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STATISTICAL RESEARCH IN EUROPE: 1985-1997

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This work presents a descriptive analysis of statistical research in Europe in the period 1985-1997. Research productivity is measured by using the volume of articles published in a set of journals with high impact index. We present a comparison of the research productivity of the different countries in the period, and study the dynamic evolution by comparing the first and the last five years in the sample. This type of analysis is also applied to obtain a comparison of the statistical research institutions in Europe.

Key Words

Bibliometrics; productivity rankings; statistical research; time series; trend of institutions.

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Statistical Research in Europe: 1985-1997

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Abstract

This work presents a descriptive analysis of statistical research in Europe in the period 1985–1997. Research productivity is measured by using the volume of articles published in a set of journals with high impact index. We present a comparison of the research productivity of the different countries in the period, and study the dynamic evolution by comparing the first and the last five years in the sample. This type of analysis is also applied to obtain a comparison of the statistical research institutions in Europe.

Keywords: Bibliometrics, productivity rankings, statistical research, trend of countries, trend of institutions.

1 Introduction

The analysis of objective measures of research productivity is important in order to evaluate the relative position of each institution and establish strategies for improvement. This analysis is also important at the country level in order to identify the strengths and weakness of different scientific fields and evaluate the efficiency of resource allocations. For instance Caballero and Peña (1987) analyzed the relative efficiency of funds allocation in Spain and found that this efficiency has been very high. Analyzing research productivity is becoming standard practice in many scientific fields. In the field of statistics, Phillips *et al.* (1988) present the first study of research productivity by countries and institutions by using a worldwide survey of refereed journals over the period 1980-1986. Genest (1997) updates the study of Phillips *et al.* by comparing the statistical research output of countries and establishments between 1985 and 1995 and Gil *et al.* (1999) have compared the trends in research productivity in the most productive institutions in the world in the period 1985-1997. In this article we will use this same data base to analyse statistical research in Europe.

As indicated in the previous references, measuring the research productivity of an institution in a given period of time is not an easy task because of the many dimensions that should

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be taken into account. First we have to define the research output of the members of the institution. Second, we have to decide the relative weight of each piece of research. Third, we have to decide how to combine the different contributions. The most usual measures of research output in the field of statistics are based on the number of articles published in refereed statistical journals. This choice can be criticized because this variable clearly does not represent the total research contribution of an institution. It does not include books, PHD. theses, or articles published in subject matter journals. However, it is generally accepted that, although incomplete, the number of articles in the key journals of the field is the single most important variable of research excellence of an institution and we will use this measure in this study. Second, we have to decide the relative weight of each article. There are three key variables to be considered: (1) number of authors, (2) article length and (3) journal. The usual procedure is to weight each article by a factor

$$F = \frac{P}{A} I$$

where P is the number of adjusted pages of the article, A is the number of authors of the article and I is an indicator variable that takes the value 1 if the journal is included in the data base used and 0 otherwise. Again this weighting can be criticized in a number of ways. First the contribution of an article is not in general related to its length, second this method penalizes articles written by several authors, third it has a strong bias towards the journals included in the data base. However, it is not easy to overcome these limitations. Some authors have proposed weighting each article by its impact factor defined as the number of references it has received in a period of time but on this option has also some objections: the result will depend very much of the period considered as some important papers are only recognized as such after several years; theoretical papers can have advantage over practical papers if we considered only statistical journals but the situation will be reversed if we include the impact in the subject matter field; it is impossible to evaluate new papers; etc. With respect to the variable I some people have suggested weighting the journals by its impact factor. For instance, Dusansky and Vernon (1998) use this criterion to produce rankings of U.S. Economics Departments. Again there is no general agreement on this approach because in many fields, and in particular in statistics, journals that publish survey papers will be possible overweighed with respect to top research journals.

Given the previous problems we have decided to use the measure proportional adjusted pages by authors (PAG as defined by Genest, 1997) introduced by previous workers in the field. It has the advantage of allowing comparison with previous work and preventing from introducing our personal bias into this analysis. For instance if a member of an institution has written three articles, the first one on his own, (23 adjusted pages), the second one in collaboration with another author (18 adjusted pages) and the third one in collaboration with two other authors (21 adjusted pages), the value of this variable for this author will be $PAG=23+18/2+21/3=39$

The rest of this article is organized as follows. In section 2, we define the data base used in this study. In section 3, we analyze the productivity of European Countries. In section 4, we analyze the productivity of the main European statistical research institutions. Section 5 includes some final remarks. Appendix A shows a table with the top 150 European

Abbrev	Journals	Impact Factor
AS	The Annals of Statistics	.978
ASM	Annals of the Institute of Statistical Mathematics	.287
BIOICS	Biometrics	1.051
BIOIKA	Biometrika	.989
ISR	International Statistical Review	.698
JASA	Journal of the American Statistical Association	1.403
JMA	Journal of Multivariate Analysis	.333
JSPI	Journal of Statistical Planning and Inference	.262
CJS	The Canadian Journal of Statistics	.305
JRSSB	Journal of the Royal Statistical Society, Series B	2.108
SCJST	Scandinavian Journal of Statistics	.467
STSIN	Statistica Sinica	.398
TECHNO	Technometrics	1.384

Table 1: Averaged Impact Factor (1992–1996) of Journals including in the database. Bold numbers indicate journals with a half life bigger than 10.

institutions ranked by their productivity in period 1993–1997. Finally, appendix B presents a brief analysis of statistical research institutions in Spain.

2 The Data Base

The data base is a subset of the one used by Gil *et al.* (1999). This main data set consists of all research articles about statistical theory published from 1985 until 1997, both years included, in 13 journals which can be considered as are the core of the methodological contribution to the statistical research mainstream. Table 1 presents these journals and its average impact factor in the last five years of the sample. The *impact factor* of a journal in a given year is defined as *the number of current citations to articles published in a specific journal in a two year period divided by the total number of articles published in the same journal in the corresponding two year period*. This data has been taken from *SCI Journal Citation Report*. Although this set of journals may underestimate the statistical contributions in some fields, as for instance the interface between statistics and econometrics, a set of similar journals has been used by previous authors and it is broadly reasonable.

The pages of the journals have been adjusted following the suggestion by Phillips *et al.* (1988) and Genest (1997), and taking the factors proposed by Genest (1997), that are calculated using the printed surface of journals, choosing as the reference journal *The Annals of Statistics*, and multiplying the number of pages of an article by the corresponding journal factor to obtain the number of adjusted pages. The productivity of an institution is the sum of the proportional adjusted pages of every author that sign a paper under the name of that institution, and the productivity of a Country is the sum of all their institutions.

Gil *et al.* (1999) analyze the trend of this set of journals. They show that all the journals increase their number of adjusted pages per year, but there is a clear change over time in the contributions to each journal to the total output. The percentage of contribution increases the most in the *Journal of Statistical Planning Inference* where this variable goes from 8% in 1985 to 18% in 1997. *Statistica Sinica* appears in 1991 and in 1997 has reached

Journal	Perc. of Journal over World	Perc. of Journal over Europe	Index of European participation	Perc of Europe over journal
AS	15.75	16.80	1.07	25.33
ASM	5.30	4.35	.82	19.47
BIOICS	10.93	8.99	.82	19.53
BIOIKA	7.56	8.87	1.17	27.87
ISR	3.15	5.69	1.81	42.86
JASA	18.28	8.75	.48	11.37
JMA	8.06	9.98	1.24	29.38
JSPI	11.82	14.10	1.19	28.31
CJS	3.65	1.48	.41	9.64
JRSSB	5.00	8.83	1.77	41.95
SCJST	3.10	8.77	2.83	67.16
STSIN	3.37	1.72	.51	12.10
TECHNO	4.03	1.66	.41	9.79

Table 2: Relative contribution of journals to the European countries output in the period 1985–1997

the fifth position in the percentage of contribution to this data base. Two journals have a clear decrease output: *Biometrika*, that moves from around 9% in 1985 to 6% in 1997, and *Technometrics*, that moves from 6% in 1985 to 3.3% in 1997.

Table 2 shows in its first two columns the distribution of World and European productivity over the thirteen journals contained in our data base. The third column shows the index of European participation, that is the ratio of the first two columns. And in the last column we have presented the percentage of pages of each journal published by European countries. For example, the first row indicates that the *The Annals of Statistics* includes 16.8% of the total number of adjusted pages published by European institutions and this is based on the 25.3% of the pages that this journal has published in this period. The journals with smaller contributions from European countries are *Canadian Journal of Statistics*, *Statistica Sinica* and *Technometrics*. Jointly, these three journals contain less that 5% of European productivity. On the other hand, *The Annals of Statistics* and *Journal of Statistical Planning Inference* accumulate around 30% of this productivity. From the fourth column, we can see that the 67% of the pages published in *The Scandinavian Journal of Statistics* are signed by authors that belong to European institutions. Next are the *International Statistical Review* and the *Journal of the Royal Statistical Society B* that have around 40% of its pages contributed by Europe. Note that as indicated in Gil et al (1999) the contribution of Europe to the total research output in statistics is around 25%. This means that these three journals have a bias towards European contributions. On the other hand, the contribution of European institutions is below average in *Canadian Journal of Statistics*, *Technometrics*, *Journal of the American Statistical Association* and *Statistica Sinica*.

Table 3 presents the distribution of European countries' productivity over the thirteen journals in the period 1985–1997 and compares it with the distribution of the World productivity of these journals (last row of the table). As a measure of comparison we use the χ^2 distance: $\sum_i (p_i - \hat{p}_{i,j})^2 / p_i$, where p_i is the percentage of the World output published in the i -th journal and $\hat{p}_{i,j}$ is the same but for the j -th European country. The countries have

Country	AS	ASM	BIOICS	BIOIKA	ISR	JASA	JMA	JSPI	CJS	JRSSB	SCJST	STSIN	TECH	χ^2
Belgium	19.5	4.7	4.0	2.6	3.1	18.1	11.1	20.3	2.1	5.8	2.4	5.9	.6	.22
Switzerland	17.2	3.7	4.0	5.9	8.6	18.7	11.9	17.6	1.5	3.6	3.3	1.9	2.1	.23
Italy	12.8	8.3	3.8	13.8	8.3	17.6	7.7	12.5	1.6	4.3	6.0	.5	2.9	.27
Ireland	24.0	—	9.1	17.4	—	22.8	3.7	11.1	—	8.1	—	—	3.7	.41
Germany	29.7	6.2	4.9	5.5	2.1	7.3	15.2	19.3	.8	1.7	4.9	1.5	.8	.44
Spain	10.0	5.5	5.6	5.7	3.9	14.4	19.2	26.1	1.8	2.0	.6	1.7	3.7	.45
France	16.5	4.2	15.2	4.4	2.4	3.4	17.0	15.9	3.0	4.7	11.5	1.8	—	.54
Netherlands	31.0	1.7	10.0	1.9	7.4	8.3	12.9	12.8	1.6	.8	9.7	.4	1.5	.59
Austria	10.6	—	8.2	12.2	—	9.1	20.7	33.9	—	2.6	—	2.7	—	.92
U.K	8.5	1.7	13.4	17.8	8.5	9.0	2.2	7.2	1.2	23.0	2.1	2.4	2.9	1.08
Russia	27.8	1.9	—	2.4	—	4.5	16.2	36.1	—	—	6.7	4.4	—	1.15
Hungary	30.7	4.2	—	1.1	2.2	—	26.1	21.7	10.0	1.5	2.4	—	—	1.19
Poland	18.9	7.1	1.2	1.5	—	3.5	27.6	30.8	2.3	—	5.6	.8	.7	1.20
Bulgaria	29.3	8.7	—	5.9	—	—	6.3	30.7	4.7	—	14.2	—	—	1.30
Czechoslovakia	20.7	22.4	—	4.2	—	3.9	10.5	38.4	—	—	—	—	—	1.63
USSR	39.5	—	3.4	2.6	14.3	1.4	14.2	4.5	—	20.1	—	—	—	1.74
Lithuania	27.8	—	—	—	—	—	24.8	36.4	—	—	11.0	—	—	1.77
Finland	2.2	1.6	11.0	7.9	—	19.0	8.5	8.8	1.3	5.8	25.7	4.3	3.9	1.85
Portugal	—	—	17.3	5.1	—	7.8	—	47.2	—	11.2	11.4	—	—	1.90
Greece	1.3	34.0	3.2	.9	1.2	3.4	10.9	32.5	7.2	—	1.9	2.7	.9	2.42
Sweden	6.5	4.9	4.6	4.6	12.8	8.8	7.9	13.8	.8	1.7	30.2	1.6	1.9	2.88
Denmark	16.0	4.6	11.8	7.7	11.1	3.1	1.0	2.0	.6	9.2	32.4	—	.6	3.37
Norway	11.0	.2	9.2	8.2	4.8	15.3	3.2	5.4	—	3.0	37.9	—	1.7	4.15
Slovenia	—	—	—	—	—	100	—	—	—	—	—	—	—	4.47
Yugoslavia	—	—	—	—	19.7	9.6	61.5	9.2	—	—	—	—	—	5.05
Rumania	—	54.1	—	—	—	—	24.2	21.7	—	—	—	—	—	5.66
Estonia	—	35.9	—	—	—	—	64.1	—	—	—	—	—	—	6.53
Iceland	—	—	21.0	—	—	—	—	—	—	—	79.0	—	—	19.6
Luxembourg	—	—	—	—	100	—	—	—	—	—	—	—	—	30.8
World	15.8	5.3	10.9	7.6	3.2	18.3	8.1	11.8	3.7	5.0	3.1	3.4	4.0	0

Table 3: Percentage of adjusted pages that each country published in the thirteen listed journals of Table 1

Country	Average	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
U.S.	52.9	54.6	53.6	53.0	52.2	55.3	55.9	56.1	55.5	53.1	53.7	51.5	46.2	50.8
Canada	8.3	7.0	8.4	7.0	9.9	9.1	7.7	7.4	10.0	9.8	7.6	7.8	9.3	6.5
U.K.	6.7	9.2	8.3	6.2	7.2	5.4	6.4	7.0	5.7	6.3	6.0	7.2	6.3	7.1
Australia	3.8	3.5	3.9	5.2	4.2	3.6	2.9	2.6	3.6	4.1	4.6	2.8	4.0	3.9
New Zealand	.6	.5	.8	.7	.4	.2	.6	.8	.9	.4	.5	.7	.4	.6
Hong Kong	.5	.4	.2	—	.4	.2	.3	.4	.0	.2	.4	.7	1.2	1.2
Total	72.7	75.2	75.3	72.1	74.4	73.9	73.7	74.3	75.7	73.8	72.7	70.6	67.4	70.2

Table 4: Relative contribution of the English speaking countries to the output productivity of our data base.

been ordered by this χ^2 distance. The larger the value of this χ^2 distance, the larger the deviation from the World distribution. This table confirms and clarifies some of the previous comments. It is interesting to note that journals linked to a country or group of countries show a clear bias on the direction of the sponsoring country. For instance, the U.K. output is very concentrated in the *Journal of the Royal Statistical Society B* and *Biometrika*, while the Scandinavian countries are overweighed in the *Scandinavian Journal of Statistics*. Also the output of each country is usually concentrated in a few journals. On the other hand, countries with the distribution most similar to that of the World are Belgium, Switzerland and Italy.

3 Trends in Productivity in European Countries

In this section we will analyze the trends in productivity of European Countries. As most journals included in the data base are published in English, a bias towards English speaking countries is expected. In fact, as shown in Table 4, U.S., U.K., Canada, Australia, New Zealand and Hong Kong accounts for 73% of the total statistical research output in the World.

Table 5 shows the relative contribution of each country to the World output (number of adjusted pages published by authors of the country divided by total number of adjusted pages in the year) in the thirteen years considered in our analysis. In order to analyze the dynamic evolution in these thirteen years we have compared the productivity in the first five years in the sample to the productivity in the last five years. Using the number of adjusted pages, Europe has increased its contribution between both periods, around the 71% level. This relative increase is bigger than total increase in the World, and in absolute terms the percentage of the European contribution with respect to the World has grown in the second period with respect to the first by 4%.

In Table 6 we provide the productivity of the European countries in the last and first five years of the sample. Countries have been sorted in decrease order of their productivity in the last period, 1993–1997. To compare, the fifth column presents the position of the countries if they had been sorted using their productivity in the period 1985–1989. The last

Country	Average	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
U.K	6.70	9.17	8.30	6.23	7.19	5.42	6.38	6.99	5.69	6.28	5.97	7.18	6.28	7.11
Germany	4.37	3.57	3.65	4.27	2.96	3.58	4.35	3.72	4.24	4.91	5.08	4.67	4.70	5.68
France	2.08	.61	1.26	1.48	.99	1.87	2.41	2.17	2.20	1.80	1.82	3.34	2.68	2.87
Netherlands	1.71	1.93	.75	1.61	1.45	2.42	1.98	1.97	1.72	1.22	1.29	1.86	2.00	1.82
Denmark	1.34	1.62	2.33	1.85	.98	2.91	2.11	1.89	1.24	.89	1.34	.61	.45	.59
Norway	.86	1.51	.82	.91	1.36	.45	1.30	.44	.69	.37	1.81	1.03	.56	.41
Sweden	.85	1.09	1.24	1.31	.66	1.01	.64	.93	.07	.80	.83	.63	1.01	1.06
Belgium	.77	.61	.07	.07	.66	.62	.50	.55	.85	.39	1.34	1.30	1.02	1.18
Spain	.76	—	.27	.15	.62	.66	.45	.42	.60	.92	.99	1.65	.85	1.36
Poland	.70	.53	.54	.77	1.02	.97	.72	.40	1.22	.58	.51	.82	.48	.62
Italy	.66	.17	.18	1.04	—	.31	.54	.50	.53	.83	1.08	.71	.94	1.12
Switzerland	.56	.49	.33	.46	.36	.54	.17	.46	.21	.58	1.15	.47	.59	1.10
Finland	.48	.66	.60	.64	.77	.76	.17	.38	.57	.59	.28	.45	.25	.39
Greece	.43	.32	.61	.38	.44	.58	.12	.43	.23	.38	.33	.47	.67	.53
Austria	.27	—	.08	.23	.33	.23	.15	.22	.26	.28	.54	.36	.52	.04
Hungary	.26	.61	.59	.25	.54	.35	.06	.59	—	.16	.29	—	.22	.08
USSR	.19	.33	.05	—	.47	.20	.45	.56	.09	.39	.10	—	—	—
Ireland	.19	.24	.49	.21	.14	—	.24	.07	.07	.33	.15	.19	.34	.04
Czechoslovakia	.14	.13	.19	.09	.15	.15	.17	—	.28	.05	.08	.12	.19	.16
Russia	.13	—	—	—	—	—	—	—	—	—	.09	.20	.52	.50
Bulgaria	.07	—	.06	—	.11	.13	—	.23	—	.04	.08	.19	.06	—
Portugal	.06	—	.11	—	—	.09	—	—	.09	—	.05	.32	.02	—
Yugoslavia	.04	—	.03	—	—	.16	.11	—	—	.20	—	—	—	—
Lithuania	.03	—	—	—	—	—	—	.10	.11	—	—	—	.05	.13
Iceland	.02	—	—	—	—	—	—	.05	—	—	—	.17	—	—
Rumania	.02	—	.07	.07	—	—	—	—	.09	—	—	—	—	—
Estonia	.01	—	—	—	—	—	—	—	—	.05	—	.10	—	—
Luxembourg	.01	—	—	—	—	—	—	—	—	—	.09	—	—	—
Slovenia	.00	—	—	—	—	—	—	—	—	—	—	.03	—	—
Europe	23.7	23.6	22.6	22.0	21.2	23.4	23.0	23.0	21.1	22.1	25.3	26.9	24.6	26.8

Table 5: Contribution of the European countries to the World output in the period 1985–1997

Country	93-97			85-89			Increase
	Pos	PAG	%	Pos	PAG	%	%
U.K	1	5159.9	26.15	1	3649.6	31.81	-17.8
Germany	2	3946.3	20.00	2	1828.7	15.94	25.5
France	3	1993.2	10.10	5	642.9	5.60	80.3
Netherlands	4	1302.0	6.60	4	840.7	7.33	-9.9
Spain	5	905.4	4.59	14	183.4	1.60	187.1
Belgium	6	825.9	4.19	13	211.9	1.85	126.6
Italy	7	737.2	3.74	15	172.2	1.50	149.0
Sweden	8	684.8	3.47	6	533.4	4.65	-25.3
Norway	9	638.3	3.23	7	509.6	4.44	-27.2
Switzerland	10	611.3	3.10	12	222.7	1.94	59.6
Denmark	11	594.1	3.01	3	986.7	8.60	-65.0
Poland	12	471.3	2.39	8	398.4	3.47	-31.2
Greece	13	380.0	1.93	10	239.4	2.09	-7.7
Finland	14	302.9	1.54	9	352.4	3.07	-50.0
Austria	15	270.9	1.37	18	93.2	.81	69.1
Russia	16	220.1	1.12	—	—	—	—
Ireland	17	163.7	.83	17	103.5	.90	-8.1
Hungary	18	117.9	.60	11	234.6	2.04	-70.8
Czechoslovakia	19	97.6	.49	19	71.5	.62	-20.6
USSR	20	69.7	.35	16	110.7	.96	-63.4
Portugal	21	59.8	.30	21	21.0	.18	65.9
Bulgaria	22	56.3	.29	20	33.3	.29	-1.8
Lithuania	23	31.1	.16	—	—	—	—
Yugoslavia	24	28.6	.14	22	20.8	.18	-20.0
Iceland	25	25.4	.13	—	—	—	—
Estonia	26	22.3	.11	—	—	—	—
Luxembourg	27	13.3	.07	—	—	—	—
Slovenia	28	4.6	.02	—	—	—	—
Rumania	—	—	—	23	14.1	.12	—

Table 6: Evolution of position, adjusted pages and percentage of contribution in European countries.

column shows the relative increase of countries in its percentage of contribution between both periods. The countries with the biggest relative increase are Spain, Italy, Belgium and France. Spain almost triples its percentage of contribution, and goes up nine positions in the ranking: from 15th to 5th. A similar pattern in the growth is observed in Italy and Belgium. France doubles its percentage of contribution and goes from the fifth to the third position. Countries with the biggest relative decrease are Hungary, Denmark and Finland. Hungary goes down seven position in the ranking and Denmark moves from third position in period 1985–1989 to eleventh position in period 1993–1997. U.K. suffers, in relative terms, a slight decrease (around the 17.8%) which in absolute terms is a loss of 5% of its percentage of contribution between both periods. The decrease of U.K. and the increase of Germany have reduced the difference between both countries from 16% in 1985–1989 to 6% in 1993–1997, what would imply, if this trend does not change, that the U.K. can move to a second position behind Germany in the near future.

Table 7 shows for each European country, the number of different institutions and authors that appear in the data base in the first and last five years. Columns 6 and 7 present the relative increase of the number of institutions and authors in the second period with respect to the first period. The last two columns are the average productivity for the institutions and authors from each country. It can be seen that countries with the biggest relative increase in the number of authors, have the smaller average productivity. This may be due to the entrance of many young statisticians that have initially a lower productivity than more senior people (see Spain, Italy, Austrian and France). On the contrary, Sweden, Norway and Finland have a decrease in the number of different institutions and authors that publish in the thirteen journals.

Finally, Table 8 compares for each country the percentage of contribution to statistic to the percentage of contribution to science (*all fields combined*). The latter have been taken from the *Second European Report on S&T Indicators 1997* which includes data until 1995 of the contribution in the following fields: clinical medicine, biomedical research, biology chemistry, physics, mathematics, engineering and earth & spaces sciences. As the data available for the comparison goes until 1995, Table 8 compares the periods, 1984-1989 and 1990-1995. The columns entitled *increase* show the relative increase of the percentage of contribution in the second period, 90-95, with respect to the first period, 84-89. The last column, *Rate*, shows the rate between the contribution to statistic and the contribution to science in the last period. Firstly, it can be observed that the increase in the contribution to statistic is correlated to the increase in the contribution to science. The countries with the biggest relative increase in their contribution to science are Portugal and Spain, and this last country also has the largest increase in the contribution to statistics, which is three times bigger than the one obtained in all fields. The three countries with the largest relative to all fields increase in their contribution to statistic are Greece, Norway and Belgium. On the other hand, Russia, France, Italy, Hungary and Czechoslovakia have increased in statistics less than in science in general.

Country	93-97		85-89		Increase (%)		Aver.(93-97)	
	Inst.	Aut.	Inst.	Aut.	Inst.	Aut.	$\frac{PAG}{Inst}$	$\frac{PAG}{Aut}$
U.K	96	321	85	245	13	31	53.7	16.1
Germany	84	197	56	109	50	81	47.0	20.0
France	56	174	27	74	107	135	35.6	11.5
Netherlands	28	96	21	51	33	88	46.5	13.6
Spain	23	79	14	21	64	276	39.4	11.5
Belgium	15	42	9	18	67	133	55.1	19.7
Italy	35	66	14	18	150	267	21.1	11.2
Sweden	14	39	20	43	-30	-9	48.9	17.6
Norway	13	38	16	39	-19	-3	49.1	16.8
Switzerland	14	39	11	19	27	105	43.7	15.7
Denmark	12	37	13	40	-8	-8	49.5	16.1
Poland	16	33	14	40	14	-18	29.5	14.3
Greece	9	30	6	23	50	30	42.2	12.7
Finland	10	23	12	27	-17	-15	30.3	13.2
Austria	5	21	5	8	0	163	54.2	12.9
Russia	9	19	—	—	—	—	24.5	11.6
Ireland	4	7	4	8	0	-13	40.9	23.4
Hungary	5	10	4	13	25	-23	23.6	11.8
Czechoslovakia	4	7	4	7	0	0	24.4	13.9
USSR	3	4	8	12	-63	-67	23.2	17.4
Portugal	6	6	1	4	500	50	10.0	10.0
Bulgaria	3	5	3	4	0	25	18.8	11.3
Lithuania	2	3	—	—	—	—	15.6	10.4
Yugoslavia	1	1	3	4	-67	-75	28.6	28.6
Iceland	1	1	—	—	—	—	25.4	25.4
Estonia	1	1	—	—	—	—	22.3	22.3
Luxembourg	1	1	—	—	—	—	13.3	13.3
Slovenia	1	1	—	—	—	—	4.6	4.6
Rumania	—	—	1	1	—	—	—	—
Europe	471	1301	351	828	34.2	57.1	41.9	15.2

Table 7: Number of institutions and authors in European countries

Country	Statistic			Science			Rate
	85-89	93-97	Increase	84-89	90-95	increase	
	%	% (1)	%	%	% (2)	%	(1)/(2)
U.K	31.81	26.15	-17.8	21.22	19.85	-6.5	1.3
Germany	15.94	20.00	25.5	14.33	15.94	11.2	1.3
France	5.60	10.10	80.3	11.91	12.63	6.0	0.8
Netherlands	7.33	6.60	-9.9	4.63	5.15	11.3	1.3
Spain	1.60	4.59	187.1	2.79	4.47	60.3	1.0
Belgium	1.85	4.19	126.6	2.21	2.36	6.8	1.8
Italy	1.50	3.74	149.0	6.20	7.50	21.0	0.5
Sweden	4.65	3.47	-25.3	4.24	4.08	-3.7	0.9
Norway	4.44	3.23	-27.2	1.22	1.22	0.3	2.6
Switzerland	1.94	3.10	59.6	3.32	3.59	8.1	0.9
Denmark	8.60	3.01	-65.0	2.05	2.04	-0.5	1.5
Poland	3.47	2.39	-31.2	2.23	2.08	-6.8	1.1
Greece	2.09	1.93	-7.7	0.69	0.86	24.3	2.2
Finland	3.07	1.54	-50.0	1.54	1.68	8.5	0.9
Austria	0.81	1.37	69.1	1.36	1.52	12.2	0.9
Russia	—	1.12	—	15.78	10.65	-32.5	0.1
Ireland	0.90	0.83	-8.1	0.46	0.49	7.2	1.7
Hungary	2.04	0.60	-70.8	1.11	0.95	-14.5	0.6
Czechoslovakia	0.62	0.49	-20.6	1.54	1.63	5.8	0.3
USSR	0.96	0.35	-63.4	—	—	—	—
Portugal	0.18	0.30	65.9	0.23	0.41	77.1	0.7
Bulgaria	0.29	0.29	-1.8	0.62	0.56	-10.2	0.5
Lithuania	—	0.16	—	—	—	—	—
Yugoslavia	0.18	0.14	-20.0	—	—	—	—
Iceland	—	0.13	—	0.05	0.06	39.9	2.0
Estonia	—	0.11	—	—	—	—	—
Luxembourg	—	0.07	—	—	0.02	—	3.1
Slovenia	—	0.02	—	—	—	—	—
Rumania	0.12	—	—	0.28	0.26	-6.8	—

Table 8: Comparative between the percentage of contribution to statistics and the percentage of contribution to science.

4 Trends in the Institutions

In this section we will analyze trends in productivity of institutions in European countries. Before presenting this analysis we make two comments. First, this analysis involves a bias towards the biggest institutions. Second, the decrease in the percentage of contribution does not always imply a decrease in the productivity, but a smaller growth than the other European institutions. It must be taken into account that this reduction in the percentage is also due to the incorporation of 120 new European institutions that do not appear in the period 1985–1989.

Table 9 shows the 50 European institutions with the biggest productivity in the period 1985–1989. For each of them, we include the percentage of contribution over the total of Europe and the position that it then occupies in the ranking of European institutions in this period. The last column gives the position that these institutions occupy in the period 1993–1997, so that we may observe its evolution in the ranking. Imperial College is in the first position in both periods, but in the last period it moved from 3.37% to 2.09%, losing more than 1% of the percentage of its contribution. The next two institutions belong to Denmark who in the last period suffer a clear decrease in its positions: the University of Aarhus which moved from second to fourth, and the University of Copenhagen who moved from third to the 49th position. It is very noticeable that there is a clear difference that exists in the period 1985–1989 between the two best institutions and institutions that follow. There is a jump in the percentages around the 1% level. This difference disappears among the 50 institutions that become more productive in the period 1993–1997.

In Table 10 we present the 50 European institutions with the biggest productivity in the period 1993–1997. The first surprising point is the incorporation of 25 new institutions that do not appear in Table 9 among the top 50 institutions of that table. Some institutions such as the London School of Economics, University of Giessen and Université Catholique de Louvain, not only appear among the top 50 but occupy first positions in this rankings. This pattern is similar if we take some other top institutions: only four of the top 10 institutions in 1985–1989 have stayed in the ten best institutions in 1993–1997; only seven of the top 20; only twelve of the top 30; etc.

In this period, the first two institutions are from the U.K. and the third from Germany, and all of them have a similar percentage of contribution. It must be noted that the London School of Economics goes up 81 positions in the ranking, and is the second institution in this period. It must also be noted that two universities without any percentage of contribution in the first period appear now among the top 50: University Carlos III in the 26th position, and Katholische University of Eichstatt in position 32.

Now, we look at the countries to which these institutions belong. U.K. had 21 institutions in Table 9 and only 17 in Table 10. Germany moves from 6 institutions to 12 institutions in the last period. Denmark goes from 5 to 2 institutions. Notice that the institutions that belong to Hungary (2 institutions) and Finland (1) disappear, replaced by institutions from Switzerland (3), Spain (2) and Italy (1).

In the Appendix A we present the continuation of Table 11 with the European institutions up to position 150 listed in terms of its productivity in the period 1993–1997.

Country	Institution	85-89		93-97
		%	Pos	Pos
U.K.	Imperial College	3.37	1	1
Denmark	Univ. of Aarhus	3.17	2	4
Denmark	Univ. of Copenhagen	1.95	3	49
Norway	Univ. of Oslo	1.81	4	11
Germany	Univ. of Heidelberg	1.52	5	3
Sweden	Univ. of Stockholm	1.49	6	102
U.K.	Univ. of Surrey	1.38	7	22
U.K.	Univ. of Warwick	1.30	8	38
U.K.	Univ. of Southampton	1.20	9	7
U.K.	Univ. of Bath	1.20	10	58
U.K.	Univ. of Birmingham	1.18	11	160
Denmark	Univ. of Aalborg	1.17	12	110
U.K.	Univ. of Durham	1.17	13	158
U.K.	Univ. of Oxford	1.10	14	50
Hungary	Univ. of Szeged	1.09	15	—
U.K.	Univ. of St Andrews	1.06	16	132
U.K.	Univ. of Glasgow	1.05	17	31
U.K.	Univ. of Reading	1.04	18	272
Germany	Univ. of Cologne	1.04	19	20
Netherlands	Univ. of Leiden	.94	20	17
Finland	Univ. of Oulu	.94	21	54
U.K.	Univ. of Sheffield	.92	22	57
Poland	Academy of Agriculture in Poznan	.91	23	95
U.K.	Univ. of Leeds	.91	24	25
U.K.	Univ. of Edinburgh	.88	25	181
Netherlands	Univ. of Utrecht	.86	26	83
U.K.	Univ. College London	.85	27	10
U.K.	Rothamsted Experimental Station	.80	28	—
U.K.	Univ. of Kent	.79	29	9
U.K.	Univ. of Cambridge	.79	30	6
Germany	Freie Univ. of Berlin	.78	31	30
Belgium	Univ. Libre de Bruxelles	.78	32	37
Netherlands	Centre for Math. and Comp. Science	.76	33	414
Denmark	Royal Veterinary and Agricul. Univer.	.74	34	139
France	Université Paris VI	.72	35	14
Poland	Univ. of Wroclaw	.71	36	46
Netherlands	Free Univ. Amsterdam	.70	37	59
Germany	Univ. of Essen	.70	38	78
France	INRA	.69	39	8
U.K.	Univ. of Liverpool	.68	40	72
Hungary	Hungarian Academy of Sciences	.66	41	97
U.K.	Univ. of London	.66	42	48
Denmark	Novo Research Institute	.65	43	—
Sweden	Univ. of Lund	.65	44	19
Germany	Univ. of Hamburg	.60	45	111
France	Université Paul Sabatier	.59	46	5
Greece	Univ. of Athens	.59	47	15
U.K.	Univ. of Newcastle	.59	48	62
Netherlands	Univ. of Twente	.57	49	64
Germany	Univ. of Bonn	.57	50	179

Table 9: The top 50 European institutions in the period 1985–1989

Country	Institution	85-89	93-97	
		Pos	Pos	%
U.K.	Imperial College	1	1	2.09
U.K.	L.School E.	83	2	2.07
Germany	Univ. of Heidelberg	5	3	1.93
Denmark	Univ. of Aarhus	2	4	1.56
France	Université Paul Sabatier	46	5	1.53
U.K.	Univ. of Cambridge	30	6	1.49
U.K.	Univ. of Southampton	9	7	1.35
France	INRA	39	8	1.21
U.K.	Univ. of Kent	29	9	1.21
U.K.	Univ. College London	27	10	1.17
Norway	Univ. of Oslo	4	11	1.16
Germany	Univ. of Giessen	107	12	1.12
Germany	Humboldt Univ. of Berlin	89	13	1.08
France	Université Paris VI	35	14	1.06
Greece	Univ. of Athens	47	15	1.06
Belgium	Université Catholique de Louvain	321	16	.99
Netherlands	Univ. of Leiden	20	17	.95
U.K.	Univ. of Lancaster	76	18	.91
Sweden	Univ. of Lund	44	19	.90
Germany	Univ. of Cologne	19	20	.88
Germany	Univ. of Gottingen	70	21	.84
U.K.	Univ. of Surrey	7	22	.82
U.K.	Univ. of Nottingham	175	23	.82
U.K.	Univ. of Bristol	316	24	.81
U.K.	Univ. of Leeds	24	25	.81
Spain	Univ. Carlos III Madrid	—	26	.81
Netherlands	Erasmus Univ.	96	27	.79
Norway	Univ. of Bergen	111	28	.78
Belgium	Limburgs Universitair Centrum	72	29	.76
Germany	Freie Univ. of Berlin	31	30	.74
U.K.	Univ. of Glasgow	17	31	.73
Germany	Katholische Univ. of Eichstatt	—	32	.73
U.K.	Nuffield College	304	33	.72
Switzerland	ETH Zurich	53	34	.71
Germany	Ruhr Univ. of Bochum	212	35	.70
Switzerland	Univ. of Zurich	277	36	.66
Belgium	Univ. Libre de Bruxelles	32	37	.66
U.K.	Univ. of Warwick	8	38	.66
Germany	Univ. of Dortmund	186	39	.65
Germany	Univ. of Bielefeld	142	40	.64
Switzerland	Univ. of Geneve	130	41	.63
Germany	Technical Univ. of Aachen	125	42	.63
Spain	Univ. of Cantabria	227	43	.60
U.K.	Imperial Cancer Research Fund.	73	44	.59
Germany	Univ. of Munich	274	45	.57
Poland	Univ. of Wroclaw	36	46	.57
Italy	Univ. of Rome	108	47	.55
U.K.	Univ. of London	42	48	.55
Denmark	Univ. of Copenhagen	3	49	.54
U.K.	Univ. of Oxford	14	50	.53

Table 10: The top 50 European institutions in the period 1993–1997

5 Conclusions

This paper extends the descriptive statistical analysis of Genest (1997) for European countries, incorporating a dynamic analysis over the period 1985–1997. To observe the trend we examined the productivity of the first five years of the sample and compared it with the productivity of the last five years. The countries with the biggest relative increase are Spain, Italy, Belgium and France. We also analyze the trend in productivity of institutions in European countries. When we analyzed the 50 institutions with the biggest productivity in the period 1993–1997, we were surprised of the incorporation of 25 new institutions that did not appear in the period 1985–1989 among the then top 50 institutions. The most outstanding case, among the best 10 institutions, is the increase in the last period of the London School of Economics that went up 81 positions in the ranking, and is the second ranked institution in this period.

A APPENDIX

Country	Institution	93-97			85-89		
		Pos	PAG	%	Pos	PAG	%
Belgium	Univ. of Antwerp	51	104	.53	–	–	–
Netherlands	Statistics Netherlands	52	102	.52	92	37	.32
Norway	Norwegian Institute of Technology	53	101	.51	98	34	.30
Finland	Univ. of Oulu	54	100	.51	21	108	.94
France	INSERM	55	100	.51	52	64	.56
U.K.	Open Univ.	56	98	.50	155	20	.17
U.K.	Univ. of Sheffield	57	98	.50	22	106	.92
U.K.	Univ. of Bath	58	98	.49	10	138	1.20
Netherlands	Free Univ. Amsterdam	59	97	.49	37	80	.70
Germany	Univ. of Dusseldorf	60	96	.49	–	–	–
Austria	Univ. of Vienna	61	95	.48	183	15	.13
U.K.	Univ. of Newcastle	62	92	.47	48	67	.59
Belgium	Catholic Univ. of Leuven	63	90	.46	105	29	.25
Netherlands	Univ. of Twente	64	89	.45	49	66	.57
Germany	Univ. of Karlsruhe	65	88	.45	–	–	–
Russia	Academy of Sciences of Russia	66	88	.44	–	–	–
Austria	Univ. of Economics Vienna	67	87	.44	–	–	–
Spain	Univ. of Barcelona	68	87	.44	86	39	.34
France	Univ. of Rouen	69	86	.44	213	12	.10
Poland	Polish Academy of Sciences	70	84	.43	66	55	.48
Finland	Univ. of Tampere	71	84	.42	54	62	.54
U.K.	Univ. of Liverpool	72	84	.42	40	79	.68
Spain	Univ. Complutense Madrid	73	82	.42	151	21	.18
Sweden	Univ. of Uppsala	74	82	.41	149	21	.18
Sweden	Statistics Sweden	75	81	.41	205	12	.11
Germany	Univ. of Freiburg	76	80	.40	62	59	.51
France	Univ. Of Grenoble	77	78	.40	106	29	.25

Table 11: (Continued)

Country	Institution	93-97			85-89		
		Pos	PAG	%	Pos	PAG	%
Germany	Univ. of Essen	78	77	.39	38	80	.70
Italy	Univ. of Padua	79	75	.38	121	26	.23
Germany	Univ. of Siegen	80	75	.38	56	62	.54
Ireland	Univ. College Dublin	81	74	.38	303	6	.05
Netherlands	Catholic Univ. of Nijmegen	82	73	.37	77	48	.42
Netherlands	Univ. of Utrecht	83	73	.37	26	99	.86
Germany	Technical Univ. of Dresden	84	71	.36	—	—	—
Germany	Univ. of Trier	85	70	.35	68	55	.48
Germany	Univ. of Augsburg	86	69	.35	64	57	.50
Netherlands	Eindhoven Univ. of Technology	87	68	.34	71	51	.45
Germany	Karl Weierstrass Inst. of Math.	88	68	.34	—	—	—
Italy	Univ. of Pavia	89	66	.34	—	—	—
Netherlands	Univ. of Tilburg	90	65	.33	124	26	.23
France	Université Paris Sud	91	65	.33	168	17	.15
Germany	Univ. of Rostock	92	65	.33	—	—	—
Netherlands	Agricultural Univ. Wageningen	93	64	.33	220	11	.10
France	Université Montpellier II	94	64	.32	—	—	—
Poland	Academy of Agriculture in Poznan	95	63	.32	23	105	.91
Czechoslovakia	Charles Univ.	96	62	.31	146	21	.18
Hungary	Hungarian Academy of Sciences	97	62	.31	41	76	.66
U.K.	Medical Research Council (MRC)	98	61	.31	117	27	.24
Spain	Univ. Autónoma Madrid	99	61	.31	307	5	.04
Italy	European Univ. Institute	100	60	.30	—	—	—
Spain	Univ. of Valencia	101	60	.30	242	9	.08
Sweden	Univ. of Stockholm	102	60	.30	6	171	1.49
Germany	Univ. of Munster	103	59	.30	81	46	.40
Netherlands	Univ. of Amsterdam	104	59	.30	104	29	.26
Ireland	Univ. College Cork	105	59	.30	85	39	.34
Spain	Univ. of Santiago de Compostela	106	58	.29	275	7	.06
France	CNRS	107	58	.29	163	18	.16
Austria	Technical Univ. of Vienna	108	57	.29	90	38	.33
USSR	Research Council for Cybernetics	109	55	.28	—	—	—
Denmark	Univ. of Aalborg	110	55	.28	12	134	1.17
Germany	Univ. of Hamburg	111	54	.28	45	69	.60
Netherlands	Delft Univ. of Technology	112	54	.28	102	32	.27
Russia	Univ. of Saint Petersburg	113	54	.27	—	—	—
U.K.	Univ. of Leicester	114	53	.27	264	8	.07
France	CREST	115	52	.26	—	—	—
U.K.	Univ. of Manchester	116	50	.26	161	19	.16
Sweden	Univ. of Goteborg	117	50	.25	305	5	.05
France	INSEE	118	50	.25	—	—	—
Germany	Univ. of Stuttgart	119	50	.25	—	—	—
Sweden	Swedish Univ. of Agricult. Sci.	120	49	.25	209	12	.10
Finland	Univ. of Helsinki	121	48	.24	60	60	.52
U.K.	Univ. of Essex	122	48	.24	207	12	.10

Table 11: (Continued)

Country	Institution	93-97			85-89		
		Pos	PAG	%	Pos	PAG	%
Switzerland	Univ. of Neuchatel	123	48	.24	—	—	—
U.K.	Horticulture Research Internat.	124	48	.24	—	—	—
Poland	Nicolas Copernic Univ.	125	47	.24	114	28	.24
France	Inst. Nat. Agron. Paris Grignon	126	47	.24	224	11	.09
Sweden	Stockholm Univ.	127	46	.23	—	—	—
U.K.	City Univ. London	128	46	.23	123	26	.23
U.K.	Univ. of Sussex	129	46	.23	118	27	.24
Germany	Weierstrass Inst. (WIAS)	130	46	.23	—	—	—
Switzerland	Swiss Federal Inst. of Tech.	131	45	.23	190	14	.12
U.K.	Univ. of St Andrews	132	44	.22	16	121	1.06
France	Univ. of Paris VII	133	44	.22	278	7	.06
France	Univ. of Picardie	134	44	.22	—	—	—
U.K.	Univ. of Aberdeen	135	43	.22	65	56	.49
Italy	Univ. Institute of Venice	136	43	.22	—	—	—
France	Univ. des Sci. et Technol. de Lille	137	43	.22	—	—	—
Greece	Univ. of Patras	138	41	.21	84	41	.36
Denmark	Royal Veterinary and Agric. Univ.	139	41	.21	34	85	.74
Norway	Univ. of Tromso	140	41	.21	88	39	.34
Germany	Univ. of Tübingen	141	41	.21	87	39	.34
Bulgaria	Bulgarian Academy of Sciences	142	40	.20	160	19	.16
Greece	Univ. of Thessaloniki	143	40	.20	55	62	.54
Italy	Univ. G d'Annunzio	144	40	.20	—	—	—
France	UdeMarne-La-Vallée	145	39	.20	—	—	—
Hungary	Technical Univ. of Budapest	146	38	.19	245	9	.08
Italy	Universita di Firenze	147	38	.19	261	8	.07
Germany	Univ. of Konstanz	148	37	.19	—	—	—
Netherlands	Univ. of Groningen	149	37	.19	335	3	.03
Belgium	Global Electronic Finance Manag.	150	36	.18	—	—	—

Table 11: (Continued)

B APPENDIX - Trends in Spanish Institutions

Table 12 shows the contribution of the main research institutions in Spain. It is to be noticed that the two measures ART and PAG (see columns 1 and 2) lead to similar results. The adjusted pages for each year are presented in next columns in the Table. These institutions have been sorted as a function of the output of adjusted pages in the period 1985–1997. Firstly, we note interesting, that there is small productivity in the first years with respect to the last years, and secondly, we note that the only year without contribution is 1985.

Table 13 compares the first five years (1985–1989) in the sample with the last five (1993–1997) in order to inspect the dynamic evolution of these institutions over time. The first institutions that appear in the Table are the University Carlos III of Madrid and the University of Cantabria. These universities have most of their productivity in the last period, so that they are allocated positions 26 and 43 in the top 50 European institutions in period 1993–1997 (see Table 10).

The last column of Table 13 shows the relative increase of the percentage of contributions

Institution	ART	PAG	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Univ. Carlos III Madrid	11.7	159.1	—	—	—	—	—	—	—	—	39.1	4.6	52.6	43.9	18.8
Univ. de Barcelona	9.2	156.6	—	—	—	5.0	34.0	16.8	—	13.4	—	9.4	61.9	16.0	—
Univ. de Cantabria	9.0	133.5	—	—	—	10.1	—	—	—	5.6	30.8	20.7	21.2	14.2	30.9
Univ. Complutense Madrid	6.3	102.5	—	—	—	12.2	8.3	—	—	—	—	23.4	40.7	—	17.9
Univ. de Santiago de Compostela	6.8	89.6	—	—	7.0	—	—	19.0	6.0	—	20.2	—	9.9	15.6	11.9
Univ. de Valencia	5.0	84.9	—	—	—	—	8.8	—	8.8	7.7	—	5.4	16.7	—	37.6
Univ. de Valladolid	5.8	74.9	—	15.0	—	—	—	—	10.0	18.6	—	—	7.5	—	23.7
Univ. de Oviedo	4.3	68.6	—	—	—	32.0	—	—	—	29.1	—	—	7.5	—	—
Univ. Autónoma Madrid	5.2	65.5	—	—	—	5.0	—	—	—	—	5.2	19.7	11.3	11.3	13.1
Univ. de Granada	4.8	56.1	—	—	—	—	7.3	—	15.0	—	6.1	7.5	4.7	—	15.6
Univ. de Murcia	4.0	41.6	—	—	—	—	7.3	—	—	—	8.5	—	4.7	21.2	—
Univ. Politécnica Madrid	3.3	41.0	—	—	7.8	—	—	—	13.9	—	—	16.0	3.4	—	—
Univ. de La Coruña	2.0	35.9	—	—	—	—	—	—	—	—	—	—	2.5	14.6	18.8
Univ. Autónoma Barcelona	2.3	30.5	—	—	—	—	—	—	—	—	—	9.4	7.9	—	13.2
Univ. de Sevilla	3.0	25.4	—	—	—	5.9	—	14.5	—	—	—	—	—	5.0	—
UNED	1.0	20.6	—	—	—	—	—	—	—	—	20.6	—	—	—	—
INE	.5	13.7	—	—	—	—	—	—	—	—	—	13.7	—	—	—
Univ. Pompeu Fabra	1.0	13.1	—	—	—	—	—	—	—	—	—	—	—	—	13.1
Univ. de Vigo	.8	10.7	—	—	—	—	—	—	—	—	—	—	—	—	10.7
Banco de España	1.0	9.8	—	9.8	—	—	—	—	—	—	—	—	—	—	—
Univ. Politécnica de Catalunya	.8	8.6	—	—	—	—	—	—	—	—	—	3.5	—	—	5.2
Generalidad Valenciana	.5	7.8	—	—	—	—	7.8	—	—	—	—	—	—	—	—
Univ. de Málaga	1.0	7.1	—	—	—	—	—	—	—	—	—	7.1	—	—	—
Univ. de Extremadura	1.7	6.7	—	—	—	—	—	—	—	—	—	—	—	6.7	—
IVIA Apartado Oficial	.5	6.5	—	—	—	—	—	—	—	6.5	—	—	—	—	—
CSIC	1.0	3.5	—	—	—	—	—	—	—	—	—	3.5	—	—	—

Table 12: Contribution of the institutions in Spain. Number of adjusted pages

Institution	93-97			85-89			Increase
	Pos	%	PAG	Pos	%	PAG	%
Univ. Carlos III Madrid	1	17.6	159.1	—	—	—	—
Univ. de Cantabria	2	13.0	117.7	5	5.5	10.1	136.6
Univ. de Barcelona	3	9.6	87.3	1	21.3	39.1	-54.7
Univ. Complutense Madrid	4	9.1	82.0	3	11.2	20.5	-18.9
Univ. Autónoma Madrid	5	6.7	60.5	14	2.7	5.0	143.0
Univ. de Valencia	6	6.6	59.6	7	4.8	8.8	36.9
Univ. de Santiago de Compostela	7	6.4	57.6	12	3.8	7.0	66.6
Univ. de La Coruña	8	4.0	35.9	—	—	—	—
Univ. de Murcia	9	3.8	34.3	11	4.0	7.3	-4.3
Univ. de Granada	10	3.7	33.9	10	4.0	7.3	-5.5
Univ. de Valladolid	11	3.5	31.3	4	8.2	15.0	-57.9
Univ. Autónoma Barcelona	12	3.4	30.5	—	—	—	—
UNED	13	2.3	20.6	—	—	—	—
Univ. Politécnica Madrid	14	2.1	19.3	8	4.3	7.8	-50.1
INE	15	1.5	13.7	—	—	—	—
Univ. Pompeu Fabra	16	1.4	13.1	—	—	—	—
Univ. de Vigo	17	1.2	10.7	—	—	—	—
Univ. Politécnica de Catalunya	18	1.0	8.6	—	—	—	—
Univ. de Oviedo	19	0.8	7.5	2	17.4	32.0	-95.2
Univ. de Málaga	20	0.8	7.1	—	—	—	—
Univ. de Extremadura	21	0.7	6.7	—	—	—	—
Univ. de Sevilla	22	0.6	5.0	13	3.2	5.9	-82.6
CSIC	23	0.4	3.5	—	—	—	—
Banco de España	—	—	—	6	5.3	9.8	—
Generalidad Valenciana	—	—	—	9	4.3	7.8	—

Table 13: Evolution of the Spanish institutions

in second period with respect to the first period. This relative increase has been calculated only in the institutions with productivity in the first period (13 in our data base). The two institutions with the biggest relative increase are the University Autónoma of Madrid and the University of Cantabria.

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