1,97	0,28	0,22	1,41	0,03	0,02
Telematics Engineering	254	46	2,76	0,78	0,05	1,76	0,07	0,10
Thermal & Fluids Eng.	76	29	1,31	0,53	0,00	0,74	0,00	0,03

*Note: * number of professors includes all teachers with research activity: Full professors, Tenured professors, Visiting researchers, Assistants and Contract researchers*

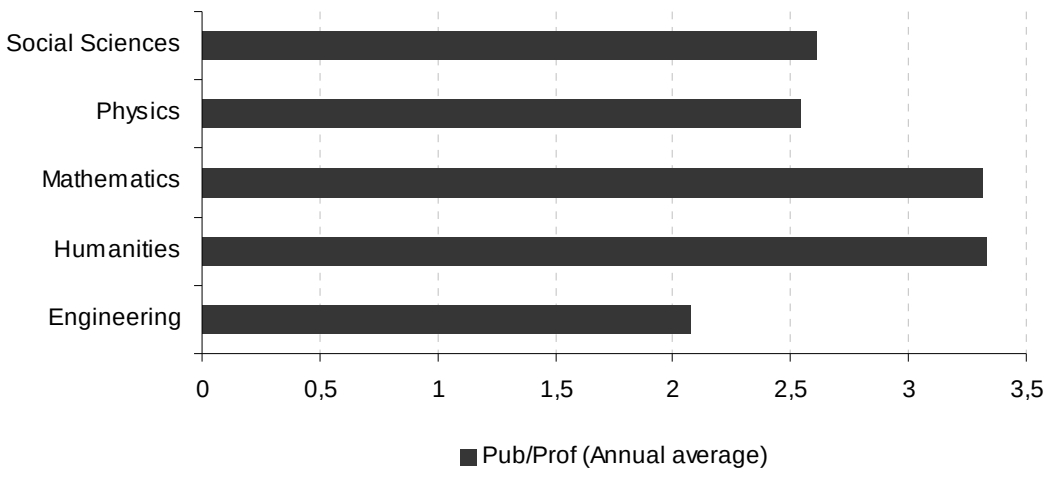
SCIENTIFIC AREA LEVEL

Considering thematic classification we can see that Humanities and Mathematics present the greater number of publications per professor (table 15 and Figure 14).

TABLE 15. PRODUCTIVITY PER THEMATIC AREA (UC3M)

Thematic Area	Total output 2005-2006	Annual average	N professors	Pub/Prof
Engineering	1870	935.0	451	2.07
Humanities	945	472.5	142	3.33
Mathematics	232	116.0	35	3.31
Physics	117	58.5	23	2.54
Social Sciences	2021	1010.5	387	2.61

FIGURE 14. PRODUCTIVITY PER THEMATIC AREA (UC3M)



4.1.2. UNIVERSITAT DE BARCELONA

During the period of study 2005-2006, 7743 documents were produced by 1147 UB professors. The average productivity was 3,38 publications/professor. Article journals predominate (1,39 art./prof). "Others" includes Thesis (Table 16).

TABLE 16. PRODUCTIVITY IN EACH DOCUMENT TYPE (UB)

	Articles	Chapters in books	Congresses	Books	Others	Total output 2005-2006	N prof
Total output 2005-2006	3190	836	3137	300	280	7743	1147
Productivity 2005-2006	2,78	0,73	2,73	0,26	0,24	6,75	
Annual productivity average	**1,39**	**0,36**	**1,37**	**0,13**	**0,12**	**3,38**	

DEPARTMENT LEVEL

In Table 17, we see that the largest total output is that of the department of Medicine. Considering the average productivity of UB departments, the most relevant department is Medicine as well, clearly over the university average.

TABLE 17. **PRODUCTIVITY PER DEPARTMENT (UB)**

Departments	Total output 2005-06	N prof	Pub/prof (annual average)	Productivity per type of document (Annual average)				
				J articles /Prof	Chapters /Prof	Congress /Prof	Books /Prof	Others /Prof
Biochemistry and Molecular Biology	405	65	3,12	1,62	0,14	1,12	0,00	0,23
Genetics	267	39	3,42	1,14	0,05	1,86	0,17	0,21
Pharmacology and Therapeutic Chemistry	390	58	3,36	1,49	0,10	1,58	0,01	0,18
Pharmacy and Pharmaceutical Technology	257	32	4,02	1,08	0,34	2,25	0,22	0,13
Clinical Sciences	92	20	2,30	1,63	0,13	0,53	0,00	0,03
Dentistry and Stomatology	140	13	5,38	1,23	0,12	3,77	0,19	0,08
Obstetrics and Gynecology, Pediatrics, Radiology and Anatomy	145	21	3,45	1,74	0,05	1,57	0,02	0,07
Medicine	444	30	7,40	4,65	0,67	1,78	0,15	0,15
Ecology	259	27	4,80	1,74	0,41	2,46	0,11	0,07
Organic Chemistry	197	54	1,82	1,06	0,02	0,52	0,06	0,18
Inorganic Chemistry	440	43	5,12	2,99	0,02	1,93	0,02	0,15
Structure and Constituents of Matter	433	48	4,51	3,19	0,29	0,85	0,06	0,11
Fundamental Physics	300	62	2,42	1,23	0,12	1,04	0,02	0,02
Astronomy and Meteorology	236	33	3,58	1,41	0,26	1,68	0,05	0,18
Electronics	426	43	4,95	1,72	0,02	3,15	0,01	0,05
Chemical Engineering	249	33	3,77	1,33	0,18	1,97	0,09	0,20
Applied Mathematics and Analysis	157	49	1,60	0,65	0,20	0,70	0,02	0,02
Painting	82	46	0,89	0,18	0,14	0,21	0,24	0,12
Prehistory, Ancient History and Archaeology	395	35	5,64	2,11	1,27	1,61	0,41	0,23

Departments	Total output 2005-06	N prof	Pub/prof (annual average)	Productivity per type of document (Annual average)				
				J articles /Prof	Chapters /Prof	Congress /Prof	Books /Prof	Others /Prof
History of Philosophy, Aesthetics and Cultural Philosophy	263	24	5,48	1,83	1,40	1,63	0,38	0,25
Romance Languages	274	52	2,63	0,95	0,69	0,81	0,13	0,06
Library and Information Science	162	30	2,70	0,98	0,35	1,18	0,08	0,10
Personality, Evaluation and Psychological Treatment	235	31	3,79	1,08	0,35	2,02	0,13	0,21
Methods of Research and Diagnosis in Education	275	49	2,81	0,66	0,36	1,28	0,38	0,13
Political Economy and the Public Treasury	268	47	2,85	0,67	0,41	1,57	0,15	0,04
Econometrics, Statistics and Spanish Economy	248	50	2,48	0,80	0,24	1,11	0,30	0,03
Civil Law	236	35	3,37	0,84	1,31	0,91	0,21	0,09
Constitutional Law and Political Science	195	39	2,50	0,49	0,88	0,86	0,21	0,06
Sociological Theory, Philosophy of Law and Methodology of the Social Sciences	273	39	3,50	1,28	0,86	0,96	0,21	0,19

** NOTE: number of professors includes all teachers with full time dedication to the university and research activity: full professors, tenured professors, assistants and contracted non-tenured teachers.*

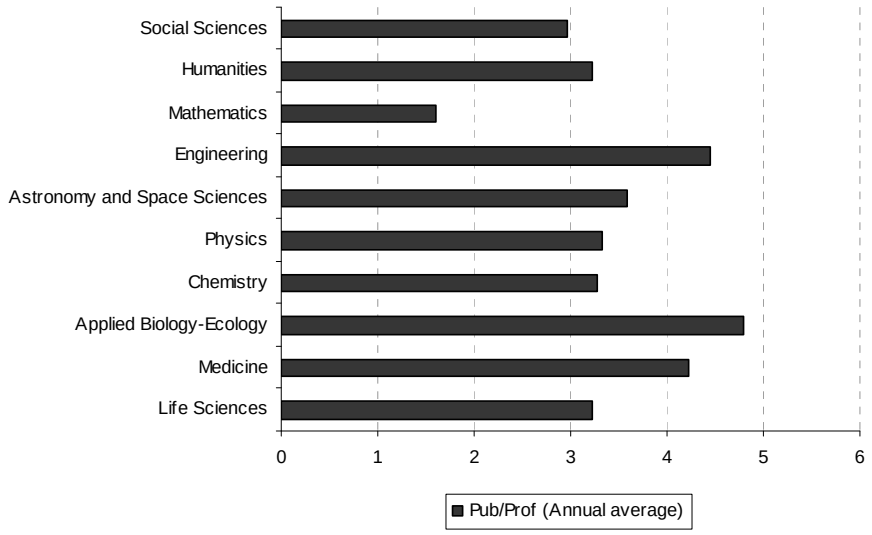
SCIENTIFIC AREA LEVEL

Considering thematic classification we can see that Applied Biology and Engineering present the greater number of publications per professor (4,80 and 4,44), with similar figures for Medicine (4,22).

TABLE 18. **PRODUCTIVITY PER THEMATIC AREA (UB)**

Thematic Area	Total output 2005-2006	Annual average	N profess.	Pub/Prof Annual average
Life Sciences	672	336	104	3,23
Medical Research	1468	734	174	4,22
Applied Biology-Ecology	259	129,5	27	4,80
Chemistry	637	318,5	97	3,28
Physics	733	366,5	110	3,33
Astronomy and Space Sciences	236	118	33	3,58
Engineering	675	337,5	76	4,44
Mathematics	157	78,5	49	1,60
Humanities	1014	507	157	3,23
Social Sciences	1892	946	320	2,96

FIGURE 15. **PRODUCTIVITY PER THEMATIC AREA (UB)**



4.2 DESCRIPTOR 2. DIFFERENTIATION IN SCIENTIFIC PRODUCTION

4.2.1. UNIVERSIDAD CARLOS III DE MADRID

In Carlos III University the congresses are the predominant document type (51%), followed by journal articles with 28% and book chapters (table 19).

TABLE 19. DIFFERENTIATION IN SCIENTIFIC PRODUCTION (UC3M)

UC3M	Articles	Books	Chapters in books	Congresses	Other	Total
N publications 2005-2006	1642	293.0	761.0	3038.0	212.0	5946
N publications (annual average)	821	146.5	380.5	1519.0	106.0	2973
Percentage	27,61	4.9	12.8	51.0	3.6	100

DEPARTMENT LEVEL

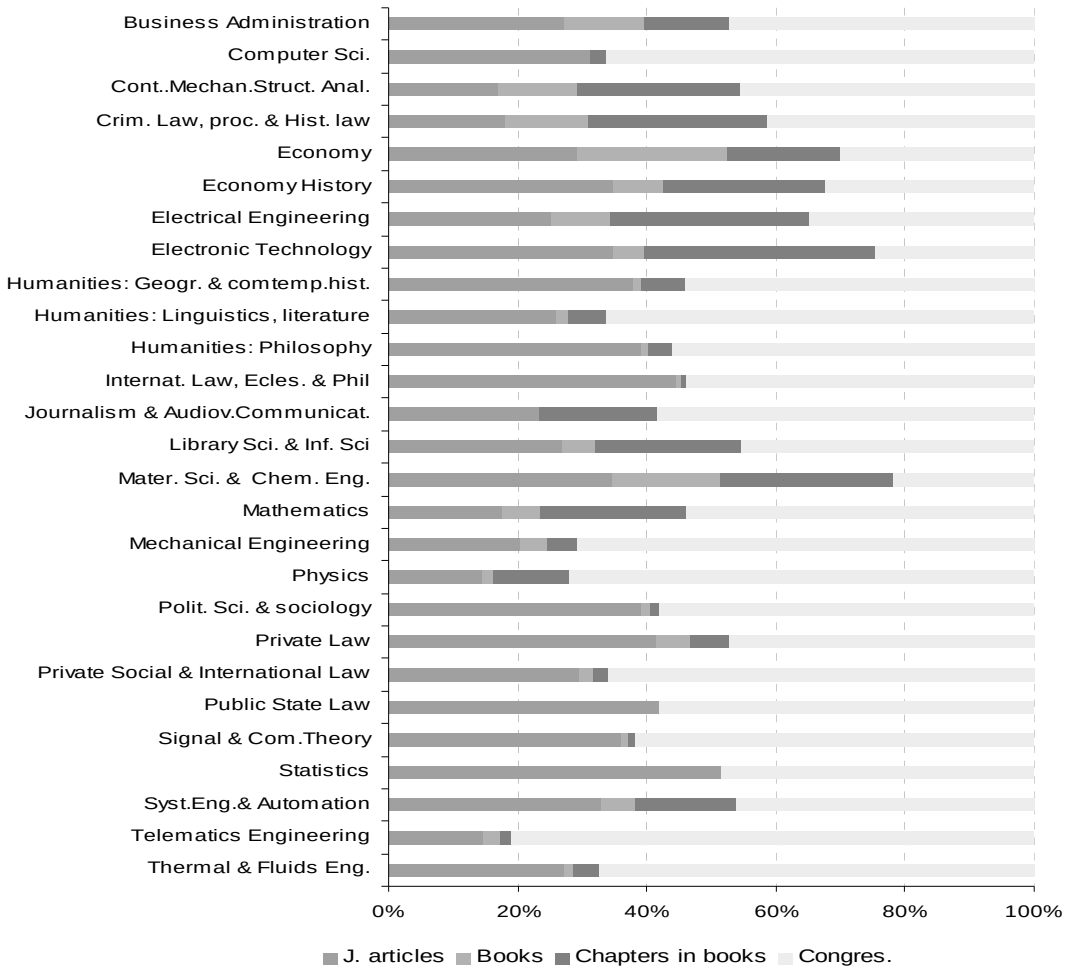
The distribution of scientific production in each department can be appreciated in the following tables. Table 20 shows number of publications per department and percentages of the different document types in the total publications. The department with the highest output is Computer Science. We can observe that –in percentages- journal articles are predominant in the department of Continuum Mechanics, being more than half of its total production. The books are very outstanding in the department of Criminal and Procedural Law where they represent almost one quarter of the production. The chapters in books are important in the departments of Law, Political Science and Humanities, whereas the congresses are the most abundant document type

in almost all the departments and especially in Electronic Technology, Systems Engineering and Signal Theory.

TABLE 20. DIFFERENTIATION IN SCIENTIFIC PRODUCTION PER DEPARTMENT (UC3M)

Departments	Publications		Percentage/total publications			
	2005-2006	Annual average	J. articles	Books	Chapters	Congresses
Business Administration	316	158.00	23.73	1.58	5.38	60.44
Computer Sci.	473	236.50	19.66	4.02	4.44	68.29
Cont..Mechan.Struct. Anal.	33	16.50	51.52	0.00	0.00	48.48
Crim. Law, proc. & Hist. law	104	52.00	28.85	23.08	17.31	29.81
Economy	234	117.00	32.48	0.85	5.98	46.15
Economic History	68	34.00	20.59	0.00	16.18	51.47
Electrical Engineering	70	35.00	38.57	1.43	1.43	57.14
Electronic Technology	187	93.50	14.44	2.67	1.60	80.21
Humanities: Geogr. & comtemp.hist.	78	39.00	34.62	16.67	26.92	21.79
Humanities: Linguistics, literature	217	108.50	17.51	5.99	22.58	53.46
Humanities: Philosophy	212	106.00	26.42	5.19	22.17	44.81
Internat. Law, Ecles. & Phil	214	107.00	17.76	12.15	27.10	40.19
Journalism & Audiov.Communicat.	227	113.50	32.60	5.29	15.42	45.81
Library Sci. & Inf. Sci	211	105.50	25.59	11.85	12.32	44.55
Mater. Sci. & Chem. Eng.	247	123.50	31.17	0.00	2.43	65.99
Mathematics	232	116.00	34.48	1.29	0.86	59.48
Mechanical Engineering	182	91.00	38.46	4.95	5.49	43.96
Physics	117	58.50	44.44	0.85	0.85	53.85
Polit. Sci. & Sociology	196	98.00	16.84	12.24	25.00	45.41
Private Law	186	93.00	34.41	7.53	24.73	31.72
Private Social & International Law	241	120.50	34.44	4.98	35.27	24.48
Public State Law	206	103,00	24,27	8.74	29.61	33.50
Signal & Com.Theory	234	117.00	26.92	1.28	3.85	66.67
Statistics	256	128.00	36.72	1.17	3.52	52.73
Syst.Eng.& Automation	112	56.00	14.29	1.79	11.61	71.43
Telematics Engineering	254	127.00	28.35	2.36	1.97	63.78
Thermal & Fluids Eng.	76	38.00	40.79	0.00	0.00	56.58
Without data	849	424.50	27.09	5.06	17.08	47.11
Summation	**5946**	**2973.00**	**27.54**	**4.87**	**12.63**	**51.43**

FIGURE 16. SCIENTIFIC PRODUCTION OF DEPARTMENTS (UC3M)



Considering the number of pofessors, we can observe that there are departments with a high number of professors, as Computer Sciences. Therefore when calculating productivity, Humanities and Private Social Law show the highest values. This department is important as to its productivity in journal articles and chapters in books. Criminal Law is the most productive department in books; Humanities: Lingüistic and Humanities: Geography are relevant because of their productivity in congresses and Economic History in other document type (table 21).

TABLE 21. PRODUCTIVITY PER DOCUMENT TYPE AND DEPARTMENT (UC3M)

Departments	N prof	Annual average	Productivity	Publications/prof			
				Articles/ prof	Books/ prof	Chapter/ prof	Congress/ prof
Business Administration	66	158.00	2.39	0.57	0.04	0.13	1.45
Computer Sci.	119	236.50	1.99	0.39	0.08	0.09	1.36
Continu.Mechan.& Struct. Analysis	17	16.50	0.97	0.50	0.00	0.00	0.47
Criminal Law. procedural & Hist. law	24	52.00	2.17	0.63	0.50	0.38	0.65
Economy	63	117.00	1.86	0.60	0.02	0.11	0.86
Economic History	12	34.00	2.83	0.58	0.00	0.46	1.46
Electrical Engineering	25	35.00	1.40	0.54	0.02	0.02	0.80

Departments	N prof	Annual average	Productivity	Publications/prof			
				Articles/ prof	Books/ prof	Chapter/ prof	Congress/ prof
Electronic Technology	52	93.50	1.80	0.26	0.05	0.03	1.44
Humanities: Geography & comtemp.hist.	18	39.00	2.17	0.75	0.36	0.58	0.47
Humanities: Linguistics. literature	19	108.50	5.71	1.00	0.34	1.29	3.05
Humanities: Philosophy	19	106.00	5.58	1.47	0.29	1.24	2.50
Internat. Law. Eclesiastic & Philosop.	34	107.00	3.15	0.56	0.38	0.85	1.26
Journalism & Audiovisual Communication	46	113.50	2.47	0.80	0.13	0.38	1.13
Library Sci. & Inf. Sci	40	105.50	2.64	0.68	0.31	0.33	1.18
Mater. Sci. & Chem. Eng.	38	123.50	3.25	1.01	0.00	0.08	2.14
Mathematics	35	116.00	3.31	1.14	0.04	0.03	1.97
Mechanical Engineering	48	91.00	1.90	0.73	0.09	0.10	0.83
Physics	23	58.50	2.54	1.13	0.02	0.02	1.37
Polit. Sci. & sociology	31	98.00	3.16	0.53	0.39	0.79	1.44
Private Law	33	93.00	2.82	0.97	0.21	0.70	0.89
Private Social & International Law	24	120.50	5.02	1.73	0.25	1.77	1.23
Public State Law	39	103.00	2.64	0.64	0.23	0.78	0.88
Signal & Communication Theory	48	117.00	2.44	0.66	0.03	0.09	1.63
Statistics	61	128.00	2.10	0.77	0.02	0.07	1.11
Systems Engineering & Automation	29	56.00	1.93	0.28	0.03	0.22	1.38
Telematics Engineering	46	127.00	2.76	0.78	0.07	0.05	1.76
Thermal & Fluids Eng.	29	38.00	1.31	0.53	0.00	0.00	0.74

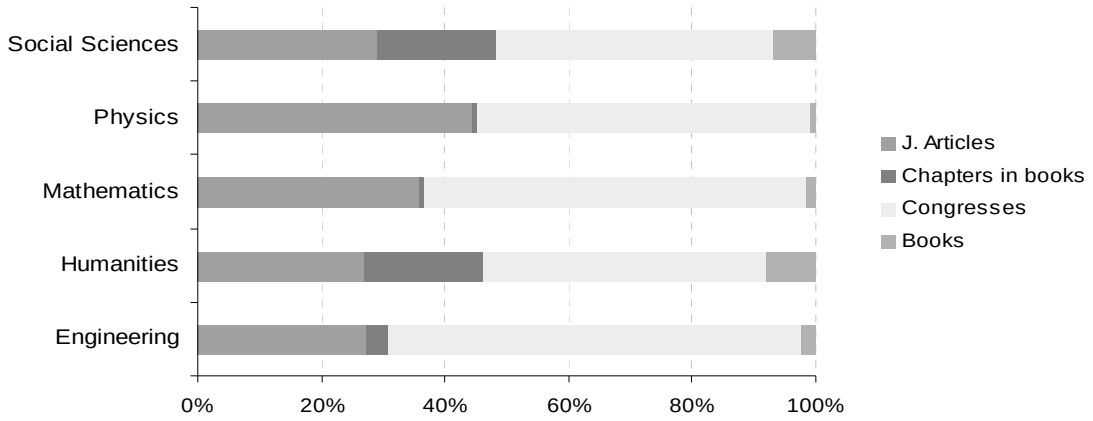
SCIENTIFIC AREA LEVEL

Considering scientific production per thematic area, in table 22 we can observe that congresses and journal articles are the document types more relevant in all areas, particularly congresses in Engineering and journal articles in Physics; books are important in Humanities and Social Sciences.

TABLE 22. DIFFERENTIATION IN SCIENTIFIC PRODUCTION PER THEMATIC AREA (UC3M)

Thematic Area	Annual average	Percentage/total publication			
		J. Articles	Chapters in books	Congresses	Books
Engineering	935.0	26.36	3.64	64.97	2.41
Humanities	472.5	26.35	18.84	45.08	7.83
Mathematics	116.0	34.48	0.86	59.48	1.29
Physics	58.5	44.44	0.85	53.85	0.85
Social Sciences	1010.5	27.56	18.21	42.65	6.33

FIGURE 17. SCIENTIFIC PRODUCTION PER THEMATIC AREA (UC3M)



Productivity per thematic area shows that the greater values are those of congresses in Mathematics (1.97 cong/prof) followed by articles in Mathematics and Physics (Table 23).

TABLE 23. PRODUCTIVITY PER DOCUMENT TYPE AND THEMATIC AREA (UC3M)

Thematic Area	N Prof.	Annual average	Productiv.	Publications/prof			
				J articles/ Prof	Chapters/ Prof	Congress/ Prof	Books/ Prof
Engineering	451	935.00	2.07	0.55	0.08	1.35	0.05
Humanities	142	472.50	3.33	0.88	0.63	1.50	0.26
Mathematics	35	116.00	3.31	1.14	0.03	1.97	0.04
Physics	23	58.50	2.54	1.13	0.02	1.37	0.02
Social Sciences	387	1010.50	2.61	0.72	0.48	1.11	0.17

4.2.2. UNIVERSITAT DE BARCELONA

In UB journal articles are the predominant document type (41,20%), followed by congresses (40,51%), with less that 20% for the other three types of outputs (Table 24).

TABLE 24. DIFFERENTIATION IN SCIENTIFIC PRODUCTION (UB)

UB	Articles	Books	Chapters in books	Congresses	Other	Total
N publications 2005-2006	3190	300	836	3137	280	7743
N publications (annual average)	1595	150	418	1568,5	140	3871,5
Percentage	41,20	3,87	10,80	40,51	3,62	100

DEPARTMENT LEVEL

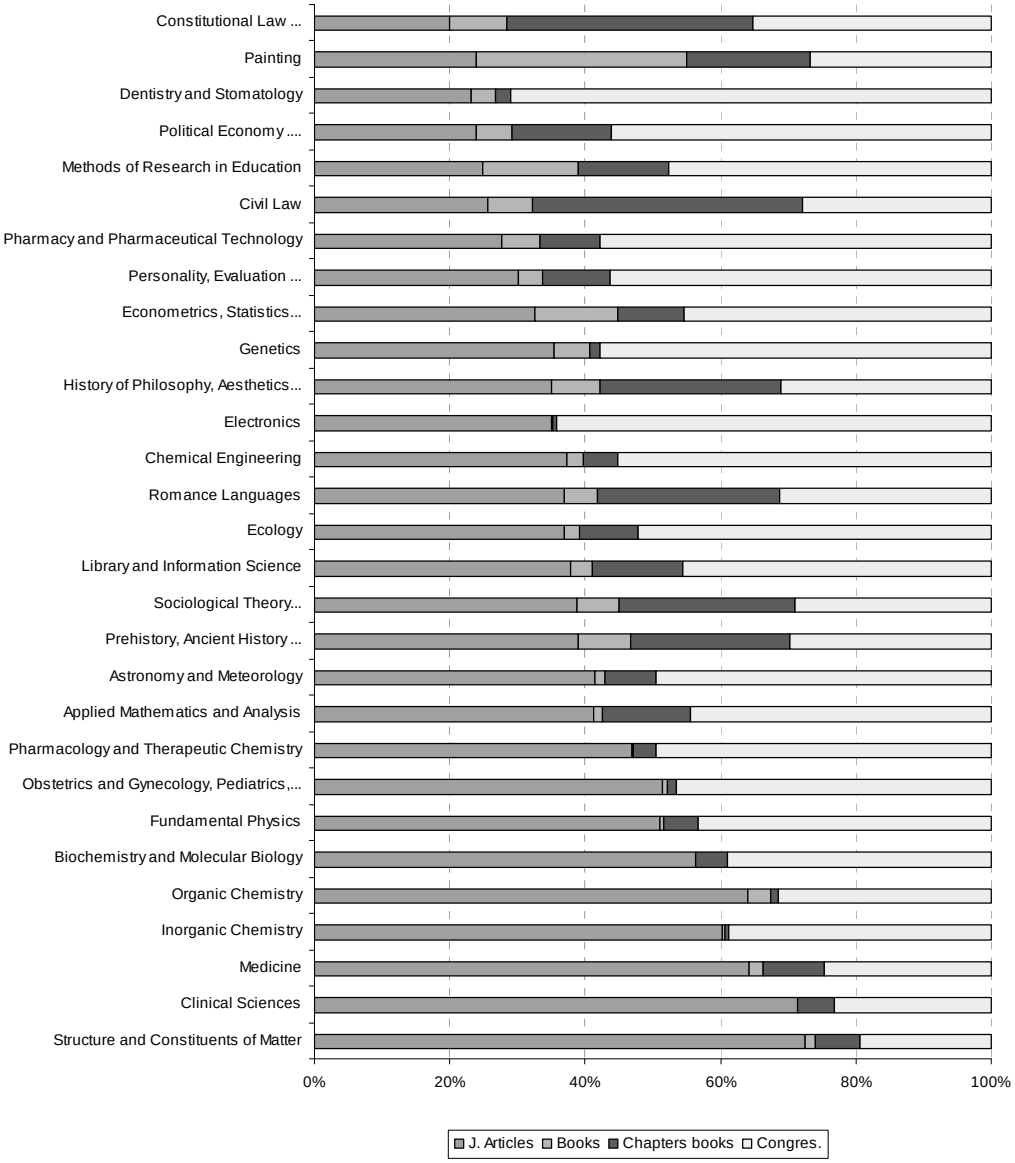
The distribution of scientific production in each department can be appreciated in the following tables. Table 25 and Figure 18 show the number of publications per department and percentages of the different document types in the total of publications. We can observe that –in percentages-

journal articles are clearly predominant in eight departments (all in the areas of natural, biomedical and experimental sciences), with more than half of its total production in journal articles. Books are very outstanding only in one department (Painting) where this type represents almost one quarter of the production. In the case of six departments (all in the areas of social sciences and humanities), chapters in books represent almost one quarter of the production, whereas congresses dominate with more than half of the total production in eight departments from biomedical and experimental sciences as well as from social sciences.

TABLE 25. DIFFERENTIATION IN SCIENTIFIC PRODUCTION PER DEPARTMENT (UB)

Departments	Publications		Percentage/total publications			
	2005-2006	Annual average	J. articles	Books	Chapters	Congresses
Biochemistry and Molecular Biology	405	202,5	52,10	0,00	4,44	36,05
Genetics	267	133,5	33,33	4,87	1,50	54,31
Pharmacology and Therapeutic Chemistry	390	195	44,36	0,26	3,08	46,92
Pharmacy and Pharmaceutical Technology	257	128,5	26,85	5,45	8,56	56,03
Clinical Sciences	92	46	70,65	0,00	5,43	22,83
Dentistry and Stomatology	140	70	22,86	3,57	2,14	70,00
Obstetrics and Gynecology, Pediatrics, Radiology and Anatomy	145	72,5	50,34	0,69	1,38	45,52
Medicine	444	222	62,84	2,03	9,01	24,10
Ecology	259	129,5	36,29	2,32	8,49	51,35
Organic Chemistry	197	98,5	57,87	3,05	1,02	28,43
Inorganic Chemistry	440	220	58,41	0,45	0,45	37,73
Structure and Constituents of Matter	433	216,5	70,67	1,39	6,47	18,94
Fundamental Physics	300	150	50,67	0,67	5,00	43,00
Astronomy and Meteorology	236	118	39,41	1,27	7,20	47,03
Electronics	426	213	34,74	0,23	0,47	63,62
Chemical Engineering	249	124,5	35,34	2,41	4,82	52,21
Applied Mathematics and Analysis	157	78,5	40,76	1,27	12,74	43,95
Painting	82	41	20,73	26,83	15,85	23,17
Prehistory, Ancient History and Archaeology	395	197,5	37,47	7,34	22,53	28,61
History of Philosophy, Aesthetics and Cultural Philosophy	263	131,5	33,46	6,84	25,48	29,66
Romance Languages	274	137	36,13	4,74	26,28	30,66
Library and Information Science	162	81	36,42	3,09	12,96	43,83
Personality, Evaluation and Psychological Treatment	235	117,5	28,51	3,40	9,36	53,19
Methods of Research and Diagnosis in Education	275	137,5	23,64	13,45	12,73	45,45
Political Economy and the Public Treasury	268	134	23,51	5,22	14,55	55,22
Econometrics, Statistics and Spanish Economy	248	124	32,26	12,10	9,68	44,76
Civil Law	236	118	25,00	6,36	38,98	27,12
Constitutional Law and Political Science	195	97,5	19,49	8,21	35,38	34,36
Sociological Theory, Philosophy of Law and Methodology of the Social Sciences	273	136,5	36,63	5,86	24,54	27,47
Summation	**7724**	**3862**	**41,20**	**3,87**	**10,80**	**40,51**

FIGURE 18. SCIENTIFIC PRODUCTION OF DEPARTMENTS (IN ORDER OF JOURNAL ARTICLES SHARE) (UB)



Considering the number of professors (Table 26), we can observe that the rankings of productivity per professor in each typology are almost equal to the share of total production by typology we have analyzed in Table 25.

TABLE 26. PRODUCTIVITY PER DOCUMENT TYPE AND DEPARTMENT (UB)

Departments	N prof	Annual average	Productivity	Publications/prof			
				Articles/ prof	Books/ prof	Chapter/ prof	Congress/ prof
Biochemistry and Molecular Biology	65	202,5	3,12	1,62	0,00	0,14	1,12
Genetics	39	133,5	3,42	1,14	0,17	0,05	1,86

Departments	N prof	Annual average	Productivity	Publications/prof			
				Articles/ prof	Books/ prof	Chapter/ prof	Congress/ prof
Pharmacology and Therapeutic Chemistry	58	195	3,36	1,49	0,01	0,10	1,58
Pharmacy and Pharmaceutical Technology	32	128,5	4,02	1,08	0,22	0,34	2,25
Clinical Sciences	20	46	2,30	1,63	0,00	0,13	0,53
Dentistry and Stomatology	13	70	5,38	1,23	0,19	0,12	3,77
Obstetrics and Gynecology, Pediatrics, Radiology and Anatomy	21	72,5	3,45	1,74	0,02	0,05	1,57
Medicine	30	222	7,40	4,65	0,15	0,67	1,78
Ecology	27	129,5	4,80	1,74	0,11	0,41	2,46
Organic Chemistry	54	98,5	1,82	1,06	0,06	0,02	0,52
Inorganic Chemistry	43	220	5,12	2,99	0,02	0,02	1,93
Structure and Constituents of Matter	48	216,5	4,51	3,19	0,06	0,29	0,85
Fundamental Physics	62	150	2,42	1,23	0,02	0,12	1,04
Astronomy and Meteorology	33	118	3,58	1,41	0,05	0,26	1,68
Electronics	43	213	4,95	1,72	0,01	0,02	3,15
Chemical Engineering	33	124,5	3,77	1,33	0,09	0,18	1,97
Applied Mathematics and Analysis	49	78,5	1,60	0,65	0,02	0,20	0,70
Painting	46	41	0,89	0,18	0,24	0,14	0,21
Prehistory, Ancient History and Archaeology	35	197,5	5,64	2,11	0,41	1,27	1,61
History of Philosophy, Aesthetics and Cultural Philosophy	24	131,5	5,48	1,83	0,38	1,40	1,63
Romance Languages	52	137	2,63	0,95	0,13	0,69	0,81
Library and Information Science	30	81	2,70	0,98	0,08	0,35	1,18
Personality, Evaluation and Psychological Treatment	31	117,5	3,79	1,08	0,13	0,35	2,02
Methods of Research and Diagnosis in Education	49	137,5	2,81	0,66	0,38	0,36	1,28
Political Economy and the Public Treasury	47	134	2,85	0,67	0,15	0,41	1,57
Econometrics, Statistics and Spanish Economy	50	124	2,48	0,80	0,30	0,24	1,11
Civil Law	35	118	3,37	0,84	0,21	1,31	0,91
Constitutional Law and Political Science	39	97,5	2,50	0,49	0,21	0,88	0,86
Sociological Theory, Philosophy of Law and Methodology of the Social Sciences	39	136,5	3,50	1,28	0,21	0,86	0,96

SCIENTIFIC AREA LEVEL

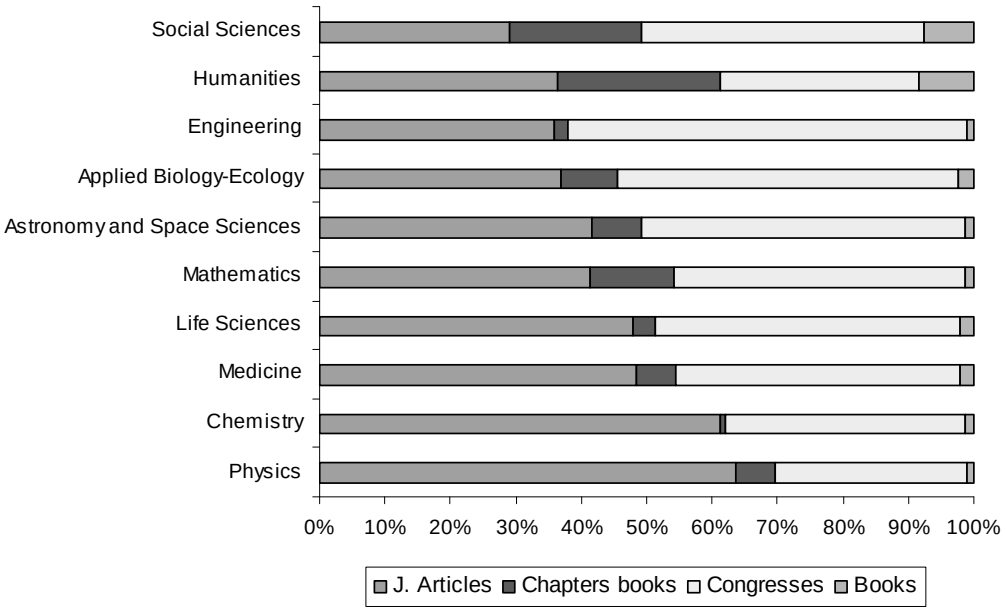
Considering scientific production per thematic area, in Table 27 we can observe that journal articles are the document type more relevant in Life Sciences, Medicine, Chemistry, Physics, and Humanities, but on the other hand in Social Sciences, Astronomy, Applied Biology, Engineering and Mathematics congresses surpass the share of journal articles. Despite they are not dominant,

books and chapters amount to an important share if we add the two types in Humanities (31,86%) and Social Sciences (26,95). These last figures are very consistent with the communication system in these areas, despite journal articles and congresses have a greater share in these areas as well, because the high volume of work needed to publish a book media implies less number of items in this document type.

TABLE 27. DIFFERENTIATION IN SCIENTIFIC PRODUCTION PER THEMATIC AREA (UB)

Thematic Area	Annual average	Percentage/total publication			
		J. Articles	Chapters in books	Congresses	Books
Life Sciences	336	44,64	3,27	43,30	1,93
Medical Reseach	734	47,07	5,72	42,17	2,04
Applied Biology-Ecology	129,5	36,29	8,49	51,35	2,32
Chemistry	318,5	58,24	0,63	34,85	1,26
Physics	366,5	62,48	5,87	28,79	1,09
Astronomy and Space Sciences	118	39,41	7,20	47,03	1,27
Engineering	337,5	34,96	2,07	59,41	1,04
Mathematics	78,5	40,76	12,74	43,95	1,27
Humanities	507	34,71	23,77	28,99	8,09
Social Sciences	946	28,07	19,50	41,54	7,45

FIGURE 19. SCIENTIFIC PRODUCTION PER THEMATIC AREA (IN ORDER OF JOURNAL ARTICLES SHARE) (UB)



Productivity per thematic area shows that the greater values (with more than two items per professor and year) are those of Physics in journal articles; Applied Biology, and Engineering in

congresses. Humanities have the greatest productivity in chapters (0,77) and books (0,26) (Table 28).

TABLE 28. PRODUCTIVITY PER DOCUMENT TYPE AND THEMATIC AREA (UB)

Thematic Area	N Prof.	Annual average	Productivity	Publications/prof			
				J articles/ Prof	Chapters/ Prof	Congress/ Prof	Books/ Prof
Life Sciences	104	336	3,23	1,44	0,11	1,40	0,06
Medical Research	174	734	4,22	1,99	0,24	1,78	0,09
Applied Biology-Ecology	27	129,5	4,80	1,74	0,41	2,46	0,11
Chemistry	97	318,5	3,28	1,91	0,02	1,14	0,04
Physics	110	366,5	3,33	2,08	0,20	0,96	0,04
Astronomy and Space Sciences	33	118	3,58	1,41	0,26	1,68	0,05
Engineering	76	337,5	4,44	1,55	0,09	2,64	0,05
Mathematics	49	78,5	1,60	0,65	0,20	0,70	0,02
Humanities	157	507	3,23	1,12	0,77	0,94	0,26
Social Sciences	320	946	2,96	0,83	0,58	1,23	0,22

4.3 DESCRIPTOR 3. NATIONAL/INTERNATIONAL ORIENTATION

4.3.1. UNIVERSIDAD CARLOS III DE MADRID

To analyze the national or international orientation of scientific publications, different indicators were considered.

Journal articles: in the period 2005-2006 UC3M produced 1642 journal articles. UNIVERSITAS XXI database contains information about language of journals, country of publication and scope of journals (national or international). With this information we can observe that 51% of journal articles were published in Spanish. Amongst the other languages, English predominates. A 58% of the articles have been classified by the authors as of international scope, in agreement with 63% where the country of origin of the publisher is not Spain. This shows a certain trend towards international publication.

Books: 293 books have been published and we have information on the publication language, the scope and country of publication. Considering the language, the majority (96%) has been published in Spanish. Around 90% of books published in the period of analysis have been considered “national publications”. The information on the publication country is present only in 6% of the cases, so it is not possible to obtain relevant conclusions (perhaps it is only registered when the country is not Spain). In this document type, the national scope predominantes.

Chapters in books: in the period of analysis 761 book chapters were produced at UC3M. Although the database includes the field language. no document includes this information. On the contrary, they all include information on international or national scope of the publication: a 75% are locally orientated. As far as publication country, only 16% of the book chapters included this information and in almost all cases the country was not Spain. Although this does not agree with the scope of

the publication, it is not reliable due to the shortage of data. Perhaps when the country is Spain it is not registered. With the data obtained we can consider that this document type is oriented towards the national publication.

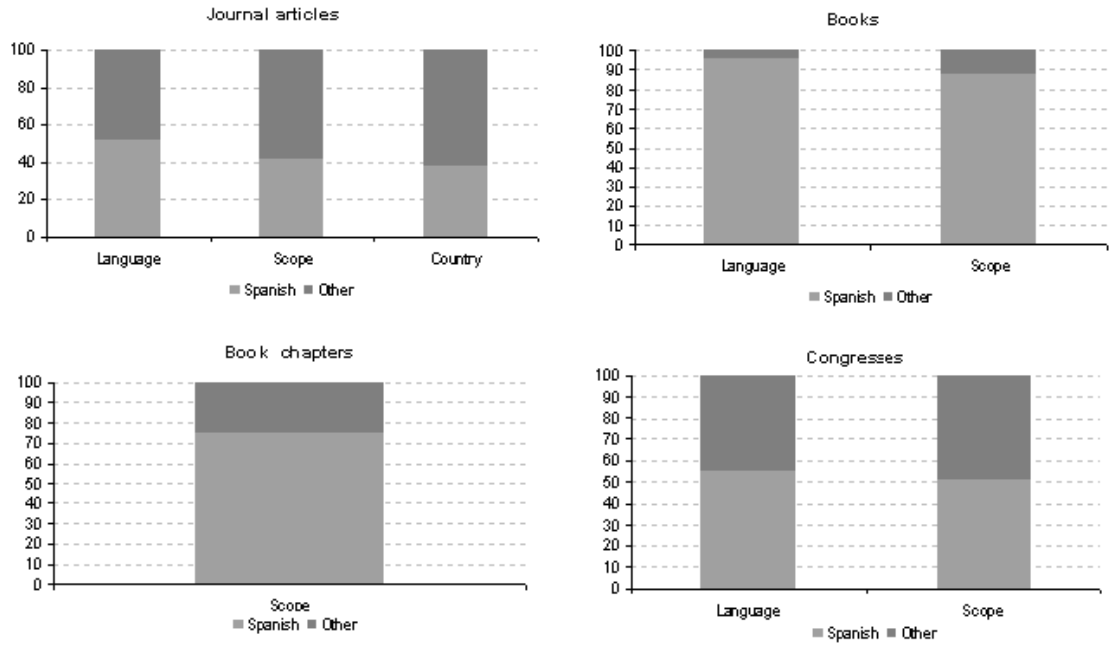
Communications in congresses: during the period of study the UC3M produced 3038 communications in congresses. These publications have information on the official language of the scientific event, the country and the national or international scope. Considering the language we can observe that 55% were in Spanish followed by 45% in English. Considering the scope of the congress, 49% were international. The country of the congress is only registered in half of the documents and only countries other than Spain appear. We can consider a balance in the national-international orientation.

TABLE 29. NATIONAL/INTERNATIONAL ORIENTATION IN EACH DOCUMENT TYPE (ANNUAL AVERAGE) (UC3M)

Indicator	Journal articles		Books		Chapters in books		Comm. congresses	
	Annual average	%	Annual average	%	Annual average	%	Annual average	%
Language								
Spanish	358.5	51.3	137.0	95.8	without data		840.0	55.4
Other	340.0	48.7	6.0	4.2	without data		677.0	44.6
Total with language	698.5	100	143.0	100			1517.0	100
Scope								
National	342.0	41.7	129.0	88.0	283.5	74.5	770.5	50.7
International	479.0	58.3	17.5	11.9	97.0	25.5	748.5	49.3
Total with scope	821.0	100	146.5	100	380.5	100	1519.0	100
Country								
Spain	267.5	37.5	0.5	5.0	2.0	3.4	2.0	0.3
Other	446.0	62.5	9.5	95.0	57.5	96.6	702.0	99.7
Total with country	713.5	100	10.0*	100	59.5*	100	702.0*	100
Total annual	**821.0**		**146.5**		**380.5**		**1519.0**	

*NOTE * low reliability, few cases with information*

FIGURE 20. NATIONAL/INTERNATIONAL ORIENTATION IN EACH DOCUMENT TYPE (UC3M)



DEPARTMENT LEVEL

In order to obtain this indicator at the department level we have chosen to consider only national/international scope because it is most exact and we have data in the majority of the document types. Only data for the publications in which this indicator is relevant are shown, since in Thesis there are no data.

In the case of Journal articles the most relevant are the departments of Theory of the Signal and Physics, where the whole production is of international scope. In table 30 the distribution by department can be appreciated and we have outlined those with more than 80% of their articles of international scope. We can observe that in the departments of Humanities and Law the national orientation predominates.

The trend towards national orientation in the books can be appreciated as, on average, only 13% of publications have an international scope. Eight departments have the whole of their book production of national scope.

The book chapters show also a trend towards national production. The departments of International Law and Public State Law have more than 90% of their production of this document type of national scope. On the contrary, in departments as Statistics and Signal & Communication Theory all book chapters are of international scope.

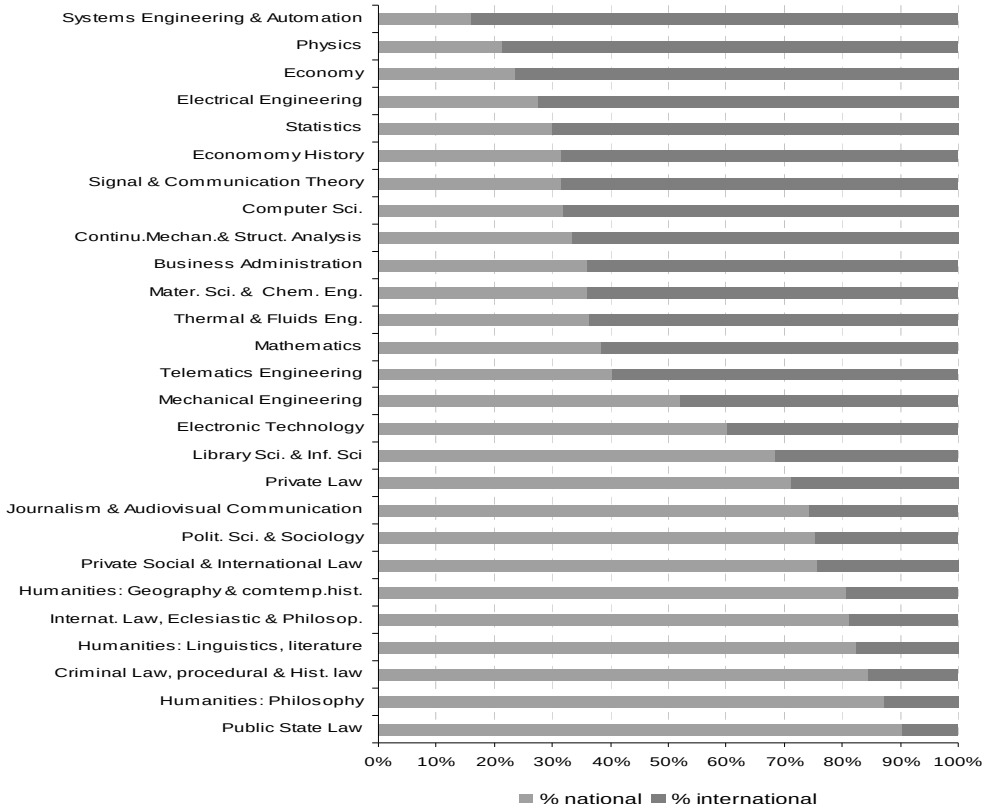
In the case of congresses, there is an equilibrium between national and international scope. Within the first group (national orientation) the departments of Humanities, especially those of Linguistics and Philosophy and Public State Law (with more than 80% of congresses of national scope). On the contrary, only the Department of Systems Engineering & Automation has over 80% of its production of international orientation.

TABLE 30. NATIONAL/INTERNATIONAL ORIENTATION PER DOCUMENT TYPE IN EACH DEPARTMENT (UC3M)

Departments	Journal articles		Books		Chapters in books		Congresses	
	% national	% internat.	% national	% internat.	% national	% internat.	% national	% Internat.
Business Administration	32.00	68.00	100.00	0.00	58.82	41.18	34.03	65.97
Computer Sci.	18.28	81.72	73.68	26.32	23.81	76.19	33.75	66.25
Continu.Mechan.& Struct. Analysis	29.41	70.59			0.00	0.00	37.50	62.50
Criminal Law. procedural & Hist. law	86.67	13.33	87.50	12.50	83.33	16.67	80.65	19.35
Economiy	7.89	92.11	100.00	0.00	50.00	50.00	29.63	70.37
Economic History	57.14	42.86			9.09	90.91	28.57	71.43
Electrical Engineering	18.52	81.48	100.00	0.00	100.00	0.00	30.00	70.00
Electronic Technology	7.41	92.59	80.00	20.00	100.00	0.00	42.00	58.00
Hum.: Geography & comtemp.hist.	88.89	11.11	92.31	7.69	71.43	28.57	70.59	29.41
Hum.: Linguistics. literature	76.32	23.68	84.62	15.38	83.67	16.33	83.62	16.38
Hum.: Philosophy	67.86	32.14	100.00	0.00	93.62	6.38	93.68	6.32
Internat. Law. Eclesiastic & Philosop.	81.58	18.42	96.15	3.85	93.10	6.90	68.60	31.40
Journalism & Audiovisual Comm.	68.92	31.08	100.00	0.00	71.43	28.57	75.96	24.04
Library Sci. & Inf. Sci	74.07	25.93	88.00	12.00	88.46	11.54	54.26	45.74
Mater. Sci. & Chem. Eng.	14.29	85.71			50.00	50.00	46.01	53.99
Mathematics	7.50	92.50	33.33	66.67	100.00	0.00	55.80	44.20
Mechanical Engineering	45.71	54.29	88.89	11.11	50.00	50.00	53.75	46.25
Physics	0.00	100.00	0.00	100.00	100.00	0.00	38.10	61.90
Polit. Sci. & Sociology	69.70	30.30	91.67	8.33	73.47	26.53	74.16	25.84
Private Law	79.69	20.31	100.00	0.00	69.57	30.43	55.93	44.07
Private Social & International Law	79.52	20.48	100.00	0.00	82.35	17.65	55.93	44.07
Public State Law	88.00	12.00	100.00	0.00	93.44	6.56	86.96	13.04
Signal & Communication Theory	0.00	100.00	0.00	100.00	0.00	100.00	33.33	66.67
Statistics	10.64	89.36	66.67	33.33	0.00	100.00	44.44	55.56
Systems Engineering & Automation	18.75	81.25	0.00	100.00	7.69	92.31	17.07	82.93
Telematics Engineering	30.56	69.44	66.67	33.33	100.00	0.00	41.98	58.02
Thermal & Fluids Eng.	25.81	74.19			0.00	0.00	44.19	55.81

Considering the total production, we can see that the departments of Humanities and Law present a national orientation in their publications. On the contrary, the departments of Systems Engineering, Electrical Engineering, Physics and Economy present a greater orientation towards international publication. This trend is also related to the predominant type of documents in each department.

FIGURE 21. NATIONAL/INTERNATIONAL ORIENTATION IN EACH DEPARTMENT (ALL PUBLICATIONS) (UC3M)



Note: Total publications include: Journal articles, books, chapters in books and congresses. N = 5734

LANGUAGE OF THE PUBLICATION CRITERIA

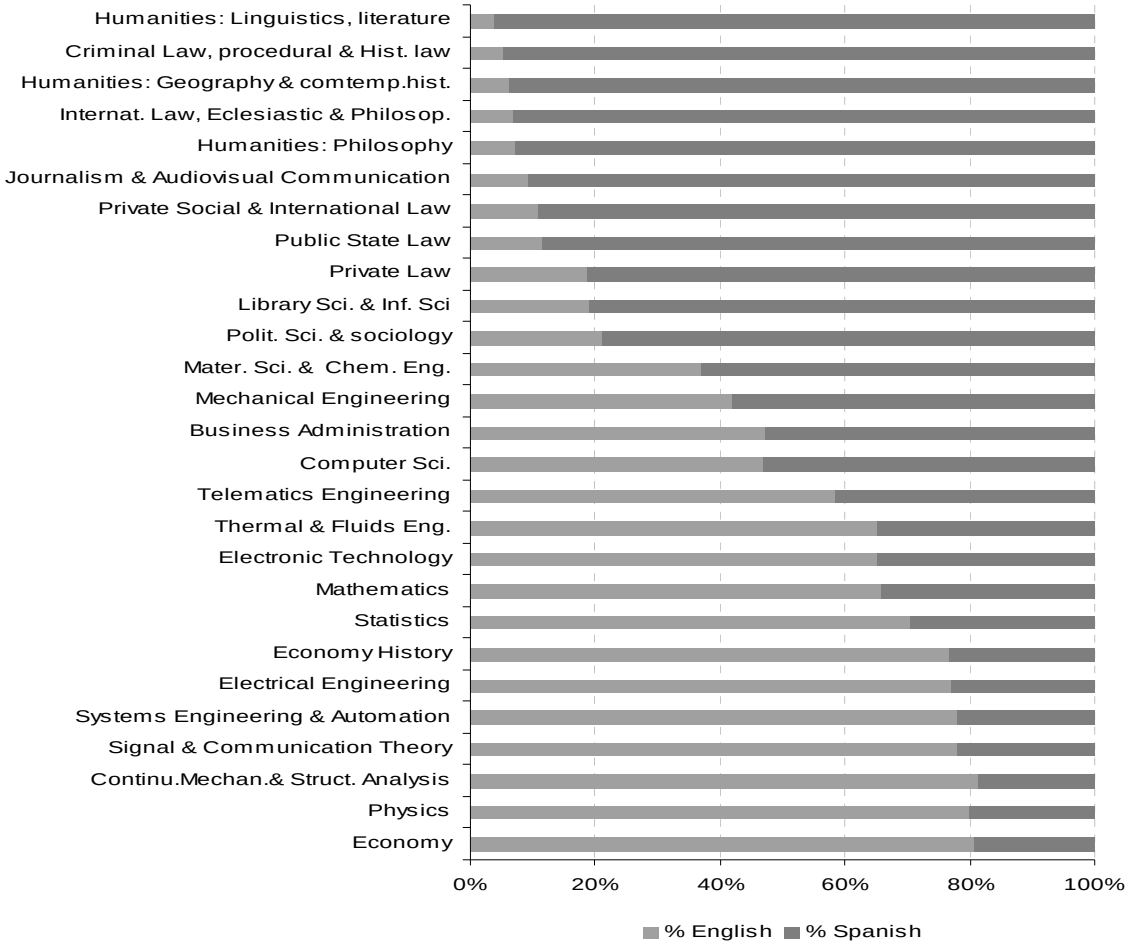
DEPARTMENT LEVEL

Considering publications in Spanish, in journal articles the department of International Law has the greater percentage (91%) while in congresses the highest percentages correspond to departments of Criminal Law, Private Social & International Law, Humanities: Philosophy and Humanities: Geography. In the case of Books the majority of departments have all publications in Spanish. We can observe that publications in English as percentage of total publications, predominate in journal articles in the department of Continuum Mechanic & Structural Analysis (94%) and Electronic Technology (87%), while congresses in English are relevant in Economy (92%), Electrical Engineering, Physics and Systems Engineering; Books are all in English in Physics and in Signal & Communication Theory.

TABLE 31. PUBLICATIONS IN ENGLISH AS PERCENTAGE OF TOTAL PUBLICATIONS PER DEPARTMENTS (UC3M)

Departments	Journal Articles (annual average)			Congresses (annual average)			Books (annual average)		
	N with language	% Spanish	% English	N with language	% Spanish	% English	N with language	% Spanish	% English
Business Administration	35.0	48.57	44.29	93.0	52.15	48.4	2.5	100.00	0.0
Computer Sci.	36.0	50.00	50.00	156.0	51.92	48.08	9.5	100.00	0.0
Continu.Mechan.& Struct. Analysis	8.5	5.88	94.12	8.0	31.25	62.5	0.0	--	--
Criminal Law. proc. & Hist. law	11.5	78.26	17.39	15.5	100.00	0.0	12.0	100.00	0.0
Economy	37.0	35.14	63.51	53.5	7.48	92.5	1.0	50.00	50.0
Economic History	4.0	75.00	25.00	17.5	11.43	88.6	0.0	--	--
Electrical Engineering	12.0	25.00	75.00	20.0	20.00	80.0	0.5	100.00	0.0
Electronic Technology	11.5	13.04	86.96	75.0	36.67	63.3	2.5	80.00	20.0
Hum.: Geography & comtemp.hist.	9.5	84.21	15.79	8.5	100.00	0.0	6.0	100.00	0.0
Hum.: Linguistics. literature	16.0	75.00	18.75	58.0	99.14	0.0	7.0	100.00	0.0
Hum.: Philosophy	23.5	68.09	21.28	46.0	100.00	0.0	3.0	100.00	0.0
Internat. Law. Ecles. Philosop.	17.5	91.43	5.71	43.0	90.70	9.3	13.0	100.00	0.0
Journalism & Audiovisual Comm.	34.0	75.00	22.06	53.5	94.39	1.9	6.0	100.00	0.0
Library Sci. & Inf. Sci	22.0	68.18	27.27	47.0	77.66	19.1	12.5	100.00	0.0
Mater. Sci. & Chem. Eng.	34.0	51.47	48.53	81.0	67.90	32.1	0.0	--	--
Mathematics	28.5	22.81	75.44	69.0	38.41	61.6	1.5	33.33	66.7
Mechanical Engineering	28.5	52.63	45.61	40.0	60.00	40.0	4.5	100.00	0.0
Physics	17.0	38.24	61.76	30.0	10.00	88.3	0.5	0.00	100.0
Polit. Sci. & sociology	15.5	70.97	22.58	44.5	70.79	23.6	12.0	95.83	4.2
Private Law	22.0	77.27	18.18	29.5	74.58	22.0	7.0	100.00	0.0
Private Social & International Law	38.0	71.05	19.74	29.5	100.00	0.0	6.0	100.00	0.0
Public State Law	24.5	63.27	30.61	34.5	98.55	0.0	9.0	100.00	0.0
Signal & Communication Theory	29.0	25.86	74.14	78.0	21.15	78.8	1.5	0.00	100.0
Statistics	42.0	28.57	67.86	67.5	27.41	71.9	1.5	100.00	0.0
Systems Engineering & Automation	6.0	25.00	66.67	41.0	19.51	80.5	1.0	100.00	0.0
Telematics Engineering	34.5	26.09	73.91	79.0	46.84	53.2	3.0	83.33	16.7
Thermal & Fluids Eng.	11.5	43.48	56.52	21.5	30.23	69.8	0.0	--	--

FIGURE 22. LANGUAGE OF PUBLICATIONS PER DEPARTMENTS (UC3M)



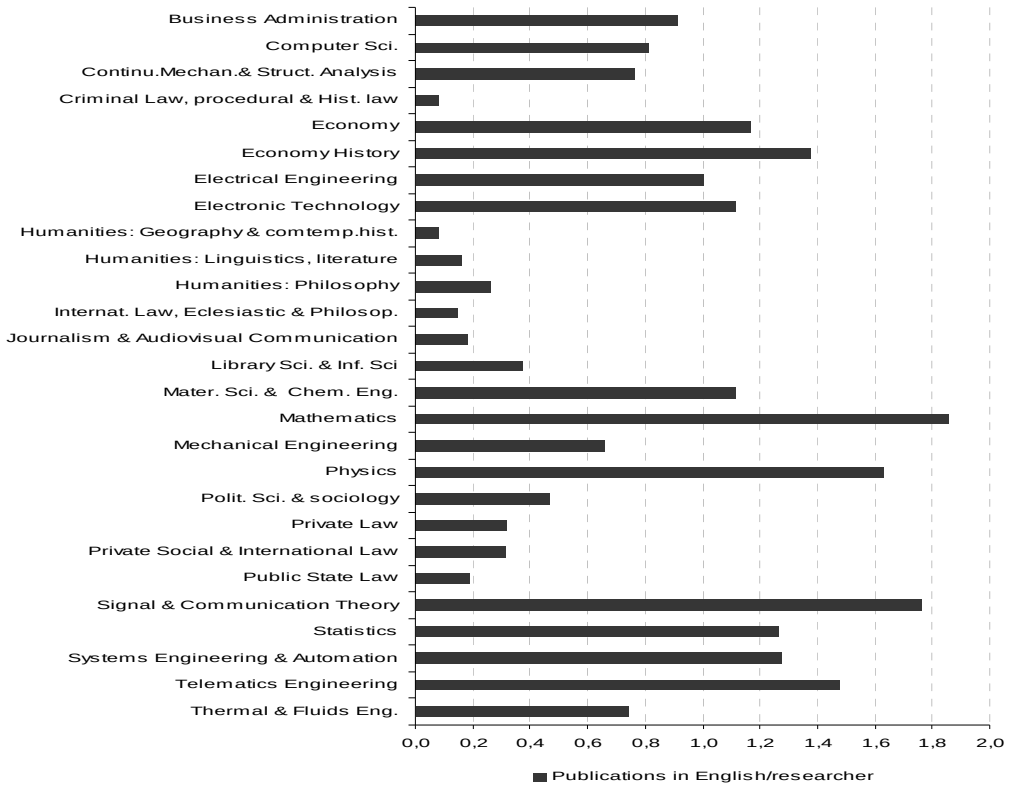
Considering publications in English per professor, the higher values are shown in the departments of Mathematics and Signal & Communications Theory (Table 32).

TABLE 32. PUBLICATIONS IN ENGLISH PER RESEARCHER AND DEPARTMENTS (UC3M)

Departments	N public. (annual average)	Public. in English	% Public. in English	N prof	Publ. English/ professor
Library Sci. & Inf. Sci	81.5	15.0	18.4	40	0.4
Mater. Sci. & Chem. Eng.	115.0	42.5	37.0	38	1.1
Polit. Sci. & sociology	72.0	14.5	20.1	31	0.5
Internat. Law. Eclesiastic & Philosop.	73.5	5.0	6.8	34	0.1
Criminal Law. procedural & Hist. law	39.0	2.0	5.1	24	0.1
Private Law	58.5	10.5	17.9	33	0.3
Public State Law	68.0	7.5	11.0	39	0.2
Private Social & International Law	73.5	7.5	10.2	24	0.3
Economy	91.5	73.5	80.3	63	1.2
Business Administration	130.5	60.5	46.4	66	0.9
Statistics	111.0	77.0	69.4	61	1.3

Departments	N public. (annual average)	Public. in English	% Public. in English	N prof	Publ. English/ professor
Physics	47.5	37.5	78.9	23	1.6
Economic History	21.5	16.5	76.7	12	1.4
Humanities: Philosophy	72.5	5.0	6.9	19	0.3
Humanities: Geography & comtemp.hist.	24.0	1.5	6.3	18	0.1
Humanities: Linguistics. literature	81.0	3.0	3.7	19	0.2
Computer Sci.	201.5	96.5	47.9	119	0.8
Systems Engineering & Automation	48.0	37.0	77.1	29	1.3
Electrical Engineering	32.5	25.0	76.9	25	1.0
Mechanical Engineering	73.0	31.5	43.2	48	0.7
Telematics Engineering	116.5	68.0	58.4	46	1.5
Thermal & Fluids Eng.	33.0	21.5	65.2	29	0.7
Mathematics	99.0	65.0	65.7	35	1.9
Continu.Mechan.& Struct. Analysis	16.5	13.0	78.8	17	0.8
Journalism & Audiovisual Communication	93.5	8.5	9.1	46	0.2
Electronic Technology	89.0	58.0	65.2	52	1.1
Signal & Communication Theory	108.5	84.5	77.9	48	1.8

FIGURE 23. PRODUCTIVITY OF ENGLISH PUBLICATIONS (UC3M)



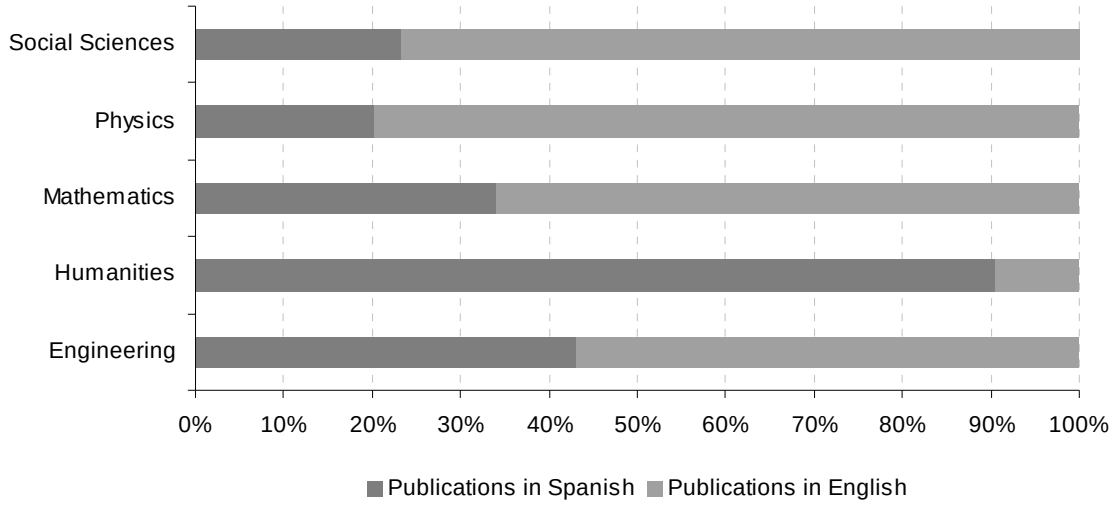
SCIENTIFIC AREA LEVEL

The distribution of language per thematic area shows that Humanities has the highest percentage of publications in Spanish (88%) and Physics presents the greater percentage of publications in English (79%).

TABLE 33. PERCENTAGE OF PUBLICATIONS IN SPANISH AND ENGLISH PER THEMATIC AREA (UC3M)

Thematic area	Publications in Spanish (annual average)	Publications in English (annual average)	Total	% in Spanish	% in English
Engineering	722	955	1667	43.31	57.29
Humanities	623	66	705	88.37	9.36
Mathematics	67	130	198	33.84	65.66
Physics	19	75	95	20.00	78.95
Social Sciences	10	33	43	23.26	76.74

FIGURE 24. LANGUAGE OF PUBLICATIONS PER THEMATIC AREA (UC3M)

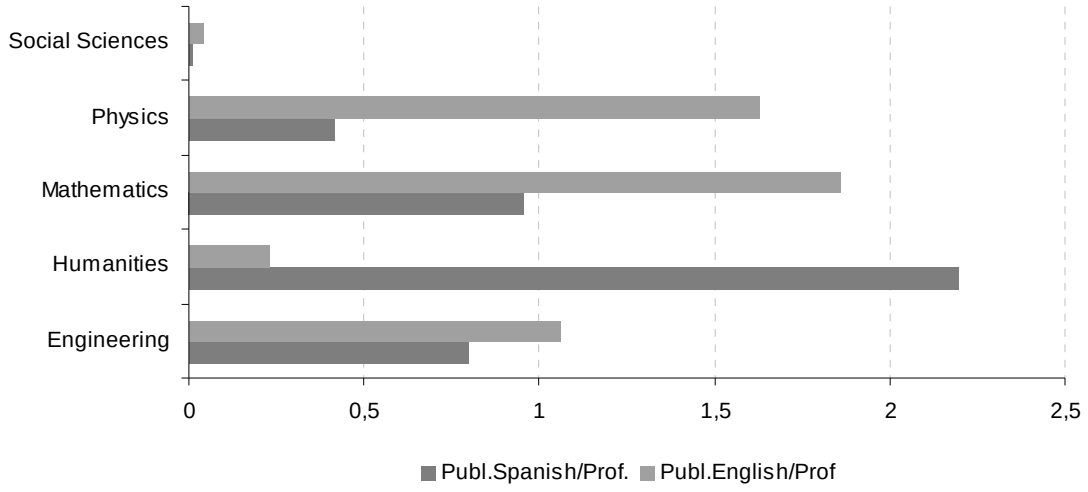


Considering productivity by language and thematic area, high values of publications in Spanish are found in Humanities (2.19 pub/prof), while productivity in English is higher in Mathematics and Physics (1.86; 1.63 pub/prof).

TABLE 34. PRODUCTIVITY IN SPANISH AND ENGLISH PER THEMATIC AREA (UC3M)

Thematic area	N prof	Publ. in Spanish/prof	Publ.in English/prof
Engineering	451	0.80	1.06
Humanities	142	2.19	0.23
Mathematics	35	0.96	1.86
Physics	23	0.41	1.63
Social Sciences	387	0.01	0.04

FIGURE 25. PRODUCTIVITY IN SPANISH AND ENGLISH PER THEMATIC AREA (UC3M)



4.3.2. UNIVERSITAT DE BARCELONA

To analyze the national or international orientation of scientific publications, different indicators were considered (Table 35). GREC does not include information about languages; therefore it is not possible to analyze this indicator with this source to study the national/international orientation.

Journal articles: In the period, 2005-2006 GREC traces a production of 3190 journal articles. GREC database contains information about country of publication and scope of journals (national or international), but not about language of the article. With this information we can observe that 74% of the articles have been classified by the authors as international, in agreement with 71,29% where the country of origin of the publisher is not Spain. This shows a certain trend towards international publication.

Books: We have information on the scope and country of publication for 300 books. Around 84% of books published in the period of analysis have been considered "national publications", in agreement with 90,94% where the country of origin of the publisher is Spain. This shows, maybe, a certain trend towards national publication, but when the language is Spanish (we do not have these data) it is not easy to state the scope if it is international or national. In some cases, there is confusion on the judgement on the nature of national/international scope: not all books published in Spain are national in scope; it depends of the international distribution of the book, and the individual researcher who fills the form in CV does not know these data.

Chapters in books: in the period of analysis 835 book chapters were produced at UB and 60,65% are locally oriented, in agreement with 70,90% where the country of origin of the publisher is Spain. With the data obtained, we can consider that this document type is slightly oriented towards the national publication.

Communications in congresses: During the period of study, the UB produced 3137 communications in congresses. These publications have information on the country and the

national or international scope. Considering the scope of the congress, 60,57% were international, despite Spain as a country of the congress dominates (60,57%). The data of the country of the congress is consistent with the scope, because many international congresses choose Spain as venue, and Spanish researchers take advantage of that. So that, we can consider there is equilibrium in the national-international orientation.

TABLE 35. NATIONAL/INTERNATIONAL ORIENTATION IN EACH DOCUMENT TYPE (ANNUAL AVERAGE) (UB)

Indicator	Journal articles		Books		Chapters in books		Comm. congresses	
	Annual average	%	Annual average	%	Annual average	%	Annual average	%
Language								
Spanish	without data		without data		without data		without data	
Other	without data		without data		without data		without data	
Total with language	0		0		0		0	
Scope								
National	830	26,00	252	84,00	507	60,65	1163	37,07
International	2360	74,00	48	16,00	329	39,35	1974	62,93
Total with scope	3190	100	300	100	836	100	3137	100
Country								
Spain	916	28,71	271	90,94	592	70,90	1900	60,57
Other	2274	71,29	27	9,06	243	29,10	1237	39.43
Total with country	3190	100	298	100	835	100	3137	100
Total annual	**3190**		**300**		**836**		**3137**	

DEPARTMENT LEVEL

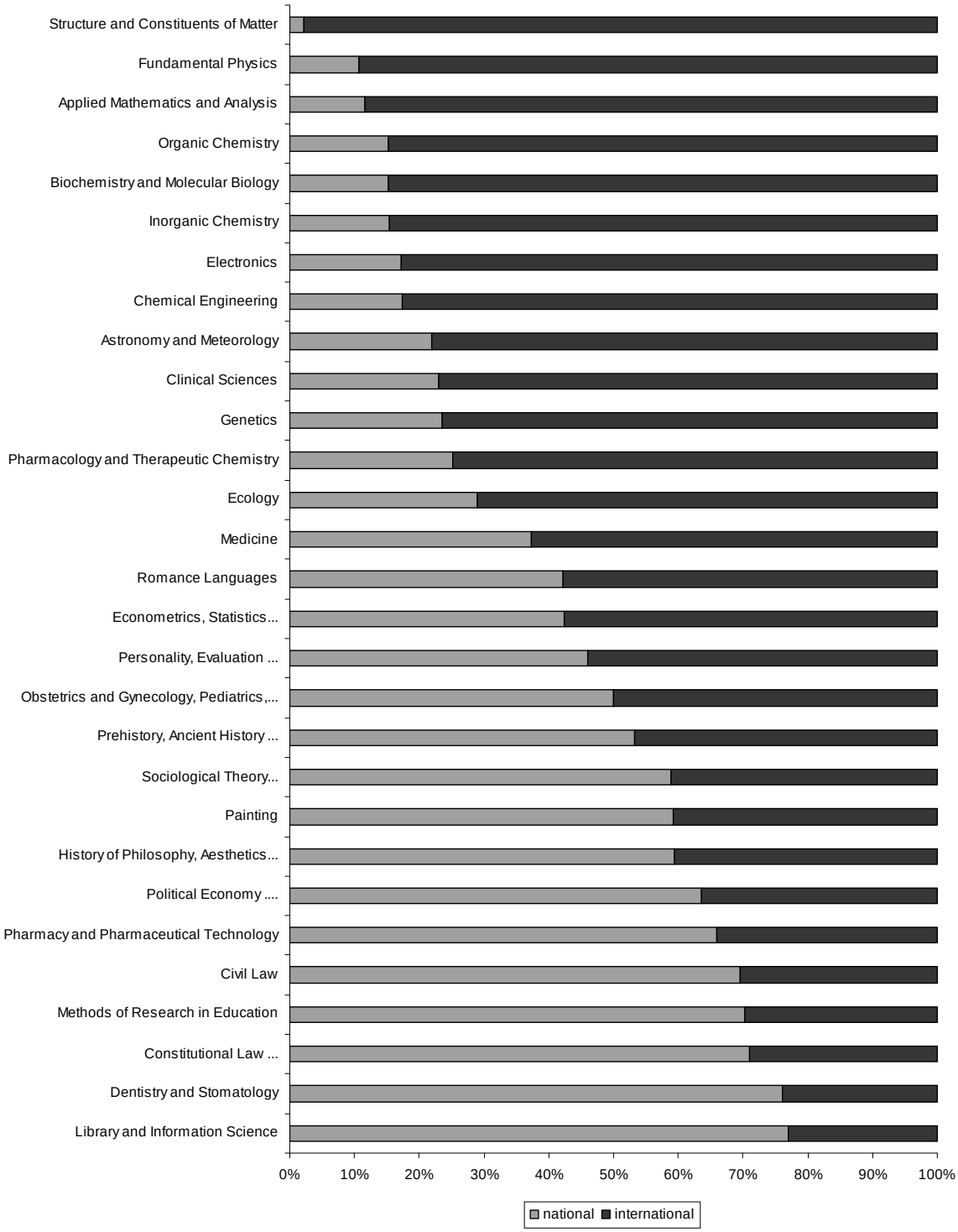
We think that for GREC, the significance of the international scope at department level is more reliable in journals, so that we focus our analysis for this orientation in this document type. In the case of journal articles, almost the whole production of 10 departments is international, with less than 10% of national articles. Furthermore, two departments (Electronic and Organic Chemistry) have their 100% of articles in the international area. In Table 4.14, the distribution by department can be appreciated and we have outlined those with more than 80% of their articles of international scope.

The trend towards national orientation in the books can be appreciated as, on average, only 16% of publications have an international scope. 18 departments have 80% or more of their book production of national scope. The book chapters show also a trend towards national production. In the case of congresses, there is equilibrium between national and international scope.

TABLE 36. NATIONAL/INTERNATIONAL ORIENTATION PER DOCUMENT TYPE IN EACH DEPARTMENT (UB)

Departments	Journal articles		Books		Chapters in books		Congresses	
	% national	% internat.	% national	% internat.	% national	% internat.	% national	% Internat.
Biochemistry and Molecular Biology	1,90	98,10	NA	NA	11,11	88,89	34,93	65,07
Genetics	3,37	96,63	92,31	7,69	0,00	100,00	30,34	69,66
Pharmacology and Therapeutic Chemistry	10,40	89,60	100,00	0,00	41,67	58,33	37,70	62,30
Pharmacy and Pharmaceutical Technology	68,12	31,88	100,00	0,00	81,82	18,18	59,03	40,97
Clinical Sciences	7,69	92,31	NA	NA	80,00	20,00	57,14	42,86
Dentistry and Stomatology	56,25	43,75	100,00	0,00	100,00	0,00	80,61	19,39
Obstetrics and Gynecology, Pediatrics, Radiology and Anatomy	30,14	69,86	100,00	0,00	100,00	0,00	69,70	30,30
Medicine	27,60	72,40	88,89	11,11	82,50	17,50	41,12	58,88
Ecology	13,83	86,17	66,67	33,33	72,73	27,27	30,83	69,17
Organic Chemistry	0,00	100,00	100,00	0,00	0,00	100,00	37,50	62,50
Inorganic Chemistry	1,95	98,05	100,00	0,00	0,00	100,00	35,54	64,46
Structure and Constituents of Matter	1,31	98,69	33,33	66,67	0,00	100,00	3,66	96,34
Fundamental Physics	2,63	97,37	50,00	50,00	46,67	53,33	15,50	84,50
Astronomy and Meteorology	9,68	90,32	100,00	0,00	17,65	82,35	30,63	69,37
Electronics	0,00	100,00	0,00	100,00	0,00	100,00	26,94	73,06
Chemical Engineering	17,05	82,95	100,00	0,00	41,67	58,33	11,54	88,46
Applied Mathematics and Analysis	1,56	98,44	50,00	50,00	10,00	90,00	20,29	79,71
Painting	82,35	17,65	68,18	31,82	61,54	38,46	26,32	73,68
Prehistory, Ancient History and Archaeology	67,57	32,43	75,86	24,14	58,43	41,57	24,78	75,22
History of Philosophy, Aesthetics and Cultural Philosophy	67,05	32,95	83,33	16,67	73,13	26,87	33,33	66,67
Romance Languages	60,61	39,39	84,62	15,38	38,89	61,11	16,67	83,33
Library and Information Science	88,14	11,86	80,00	20,00	66,67	33,33	70,42	29,58
Personality, Evaluation and Psychological Treatment	41,79	58,21	100,00	0,00	68,18	31,82	40,80	59,20
Methods of Research and Diagnosis in Education	72,31	27,69	97,30	2,70	80,00	20,00	58,40	41,60
Political Economy and the Public Treasury	77,78	22,22	71,43	28,57	87,18	12,82	50,68	49,32
Econometrics, Statistics and Spanish Economy	40,00	60,00	90,00	10,00	54,17	45,83	28,83	71,17
Civil Law	83,05	16,95	100,00	0,00	71,74	28,26	46,88	53,13
Constitutional Law and Political Science	78,95	21,05	81,25	18,75	84,06	15,94	50,75	49,25
Sociological Theory, Philosophy of Law and Methodology of the Social Sciences	65,00	35,00	62,50	37,50	62,69	37,31	46,67	53,33

FIGURE 26. NATIONAL/INTERNATIONAL ORIENTATION IN EACH DEPARTMENT (FOR ALL PUBLICATIONS IN ORDER OF INTERNATIONAL SHARE) (UB)



Considering the total production (Figure 26), we can see that the trend is that the departments of Humanities and Social Sciences present a national orientation in their publications, and the departments of Experimental and Biomedical Sciences present a greater orientation towards international publication. This trend is also related to the predominant type of documents in each department, as well as with the degree of co-authorship.

4.4 DESCRIPTOR 4: IF/NON IF

4.4.1. UNIVERSIDAD CARLOS III DE MADRID

UNIVERSITY LEVEL

UNIVERSITAS XXI database includes information on the IF for each journal. These data are loaded automatically when the researcher selects from a list the name of the journal. Nevertheless, we have detected some errors in this information. Therefore the data have been obtained directly from the Journal Citation Reports (JCR) from Thomson-Reuters for SCI and SSCI. We matched the titles of the journals included in this database -between 1997 and 2007- with the titles of journals where UC3M professors published between 2005 and 2006. The data show that considering the total journal articles, 34% were published in journals with IF (table 37).

TABLE 37. JOURNAL ARTICLES WITH IF (UC3M)

UC3M	Journal articles	Articles with IF	%
Total publications	1642	563.0	34.29
Annual average	821	281.5	34.29

DEPARTMENT LEVEL

TABLE 38. JOURNAL ARTICLES WITH IF (ANNUAL AVERAGE) (UC3M)

Departments	Journal articles	Articles with IF	Articles without IF	% articles with IF	% articles without IF
Business Administration	37.5	10.5	27.0	28.0	72.0
Computer Sci.	46.5	15.5	31.0	33.3	66.7
Continu.Mechan.& Struct. Analysis	8.5	5.0	3.5	58.8	41.2
Criminal Law. procedural & Hist. law	15.0	0.0	15.0	0.0	100.0
Economy	38.0	21.0	17.0	55.3	44.7
Economic History	7.0	1.5	5.5	21.4	78.6
Electrical Engineering	13.5	7.0	6.5	51.9	48.1
Electronic Technology	13.5	10.0	3.5	74.1	25.9
Humanities: Geography & comtemp.hist.	13.5	0.0	13.5	0.0	100.0
Humanities: Linguistics. literature	19.0	0.0	19.0	0.0	100.0
Humanities: Philosophy	28.0	0.0	28.0	0.0	100.0
Internat. Law. Eclesiastic & Philosop.	19.0	0.0	19.0	0.0	100.0
Journalism & Audiovisual Communication	37.0	0.0	37.0	0.0	100.0
Library Sci. & Inf. Sci	27.0	1.5	25.5	5.6	94.4
Mater. Sci. & Chem. Eng.	38.5	25.0	13.5	64.9	35.1
Mathematics	40.0	32.0	8.0	80.0	20.0
Mechanical Engineering	35.0	16.5	18.5	47.1	52.9

Departments	Journal articles	Articles with IF	Articles without IF	% articles with IF	% articles without IF
Physics	26.0	22.0	4.0	84.6	15.4
Polit. Sci. & sociology	16.5	1.0	15.5	6.1	93.9
Private Law	32.0	0.0	32.0	0.0	100.0
Private Social & International Law	41.5	0.0	41.5	0.0	100.0
Public State Law	25.0	0.0	25.0	0.0	100.0
Signal & Communication Theory	31.5	25.0	6.5	79.4	20.6
Statistics	47.0	29.5	17.5	62.8	37.2
Systems Engineering & Automation	8.0	4.0	4.0	50.0	50.0
Telematics Engineering	36.0	21.0	15.0	58.3	41.7
Thermal & Fluids Eng.	15.5	8.0	7.5	51.6	48.4

FIGURE 27. ARTICLES WITH AND WITHOUT IF PER DEPARTMENTS (UC3M)

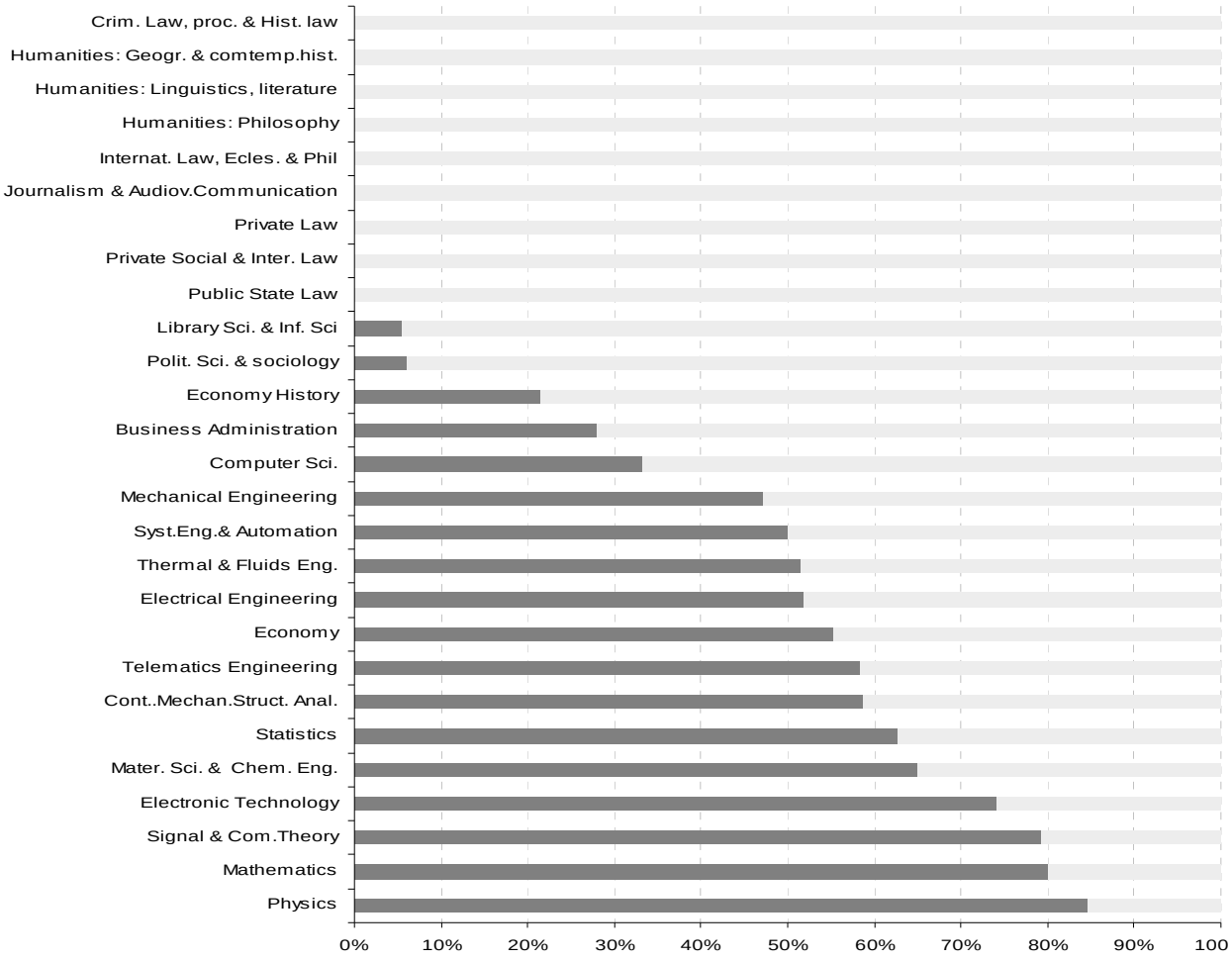
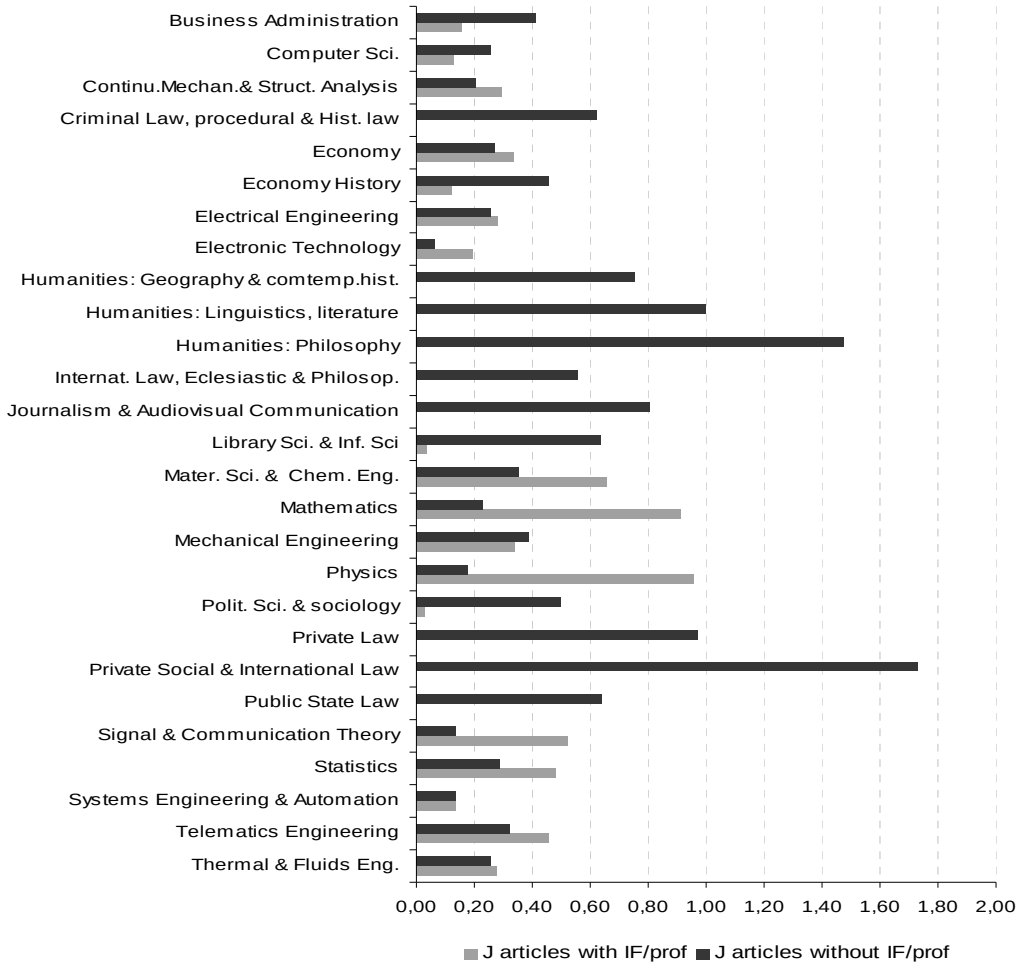


Table 39 shows productivity of professors considering journal articles with and without impact factor. We can see that the second group has greater values, particularly in the departments of Private Social & International Law and Humanities: Philosophy. The departments of Physics and Mathematics present higher productivity in articles with IF.

TABLE 39. PRODUCTIVITY JOURNAL ARTICLES WITH AND WITHOUT IF PER PROFESSOR AND DEPARTMENT (UC3M)

Departments	N prof	J. articles with IF/prof.	J. articles without IF/prof.
Business Administration	66	0.16	0.41
Computer Sci.	119	0.13	0.26
Continu.Mechan.& Struct. Analysis	17	0.29	0.21
Criminal Law. procedural & Hist. law	24	0.00	0.63
Economy	63	0.33	0.27
Economy History	12	0.13	0.46
Electrical Engineering	25	0.28	0.26
Electronic Technology	52	0.19	0.07
Humanities: Geography & comtemp.hist.	18	0.00	0.75
Humanities: Linguistics. literature	19	0.00	1.00
Humanities: Philosophy	19	0.00	1.47
Internat. Law. Eclesiastic & Philosop.	34	0.00	0.56
Journalism & Audiovisual Communication	46	0.00	0.80
Library Sci. & Inf. Sci	40	0.04	0.64
Mater. Sci. & Chem. Eng.	38	0.66	0.36
Mathematics	35	0.91	0.23
Mechanical Engineering	48	0.34	0.39
Physics	23	0.96	0.17
Polit. Sci. & sociology	31	0.03	0.50
Private Law	33	0.00	0.97
Private Social & International Law	24	0.00	1.73
Public State Law	39	0.00	0.64
Signal & Communication Theory	48	0.52	0.14
Statistics	61	0.48	0.29
Systems Engineering & Automation	29	0.14	0.14
Telematics Engineering	46	0.46	0.33
Thermal & Fluids Eng.	29	0.28	0.26

FIGURE 28. PRODUCTIVITY OF JOURNAL ARTICLES WITH AND WITHOUT IF PER DEPARTMENTS (UC3M)



SCIENTIFIC AREA LEVEL

TABLE 40. JOURNAL ARTICLES WITH AND WITHOUT IF PER THEMATIC AREA (UC3M)

Thematic area	N prof	Public/ with IF	Public/ without IF	Total	% articles with IF	% articles without IF	With IF /prof	Without IF/prof.
Engineering	451	137.0	109.50	246.50	55.58	44.42	0.30	0.24
Humanities	142	1.5	123.00	124.50	1.20	98.80	0.01	0.87
Mathematics	35	32.0	8.00	40.00	80.00	20.00	0.91	0.23
Physics	23	22.0	4.00	26.00	84.62	15.38	0.96	0.17
Social Sciences	387	63.5	215.00	278.50	22.80	77.20	0.16	0.56

FIGURE 29. JOURNAL ARTICLES WITH AND WITHOUT IF PER THEMATIC AREA (UC3M)

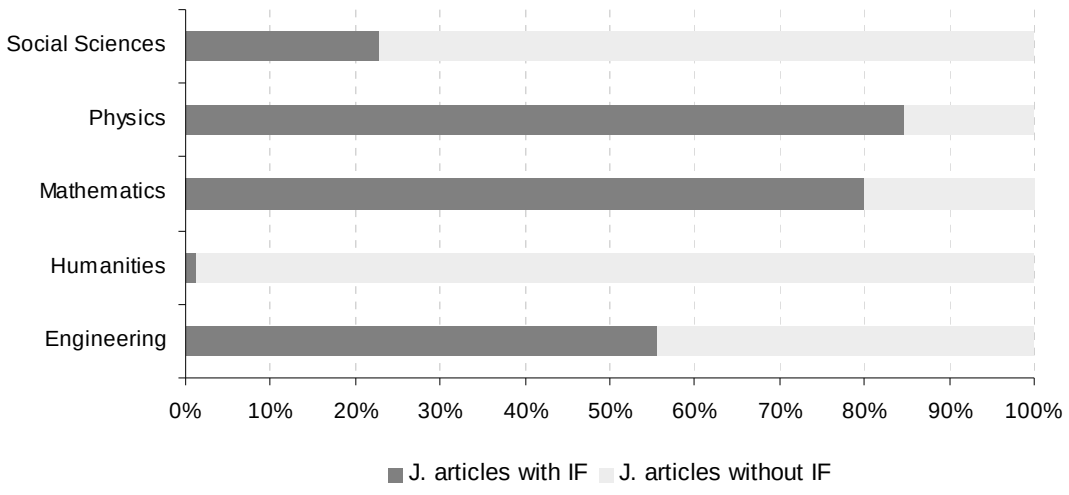
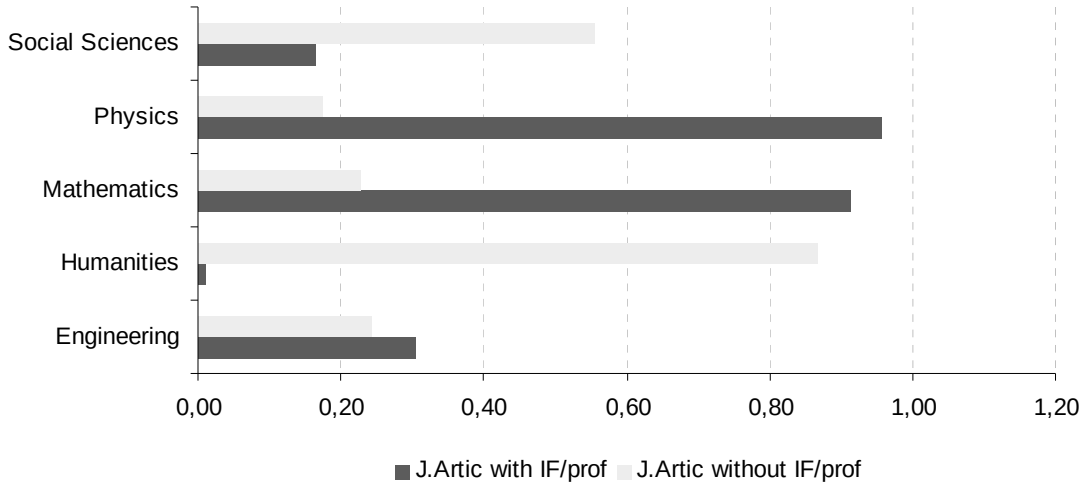


FIGURE 30. PRODUCTIVITY OF ARTICLES WITH AND WITHOUT IF PER THEMATIC AREA (UC3M)



4.4.2. UNIVERSITAT DE BARCELONA

UNIVERSITY LEVEL

GREC, as a relational set of tables and databases, includes information on the IF for each journal from Thomson Reuters ISI Journal Citation Report. When the researcher selects from an authoritative list the title of the journal where she/he has published their article, she/he establishes the relation between their article record and the journal record, where the IF is a field. The data show that considering the total journal articles, 63.35% of articles were published in journals with Thomson JCR IF (Table 41). The distribution by departments (Table 42) correlates

with departments with article journals of international scope (Table 36): the Department of Organic Chemistry stands out with 99,12% of articles with JCR IF, and other 9 departments with 80% or more of their articles with IF (Figure 31).

TABLE 41. JOURNAL ARTICLES WITH IF (UB)

UB	Journal articles	Articles with IF	%
Total publications	3190	2021	63.35
Annual average	1595	1010,5	63.35

DEPARTMENT LEVEL

TABLE 42. JOURNAL ARTICLES WITH JCR IF (ANNUAL AVERAGE) (UB)

Departments	Journal articles	Articles with IF	Articles without IF	% articles with IF	% articles without IF
Biochemistry and Molecular Biology	105,5	97,5	8	92,42	7,58
Genetics	44,5	40,5	4	91,01	8,99
Pharmacology and Therapeutic Chemistry	86,5	74,5	12	86,13	13,87
Pharmacy and Pharmaceutical Technology	34,5	6,5	28	18,84	81,16
Clinical Sciences	32,5	29	3,5	89,23	10,77
Dentistry and Stomatology	16	5,5	10,5	34,38	65,63
Obstetrics and Gynecology, Pediatrics, Radiology and Anatomy	36,5	22	14,5	60,27	39,73
Medicine	139,5	108	31,5	77,42	22,58
Ecology	47	31	16	65,96	34,04
Organic Chemistry	57	56,5	0,5	99,12	0,88
Inorganic Chemistry	128,5	123,5	5	96,11	3,89
Structure and Constituents of Matter	153	145	8	94,77	5,23
Fundamental Physics	76	70	6	92,11	7,89
Astronomy and Meteorology	46,5	33,5	13	72,04	27,96
Electronics	74	62	12	83,78	16,22
Chemical Engineering	44	36	8	81,82	18,18
Applied Mathematics and Analysis	32	25	7	78,13	21,88
Painting	8,5	0	8,5	0,00	100,00
Prehistory, Ancient History and Archaeology	74	4,5	69,5	6,08	93,92
History of Philosophy, Aesthetics and Cultural Philosophy	44	1,5	42,5	3,41	96,59
Romance Languages	49,5	0	49,5	0,00	100,00
Library and Information Science	29,5	0,5	29	1,69	98,31
Personality, Evaluation and Psychological Treatment	33,5	14,5	19	43,28	56,72
Methods of Research and Diagnosis in Education	32,5	0,5	32	1,54	98,46
Political Economy and the Public Treasury	31,5	4	27,5	12,70	87,30
Econometrics, Statistics and Spanish Economy	40	17,5	22,5	43,75	56,25
Civil Law	29,5	0	29,5	0,00	100,00
Constitutional Law and Political Science	19	0,5	18,5	2,63	97,37
Sociological Theory, Philosophy of Law and Methodology of the Social Sciences	50	1	49	2,00	98,00

FIGURE 31. ARTICLES WITH AND WITHOUT IF PER DEPARTMENTS (UB)

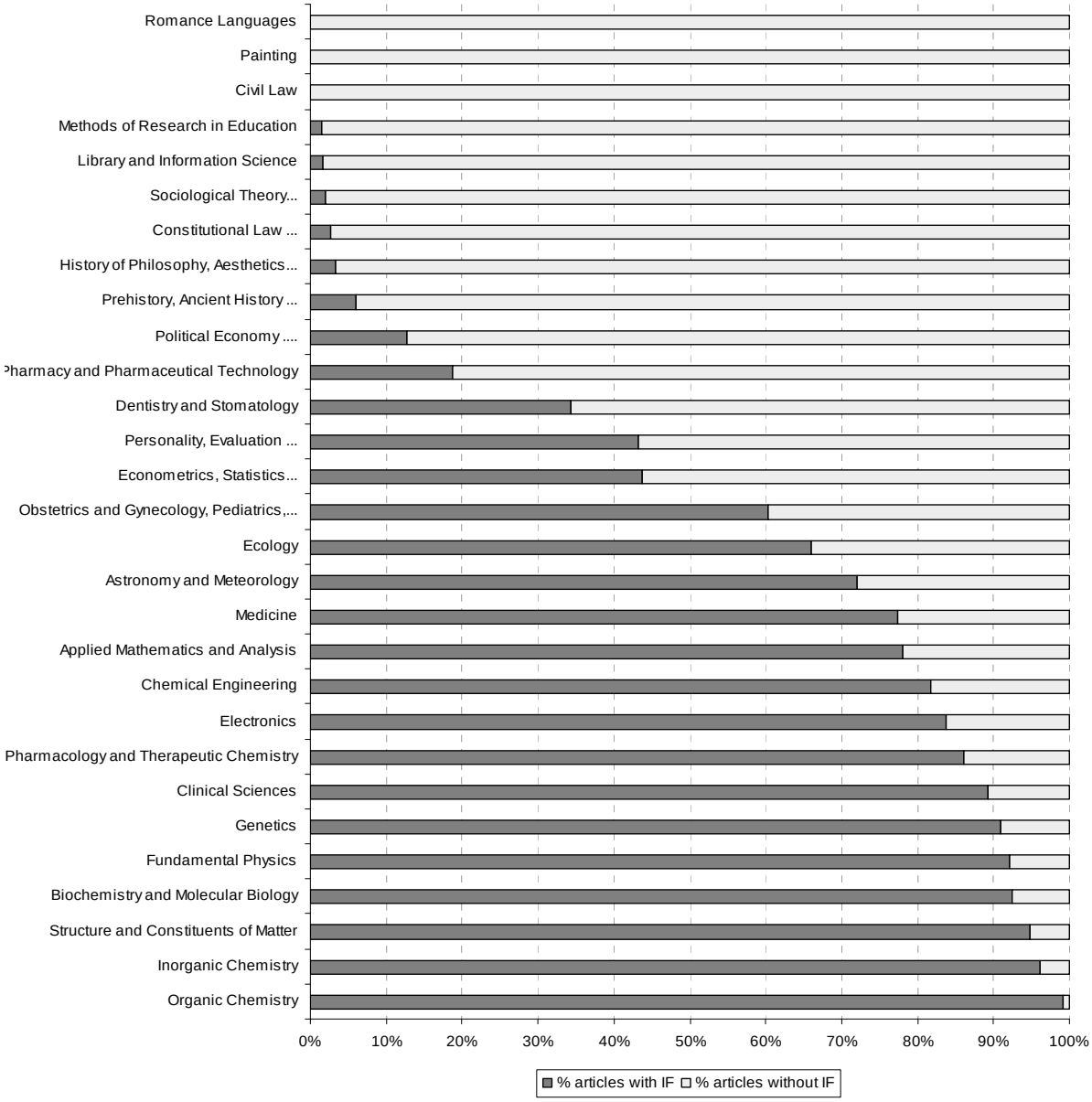


Table 43 shows productivity of professors considering journal articles with and without impact factor. We can see that the majority of Experimental and Biomedical Sciences departments are more productive in the column of articles with JCR IF.

TABLE 43. ANNUAL PRODUCTIVITY IN JOURNAL ARTICLES WITH AND WITHOUT IF PER PROFESSOR AND DEPARTMENT (UB)

Departments	N prof	J. articles with IF/prof.	J. articles without IF/prof.
Biochemistry and Molecular Biology	65	1,50	0,12
Genetics	39	1,04	0,10
Pharmacology and Therapeutic Chemistry	58	1,28	0,21
Pharmacy and Pharmaceutical Technology	32	0,20	0,88
Clinical Sciences	20	1,45	0,18
Dentistry and Stomatology	13	0,42	0,81
Obstetrics and Gynecology, Pediatrics, Radiology and Anatomy	21	1,05	0,69
Medicine	30	3,60	1,05
Ecology	27	1,15	0,59
Organic Chemistry	54	1,05	0,01
Inorganic Chemistry	43	2,87	0,12
Structure and Constituents of Matter	48	3,02	0,17
Fundamental Physics	62	1,13	0,10
Astronomy and Meteorology	33	1,02	0,39
Electronics	43	1,44	0,28
Chemical Engineering	33	1,09	0,24
Applied Mathematics and Analysis	49	0,51	0,14
Painting	46	0,00	0,18
Prehistory, Ancient History and Archaeology	35	0,13	1,99
History of Philosophy, Aesthetics and Cultural Philosophy	24	0,06	1,77
Romance Languages	52	0,00	0,95
Library and Information Science	30	0,02	0,97
Personality, Evaluation and Psychological Treatment	31	0,47	0,61
Methods of Research and Diagnosis in Education	49	0,01	0,65
Political Economy and the Public Treasury	47	0,09	0,59
Econometrics, Statistics and Spanish Economy	50	0,35	0,45
Civil Law	35	0,00	0,84
Constitutional Law and Political Science	39	0,01	0,47
Sociological Theory, Philosophy of Law and Methodology of the Social Sciences	39	0,03	1,26

SCIENTIFIC AREA LEVEL

We should take into account reading Table 44, as well as Table 43, that Humanities is not covered by JCR, and that the number of journals in Social Sciences Citation Index is not representative of research journals in this area. So that this observation explains that all areas of UB except Humanities and Social Sciences surpass the 65% of articles with IF, because these departments are very international in their research activity.

TABLE 44. JOURNAL ARTICLES WITH AND WITHOUT IF PER THEMATIC AREA (UB)

Thematic area	N prof	Public/ with IF	Public/ without IF	Total	% articles with IF	% articles without IF	With IF /prof	Without IF/prof.
Life Sciences	104	138	12,00	150,00	92,00	8,00	1,33	0,12
Medicine	174	245,50	100,00	345,50	71,06	28,94	1,41	0,57
Applied Biology-Ecology	27	31,00	16,00	47,00	65,96	34,04	1,15	0,59
Chemistry	97	180,00	5,50	185,50	97,04	2,96	1,86	0,06
Physics	110	215,00	14,00	229,00	93,89	6,11	1,95	0,13
Astronomy and Space Sciences	33	33,50	13,00	46,50	72,04	27,96	1,02	0,39
Engineering	76	98,00	20,00	118,00	83,05	16,95	1,29	0,26
Mathematics	49	25,00	7,00	32,00	78,13	21,88	0,51	0,14
Humanities	157	6,00	170,00	176,00	3,41	96,59	0,04	1,08
Social Sciences	320	38,50	227,00	265,50	14,50	85,50	0,12	0,71

4.5 DESCRIPTOR 5: COLLABORATIONS

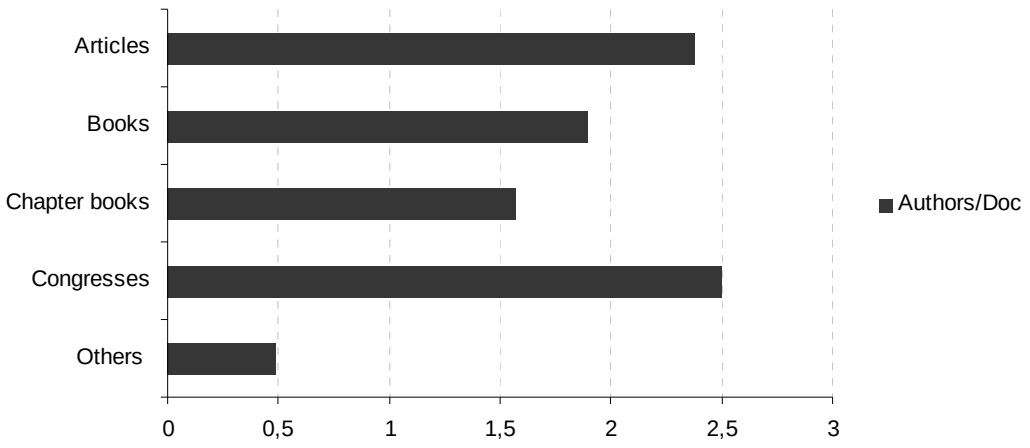
4.5.1. UNIVERSIDAD CARLOS III DE MADRID

One of the most interesting data to analyze is the collaboration between authors. This information (number of authors per document) is not explicitly included in UNIVERSITAS XXI; however, through the name of the authors of each type of document we calculate the number of authors per document. In table 45 and Figure 32 we see that congresses and articles are those document types in which a greater number of authors participate. In the total production of the University, the rate of co-authorship is of 2.3 authors per document.

TABLE 45. NUMBER OF AUTHORS PER DOCUMENT IN EACH DOCUMENT TYPE (UC3M)

Document type	N Doc Total publ 2005-2006	N Authors	Authors/Doc
Journal articles	1642	3903	2.38
Books	293	556	1.90
Chapters in books	761	1195	1.57
Congresses	3038	7601	2.50
Others	212	434	0,49
Total	**5946**	**13689**	**2.30**

FIGURE 32. NUMBER OF AUTHORS PER DOCUMENT IN EACH DOCUMENT TYPE (UC3M)



DEPARTMENT LEVEL

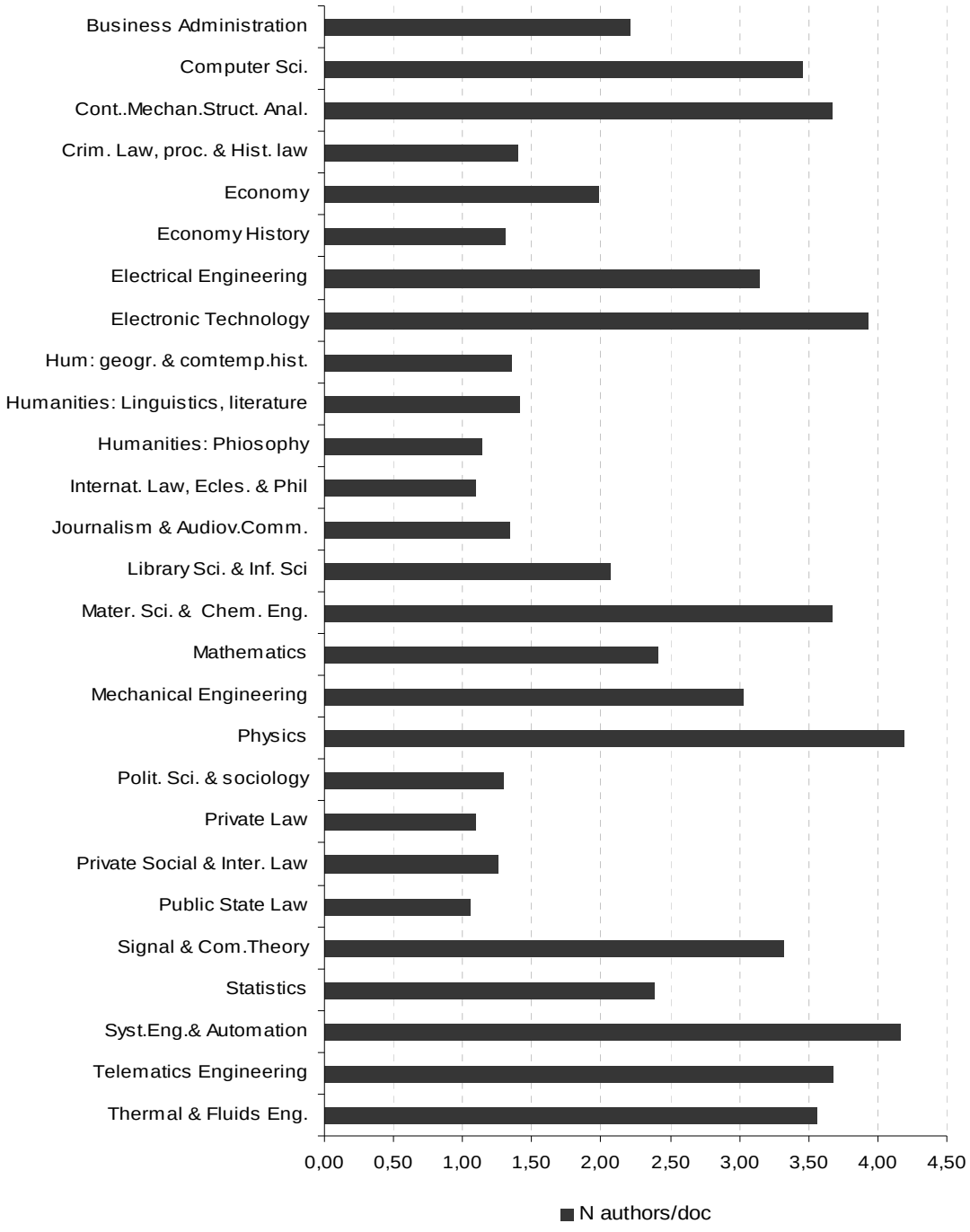
The distribution of authors per document in each department shows that, in general, the departments with greater collaboration are those of Physics and Engineering. On the contrary, those of less collaboration are the departments of Law and Humanities. The higher co-authorship was detected in congresses and journal articles. In table 46 and Figure 33 the numbers of authors of each department by document type and in the whole of its production are shown.

Considering number of authors per document, the highest values are those of the departments of Computer Sciences in chapters in books (6.3 auth/doc) and books (4,5), followed by congresses in System Engineering (4.3) and journal articles in Physics (4.2) (table 46).

TABLE 46. NUMBER OF AUTHORS PER DOCUMENT IN EACH DOCUMENTAL TYPE PER DEPARTMENTS (UC3M)

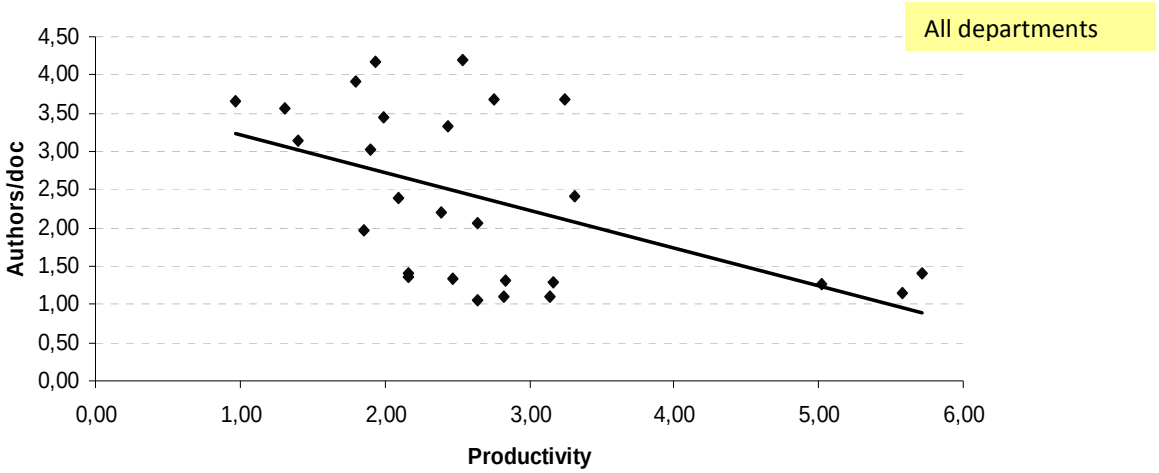
Departments	Authors/document					
	J. articles	Books	Chapters in books	Congresses	Others	Total
Busines Administration	2.08	2.40	2.41	2.33	2.39	2.21
Computer Sci.	3.48	4.53	6.31	3.49	2.60	3.45
Cont..Mechan.Struct. Anal.	3.59	0.00	0.00	3.75	0.00	3.67
Crim. Law. proc. & Hist. law	1.10	1.79	2.17	1.00	0.00	1.40
Economy	2.41	2.00	1.64	1.71	2.34	1.98
Economic History	1.29	0.00	1.36	1.34	1.13	1.31
Electrical Engineering	3.22	2.00	2.00	3.23	0.00	3.14
Electronic Technology	3.89	2.60	1.33	4.08	0.00	3.93
Hum: geogr. & comtemp.hist.	1.04	1.38	2.00	1.06	0.00	1.36
Humanities: Linguistics. literature	1.11	1.54	1.39	1.51	1.00	1.41
Humanities: Phiosophy	1.00	1.55	1.19	1.16	1.00	1.14
Internat. Law. Ecles. & Phil	1.16	1.65	1.05	1.00	0.00	1.09
Journalism & Audiov.Comm.	1.19	1.08	1.57	1.41	1.00	1.34
Library Sci. & Inf. Sci	2.35	1.96	2.12	2.19	0.00	2.07
Mater. Sci. & Chem. Eng.	3.91	0.00	2.17	3.63	0.00	3.67
Mathematics	2.83	1.67	2.50	2.35	0.00	2.41
Mechanical Engineering	3.61	3.22	2.30	3.03	2.00	3.03
Physics	4.23	2.00	4.00	4.19	0.00	2.88
Polit. Sci. & sociology	1.12	1.92	1.43	1.12	0.00	1.29
Private Law	1.17	1.00	1.17	1.03	0.00	1.10
Private Social & Inter. Law	1.24	1.75	1.39	1.03	0.00	1.26
Public State Law	1.10	1.28	1.11	1.01	2.00	1.06
Signal & Com.Theory	3.79	3.33	3.00	3.21	0.00	3.32
Statistics	2.64	1.67	2.33	2.34	1.82	2.38
Syst.Eng.& Automation	3.63	1.50	4.54	4.34	0.00	4.17
Telematics Engineering	3.97	3.83	3.40	3.77	0.00	3.69
Thermal & Fluids Eng.	3.48	0.00	0.00	3.79	0.00	3.57
Without data	1.97	1.37	1.28	1.94	1.56	1.76
Total	2.38	1.90	1.57	2.50	1.59	2.32

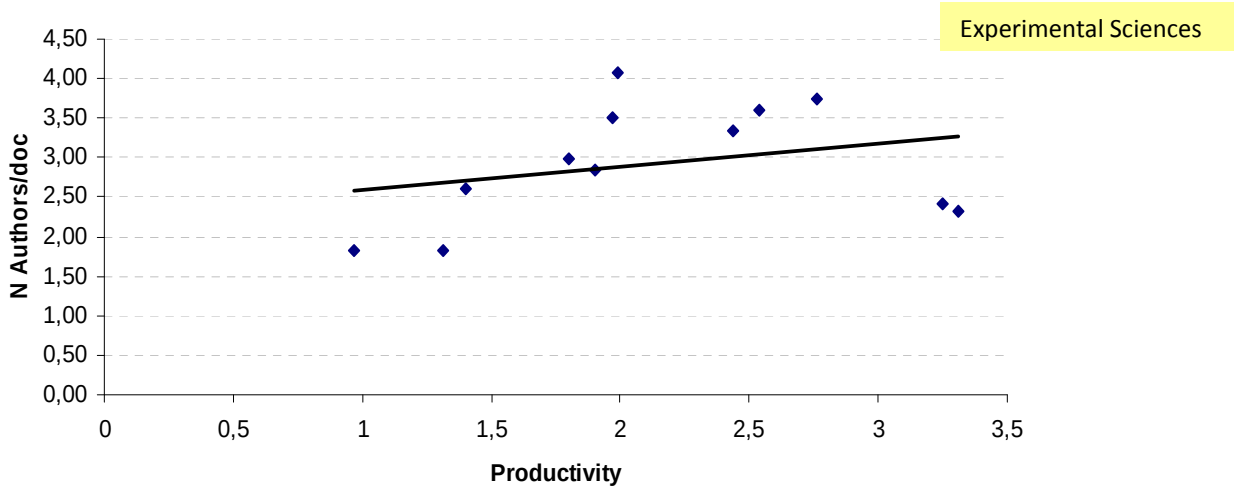
FIGURE 33. NUMBER OF AUTHORS PER DOCUMENT PER DEPARTMENT (UC3M)

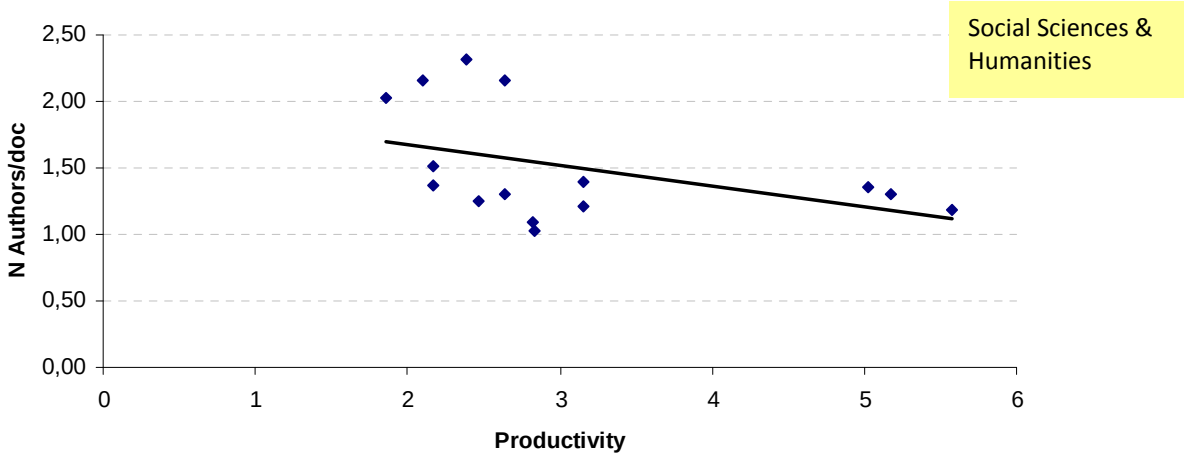


In spite of the fact that collaboration enhances productivity, when representing the data of the departments we do not observe this relation. In the following figure we can see that the productivity decreases with the number of authors per document, this is possibly because departments with high productivity as Humanities have a few number of authors per document as we can observe analysing data per thematic areas (figure 34).

FIGURE 34. CO-AUTHORSHIP VERSUS PRODUCTIVITY (ALL DEPARTMENTS) (UC3M)







SCIENTIFIC AREA LEVEL

At the level of thematic areas, in the total of publications the highest number of authors per document is detected in Engineering. In table 47 the collaboration in each thematic area and type of document is shown.

TABLE 47. NUMBER OF AUTHORS PER DOCUMENT IN EACH DOCUMENT TYPE PER THEMATIC AREA (UC3M)

Thematic area	J.articles	Books	Chapters in books	Congresses	Others	Total
Engineering	3.65	3.00	3.13	3.63	2.30	3.14
Humanities	1.34	1.50	1.65	1.46	1.00	1.39
Mathematics	2.83	1.67	2.50	2.35	0.00	2.41
Physics	4.23	2.00	4.00	4.19	0.00	2.88
Social Sciences	1.53	1.71	1.61	1.39	1.94	1.64

4.4.2. UNIVERSITAT DE BARCELONA

One of the most interesting data to analyze is the collaboration between authors. This information (number of authors per document) is included in all forms of output items in GREC, but should be a controlled automatic field linked to the author names field, because it's the researcher who introduces the number, and maybe not always in uniform and consistent way, despite the author must include their position in the order of authors. Actually, the standard and guidelines to fill the author field data in the form help us to calculate, through the number of names of the authors, the number of authors (that means that the field "number of authors" could be an automatically calculated one).

In Table 48 we see that congresses and articles are those document types in which a greater number of authors participate. In the total production of the UB, the rate of co-authorship is 3,79 authors per document.

TABLE 48. NUMBER OF AUTHORS PER DOCUMENT IN EACH DOCUMENT TYPE (UB)

Document type	N Doc Total publ 2005-2006	N Authors	Authors/Doc
Journal articles	3190	13435	4,21
Books	300	917	3,06
Chapters in books	837	1765	2,11
Congresses	3137	12144	3,87
Total	**7463**	**28261**	**3,79**

DEPARTMENT LEVEL

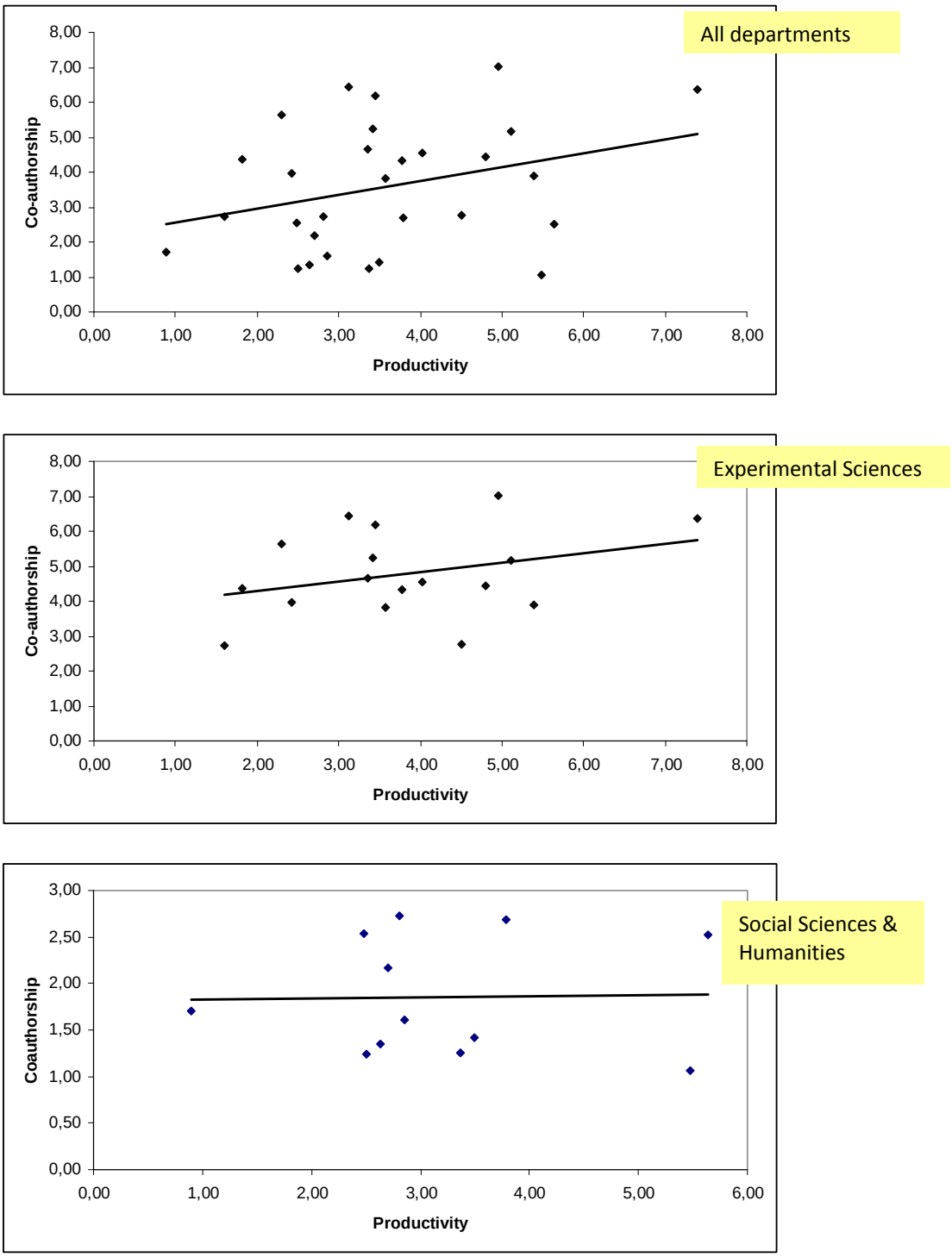
The distribution of authors per document in each department shows that, in general, the departments with greater collaboration are those of Experimental and Biomedical Sciences. On the contrary, those of less collaboration are the departments of Humanities and Social Sciences. The higher co-authorship was detected in congresses and journal articles. In Table 49 the numbers of authors per document of each department involved by document type and in the whole of its production are shown.

TABLE 49. NUMBER OF AUTHORS PER DOCUMENT IN EACH DOCUMENTAL TYPE PER DEPARTMENTS (UB)

Departments	Authors/document				
	J. articles	Books	Chapters in books	Congresses	Total
Biochemistry and Molecular Biology	6,87	NA	4,56	6,00	6,42
Genetics	5,85	1,46	2,50	5,28	5,24
Pharmacology and Therapeutic Chemistry	5,24	3,00	2,42	4,22	4,64
Pharmacy and Pharmaceutical Technology	3,91	6,00	3,68	4,82	4,53
Clinical Sciences	6,28	NA	2,40	4,33	5,62
Dentistry and Stomatology	4,13	3,20	1,33	3,94	3,90
Obstetrics and Gynecology, Pediatrics, Radiology and Anatomy	6,01	1,00	2,00	6,61	6,20
Medicine	6,73	2,22	2,30	7,21	6,35
Ecology	4,67	5,67	3,86	4,29	4,42
Organic Chemistry	4,58	2,00	3,50	4,20	4,36
Inorganic Chemistry	5,56	6,00	3,00	4,62	5,18
Structure and Constituents of Matter	2,82	2,67	2,89	2,48	2,76
Fundamental Physics	4,01	6,50	2,20	4,08	3,97
Astronomy and Meteorology	4,39	2,00	4,06	3,33	3,81
Electronics	7,01	8,00	9,50	6,99	7,01
Chemical Engineering	3,95	3,67	4,25	4,63	4,33
Applied Mathematics and Analysis	2,69	2,00	3,55	2,52	2,72
Painting	1,24	1,59	2,31	1,84	1,70
Prehistory, Ancient History and Archaeology	2,36	2,00	2,89	2,57	2,52
History of Philosophy, Aesthetics and Cultural Philosophy	1,02	1,22	1,07	1,04	1,06
Romance Languages	1,78	1,15	1,11	1,07	1,35
Library and Information Science	1,73	1,80	2,67	2,42	2,17
Personality, Evaluation and Psychological Treatment	2,61	4,00	2,14	2,72	2,68
Methods of Research and Diagnosis in Education	2,14	7,51	1,66	1,92	2,73
Political Economy and the Public Treasury	1,67	2,29	1,51	1,55	1,61
Econometrics, Statistics and Spanish Economy	2,61	3,00	2,13	2,46	2,54
Civil Law	1,08	1,13	1,45	1,14	1,25
Constitutional Law and Political Science	1,34	1,44	1,22	1,16	1,24
Sociological Theory, Philosophy of Law and Methodology of the Social Sciences	1,21	2,25	1,52	1,44	1,42

In UB, collaboration enhances productivity taking into account all departments (Figure 35), with a more clearly positive relation in Experimental and Biomedical Sciences than in Social Sciences and Humanities. So that, we observe a certain positive correlation between de data in table 17 and table 19.

FIGURE 35. CO-AUTHORSHIP VERSUS PRODUCTIVITY (ALL DEPARTMENTS) (UB)



SCIENTIFIC AREA LEVEL

At the level of thematic areas, in the total of publications the highest number of authors per document is in Engineering. In Table 50 the collaboration in each thematic area and type of document is shown.

TABLE 50. NUMBER OF AUTHORS PER DOCUMENT IN EACH DOCUMENT TYPE PER THEMATIC AREA (UB)

Thematic area	J.articles	Books	Chapters in books	Congresses	Total
Life Sciences	6,57	1,46	4,18	5,64	5,95
Medical Research	5,84	4,13	2,64	5,09	5,29
Applied Biology-Ecology	2,87	5,67	3,86	4,29	3,76
Chemistry	5,26	3,00	3,25	4,51	4,94
Physics	3,22	3,63	2,65	3,45	3,26
Astronomy and Space Sciences	4,39	2,00	4,06	3,33	3,81
Engineering	5,87	4,29	5,00	6,23	6,05
Mathematics	2,69	2,00	3,55	2,52	2,72
Humanities	1,81	1,59	1,82	1,69	1,76
Social Sciences	1,82	3,67	1,60	1,93	1,96

4.A INDICATOR A- REFERENCE COMMUNITY

4.A.1. UNIVERSIDAD CARLOS III DE MADRID

UNIVERSITY LEVEL

When classifying audience and destination of the university output, we have assigned articles, books book chapters and thesis to the "Scientific & scholarly community" that in UC3M concentrates 48% of the total production. The other category: "Society/professional community" includes communications in congresses. With this distribution we can appreciate a relative equilibrium in the orientation of publications (table 51).

TABLE 51. REFERENCE COMMUNITY AND AIM OF PUBLICATION (UC3M)

Audience	N doc 2005-2006	Annual average	%
Scientific & scholarly community			
Journal articles	1642	821	
Books	293	146.5	
Chapters in books	761	380.5	
Thesis	118	59	
Total	2814	1407	48,09
Society/professional community			
Communication in congresses	3038	1519	
Total	3038	1519	51,91
Total UC3M	**5852**	**2926**	**100**

DEPARTMENT LEVEL

Table 52 shows the distribution of the audience and destination of output in each department. The departments of Humanities: Geography and Private Social & International Law are mostly oriented to the Scientific & scholarly community. The departments of Electronic Technology, Systems Engineering & Automation and Computer science are oriented to the Society/professional community.

TABLE 52. DISTRIBUTION BY REFERENCE COMMUNITY AND AIM OF PUBLICATION (DEPARTMENTS) (UC3M)

Departments	Scientific & scholarly community	%	Society/ professional community	%	Total
Business Administration	53,50	35,91	95,50	64,09	149,00
Computer Sci.	72,50	30,98	161,50	69,02	234,00
Continu.Mechan.& Struct. Analysis	8,50	51,52	8,00	48,48	16,50
Criminal Law, procedural & Hist. law	36,50	70,19	15,50	29,81	52,00
Economy	48,50	47,32	54,00	52,68	102,50
Economic History	12,50	41,67	17,50	58,33	30,00
Electrical Engineering	15,00	42,86	20,00	57,14	35,00
Electronic Technology	18,50	19,79	75,00	80,21	93,50
Humanities: Geography & comtemp.hist.	30,50	78,21	8,50	21,79	39,00
Humanities: Linguistics, literature	50,00	46,30	58,00	53,70	108,00
Humanities: Philosophy	57,50	54,76	47,50	45,24	105,00
Internat. Law, Eclesiastic & Philosop.	64,00	59,81	43,00	40,19	107,00
Journalism & Audiovisual Communication	61,00	53,98	52,00	46,02	113,00
Library Sci. & Inf. Sci	58,50	55,45	47,00	44,55	105,50
Mater. Sci. & Chem. Eng.	42,00	34,01	81,50	65,99	123,50
Mathematics	47,00	40,52	69,00	59,48	116,00
Mechanical Engineering	50,00	55,56	40,00	44,44	90,00
Physics	27,00	46,15	31,50	53,85	58,50
Polit. Sci. & sociology	53,50	54,59	44,50	45,41	98,00
Private Law	63,50	68,28	29,50	31,72	93,00
Private Social & International Law	91,00	75,52	29,50	24,48	120,50
Public State Law	68,00	66,34	34,50	33,66	102,50
Signal & Communication Theory	39,00	33,33	78,00	66,67	117,00
Statistics	55,00	44,90	67,50	55,10	122,50
Systems Engineering & Automation	16,00	28,57	40,00	71,43	56,00
Telematics Engineering	46,00	36,22	81,00	63,78	127,00
Thermal & Fluids Eng.	16,50	43,42	21,50	56,58	38,00

FIGURE 36. REFERENCE COMMUNITY PER DEPARTMENT (UC3M)

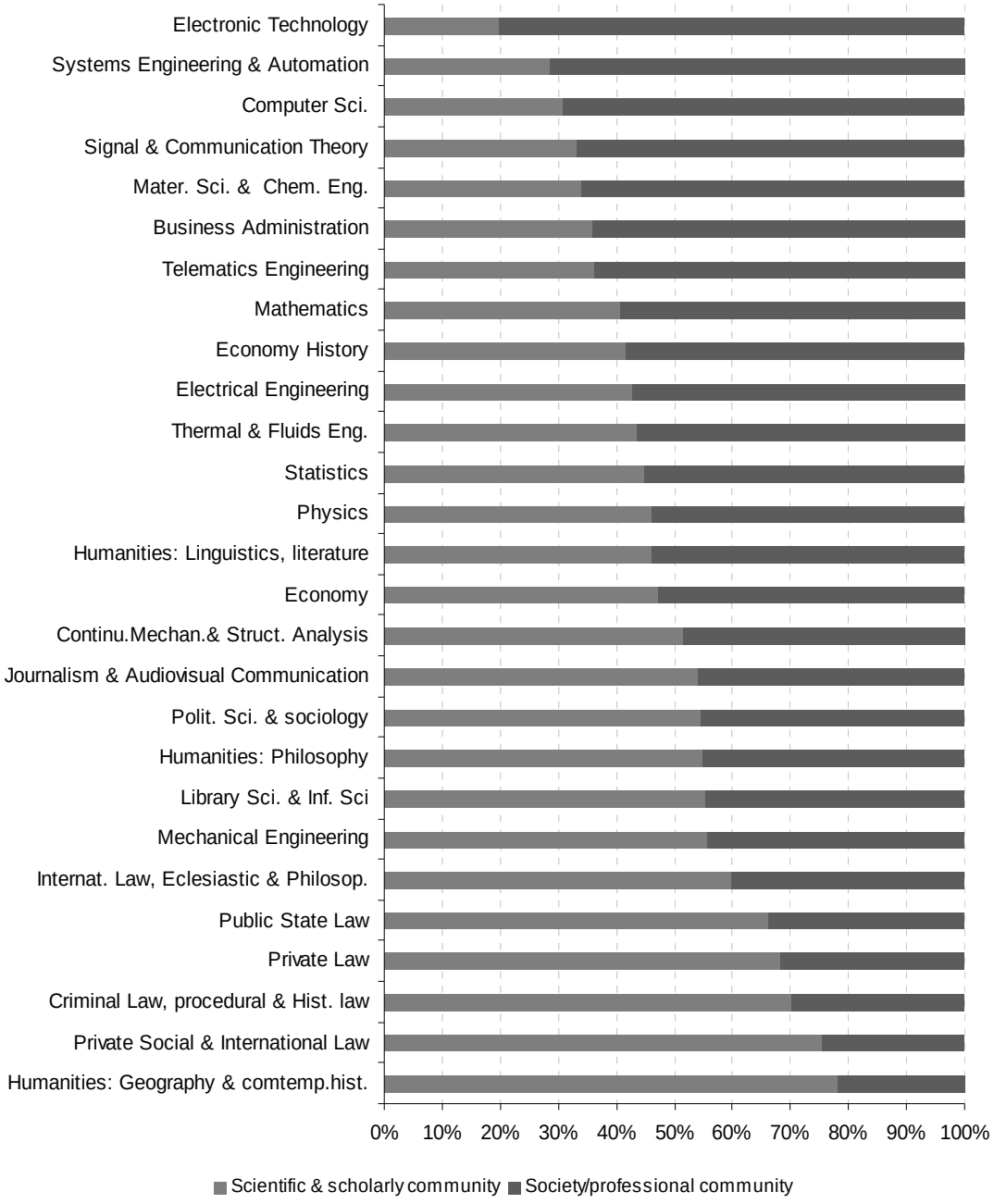


Table 53 shows the productivity per department and reference community. In the scientific scholarly community the highest values are those of Private Social & International Law and Humanities: Philosophy; in Professional and Social Community Humanities: linguistics show the highest productivity.

TABLE 53. PRODUCTIVITY BY REFERENCE COMMUNITY AND DEPARTMENT (UC3M)

Departments	Scientific & scholarly community	Society/ professional community
Business Administration	0,81	1,45
Computer Sci.	0,61	1,36
Continu.Mechan.& Struct. Analysis	0,50	0,47
Criminal Law, procedural & Hist. law	1,52	0,65
Economy	0,77	0,86
Economic History	1,04	1,46
Electrical Engineering	0,60	0,80
Electronic Technology	0,36	1,44
Humanities: Geography & comtemp.hist.	1,69	0,47
Humanities: Linguistics, literature	2,63	3,05
Humanities: Philosophy	3,03	2,50
Internat. Law, Eclesiastic & Philosop.	1,88	1,26
Journalism & Audiovisual Communication	1,33	1,13
Library Sci. & Inf. Sci	1,46	1,18
Mater. Sci. & Chem. Eng.	1,11	2,14
Mathematics	1,34	1,97
Mechanical Engineering	1,04	0,83
Physics	1,17	1,37
Polit. Sci. & sociology	1,73	1,44
Private Law	1,92	0,89
Private Social & International Law	3,79	1,23
Public State Law	1,74	0,88
Signal & Communication Theory	0,81	1,63
Statistics	0,90	1,11
Systems Engineering & Automation	0,55	1,38
Telematics Engineering	1,00	1,76
Thermal & Fluids Eng.	0,57	0,74

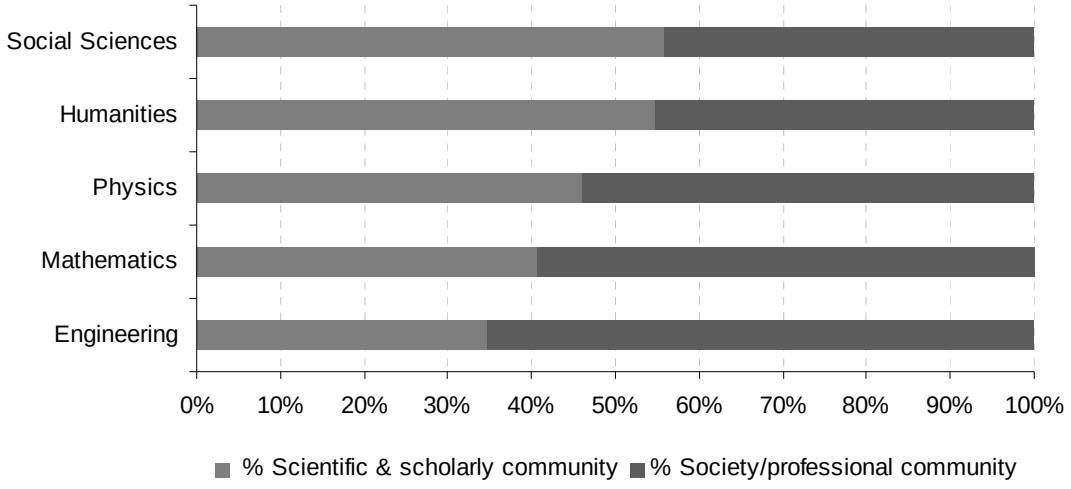
SCIENTIFIC AREA LEVEL

At the level of thematic area for Humanities and Social Sciences the most relevant is the Scientific & scholarly community, with more than half of its publications. In Engineering 65% of the production is oriented towards the Society/professional community.

TABLE 54. DISTRIBUTION BY REFERENCE COMMUNITY AND THEMATIC AREA (UC3M)

Scientific area	Scientific & scholarly community		Society/professional community		Total
	Average 2005-2006	%	Average 2005-2006	%	
Engineering	324	34,82	606,5	65,18	930,50
Humanities	257,5	54,73	213	45,27	470,50
Mathematics	47	40,52	69	59,48	116,00
Physics	27	46,15	31,5	53,85	58,50
Social Sciences	546	55,89	431	44,11	977,00

FIGURE 37. REFERENCE COMMUNITY PER THEMATIC AREA (UC3M)



Considering productivity per thematic area, high values are shown by Humanities in the Scientific Community and Mathematics in Professional Community.

TABLE 55. REFERENCE COMMUNITY AND PRODUCTIVITY PER THEMATIC AREA (UC3M)

Scientific area	Scientific & scholarly community	Society/ professional community
Engineering	0,72	1,34
Mathematics	1,34	1,97
Physics	1,17	1,37
Humanities	1,81	1,50
Social Sciences	1,41	1,11

4.A.2. UNIVERSITAT DE BARCELONA

UNIVERSITY LEVEL

When classifying audience and destination of the university output, we have assigned articles, books, book chapters and thesis to the “Scientific & scholarly community” that in UB concentrates 59% of the total production. The other category: “Social & scholarly community” includes communications in congresses and represent 41% (Table 56).

TABLE 56. REFERENCE COMMUNITY AND AIM OF PUBLICATION (UB)

Audience	N doc 2005-2006	Annual average	%
Scientific & scholarly community			
Journal articles	3190	1595	
Books	300	150	
Chapters in books	836	418	
Theses	280	140	
Total	4606	2303	59,49
Social/professional community			
Communication in congresses	3137	1568,5	
Total	3137	1568,5	40,51
Total	7743	3871,5	100

DEPARTMENT LEVEL

Table 57 shows the distribution of the audience and destination of output in each department. With more than 70% of publication in the "Scientific and Scholarly community" we see the departments of Clinical Sciences, Medicine, Structure and Constituents of Matter, and Civil Law.

TABLE 57. DISTRIBUTION BY REFERENCE COMMUNITY AND AIM OF PUBLICATION (DEPARTMENTS) (UB)

Departments	Scientific & scholarly community	%	Social/professional community	%	Total annual average
Applied Mathematics and Analysis	44	56,05	34,5	43,95	78,5
Astronomy and Meteorology	62,5	52,97	55,5	47,03	118
Biochemistry and Molecular Biology	129,5	63,95	73	36,05	202,5
Chemical Engineering	59,5	47,79	65	52,21	124,5
Civil Law	86	72,88	32	27,12	118
Clinical Sciences	35,5	77,17	10,5	22,83	46
Constitutional Law and Political Science	64	65,64	33,5	34,36	97,5
Dentistry and Stomatology	21	30,00	49	70,00	70
Ecology	63	48,65	66,5	51,35	129,5
Econometrics, Statistics and Spanish Economy	68,5	55,24	55,5	44,76	124
Electronics	77,5	36,38	135,5	63,62	213
Fundamental Physics	85,5	57,00	64,5	43,00	150
Genetics	61	45,69	72,5	54,31	133,5
History of Philosophy, Aesthetics and Cultural Philosophy	92,5	70,34	39	29,66	131,5
Inorganic Chemistry	137	62,27	83	37,73	220
Library and Information Science	45,5	56,17	35,5	43,83	81
Medicine	168,5	75,90	53,5	24,10	222
Methods of Research and Diagnosis in Education	75	54,55	62,5	45,45	137,5
Obstetrics and Gynecology, Pediatrics, Radiology and Anatomy	39,5	54,48	33	45,52	72,5

Organic Chemistry	70,5	71,57	28	28,43	98,5
Painting	31,5	76,83	9,5	23,17	41
Personality, Evaluation and Psychological Treatment	55	46,81	62,5	53,19	117,5
Pharmacology and Therapeutic Chemistry	103,5	53,08	91,5	46,92	195
Pharmacy and Pharmaceutical Technology	56,5	43,97	72	56,03	128,5
Political Economy and the Public Treasury	60	44,78	74	55,22	134
Prehistory, Ancient History and Archaeology	141	71,39	56,5	28,61	197,5
Romance Languages	95	69,34	42	30,66	137
Sociological Theory, Philosophy of Law and Methodology of the Social Sciences	99	72,53	37,5	27,47	136,5
Structure and Constituents of Matter	175,5	81,06	41	18,94	216,5

Table 58 shows the productivity per department and reference community. Analyzing this indicator in context with other descriptors and indicators in the case of UB, we can say that it is hard to say that "Scientific & scholarly community" and "Social/professional community" are clearly independent sets. Seeing that the higher share in "Scientific & scholarly community" is in Medicine Department and in "Social/professional community" the departments of Dentry and Stomatology and Electronics are relevant with more than 3 congresses by professor.

TABLE 58. PRODUCTIVITY BY REFERENCE COMMUNITY AND DEPARTMENT (UB)

Departments	Scientific & scholarly community	Social/professional community
Applied Mathematics and Analysis	0,90	0,71
Astronomy and Meteorology	1,89	1,68
Biochemistry and Molecular Biology	1,99	1,13
Chemical Engineering	1,80	1,97
Civil Law	2,46	0,92
Clinical Sciences	1,78	0,53
Constitutional Law and Political Science	1,64	0,86
Dentistry and Stomatology	1,62	3,77
Ecology	2,33	2,47
Econometrics, Statistics and Spanish Economy	1,37	1,11
Electronics	1,80	3,15
Fundamental Physics	1,38	1,04
Genetics	1,56	1,86
History of Philosophy, Aesthetics and Cultural Philosophy	3,85	1,63
Inorganic Chemistry	3,19	1,93
Library and Information Science	1,52	1,19
Medicine	5,62	1,79
Methods of Research and Diagnosis in Education	1,53	1,28
Obstetrics and Gynecology, Pediatrics, Radiology and Anatomy	1,88	1,57
Organic Chemistry	1,31	0,52
Painting	0,68	0,21
Personality, Evaluation and Psychological Treatment	1,77	2,02
Pharmacology and Therapeutic Chemistry	1,78	1,58
Pharmacy and Pharmaceutical Technology	1,77	2,25

Political Economy and the Public Treasury	1,28	1,58
Prehistory, Ancient History and Archaeology	4,03	1,62
Romance Languages	1,83	0,81
Sociological Theory, Philosophy of Law and Methodology of the Social Sciences	2,54	0,96
Structure and Constituents of Matter	3,66	0,86

SCIENTIFIC AREA LEVEL

With more aggregate data by thematic area (Table 59), we can see that Scientific and Scholarly community is more important in Physics and Humanities while Social/professional community only surpase 50% of output in Engineering and Applied Biology-Ecology. Considering productivity, Medicine and Physics are relevant in Scientific community while Engineering and Applied Biology-Ecology in Social/professional community (Table 60).

TABLE 59. DISTRIBUTION BY REFERENCE COMMUNITY AND THEMATIC AREA (UB)

Thematic area	Scientific and Scholarly community		Social/professsional community		Total
	Average 2005-2006	%	Average 2005-2006	%	
Life Sciences	190,5	56,70	145,5	43,30	336
Medicine	424,5	57,83	309,5	42,17	734
Applied Biology-Ecology	63	48,65	66,5	51,35	129,5
Chemistry	207,5	65,15	111	34,85	318,5
Physics	261	71,21	105,5	28,79	366,5
Astronomy and Space Sciences	62,5	52,97	55,5	47,03	118
Engineering	137	40,59	200,5	59,41	337,5
Mathematics	44	56,05	34,5	43,95	78,5
Humanities	360	71,01	147	28,99	507
Social Sciences	553	58,46	393	41,54	946

TABLE 60. REFERENCE COMMUNITY AND PRODUCTIVITY PER THEMATIC AREA (UB)

Thematic area	Scientific and Scholarly community	Social/professional
Life Sciences	1,83	1,40
Medicine	2,44	1,78
Applied Biology-Ecology	2,33	2,46
Chemistry	2,13	1,14
Physics	2,37	0,96
Astronomy and Space Sciences	1,89	1,68
Engineering	1,80	2,64
Mathematics	0,90	0,70
Humanities	2,29	0,94
Social Sciences	1,73	1,23

4.B INDICATOR B. BASIC/ APPLIED RESEARCH ACCORDING TO IPIQ CLASSIFICATION

4.B.1. UNIVERSIDAD CARLOS III DE MADRID

UNIVERSITY LEVEL

In order to measure the basic or applied character of the research, a classification of scientific journals produced for the National Science Foundation (iPIQ) was used. As these data are not included in the database UNIVERSITAS XXI, we had to match the names of the scientific journals used by the UC3M researchers, with the listing of titles of the iPIQ classification. UC3M published 1642 articles in 939 journals. In iPIQ only 305 articles of UC3M (19%) are included (table 61). Only journals of the Science Citation Index are classified into levels.

TABLE 61. JOURNAL ARTICLES IN IPIQ DATABASE (UC3M)

UC3M journal articles	iPIQ covered journals	UC3M journal articles in iPIQ	% of UC3M articles covered
1642	10343	305	18.57

Besides the 305 UC3M journal articles included in the iPIQ database others correspond to journals with a level 0 classification, that is to say without level. They can be scientific journals that recently entered the Web of Science or journals included in SSCI that therefore do not have an assigned level. As shown in table 62, in the UC3M the greater number of articles with assigned level corresponds to levels 2 and 3 (1 applied; 4 basic).

TABLE 62. BASIC-APPLIED LEVEL IN UC3M JOURNAL ARTICLES (UC3M)

Level	N articles	%
1	45	14.75
2	93	30.49
3	88	28.85
4	79	25.90
Total	**305**	**100.00**

DEPARTMENT LEVEL

Considering departments, we observe that Physics has the greater number of articles with assigned level (85%). This is because in this field the publication in journals included in WoS database is very frequent. Departments of Mathematics, Electronic Technology, Materials Science and Continuum Mechan. & Structural Analysis and Thermal & Fluid Engineering follow with more than 50%. Table 63 shows the number of articles and their corresponding level in each department.

TABLE 63. JOURNAL ARTICLES WITH BASIC/APPLIED LEVEL (DEPARTMENTS) (ABSOLUTE VALUES) (UC3M)

Departments	N art	Level 1	Level 2	Level 3	Level 4	Total	% with level
Business Administration	75	0	1	2	0	3	4.00
Computer Sci.	93	2	4	0	1	7	7.53
Continu.Mechan.& Struct. Analysis	17	0	6	3	0	9	52.94
Criminal Law. procedural & Hist. law	30	0	0	0	0	0	0.00
Economy	76	0	0	5	0	5	6.58
Economic History	14	0	0	0	0	0	0.00
Electrical Engineering	27	9	2	2	0	13	48.15
Electronic Technology	27	1	12	2	0	15	55.56
Humanities: Geography & comt. hist.	27	0	0	0	0	0	0.00
Humanities: Linguistics. literature	38	0	0	0	0	0	0.00
Humanities: Philosophy	56	0	0	0	0	0	0.00
Internat. Law. Eclesiastic & Philosop.	38	0	0	0	0	0	0.00
Journalism & Audiovisual Communic.	74	0	0	0	0	0	0.00
Library Sci. & Inf. Sci	54	0	2	0	0	2	3.70
Mater. Sci. & Chem. Eng.	77	5	11	15	10	41	53.25
Mathematics	80	0	7	20	21	48	60.00
Mechanical Engineering	70	7	1	2	0	10	14.29
Physics	52	0	4	14	26	44	84.62
Polit. Sci. & sociology	33	0	0	0	0	0	0.00
Private Law	64	0	0	0	0	0	0.00
Private Social & International Law	83	0	0	0	0	0	0.00
Public State Law	50	0	0	0	0	0	0.00
Signal & Communication Theory	63	9	14	0	3	26	41.27
Statistics	94	0	12	11	1	24	25.53
Systems Engineering & Automation	16	1	0	0	0	1	6.25
Telematics Engineering	72	3	1	0	0	4	5.56
Thermal & Fluids Eng.	31	2	6	5	3	16	51.61
Without data	230	6	10	10	14	40	17.39
Summation	1661	45	93	91	79	308	
Total	**1642**	**45**	**93**	**88**	**79**	**305**	**18.57**

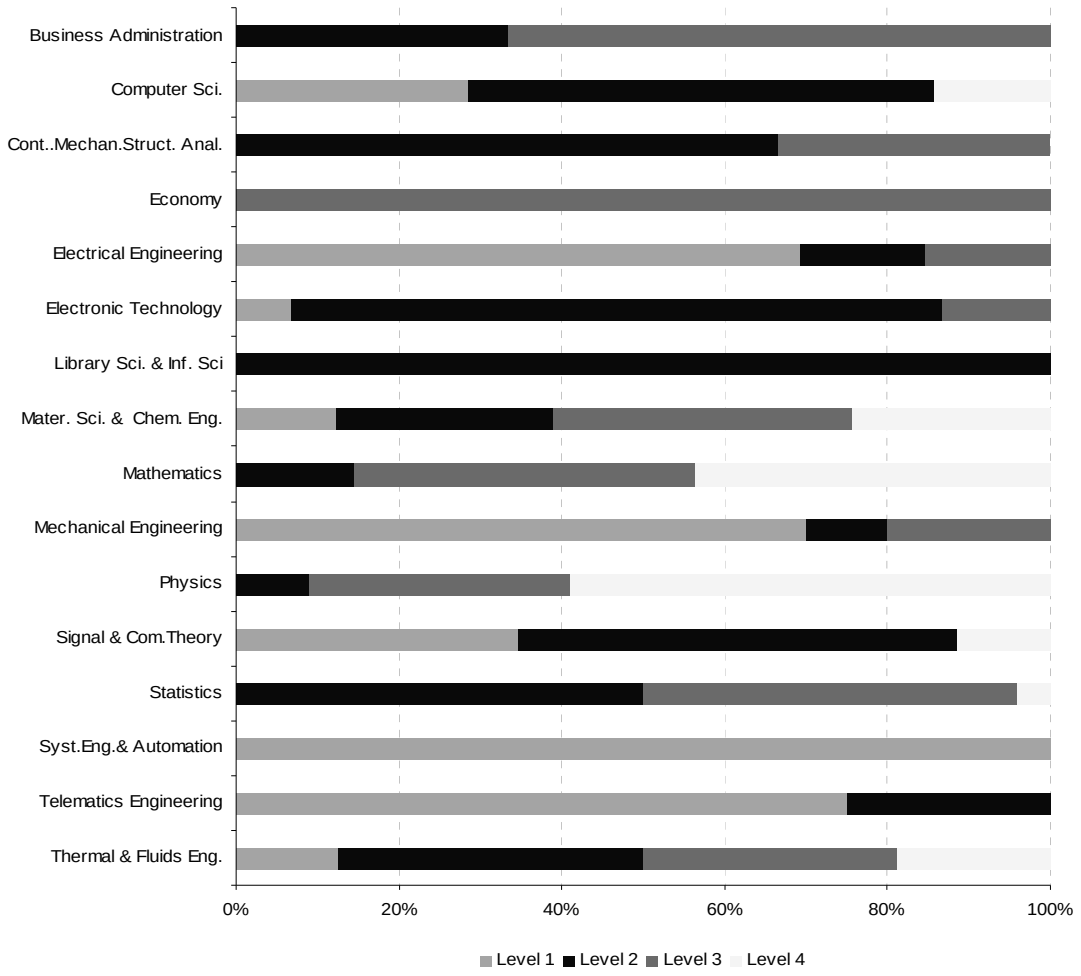
Table 64 shows that, in general, in the departments of Physics and Mathematics, whose activity is usually related to theoretical development, articles of level 3-4 (basic) predominate, whereas the departments of Engineering present the greater number of articles classified in levels 1-2 or 2-3 (more applied).

TABLE 64. JOURNAL ARTICLES WITH BASIC/APPLIED LEVEL (DEPARTMENTS) (PERCENTAGES)(UC3M)

Departments	% Level 1	% Level 2	% Level 3	% Level 4	N art with level
Business Administration	0.00	33.33	66.67	0.00	3
Computer Sci.	28.57	57.14	0.00	14.29	7
Continu.Mechan.& Struct. Analysis	0.00	66.67	33.33	0.00	9

Departments	% Level 1	% Level 2	% Level 3	% Level 4	N art with level
Criminal Law. procedural & Hist. law	0.00	0.00	0.00	0.00	0
Economic	0.00	0.00	100.00	0.00	5
Economic History	0.00	0.00	0.00	0.00	0
Electrical Engineering	69.23	15.38	15.38	0.00	13
Electronic Technology	6.67	80.00	13.33	0.00	15
Humanities: Geography & comt. hist.	0.00	0.00	0.00	0.00	0
Humanities: Linguistics. literature	0.00	0.00	0.00	0.00	0
Humanities: Philosophy	0.00	0.00	0.00	0.00	0
Internat. Law. Eclesiastic & Philosop.	0.00	0.00	0.00	0.00	0
Journalism & Audiovisual Communic.	0.00	0.00	0.00	0.00	0
Library Sci. & Inf. Sci	0.00	100.00	0.00	0.00	2
Mater. Sci. & Chem. Eng.	12.20	26.83	36.59	24.39	41
Mathematics	0.00	14.58	41.67	43.75	48
Mechanical Engineering	70.00	10.00	20.00	0.00	10
Physics	0.00	9.09	31.82	59.09	44
Polit. Sci. & sociology	0.00	0.00	0.00	0.00	0
Private Law	0.00	0.00	0.00	0.00	0
Private Social & International Law	0.00	0.00	0.00	0.00	0
Public State Law	0.00	0.00	0.00	0.00	0
Signal & Communication Theory	34.62	53.85	0.00	11.54	26
Statistics	0.00	50.00	45.83	4.17	24
Systems Engineering & Automation	100.00	0.00	0.00	0.00	1
Telematics Engineering	75.00	25.00	0.00	0.00	4
Thermal & Fluids Eng.	12.50	37.50	31.25	18.75	16
Without data	15.00	25.00	25.00	35.00	40
Summation	14.61	30.19	29.55	25.65	308
Total	**14.75**	**30.49**	**28.85**	**25.90**	**305**

FIGURE 38. JOURNAL ARTICLES WITH BASIC-APPLIED LEVEL (DEPARTMENTS) (PERCENTAGES)(UC3M)



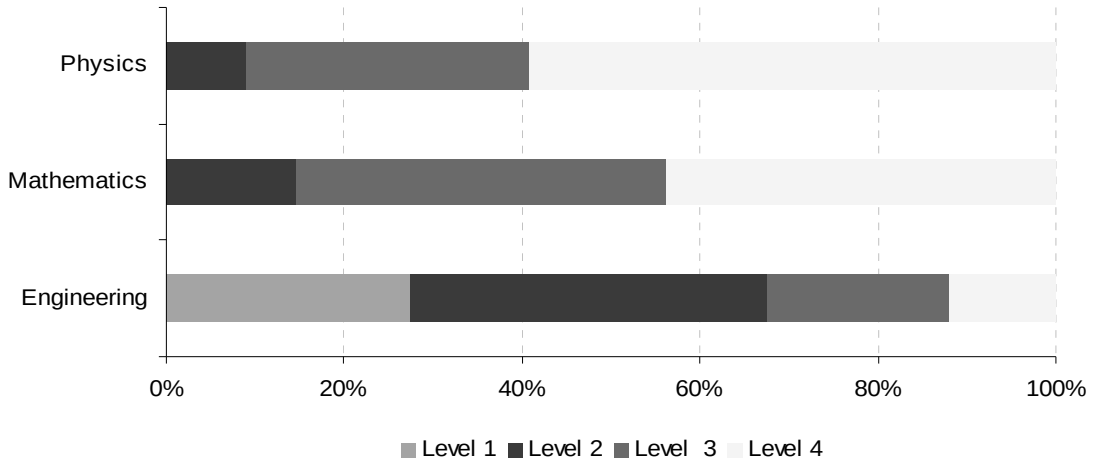
SCIENTIFIC AREA LEVEL

Considering thematic areas we can see that in Physics 85% of articles are included in the IPIQ database. Engineering is published in the most applied journals, while Physics in the most basic ones.

TABLE 65. JOURNAL ARTICLES WITH BASIC/APPLIED LEVEL (THEMATIC AREA) (PERCENTAGES) (UC3M)

Thematic area	Level 1	Level 2	Level 3	Level 4	Total	% with IPIQ level	N Doc
Engineering	39	57	29	17	142	28.80	493
Mathematics	0	7	20	21	48	60.00	80
Physics	0	4	14	26	44	84.62	52

FIGURE 39. JOURNAL ARTICLES WITH BASIC-APPLIED LEVEL PER THEMATIC AREA (UC3M)



4.B.2. UNIVERSITAT DE BARCELONA

In order to measure the basic or applied character of the research, a classification of scientific journals produced for the National Science Foundation (iPIQ) was used. As these data are not included in the database GREC, we had to match the names of the scientific journals where the UB researchers publish, with the listing of titles of the iPIQ classification. UB published 1745 articles in iPIQ journals (54,81%) (Table 66). Only journals of the Science Citation Index are classified into levels.

TABLE 66. JOURNAL ARTICLES IN IPIQ DATABASE (UB)

UB journal articles	iPIQ covered journals	UB journal articles in iPIQ	% of UB articles covered
3190	10343	1745*	54,81

*NOTE * Includes journals in level zero (not assigned)*

Within the 1745 UB journal articles included in the iPIQ database some have a level 0 of classification, that means journals without level because recently entered the Web of Science or which are included in Social Sciences Citation Index and therefore they do not have an assigned level. As shown in Table 67, the greater number of UB articles with assigned level corresponds to level 4 (1 applied; 4 basic).

TABLE 67. BASIC-APPLIED LEVEL IN UB JOURNAL ARTICLES (UB)

Level	N articles	%
1	62	3,71
2	252	15,07
3	368	22,01
4	990	59,21
Total	**1672**	**100.00**

DEPARTMENT LEVEL

Table 68 shows the number of articles and their corresponding level in each department. Considering departments, we observe that Organic Chemistry has the greater number of articles with assigned level (89,47%), but other 9 departments reach 70% or more. This is because UB has many departments that do research in fields which a great amount of journals included in Science Citation Index (SCI), and the UB departments perform very well in international journals indexed in SCI database.

TABLE 68. JOURNAL ARTICLES WITH BASIC/APPLIED LEVEL (DEPARTMENTS) (ABSOLUTE VALUES) (UB)

Departments	N art	Level 1	Level 2	Level 3	Level 4	Total	% with level
Biochemistry and Molecular Biology	211	2	13	51	113	179	84,83
Genetics	89	2	6	22	40	70	78,65
Pharmacology and Therapeutic Chemistry	173	0	1	35	91	127	73,41
Pharmacy and Pharmaceutical Technology	69	0	0	9	0	9	13,04
Clinical Sciences	65	9	13	22	1	45	69,23
Dentistry and Stomatology	32	3	7	0	0	10	31,25
Obstetrics and Gynecology, Pediatrics, Radiology and Anatomy	73	8	18	8	3	37	50,68
Medicine	279	26	92	46	13	177	63,44
Ecology	94	0	11	8	31	50	53,19
Organic Chemistry	114	0	4	5	93	102	89,47
Inorganic Chemistry	257	0	1	9	217	227	88,33
Structure and Constituents of Matter	306	0	4	10	212	226	73,86
Fundamental Physics	152	0	1	21	93	115	75,66
Astronomy and Meteorology	93	1	4	9	48	62	66,67
Electronics	148	1	46	51	12	110	74,32
Chemical Engineering	88	3	20	37	4	64	72,73
Applied Mathematics and Analysis	64	0	4	15	18	37	57,81
Total	**2307**	**55**	**245**	**358**	**989**	**1647**	**71,39**

Table 69 shows that, in general, in the departments of Inorganic Chemistry, Organic Chemistry, Structure and Constituents of Matter, Fundamental Physics and Astronomy and Meteorology, whose activity is usually related to theoretical development, articles of level 3-4 (basic) predominate, whereas the departments of Clinical Sciences, Dentistry, Obstetrics, Medicine, Electronics, Chemical Engineering and Personality present the greater number of articles classified in levels 1-2 or 2-3 (more applied).

TABLE 69. JOURNAL ARTICLES WITH BASIC/APPLIED LEVEL (DEPARTMENTS) (PERCENTAGES) (UB)

Departments	% Level 1	% Level 2	% Level 3	% Level 4	N art with level
Biochemistry and Molecular Biology	1,12	7,26	28,49	63,13	179
Genetics	2,86	8,57	31,43	57,14	70
Pharmacology and Therapeutic Chemistry	0,00	0,79	27,56	71,65	127
Pharmacy and Pharmaceutical Technology	0,00	0,00	100,00	0,00	9

Clinical Sciences	20,00	28,89	48,89	2,22	45
Dentistry and Stomatology	30,00	70,00	0,00	0,00	10
Obstetrics and Gynecology, Pediatrics, Radiology and Anatomy	21,62	48,65	21,62	8,11	37
Medicine	14,69	51,98	25,99	7,34	177
Ecology	0,00	22,00	16,00	62,00	50
Organic Chemistry	0,00	3,92	4,90	91,18	102
Inorganic Chemistry	0,00	0,44	3,96	95,59	227
Structure and Constituents of Matter	0,00	1,77	4,42	93,81	226
Fundamental Physics	0,00	0,87	18,26	80,87	115
Astronomy and Meteorology	1,61	6,45	14,52	77,42	62
Electronics	0,91	41,82	46,36	10,91	110
Chemical Engineering	4,69	31,25	57,81	6,25	64
Applied Mathematics and Analysis	0,00	10,81	40,54	48,65	37
Total	**3,34**	**14,88**	**21,74**	**60,05**	**1647**

4.C INDICATOR C- REFEREE AND NOT REFEREE

4.C.1. UNIVERSIDAD CARLOS III DE MADRID

The database UNIVERSITAS XXI does not include information about scientific journals with referees, therefore it is not possible to analyze this indicator with this source. We could consider that all those journals covered by WoS with IF have a refereeing system. This could amount to 563 articles that represent 34% of the total. Humanities journals would be excluded, as they do not have IF.

4.C.2. UNIVERSITAT DE BARCELONA

Despite the researchers must introduce the kind of authorship they have performed in a journal (they have to choose between a list that includes the option refereed/non refereed article), this information is not reliable enough, because the GREC does not include information about which scientific journals are refereed. Therefore, it is not possible to analyze this indicator with this source. We could consider that all those journals covered by WoS with JCR IF have a refereeing system. With this hypothesis, we will have an amount of 2021 articles that represent 63.35 % of the total. Humanitites journals are excluded, as they have no IF.

5. BRIEF CONCLUSIONS

Through the UNIVERSITAS XXI database it was possible to obtain a great majority of the indicators. Nevertheless, in some cases it was necessary to use complementary information. In indicator B: Scientific characterization (basic/applied), the data were related with those of the iPIQ database for the assignation of the corresponding level.

In the case of indicator C, UNIVERSITAS XXI does not include this information. To obtain these data it would be necessary to retrieve information through other sources as WoS or other national databases that include journals with refereeing sustems.

Through the GREC platform, it was possible to obtain a great majority of the descriptors and indicators in this pilot test. Nevertheless, in some cases it was necessary to use complementary information. In indicator B: Scientific characterization (basic/applied), the data were related with those of the iPIQ database for the assignation of the corresponding level.

GREC does not control the language of publications; some kind of automatic processing would be easy to perform with an algorithm, not developed at this moment.

In the case of indicator C (scientific characterization: referee/not referee), GREC includes this information (authors have to choose), but its validity is difficult to establish because of the lack of validation of this field in the form. To obtain these data we can use the authoritative list of journals imported data from Thomson Reuters JCR for each year. It would be useful to import data from other sources as we do with JCR, in order to obtain information on refereeing systems, and to have a more complete list of journals as authoritative data to introduce in the journal article form.

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- *Universitàt de Barcelona http://www.ub.edu*

ACRONYMS

ANEP	Agencia Nacional de Evalaución y Prospectiva/ National Agency of Evaluation and Prospective
CSIC	Consejo Superior de Investigaciones Científicas / Spanish Research Council
CVN	Currículum Vitae Normalizado / Standard Curriculum Vitae
FECYT	Fundación Española para Ciencia y Tecnología / Spanish Foundation for Science & Technology
FTE	Equivalente a jornada completa/ Full time equivalent
IEDCyT	Instituto de Estudios Documentales sobre Ciencia y Tecnología / Institute for Information Science Studies in Science & Technology
MRO	Oficina de gestión de la investigación / Management of research Office
OTRI	Oficina de Transferencia de Resultados de la Investigación / Transference Research Output Office
RTS	Cuerpo de docentes investigadores/Research and teaching staff
UB	Universitàt de Barcelona / University of Barcelona
UC3M	Universidad Carlos III de Madrid / Carlos III University of Madrid