Ranking European Economic Departments: a Statistical Approach

Luc Bauwens[1] Alan Kirman[2] Michel Lubrano[3]

Camelia Protopopescu[4]

February 2002

Abstract

Economic authors are identified country by country on the basis of their declared affiliation in the JEL CD-ROM. The journals in which they have published are ranked using a scale between 1 and 10. The ranking is obtained by use of the Delphi method to combine expert opinions and citation data. The publication output of fifteen European countries plus California are then compared using the tools of stochastic dominance. Differences in publication habits and publication outlets (use of top journals, of national journals) are detailed. Individuals with a contribution greater than a predetermined minimum level are then regrouped into institutions for a global ranking. The distribution of department scores for a given country is confronted with that of California using a non parametric approach.

JEL Classification: I29, D63, C12, C14
Keywords: Ranking economic departments, journal ranking, economics of inequality, stochastic dominance.

[1]CORE and Department of Economics, Université catholique de Louvain, Belgium; email: bauwens@core.ucl.ac.be.

[2]GREQAM-EHESS, Centre de la Vieille Charité, 2 rue de la Charité, F-13002 Marseille, France; email: kirman@ehess.cnrs-mrs.fr.

[3]GREQAM-CNRS, Centre de la Vieille Charité, 2 rue de la Charité, F-13002 Marseille, France; email: lubrano@ehess.cnrs-mrs.fr. Corresponding author.

[4]GREQAM, Centre de la Vieille Charité, 2 rue de la Charité, F-13002 Marseille, France.

Support of the European Economic Association through a contract "Ranking Economic Departments in Europe" is gratefully acknowledged.

Contents

1 Introduction

There is a vast literature on how to rank the research output of economic departments in the USA. Some of the most recent references are Conroy and Dusansky (1995), Dusansky and Vernon (1998), Feinberg (1998), and Griliches and Einav (1998). If we now turn to Europe, there is the earlier work of Kirman and Dahl (1994) and the more recent paper of Kalaitzidakis, Mamuneas and Stengos (1999) in the EER. Elements of comparison between European and US departments are given in the last reference. Some authors have focused on individual European countries: Combes and Linnemer (2001) for France, Bauwens (1999) for Belgium, van Damme (1996) for Netherlands. Coupé (2000) was one of the first to face the challenge of obtaining a world ranking.

The process of ranking departments is complex and controversial. It is in many ways a problem of aggregation and of interpersonal comparisons. There is no generally accepted methodology for these comparisons although there seems to be some convergence over time. We shall try to follow a simple paradigm: that of a postgraduate student looking for a place in Europe in which to write his PhD dissertation. How should he select this place? He will be looking first for a superviser (a person) and second for a scientific environment (an institution). How should he judge the institutions and individuals he wishes to consider?

Individuals employed by research and teaching institutions have multiple activities which may or may not lead to tangible output. They teach, they supervise PhD students, they write books, they publish articles, they act as referees for journals, sometime they act as scientific editors for those journals. They gain a reputation among their colleagues by being elected as distinguished members of a scientific society or even president of a society. Finally they can win scientific prizes, the most important one being the Nobel Prize[1].

Publications in journals are the most visible and well known output of researchers. Most published rankings are based on counting publications. But one must keep in mind several facts which can counterbalance the overwhelming weight given to articles:

- Books are reputed not to carry much weight in economics. However, some books in economics are very often cited and perceived as major contributions. Books are generally recognised as major outputs in other social sciences. The main difficulty is that it is impossible to say on a priori grounds if a book is good or not, while it seems to be possible to say that an article is published in a good or in a bad journal.

- Young researchers write papers, older researchers have their important papers cited by others (this might seem to be a joke, but it is a serious one.)

- Alfred Einstein stopped publishing after 1920 and John Nash got the Nobel prize with only two published articles.

[1] We have omitted from this description any of the administrative and consultancy activities which occupy a considerable amount of the time of many university economists.

- Having a paper published in a given journal referenced in a data base is fundamentally a random process.

The appreciation of individual activity should not therefore rely solely on a deterministic counting of publications in journals.

Individuals are employed by institutions which organise research and teaching. One thinks immediately of universities, departments, research centers... Many factors undermine this apparent simplicity. Individuals have specialties and have a tendency to group themselves into research centers. Consequently, a department may be good in some fields, and not so good in other fields. So the comparison between departments can be made in several ways. The role of research centers may be important in certain countries, we are thinking in particular of the French system. In their study, Kirman and Dahl (1996) pointed out the numerical importance of the University of Paris I, but without disaggregating this University into its research centers. So it is difficult to obtain a precise picture. On the other hand, focusing too much on disaggregated entities as in Combes and Linnemer (2001) may also be misleading because PhD students are enrolled at a University and not at a research center, even if they may undertake their research in a research center. Finally, we can point out many errors contained in the diverse published rankings due to the difficulty of knowing the peculiarities of any particular national system. We noted many errors concerning the French system, because we know it rather well, but other readers may certainly find mistakes for other educational systems.

This paper is intended to be a contribution to the evaluation of European economic departments and to the comparison of top European economic department to those of California, a state comparable in size with a large European country. On one side, it looks similar to other contributions in the field because we basically use articles referenced in the JEL data base as a proxy for scientific output combined with a particular ranking of journals. But on the other side, it differs from the standard literature on the subject in several aspects. The available bibliographical data bases give a partial view of individual activity which we consider as a random variable. Statistical variability is explained by several facts: the time between submission and publication is random, the final decision of the editor is influenced by the choice he has made when selecting his referees, the probability of being accepted depends on the choice made at the time of submission and this may not be directly related to the quality of the journal, the journal may or may not be referenced in the data base...

In order to get a plausible estimation of individual activity, we have to observe this random variable on a reasonably long period. We have chosen ten years. Bauwens (1999) for instance observed a great variability of individual rankings between two periods of time. We want to smooth out this type of variability. We finally get a distribution of individual performances for a given country. So, independent of the organisation of the academic system, we can have a first comparison of countries using the tools of stochastic dominance. In a second stage, individuals are allocated to institutions. The performance of an institution is obtained as the sum of n_k random variables where n_k is the number of active individuals. We define an active individual as an author having a publication output greater than a given threshold

z, fixed in advance. We give a global ranking of institutions, but this ranking has to be interpreted as a particular realisation of random variables which means that two institutions with different rankings can be statistically equivalent. Once we have obtained the scores of institutions, we can consider its distribution over a country. This distribution is a discrete mixture with as many terms as there are institutions. Using simulation techniques, we can once again use the tool of stochastic dominance to compare countries, taking into account this time the impact of the institutional organisation.

The paper is organised as follows. In section 2, we spell out and compare the available sources of information. Section 3 justifies our choice for ranking journals. In section 4, we give details of the choices we made to measure the impact of an author. Section 5 describes the method we used for searching the JEL data base and some of the corrections we had to make to the data. We consider essential to have data of good quality and this work was very time consuming. We justify the choice we made of California as a point of comparison. Nations have different habits of publications and this is analysed in section 6. The economics of academic inequality is introduced in section 7 which also gives our first statistical results. An institution is a complicated object which needs a careful definition and may require several. Section 8 shows in which dimensions institutions are comparable and which aspects are not comparable. Section 9 delivers what the hasty reader wants to know: the global ranking of institutions. Section 10 compares top European departments to California and propose statistical tests to compare countries. Section 11 analyses the efficiency of education policies or in other terms what might explain the differences between countries. Section 12 concludes.

2 Available sources of information

The most widely used criterion for measuring individual output and aggregating this output into institutions is to count the number of published journal articles. In order to count the number of publications, we need a data base. In the field of economics, we have two different sources: The Journal of Economic Literature and The Social Science Citation Index.

2.1 The Journal of Economic Literature

The Journal of Economic Literature (JEL) CD-ROM reports the cumulative content of 681 journals, starting for some of them in 1969. These journals cover the basic field of general economics and micro and macro economics but also includes econometrics, some part of statistics, game theory or history and diverse domains of application such as health, labour, industrial organisation, finance, management. A large place is devoted to national journals. The JEL and its associate CD-ROM are published by the American Economic Association.

2.2 The Social Science Citation index

The Institute of Scientific Information, a private institution based in Philadelphia, maintains a huge data base covering a large range of scientific journals. It edits two CD-ROMs, the SSCI (Social Science Citation Index) and the SCI (Science Citation Index) which contain references to journals published in a given year and the citations contained in them. One might be tempted to favour the SSCI which covers, as indicated by its name, most of the social sciences, including economics and management. Its coverage is better than that of the JEL CD-ROM for management and finance, but must be considered to be deficient for pure economics as only 166 economic journals[2] are indexed. Compared to the 681 journals of the JEL CD-ROM, national journals, very new journals and journals of a lesser importance are missing. Statistical journals (like JASA) which are indexed in the SCI, are also missing. Contrary to the JEL CD-ROM, the SSCI and SCI include the bibliography of every article reported and exploit this information for citation analysis. At the end of each year, the *Journal Citation Reports* provides statistics on citations and computes various indicators including the now well known "impact factor".

2.3 Why choose the JEL?

In this study, we use mainly the information coming from the JEL CD-ROM simply because it gives a better coverage of the overall activity of economists it contains numerous journals in language other than English. We may of course complete this information by the statistics provided by the *Journal of Citation Reports*, at least for the journals which are common to the two data bases.

3 Journal rankings

Once publications are identified, they have to be weighted by a quality indicator. The ranking of scientific journals is an old but important problem. Several methods have been used and may be grouped in two categories: opinion surveys and citation analysis as underlined for instance in van Damme (1996). Each method has its drawbacks. There is a recent tendency to prefer rankings based on impact factors. However, as we show below, impact factors are not as objective as might be thought and should be used with care. A method combining both sources of information can bring new insights to the field.

3.1 Opinion surveys versus citation analysis

Opinion surveys are a way to elicit prior judgements and thus are related to the elicitation methods developed in Bayesian analysis. The Delphi method is certainly

[2]Number given by the Journal Citation Reports, social science edition, year 2000, journal summary list for subject category economics. This number goes up to 184 when business-finance is added.

the most elaborate of the subjective methods of ranking[3]. Each expert in a group assesses his opinion independently of the others in a first round. In a second round, his ranking is positioned against the ranking expressed by the rest of the group. He has then the right to revise or maintain his ranking. This is a method for confronting individual opinions which avoids the bias that arises from open discussions. But its implementation is time consuming. It can be applied to a small number of journals. So most of the time, people involved in ranking journals simply skip the second round. This seem to be the case for Combes and Linnemer (2001) who ranked 307 of the 681 journals reported in the JEL CD-ROM into five groups according to expert opinions. On the contrary, the VSNU (Dutch Society of Universities) ranking results from open discussion of the committee . It considers also 5 categories (A to E) for 1383 economic and management journals which have been used by Dutch economists in the past. This ranking has the reputation of being biased and has been abandoned by Dutch economists. The bias come from the open discussion and strategic behaviour of the ranking committee which was composed by deans who knew the final use of their ranking: the evaluation of their own departments.

Citation analysis is based on the data provided by the *Journal of Citation Reports* (JCR) published by the Institute of Scientific Information. The JCR data gives among other things the impact factor associated to each of the 166 economic journals present in the SSCI:

Definition 1 *The impact factor at time t of a journal is given by the ratio between the number of citations made to that journal by a reference group of journals at time t to articles published at times $t-1$ and $t-2$ by that journal, and the total number of articles published by that journal at time $t-1$ and $t-2$.*

The importance of a journal is measured by the number of times it is quoted by other journals, corrected for size effects. Once this figure is obtained (it is directly available from the JCR), journals can be ranked accordingly. van Damme (1996) claimed that citation data provide an objective measure to rank journals which should be preferred to any other. This crude way of ranking journals was used by by Kirman and Dahl (1994) for ranking European economic departments and by Tilburg University to rank Dutch economists and Dutch economic departments.

3.2 A critical appraisal of impact factors

The direct use of impact factors has several drawbacks. ISI itself in its Web site[4] recommends not to use these data for ranking journals. We can note immediately that the value of an impact factor first varies from year to year (it is a measure of

[3]The method finds its origin at the RAND Corporation in 1944. A first paper was published in 1959 by Helmer and fellow RAND researchers entitled "The Epistemology of the Inexact Sciences. See http://www.iit.edu/ it/delphi.html for more details. See also the book Helmer, O. (1983). *Looking Forward. A Guide to Futures Research*. Beverly Hills: Sage.

[4]http://www.isinet.com/isi/index.html

the recent relevance or influence of the articles published in the journal) and second is a function of the reference group of journals (Econometrica appears in two data bases, SSCI and SCI, and thus receives two different impact factors). Impact factors are not unique, can be manipulated and do not automatically represent an academic appraisal.

- There are techniques for increasing the number of citations for a journal. Among the most well known ones are publishing surveys and editing special issues on a given topic. This could explain the very high score of the *Journal of Economic Literature*.

- Different scientific areas have different citations habits thus making comparisons hazardous. For instance, math journals cite other journals far less than economic journals do. Consequently, very formalised journals like *Journal of Mathematical Economics* and *Econometric Theory* receive a low impact factor. van Damme (1996) argues that the *JME* covers a very narrow field that has a decreasing influence in the profession. But Cribari-Neto et al (1999) note that *Econometric Theory* receives most of its citations from very high standard journals like *Econometrica* and *Journal of Econometrics* both of which have high impact factors. Its indirect influence on the profession is thus much higher than its impact factor would lead one to infer.

- The audience of a journal is inversely proportional to its technicality. The SSCI constains journals which are not academic journals such as *the Economist*, but which receive a high impact factor (7.24 in 1994 for *the Economist*). Clearly this journal cannot be ranked on the same footing as *Econometrica*. Usually, this type of journal is excluded from the ranking. But SSCI contains numerous semi professional journals which have a high impact factor, but a rather low academic content and which cannot be so easily be excluded from the ranking. These journals are over-weighted in a ranking based solely on impact factors.

- National journals are an important special case. Important because they represent a very significant part of the scientific production in European countries. For instance van Damme (1996) reported that in 1990 about half of the output of Dutch economists was published in Dutch journals. National journals are a special case because in general no impact factor is available for them. We could imagine an impact factor calculated by reference to a group of national journals. But then it could not be compared to other impact factors. Van Damme (1996) suggests evaluating Dutch papers separately. In general, research published in a national language other than English or a national review has only national interest and is mainly applied. It cannot be discarded because this would mean a normative judgement between applied and theoretical research.

Several attempts have been made to cope with these deficiencies.

Cribari-Neto et al (1999) who were interested in ranking departments in the field of theoretical econometrics, defined a somehow longer term measure. They consider 11 journals for the 11 year period 1986-1996. They computed an average impact factor defined as the total number of citations made to a journal by the 10 other journals during this period divided by the total number of articles published by that journal during this period. Table 3 reproduces these results. Comparing column 2 and column 3 shows that for top journals the valuation is not significantly different. There are differences for more specialised journals such as *Econometric Theory* and the *Journal of Applied Econometrics*, showing for those journals the importance of correctly selecting the reference group of journals.

Liebowitz and Palmer (1984) build on the idea that it is better for a journal to be cited by a good journal than by a bad journal. They proposed to weight a quotation by the quality of the journal which makes this quotation. As quality is measured by quotations, this is clearly an iterative process. Amir (2001) shows that this process converges due to a Markov property. But he also shows that an inadequate choice of the reference group for journals at the boundary of the field can explain some of the inconsistencies found in the updated rankings of Laband and Piette (1994).

Bauwens (1998) combines (multiplies) the short term indicator given by the SSCI impact factor with the longer term indicator given by the total number of citations for a given year in order to mix a short term and a longer term indicator. He then defines a step function which maps the obtained score into 5 categories given by integers from 1 to 5. Let us recall that

Definition 2 *The total number of citations of a journal in year t is the number of times any of its past articles are cited by the other journals of the reference group.*

Burton and Phimister (1995) try to incorporate long term information to determine what are the 20 "core journals". Instead of simply multiplying the above two criteria, they use the method of Data Envelopment Analysis.

3.3 Combining subjective opinions and citation data

We want to arrive at a ranking for most of the 681 different journals appearing in the JEL CD-ROM. By most we mean that it is not worth spending energy for ranking a journal that host less than 10 papers for a given country over the last 10 years. This reduces the number of significant journals to 506.

We cannot use the information contained in the VSNU ranking for the reasons mentioned above. Remains the Combes and Linnemer ranking covering 307 journals. We considered Alan Kirman as an expert and asked him to update this ranking and complete it to achieve at a ranking of 506 journals giving grades between 1 and 10 (a somehow finer grid than that used by Combes and Linnemer). We did not give him any information on impact factors for that first step.

In a second step, we collected citation data available for 364 journals in the fields of economics, finance and management (basically the data used by Bauwens 1998). We multiplied the raw impact factor by the total number of citations and converted that number into an index between 1 and 10 according to the rule stated in Table 1. Not all of this information can be used, as only 167 of these journals appear in

Table 1: From citation data to classes

Impact × citation	> 5000	> 1000	> 250	> 100	> 25	> 0
Corresponding Index	10	8	6	4	2	1
Number of journals	12	31	78	53	84	106

the JEL CD ROM. We communicated this information to Alan Kirman and asked him to update his judgements in view of this new information. This is a particular application of the Delphi method. When the subjective and the data base rankings differed, he modified some of his judgements, but most of the time maintained them. We have listed in Table 2 the journals for which there was a discrepancy greater than 2 between the two rankings at the end of this procedure . The subjective

Table 2: Discrepancies between subjective and data based rankings

Journal	Subjective	Data based
Economic-Development-and-Cultural-Change	2	6
Economic-Modelling	4	1
Environment-and-Planning-A	4	8
Foreign-Affairs	3	6
Geneva-Papers-on-Risk-and-Insurance-Theory	4	1
Health-Economics	3	6
International-Organization	4	8
Journal-of-Accounting-and-Economics	2	6
Journal-of-Accounting-Research	2	6
Journal-of-Conflict-Resolution	2	6
Journal-of-Consumer-Research	1	8
Journal-of-Peace-Research	1	4
Journal-of-Population-Economics	4	1
Journal-of-the-American-Real-Estate-and-Urban-Econ	1	4
Land-Economics	3	6
Monthly-Labor-Review	3	6
Population-and-Development-Review	3	8
Population-Bulletin	2	6
Research-Policy	2	6
Sloan-Management-Review	4	8

ranking favours academic journals which are penalised by low citations and penalises

professional or management journals which are at the margin of the field, but may receive high citations. This is in agreement with some of the comments we made concerning impact factors. The complete ranking is available on the Web[5].

4 How to measure the impact of an author

Our aim is to define a quantitative measure of the scientific impact of an author, or in other words try to measure his human capital. We make the implicit hypothesis that this goal can be achieved via a quantitative measure of his publications. In this section, we detail how this measure can be made and comment on some of the solutions adopted in the literature.

4.1 Articles, co-authors, pages

Articles may have co-authors, have different length and are published in journals of different quality. Eric van Damme (1996) promoted the following formula for individual aggregation, and which has come out to be known as the van Damme formula. For each publication p appearing at time t, a researcher i gets a score p_i defined by

$$p_i = \frac{b(p)}{a(p)} v(p) \tag{1}$$

where $b(p)$ is a number related to the length of the publication, $a(p)$ is a number related to the number n of authors of the publication and $v(p)$ is related to the quality of the publication. The total score s_i of a researcher is equal to the sum of the p_i of all the publications to which i contributed during that period. We discuss subsequently the different possible choices for $a(p)$ and $b(p)$.

A crude measure for $a(p)$ is the number of coauthors. If this coefficient is meant to allocate the merit of the publication between its authors, n would penalise collaboration which is central in modern scientific research. Fir this reason, Cribari-Neto et al (1999) propose taking $a(p) = \sqrt{n}$.

The problem is made more complex by the fact that coauthors may belong to different institutions and in this case $a(p)$ would play the role of allocating the merit of the publication between different institutions. An exact aggregation formula would thus require $a(p) = n$. We could present the question in an another way. There are large and small institutions. In small institutions, authors may have a larger tendency to find outside coauthors than their counterparts in large institutions. So choosing $a(p) = n$ would penalise small institutions and introduce an asymmetry of treatment. For this reason, we have chosen $a(p) = \sqrt{n}$.

Van Damme and his followers have chosen $b(p)$ to be a linear function of the number of pages of the article. Cribari-Neto et al (1999) (as well as many other

[5]http://durandal.cnrs-mrs.fr/PP/lubrano/rankings/mixrank.xls

authors) have chosen to standardise the size of the pages. Some people count pages in reference to the page size of the *American Economic Review*, while Cribari-Neto et al (1999) standardise in reference to the page size of *Econometrica*. The idea is to differentiate between notes and articles with the assumption that a short article has less scientific value than a long article. But things are not so simple.

The average number of standardised pages may be very different between journals. If we restrict our attention to the 11 econometric journals examined in Cribari-Neto et al (1999) this number ranges from 10 to 23 standardised pages. As a consequence, the use of the van Damme formula implies that journals with the same impact factor will no longer be considered as equivalent just because they may have a different average number of standardised pages. In Table 3, we reproduce some of the data of Cribari-Neto et al (1999). Average impact factor (AIF) is given in column 3 and

Table 3: Page impact on Journal ranking

Journal	1994 I.F.	Average I.F.	Average length	A.I.F rank.	A.I.P.×A.L. rank.
Econometrica	2.362	2.456	20.31	1	1
Rev. of Eco. Studies	1.696	1.614	22.60	2	2
JASA	1.24*	1.340	17.53	3	3
J. of Econometrics	1.195	1.058	21.02	4	4
Annals of stat.	0.78*	1.025	16.59	5	5
Biometrika	0.83*	0.974	10.45	6	8
JBES	0.634	0.782	17.97	7	7
J. of Applied Ecot.	0.369	0.707	20.55	8	6
Rev. of Eco. and Stat.	0.510	0.591	10.81	9	11
Int. Eco. Review	0.425	0.475	17.18	10	10
Econometric Theory	0.352	0.432	20.23	11	9

Impact Factors (I.F.) are computed from the SSCI except when a * indicates the SCI. A.I.F. means average impact factor and A.L. average length.

average length (AL) in column 4. In column 5, we rank the eleven journals according to their AIF. The last column show how this ranking is modified when considering the product $AIF \times AL$ which is what the van Damme formula does. This is a sufficient reason to select $b(p) = 1$. An additional reason would be that notes are sometimes more cited than plain articles and consequently that the difference between notes and plain articles should not be overemphasised.

4.2 The choice of a cardinalisation

We discuss now the choice of the quality indicator $v(p)$. Van Damme (1996) chose to simply take the impact factor of the journal. We have objected above to rank journals according to that criterion alone. We object here to choosing the impact factor as

a sensible cardinalisation. We have decided to rank journals in classes, saying in doing so all journals in a same class are equivalent, thus disregarding small variations of their impact factors. This avoids saying that a paper published in *Econometrica* (IF=2.54 in 1994 is worth one tenth of a paper published in *Science* (IF=21.91 in 1994). With our cadinalisation, these two journals are equivalent and receive a grade equal to 10. However the cardinalisation we have chosen also says that 10 papers in a lowest ranked journal is worth one paper in *Econometrica*. Although equivalence classes may be accepted without too much difficulty, the last implication may well be disputed. Objections can be made on both sides. Some will suggest that our classification does not give enough weight to major journals. Others will object

A large economic department whose authors publish only in low quality journals is certainly not equivalent to a smaller department whose authors publish only in top journals. This is a sufficient reason for proposing two rankings, one based on all the journals, a second based based only on top journals. Some American rankings consider only 8 top generalist journals[6]. This practice excludes in particular top specialised journals like *Journal of Econometrics, Journal of Public Economics, Journal of Finance*. Thus as a compromise, the option we chose for $v(p)$ is to take the 67 journals having a score between 6 and 10 and to give a weight of 0 to the other 620 journals present in the JEL data base.

5 Extracting data from the JEL CD-ROM

We have to extract data from the JEL CD-ROM. The version we used covers the period 1984-2000/09. It is organised in records corresponding to one publication and each record is decomposed in fields such as: SO or source (the name of the journal); AU or authors (the name of the author and co-authors)[7]; AF or affiliation (the affiliations of the different authors); PY or the publication year of the article[8].

We have to extract information for further processing according to one of these fields. We have chosen the affiliation field in order to determine the articles published in a given country. We have selected the 15 EEC countries, excluding Luxembourg which has no post graduate academic institution, but including Norway which while not being an EEC member, is nevertheless very close to the other Nordic countries.

[6] *The blue ribbon ranking: American Economic Review, Econometrica, Journal of Economic Theory, Journal of Political Economy, Quarterly Journal of Economics, Review of Economic Studies, International Economic Review, Review of Economics and Statistics.*

[7] The data base gives all the authors names, except when there are more than 3. In this case, the first authors is given, followed by "*et al´´*. It is very difficult, if not impossible in many such cases, to recover the name and affiliations of the remaining co-authors. We were thus obliged to consider that the paper in question was written solely by the first author. This represents 2.6% of the journal articles during the period 1991-2000/09. It would be very difficult to correct this information.

[8] We retained records with a $PY \geq 1991$ first to limit the bulk of information and second because the data and coverage are of not so good quality before that date. Each record is characterised by a type of document or DT. We have excluded all the records that do not correspond to a Journal Article because we have a ranking for journals and not for books.

Table 4: Articles published in the world
as reported by the JEL CD-ROM

year	1991	1992	1993	1994	1995
articles	*11 852*	*13 025*	*13 415*	*14 317*	*15 688*
year	1996	1997	1998	1999	2000
articles	*17 494*	*17 988*	*18 897*	*17 846*	*5 641*

We have put Cyprus and Greece together.

5.1 Published economic articles in the world

It is interesting to have an idea as to the volume of articles published in the world during the period considered. First to measure its evolution, second to measure the proportion of articles published by our sample of 15 European countries. From Table 4, we see that the number of published economic articles in the world is steadily rising. The decline in the last two years is linked to the delay in updating the data base. We can say that in ten years the number of published articles has doubled. The JEL data base contains a total of 146 163 articles out of which European countries published 41 930 which represents 29% of the total. For comparison, US departments and institutions[9] published 49 460 articles on the same period. Europe in the broad sense has a number of publications which is comparable to those of the U.S., even if it is slightly smaller.

5.2 Searching by affiliation

There is a very useful Web site maintained by by Christian Zimmermann at UQAM[10] which gives the list of "Economics Departments, Institutes and Research Centers in the World". We used that list to determine our search strategy in the data base. We looked for town names and for some acronyms of research centers or institutions. It is not possible to search for a complete name, because of differences in spelling between the two data bases.

The search cannot be done without care because some names may concern two countries. For instance, CEME exists both in Paris and in Brussels. There are many Polytechnique institutions (Paris, Mons, Montreal, Lausanne, Madrid). DELTA is a well-known research center in Paris, but there exist a Delta State University in the US. So we had to select the right target using the NOT command in the search to exclude unwanted items. Some authors give an affiliation which may seem cryptic for foreigners as it does not contain the name of the town. For instance in France, many authors give "U Louis Pasteur´´ as an affiliation without mentioning Strasbourg.

[9] US institutions include the NBER, the World Bank, the IMF and various others, all of which are U.S. based though having very different identities.

[10] http://netec.mcc.ac.uk/EDIRC

This has been corrected in the search, because we were aware of it, but there may exist similar cases which ascaped our attention.

5.3 Correcting the data

It is time to say a word about the quality of the data. Most of the information contained in the JEL are based either on authors' or on journals' declarations. There seems to be some tentative uniformisation of some institution names, but no cross checking seems to exist. This means that a huge amount of correction has to be done in order to get operational data.

We have extracted references to articles country by country. An article entered that file provided at least one of the authors of the article had an affiliation of that country. We constructed 15 different files, one for each country. An article can be present in several files if its authors belong to these different countries. We then extracted a list of authors per country. We cleaned the data, correcting misspelling of first names and initials, regrouping under a single name a single person.

From that list of authors, we worked on the affiliation data. Every now and then, an author may not give his affiliation. For the period and document type considered, 5 255 articles have at least one unlisted author. This represents 3.6% of the total number of articles. These authors enter our data base thanks to the informations given by their co-authors. In most cases, their affiliation can be reconstructed if the author in question has published several papers. Finally, we listed chronologically all the affiliations given by an author and checked for consistency, introducing corrections where it was necessary.

This involved an enormous amount of manual data correction, as 41 930 articles are involved. But without this work, our results would be meaningless.

5.4 Comparing European economic departments to US economic departments

As we have seen above, US authors have published at least as many articles as European authors did over the same period. If we want to compare Europe and the US, this would mean manipulating a huge extra amount of data and to do the job seriously, the US data should be cleaned as well. Besides, European countries are small compared to USA which had 281.4 million inhabitants in 2000. So the comparison would be first difficult and second unfair as is clear from Coupé (2000) or Combes and Linnemer (2001). Our idea is to take as a reference, not the whole USA, but a State which can be thought as representative. We have selected California. The population of this state is 33.9 millions in 2000 which makes it on one hand the most populated of the USA and which on the other hand makes it of a size relatively comparable to that of large European countries. Its population is slightly less than Spain and its surface is slightly less than France. The EDRIC Web site credits it with 143 institutions for economics. From that listing, we have counted 52 universities with an economic or a business department. Dusansky and Vernon (1998) indicate that

out of the 50 top US economic departments, 8 are located in California. With 12% of the US population, this state has 16% of the best US economic departments. This suggest that California is a very reasonable choice as a representative US state.

5.5 Descriptive statistics: cross country comparisons

A first treatment of the data produces some descriptive statistics about the publishing activities of the countries in question reported in Table 5. Column 2 gives the number of papers and column 3 the number of journals involved in publishing these articles. Column 4 gives the number of authors. There does not seem to be a great variation in

Table 5: Comparing countries
Quantitative indicators

Country	Articles total	Journals	Authors	Foreign coauthors	Pop. (millions)	Authors / pop.	Eco. Dept.
Austria	842	247	460	15%	8.1	56.67	12
Belgium	1656	298	806	19%	10.3	76.99	16
Denmark	919	253	463	14%	5.4	85.74	8
Finland	713	174	433	16%	5.2	83.27	18
Greece	861	245	403	16%	10.9	36.76	12
Ireland	460	143	256	17%	3.8	67.11	8
Netherlands	3478	415	1793	14%	16.0	111.94	10
Norway	940	233	470	13%	4.5	104.44	7
Portugal	260	117	144	25%	10.0	14.40	15
Sweden	1652	304	868	12%	8.9	97.42	21
France	5118	397	2698	17%	59.2	46.00	70
Germany	4191	406	2506	13%	82.2	30.19	98
Italy	3545	355	1921	14%	57.8	32.87	72
Spain	2338	307	1527	14%	39.8	38.37	48
UK	13351	613	6656	15%	60.0	115.60	96
Total	40324	681	21406	-	382.1	56.02	511
California	7893	560	3419	19%	33.9	100.86	52

the mean number of papers per author. The European mean is 1.94. The maximum is 2.15 with UK and Greece and the minimum is Finland and Spain with respectively 1.65 and 1.53. This number is 2.31 for California. On the other hand, there is a huge variation of the proportion of active authors in the total population, proportion given in column 7. On top, we find UK with 115.60 and a series of small countries like Netherlands, Norway and Sweden. At the bottom, if we exclude Portugal and Greece, we find large countries like France, Spain, Italy and Germany which have a ratio on average one third of the average ratio of the top group. In continental Europe, a productive country is a small country of Northern Europe. With 100.86, California

is in the top group, but slightly below the UK. A linear regression explaining the number of published papers would say that it is positively related to the number of authors, but negatively related to the size of the population[11]. Interestingly, contrary to popular belief, the total published output per head of the population in California is very close to that of the leading European countries.

The number of journals used grows with the logarithm of the number of published articles[12]. There is little variation in the proportion of foreign co-authors. This percentage is small on average, except for Portugal and Belgium.

Table 5 illustrates the dominant position of the UK in Europe with the greatest number of authors (6936) (even when compared to its population), the greatest number of papers (14 898) using the greatest number of journals (632) and the greatest number of economic departments if we exclude Germany. After correcting for the size of the population, California, has similar characteristics.

If we look at the number of economic departments, we note immediately that large countries have a fairly stable ratio of departments per million of inhabitants (1.2) except the UK which has more (1.6) and California (1.7). The numerical domination of the UK for the number of productive authors per habitant can be partially explained by a larger number of departments, but not totally. If we now turn to small countries, there is a huge variance in the number of departments. Finland and Sweden have comparatively many institutions, whilst the Netherlands has very few.

6 National publication habits

In this section, we try to analyse the vectors of publications used by European countries.

6.1 Some definitions

We have seen in Table 5 that the number of journals used is very large. But it is very easy to verify that a large number of papers are published in a small number of journals. Discarding the journals where very few papers are published can clarify the final picture. Let us begin by a first definition:

Definition 3 *A journal will be said to be a major vector of publication for a country if in the distribution of articles per journal in any given country, this journal is above the median.*

11

$$Articles = \underset{[-1.25]}{-86.77} + \underset{[54.86]}{2.29}\, authors - \underset{[6.09]}{16.61} population \qquad \mathbb{R}^2 = 0.998$$

t statistics are indicated below coefficients.

12

$$Journals = \underset{[-10.22]}{-583.98} + \underset{[15.69]}{120.12} \log(articles) \qquad \mathbb{R}^2 = 0.95$$

Definition 4 *The "major" production of a country is constituted by the articles published in the major vectors of publication of this country.*

What the role of national journals is in European countries is an important question. For instance van Damme (1996) reported that in 1990 half of the Dutch production was published in Dutch journals. But it is not easy to give a unique definition of a national journal. The language is of little help as some national journals in non-English speaking countries are now published in English and second that the UK and California would have only national journals. We would say first that a national journal receives a very significant amount of the research produced in its country. The *American Economic Review* and the *Economic Journal* are national journal in that respect. We must complete the definition by saying that papers from foreigners are in minority. In our sample, AER is a major vector of publication for California, but also for the Netherlands, Norway, Sweden and the UK. *The Economic Journal* has the same definition for the UK, Austria, California, Denmark, Ireland, the Netherlands and Sweden. We can propose the following definition

Definition 5 *A national journal is a major vector of publication for its country and does not verify this property for other countries, except eventually for one neighbouring country using the same language. The neighbouring country is marginal in the total production.*

We arrive at the following list which is rather long. We do not intend to provide a complete list of national journals, as we have discarded national journals which cannot be considered as major vectors of publication according to our definition. We have indicated in brackets, first the number of papers published by that country in this journal, second the ranking of this journal over the scale 1-10. When it was necessary, we have added the secondary country together with the number of papers concerned. As an exemple, french authors have published 575 papers in the *Revue Economique*. This journal receives a grade of 2 in our quality ranking. It is a main journal also for Belgium who has published 33 papers during the same period.

- Austria: Empirica (28,1)
- Belgium: Tijdschrift voor Economie en Management (137,1, Netherlands, 23), Cahiers Economiques de Bruxelles (90,1), Recherches Economiques de Louvain (36,3, France, 87)
- Denmark: Nationalokonomisk Tidsskrift (147,1)
- Finland: Liiketaloudellinen Aikakauskirja (148,1, Sweden, 19), Finnish Economic Papers(43,1, Sweden, 24)
- France: Revue Economique (575,2, Belgium, 33), Economies et Societes (538,1), Revue d'Economie Politique (268,2, Belgium, 9), Annales d'Economie et Statistiques (188,4, Belgium, 20), Revue d'Economie Industrielle (166,1), Economie Appliquée (148,1), Revue d'Economie Régionale et Urbaine (120,1), Economie et Prévision (94,1), Economie Internationale (71,1), Revue de L'OFCE (64,1).

- Germany: Zeitschrift fur Betriebswirtschaft (384,2, Austria, 39), Jahrbucher fur Nationalokonomie und Statistik (331,1, Austria, 24), Zeitschrift fur Wirtschafts und Sozialwissenschaften (124,1), Ifo Studien (110,1, Austria, 5), Kredit und Kapital (108,1), Mitteilungen aus der Arbeitsmarkt und Berufsforschung (108,1), Konjunkturpolitik (93,1), FinanzArchiv (75,1), Zeitschrift fur Wirtschaftspolitik (71,1), Aussenwirtschaft (50,1), OR Spektrum (33,1) (Austria 6)

- Greece: Spoudai (38,1), East-West Series in Economics, Business,and the Environment (22,1), Cyprus Review (21,1), Greek Economic Review (13,2), Cyprus Journal of Economics (10,1), Managerial-and-Decision-Economics (8,4)

- Ireland: Economic and Social Review (101,1), Journal of the Statistical and Social Inquiry Society(44,1)

- Italy: Economia e Lavoro (180,1), Rivista di Politica Economica (139,1), Economia Politica (132,1), Giornale degli Economisti e Annali di Economia (128,1), Politica Economica (117,2), Rivista Internazionale di Scienze Economiche e Commercialy (115,1, Greece, 31), Economic Notes (101,1), Rassegna Economica (96,1), Studi Economici(93,1), Rivista di Storia Economica (70,1), Rivista Internazionale di Scienze Sociali (60,1), Banca Nazionale del Lavoro Quarterly Review (50,1), International Review of Economics and Business (48,2, Greece, 25), Ricerche Economiche (46,1), Rivista Italiana degli Economisti (42,1), Economia Internazionale (40,1, Greece, 18), Review of Economic Conditions in Italy (30,1)

- Netherlands: De Economist (147,2, Belgium, 15)

- Norway: Forum for Development Studies (42,1), Marine Resource Economics (18,1)

- Portugal: Economia (Portuguese Catholic University) (38,1)

- Spain: Investigaciones Economicas (200,1), Economia Industrial (149,1), Revista de Economia Aplicada (143,1), Revista Espanola de Economia (128,1), Moneda y Credito (94,1), Informacion Comercial Espanola Revista de Economia (62,1), Banco de Espana Economic Bulletin (46,1)

- Sweden: Swedish Economic Policy Review (64,1), Ekonomiska Samfundets Tidskrift (63,2, Finland, 44)

- THE UK: National Institute Economic Review (209,2), New Economy (182,1), Scottish Journal of Political Economy (171,2), British Journal of Industrial Relations (134,4), Journal of Environmental Planning and Management (124,2), Oxford Review of Economic Policy (124,2), Journal of International Development (121,5), Fiscal Studies (119,1), Business History (113,1), Journal of Agricultural Economics (99,4), New Political Economy (93,1), International Journal of Manpower (92,1), Manchester School of Economic and Social Studies (91,4),

International Review of Applied Economics (87,1, Greece, 9), Housing Studies (85,1), Journal of the Royal Statistical Society, Series A (84,4), Economica (81,6), Economics and Business Education (80,1), Environment and Planning C: Government and Policy (80,2), Review of International Studies (75,2), Bulletin of Economic Research (69,2), International Journal of Forecasting (66,4), Asia Pacific Business Review (63,1), Economy and Society (62,1), Environmental Values (59,1), Journal of Development Studies (58,4)

The JEL coverage of national journals is certainly far from complete. When van Damme (1996) claims that half of the Dutch production was published in Dutch journals, this cannot be the case with the journals referenced in the JEL CD-ROM alone. The covering for large countries is however far better. We checked for France and found it adequate[13]. If we consider that top journals are journals which receive a grade between 6 and 10 in our cardinalisation, none of the national journals reported above enter this category, except one for THE UK (Economica). Most of the national journals have a score of 1. If we compute an average score, we have: Greece 1.13, Germany 1.26, Belgium 1.27, Fra 1.63, Net 2.00, the UK 2.32, all the other countries having a score of 1. So even if their are variations, national journals form a group which can be contrasted to the group of top journals.

6.2 The use of top and national journals

In Table 6, we have summarised some indicators concerning the publications characteristics of each countries. The distribution of articles per journal is very concentrated within a country as 50% of the number of published papers are on average published in 10% of the journals in use. But when we collect together the major vector of publication, they are 247 at the European level and thus represent 36% of the total number of journals covered by the JEL CD-ROM. There are huge variations in journal use between countries as for instance in France the major vectors represent only 4% of the total number of journals in use whereas this number goes up to 16% for Austria.

Let us now analyse what are the major vectors. If we exclude Finland, Greece and Ireland, small countries use more top journals than large European countries, including UK. Large countries have numerous national journals which can represent up to 85% of their major (not total) production.

The picture coming out of this Table is really different from that one could expect. THE UK is usually seen as the leading European country. This is due simply to a mass effect. When we think in distribution, only 20% of its major production comes out in top journals while 40% comes on in its numerous national journals. Netherlands is the European country which has the greatest percentage of articles in top journals. But even this country cannot be compared to California which is really different from

[13]If some French journals do not appear in our list, it is just because they are below the median or too recent to be compared to the mass of older journals; the following journals are referenced, but below the median: *Revue Française d'Économie, Revue d'Economie du Développement, Cahiers d'Economie et Sociologie Rurales, Finance, Revue Française d'Economie, Cahiers d'Economie Politique, Revue Française de Gestion, Revue d'Etudes Comparatives Est-Ouest*, etc...

Table 6: Publication characteristics

Country	Journals used	Major vectors	Decomposition of Major vectors			
			Top	Articles	National	Articles
Austria	247	39	11	24%	1	6%
Belgium	298	45	18	32%	3	26%
Denmark	253	28	11	29%	1	30%
Finland	174	12	4	17%	2	53%
Greece	245	32	3	6%	6	25%
Ireland	143	12	2	8%	2	63%
Nethlds	415	46	20	41%	1	8%
Norway	233	30	10	37%	2	13%
Portugal	117	18	9	39%	1	27%
Sweden	304	31	9	30%	2	15%
France	398	13	3	11%	10	85%
Germany	406	22	5	11%	11	66%
Italy	355	24	3	7%	17	81%
Spain	307	16	7	23%	7	67%
UK	613	51	9	20%	27	40%
Total	681	247	47	17%	91	40%
California	560	64	36	66%	1	2%

Top journals are journals receiving a grade between 6 and 10 in our ranking.

European countries. This State publishes 66% of its major production in 36 top journals, a figure much higher than any country of our sample.

6.3 What are the main European journals?

There is a group of three generalist journals which are used by most European countries and represent 45% of the major production: *Economics Letters*, *European Economic Review* and *Economic Journal* by decreasing order of quantitative importance. We should especially note the success of the *European Economic Review* which managed, after the creation of the European Economic Association, to become a leading European journal playing a federative role. On a more regional basis, the *Scandinavian Journal of Economics* plays this role for Sweden, Norway, Denmark and Finland in decreasing order. Note that the *American Economic Review* is also a major vector of publication for the UK, the Netherlands, Sweden and Norway, but with a far less numerical importance than the above trio.

JET, followed by *Economic Theory* and marginally completed by the *JME* are the main theoretical journals with 8% of the major European production. Together, they concern France, Spain, Belgium, the Netherlands and Portugal.

The main vehicles for public economics are the *Journal of Public Economics* and

Public Choice. Both represent 8% of the major production, concerning THE UK, Sweden, Germany, the Netherlands, Belgium, Norway, Denmark and Austria.

The major journals for econometrics are the *Journal of Econometrics*, then *Econometric Theory* and marginally the *Journal of Applied Econometrics* and the *JBES*. These journals represent 8% of the major production and concern the UK, the Netherlands, Denmark, Belgium, Finland and Greece.

Game Theory is represented by *Games and Economic Behaviour* and the *International Journal of Game Theory*. They represent 4% of the major production and concern the Netherlands, Spain, Belgium, Denmark and Austria.

Some peculiarities are worth being noted. *Econometrica* and the *Review of Economic Studies* despite their European anchor, are major vectors only for Austria and Belgium.

If we exclude some major exceptions (*Scandinavian Journal of Economics*, *Journal of Applied Econometrics*, *International Journal of Game Theory* and *Journal of Health Economics*), California uses basically all the major top vectors used by European countries (including the *European Economic Review*) plus some others that European countries do not use: *American Journal of Agricultural Economics*, *Journal of Finance*, *Journal of Economic Perspectives*, *Journal of Political Economy*, *Quarterly Journal of Economics*, *Review of Economics and Statistics*, *Journal of Economic History*, are the most important examples of the latter. California is also a great user of *Econometrica* (84 papers) and of the *Review of Economic Studies* (42 papers), contrary to most European countries.

6.4 Partial conclusions

All the countries including California display some common characteristics. The number of economic departments per inhabitant is fairly constant for large countries, even if there are more pronounced variations for small countries. The average number of papers published by authors does not vary very much across countries. The number of journals used seems just to be a function of the log of published articles. To single out differences among European countries, we must analyse the data in detail. There are huge variations in the number of active authors per habitant. There does not seem to be a quantitative effect caused by the number of economic departments.

When compared to California, European countries are characterised by a lack of access to top journals. They have significant access to 2 out of 6 journals graded 10 (*JET* and *AER*) and to 2 out of 10 journals graded 8 (*Journal of Public Economics* and *Journal of Econometrics*). It is only to the class of journal graded 6 that they have regular access. This picture is totaly inverted for California which has access to all journals graded 10 and 8, and only a partial access to specialised journals graded 6.

The second characteristic of European countries is the very large weight of national journals. They represent 40% of the major production. In no country except THE UK do these journals manage to get an international reputation. And even in this

country, the case of the *Review of Economic Studies* is worth mentioning: this journal was created in 1933 by young British economists to counter balance the influence of the *Economic Journal* which was judged to be too conservative. This journal is now graded 10, but is no longer a major vector of publication for the UK.

7 Comparing countries: Economics of inequality

We have extracted a lot of information from our data and have used it to compare countries, but up to now we have not used formula (1) which is an attempt at a cardinalisation of the intellectual wealth of an author. As we have N authors in a country, we can consider the distribution of this particular form of wealth for a particular country. In this section, we propose statistical tools for comparing country distributions.

A PhD student, when looking for a superviser, looks for a person having a certain level of intellectual prowess or fame compared to his colleagues. So we have to define a minimum level below which a person is not thought of being able to supervise a PhD student. We define this level as a minimum level of publication over the 10 year period of our sample. One paper published in a top journal with one coauthor (or its equivalent) seems reasonable. This makes $z = 10/\sqrt{(2)} = 7.07$. The ideal country is a country where most of the distribution is located above z, which means that the number of academics above z is large. Another notion would qualify the ideal country as a country where the productivity gap $y - z$ is maximal. Both of these notions are related to a variant of the concept of stochastic dominance.

7.1 Stochastic dominance

Let us call F_A and F_B the distribution of publication scores for two countries A and B. As shown for instance in Jean (1984), the notion of stochastic ordering is tightly related to the ordering of lower partial moments. Jean defines these moments as

$$LPM_A^s(x) = \frac{1}{(s-1)!}\int_0^x (x-y)^{s-1} dF_A(y)$$

where s is a positive integer. Distribution B is said to dominate distribution A stochastically at the order s if $LPM_B^s(x) < LPM_A^s(x)$ for all $x < z$.

It may however prove to be more interesting to consider upper partial moments defined as

$$UPM_A^s(x) = \frac{1}{(s-1)!}\int_x^\infty (y-x)^{s-1} dF_A(y)$$

as we are mainly concerned with the upper part of the distribution. Then distribution B is said to dominate distribution A stochastically at the order s if $UPM_B^s(x) > UPM_A^s(x)$ for all $x > z$. These two notions of stochastic dominance are equivalent for $s = 1, 2$ as proved in Lubrano and Protopopescu (2002).

Stochastic dominance of order one is obtained for $s = 1$ and means that the criterion of interest is the proportion of active academics. It is a head count measure which is invariant to the degree of activity of productive academics, provided they are above the minimum level z.

Stochastic dominance at the order two, obtained for $s = 2$ takes into account the degree of activity above the minimum level. It is related to the truncated mean of the distribution.

7.2 A simple class of indices

Stochastic dominance of B over A means that the curve $UPM_B^s(x)$ lies above the curve $UPM_A^s(x)$ for every point x greater than z. This is a very stringent condition for which it is not easy to implement a statistical test. This approach was followed in Lubrano and Protopopescu (2002). Here we prefer to consider the generalisation of a class of additive decomposable indices introduced by Foster, Greer and Thorbecke (1984) (FGT from now on). The modified version of this class of indices is

$$P^\alpha(z) = \int_z^\infty p(y, z, \alpha) dF(y) \qquad \alpha \geq 0 \tag{2}$$

where $p(.)$ is a function of the activity gap $y - z$ and α a parameter measuring the importance given to the tails of the distribution. Following FGT, we concentrate essentially on $p(y, z, \alpha) = (y - z)^\alpha$.

Definition 6 *Country B will be better ranked than country A according to the index P^α if $P_B^\alpha(z) \geq P_A^\alpha(z)$ for a given level z of minimum productivity.*

We would not like the ranking obtained in this way to be too sensitive to the choice of z. So usually, an interval is retained for z, say $[z_*, z^*]$, and the index is computed for a grid of values of z covering that interval. If $z^* = \infty$ so that the index is computed over the range $[z_*, \infty]$ and if α is an integer, clearly this class of indices is strictly equivalent to the stochastic dominance criterion. The relation with stochastic dominance is preserved if $p(.)$ belongs to a class of functions wider than the one considered by FGT as explained in Atkinson (1987). The index proposed by Watts (1968) where $p(y, z) = \log(y/z)$ is one example.

7.3 Inference and tests

The class of indices we shall use is consistently estimated by

$$\hat{P}^\alpha(z) = \frac{1}{N} \sum_{i=1}^{N} (y_i - z)^\alpha ID(y_i > z) \tag{3}$$

From Kakwani (1993), we know that the asymptotic distribution of $\sqrt{N}(\hat{P}^\alpha(z) - P^\alpha(z))$ is normal with zero mean and variance $\sigma^2(P^\alpha(z))$, a consistent estimator of which is given by

$$\hat{\sigma}^2 = \frac{1}{N} \sum_{i=1}^{N} ((y_i - z)^\alpha)^2 ID(y_i > z) - (\hat{P}^\alpha(z))^2 \tag{4}$$

Then $\hat{\sigma}^2/\sqrt{N}$ is called the standard error of $\hat{P}$. Let us consider two independent samples corresponding to countries A and B of respective size N_A and N_B. A test of the null that the two countries are not statistically different can be based on

$$t = \frac{\hat{P}_A - \hat{P}_B}{SE(\hat{P}_A - \hat{P}_B)} \tag{5}$$

where

$$SE(\hat{P}_A - \hat{P}_B) = \sqrt{\frac{\hat{\sigma}_A^2}{N_A} + \frac{\hat{\sigma}_B^2}{N_B}} \tag{6}$$

The t statistic (5) is asymptotically normal with zero mean and unit variance. So the 5% critical value is 1.96 and the 10% critical value is 1.66.

7.4 Empirical results

We have chosen three values for α: 0, 1 and 2 which would correspond to the notion of stochastic dominance at the order 1, 2 and 3 if z were to vary within a given interval. An estimation of these indices for the chosen value of z gives first indications as to the ranking of our 16 countries.

Table 7: Inequality indices for $z = 7.07$

	$\alpha = 0$		$\alpha = 1$		$\alpha = 2$
Cal	0.296	Cal	5.612	Cal	279.774
Nor	0.249	Net	3.765	Net	178.319
UK	0.241	Nor	3.405	Bel	149.706
Net	0.240	Bel	3.297	Fra	143.941
Swe	0.233	UK	3.182	Den	127.257
Bel	0.227	Den	2.959	Swe	124.631
Gre	0.213	Swe	2.955	UK	113.731
Por	0.194	Por	2.815	Nor	100.063
Den	0.184	Fra	2.498	Por	82.366
Ire	0.176	Aus	2.118	Aus	68.174
Aus	0.165	Spa	1.965	Fin	61.487
Spa	0.159	Gre	1.931	Spa	54.851
Fra	0.159	Ire	1.858	Ire	53.296
Ita	0.144	Fin	1.587	Ger	42.066
Ger	0.144	Ger	1.553	Ita	42.013
Fin	0.109	Ita	1.437	Gre	35.598

The first column of Table 7 gives the proportion of authors which are above the minimum productivity level $z = 7.07$. There are huge variations in this proportion from 30% for California to 10% for Finland. The second column is the mean productivity gap while the last column relates to the dispersion of authors above z.

From these results, California dominates according to all three criteria. Netherlands seems to be the best European country. There are countries which are consistently low in this ranking: Spain, Italy, Germany. There are countries for which the value of α has a major impact on their ranking: it has a positive impact for Finland, France, Denmark, Belgium and a negative inpact for Norway, the UK, Greece. This is an indication of the position of the active academics in the distribution of scores. When all the mass of productive academics is near z, increasing α draws the country down in the ranking. When this mass is scattered, α has no major role. When the maximum score of a country is greater than the maximum score of the other countries (France), augmenting α pushes that country up in the ranking.

Let us now set α equal to 1 and compute the t statistics. We shall use a critical level of 10% (critical value of 1.66). As indicated in Table 8, California statistically dominates all the other countries. We can find equivalent countries if we start from the top of Table 8 and read horizontally. A top group emerges with Netherlands, Norway and Belgium. A second group is formed of the UK, Denmark, Sweden and Portugal. France and Austria are in the middle. Spain, Greece, Ireland and Finland are very low, while Germany and Italy are at the bottom.

8 How to measure the scientific production of an institution

There is probably general agreement that institutions should be ranked according the aggregate scores of their members. However, this aggregation is not at all simple and has to rely on a precise definition of what constitutes an academic research institution. For this purpose, it may be helpful to keep in mind the paradigm of the student who tries to find the best location to write his PhD dissertation.

8.1 Definitions and implied aggregation formulae

We shall give two opposite definitions of what is an academic research institution. The first definition insists on short term capacity. The second one relies more on past reputation.

Definition 7 *An academic research institution is defined at time t as a collection of individuals having a research and a teaching activity in the field of economics. These individuals have a common physical location. They acknowledge their present affiliation in their scientific publications. They constitute the collective human capital of the institution.*

This definition insists on present (not past) affiliation. It is a short term definition, because it does not speak of the past affiliations of its members. The institution can thus be credited of all their past scientific achievements. In other words, the

Table 8: Normal tests for $z = 7.07$

	Cal	Net	Nor	Bel	UK	Den	Swe	Por
Cal	0.00	4.56	4.32	4.68	8.18	4.63	5.85	3.64
Net	-4.56	0.00	0.68	0.91	1.78	1.37	1.71	1.22
Nor	-4.32	-0.68	0.00	0.18	0.49	0.67	0.79	0.70
Bel	-4.68	-0.91	-0.18	0.00	0.26	0.52	0.62	0.58
UK	-8.18	-1.78	-0.49	-0.26	0.00	0.43	0.59	0.50
Den	-4.63	-1.37	-0.67	-0.52	-0.43	0.00	0.01	0.16
Swe	-5.85	-1.71	-0.79	-0.62	-0.59	-0.01	0.00	0.17
Por	-3.64	-1.22	-0.70	-0.58	-0.50	-0.16	-0.17	0.00
Fra	-8.44	-3.09	-1.67	-1.51	-2.25	-0.68	-0.87	-0.31
Aus	-7.60	-3.43	-2.25	-2.11	-2.71	-1.34	-1.60	-0.86
Spa	-11.20	-5.09	-3.06	-2.94	-5.50	-1.85	-2.42	-1.14
Gre	-9.45	-4.44	-2.85	-2.72	-4.07	-1.78	-2.22	-1.14
Ire	-7.26	-3.56	-2.50	-2.38	-2.89	-1.64	-1.92	-1.13
Fin	-8.81	-4.56	-3.19	-3.08	-4.09	-2.19	-2.63	-1.52
Ger	-13.65	-6.75	-4.10	-4.02	-9.20	-2.70	-3.63	-1.73
Ita	-13.66	-6.94	-4.30	-4.23	-9.15	-2.89	-3.86	-1.88
	Fra	Aus	Spa	Gre	Ire	Fin	Ger	Ita
Cal	8.44	7.60	11.20	9.45	7.26	8.81	13.65	13.66
Net	3.09	3.43	5.09	4.44	3.56	4.56	6.75	6.94
Nor	1.67	2.25	3.06	2.85	2.50	3.19	4.10	4.30
Bel	1.51	2.11	2.94	2.72	2.38	3.08	4.02	4.23
UK	2.25	2.71	5.50	4.07	2.89	4.09	9.20	9.15
Den	0.68	1.34	1.85	1.78	1.64	2.19	2.70	2.89
Swe	0.87	1.60	2.42	2.22	1.92	2.63	3.63	3.86
Por	0.31	0.86	1.14	1.14	1.13	1.52	1.73	1.88
Fra	0.00	1.04	2.03	1.75	1.43	2.25	3.80	4.09
Aus	-1.04	0.00	0.37	0.40	0.45	1.01	1.44	1.71
Spa	-2.03	-0.37	0.00	0.10	0.23	0.92	1.86	2.27
Gre	-1.75	-0.40	-0.10	0.00	0.14	0.74	1.23	1.56
Ire	-1.43	-0.45	-0.23	-0.14	0.00	0.47	0.67	0.91
Fin	-2.25	-1.01	-0.92	-0.74	-0.47	0.00	0.09	0.38
Ger	-3.80	-1.44	-1.86	-1.23	-0.67	-0.09	0.00	0.60
Ita	-4.09	-1.71	-2.27	-1.56	-0.91	-0.38	-0.60	0.00

institution is credited with the past work of its members (measured over a given period) because we want to approximate current human capital. The members share their present and past knowledge with their present colleagues and students. Once an individual leaves his institution, he leaves it with all his publications.

This definition insists on common location, but does not say who is paying its members. Common location implies that research institutes like the Tinbergen Institute located both in Amsterdam and Rotterdam have to be split and that its achievements have to be divided between the host institutions, Erasmus University Rotterdam, University van Amsterdam and Free University Amsterdam. The Tinbergen Institute is seen as a research network and thus will not be ranked. CEPR is an even more extreme example because its members are scattered all over Europe, while the headquarters are in London. The CNRS is another example, concerning France this time. Most researchers having a CNRS affiliation are scattered in different academic research institutions. They are paid completely by CNRS, which thus indirectly contributes to the financing of those outside institutions. The merits of individuals affiliated to CNRS have to be credited to their host institutions. The same type of reasoning can be applied to the EHESS, still in France, but to a lesser extent as we shall see.

The score of institution k at time t measuring its available human capital is thus defined by

$$sd_{k,t} = \sum_{i=1}^{n} ID(i \in \Theta_{k,t}) \sum_{j=0}^{m} s_{i,t-j} \tag{7}$$

where $\Theta_{k,t}$ is the set of members affiliated to institution k at time t. Index i covers all the n economists of a country and index j corresponds to the m year span. There is no double counting.

The above definition is of a particular interest for a PhD student looking for the ideal place where to write his dissertation, because he is looking for a readily available human capital. Formula (7) does not however correspond to the usual practice where affiliations at the time of publication are used. Note also that the country rankings we made in the previous section do not enter this definition. The score of a person for a given country was computed considering only his publications having an affiliation corresponding to this country. Consequently people with a double affiliation (for instance France and Belgium) were counted twice. So another definition is needed.

Definition 8 *An academic research institution is a "moral person" having the intellectual ownership of all the present and past research hosted in its walls.*

This definition is of course of no use to the PhD student looking for a location. But it is certainly the preferred one for a dean writing a report on past research and past achievements when he has to ask his government for money. It is a legalistic definition. It implies that publications are counted with affiliations as given at the time of their publication. The corresponding score of institution k is given by

$$\tilde{s}d_{k,t} = \sum_{i=1}^{n} \sum_{j=0}^{m} ID(i \in \Theta_{k,t-j}) s_{i,t-j} \tag{8}$$

where $\Theta_{k,t-j}$ is the set of members affiliated to institution k at time of publication. This measure can be used to assess the productivity of the money invested by the

institutions in the past.

Because the institution is defined as a moral person, the question of unicity of location is debatable. Networks can be considered as moral persons. For instance the Tinbergen Institute has multiple locations, but the Dutch government is interested in the money it puts into it as a whole. Consequently the research report concerns the whole Tinbergen Institute. The same is true for CEPR, or CNRS and EHESS in France. Consequently it may be interesting to measure the scientific production of these entities considered as a whole.

Remarks:

- Bauwens (1999) implicitly uses the legalist definition in his yearly ranking of Belgian economists and Belgian academic institutions. He took $m = 4$, but considers two periods 1992-1996 to 1993-1997. His institution rankings do not vary much, but his ranking of individuals has a large volatility.

- To our knowledge, Cribari-Neto et al (1999) are the only authors to present rankings obtained according to the two definitions. But they do not interpret the economic or legal meaning of these two rankings.

- The yearly ranking produced by CentER at Tilburg University is based only on the current year publications. For this ranking $m = 1$ and the two definitions become identical.

- Information about the affiliation at the time of publication is directly given by the JEL CD-ROM. It appears to be much more difficult to get the list of the members of an institution at time t. We cannot see a simple way to reconstruct it from the data contained in the JEL CD-ROM.

8.2 Ordering, comparability, aggregation and multi affiliations

We want to compare and rank institutions. This means that we want to arrive at a complete ordering of a particular set[14]. We started from individuals, indexed by $i = 1, n$ over a given country. We defined a personal score $s_{i,t}$, a cardinalisation function which make individuals comparable. These individuals are aggregated into institutions indexed by $k = 1, q$. An institution k is characterised by an affiliation set $\Theta_{k,t}$ defined at time t. The time index covers the period $t = 1, m$. Let us consider the set Ω_t of all the individuals having declared an affiliation within a given country for year t. We have by definition $\Theta_{k,t} \subset \Omega_t$. In order to be comparable, institutions must form a partition of Ω_t, which is translated by the following assumption:

[14]The mathematical theory is related to lattice theory, social welfare functions, aggregation, etc. People like Monjardet, Kirman, Blackorby and others have contributed to it. What we need is relatively simple if the problem is well understood.

Assusmption 1 *For a given t, $\Theta_{k,t}$, $k = 1, q$ operates a partition of Ω_t*

$$\bigcap_k \Theta_{k,t} = \emptyset \text{ and } \bigcup_k \Theta_{k,t} = \Omega_t.$$

This condition is necessary, but however not sufficient in order to produce meaningful rankings. Moreover, it is often violated. To see why, let us examine the large diversity existing among institutions producing academic research appearing in the JEL. We have universities, colleges (especially in France with Polytechnique, Ecole Normale Supérieure, etc), central banks, statistical agencies, specialised research institutes when they have a unique town location (like EHESS, Paris in France). We have already spoken about research networks (like CNRS in France or FNRS in Belgium, or CEPR) which we have decided to leave aside. While being diverse in their scientific aims, these groups are comparable because they are autonomous.

Some members (not all) of these institutions are affiliated to research groups which are subgroups. They have thus double affiliations: for instance UcL and CORE, ULB and ECARES, Toulouse and GREMAQ. Subgroups are not independent institutions. So we call the first affiliation the major affiliation and the group affiliation the secondary affiliation. Two research groups can be compared even if they belong to two different universities (ECARES, CORE, IRES for instance in Belgium). But of course, we cannot compare a research group and an autonomous institution. For instance, CREST and INSEE, because CREST can be considered as included in INSEE or at least dependent of it. Consequently CREST cannot be compared to universities. Only INSEE can be compared to universities. As a consequence, all the CREST members are arbitrarily credited of an INSEE affiliation, even if they are not paid by INSEE.

The problem of comparability is complicated when a person has several major affiliations. For instance Jean Tirole declares most of the time three major affiliations: Toulouse, ENPC and MIT; and most of the time three secondary affiliations: IDEI, GREMAQ and CERAS. A strict aggregation procedure would imply this author to be split in three pieces, one for each town and the Toulouse part in its turn to be split in two, one for each research center (GREMAQ and IDEI). This is clearly unfeasible as we have no information to determine the size of each part. We have finally considered that there are three fictitious authors, each full time in each major institution. And we discarded one of the secondary affiliations (IDEI was not ranked). Applying this type of solution to all cases renders institutions comparable.

Some institutions cannot be ranked easily because their members have different major affiliations. If CREST and CERAS can be easily viewed as subgroups of INSEE and ENCP, the case of IFS in England is tricky. It is often seen as a subset of UCL, which is on average true. But IFS has also members which are affiliated to LSE, Warwick, Essex, York or who have no university affiliation. In fact and from its Web page, IFS is an independent research organisation. We do not see how it could reasonably be ranked.

8.3 What is it useful to count

If a student is interested in a department for writing a PhD, he is interested in human capital, aggregated using $\sqrt{n}$ (instead of n when a paper is written with coauthors) because he is interested in individuals. Secondly, he is interested in authors above the minimum level of productivity z which was chosen equal to 7.07. This means that we shall not credit an economic department for all its publications, but only for the publications which were written by an author who is situated above z. The list of eligible authors is built up country by country, independently of their affiliations, provided these affiliations are situated inside the same country. If an author has not migrated between two European countries, this is the human capital view. In the copyright view, this score is divided between the different affiliations of this author when they have changed over time. We reconstructed the country trajectory of each author over the time period of the 10 years of our sample. Counting only the authors which have a total score above z has the consequence of underscoring very large institutions with a lot of academics, but publishing very little. Finally, looking for a good scientific surrounding, a student will choose an institution where there is a minimum mass of publications (and maybe a minimum number of authors). This can be defined as one major paper every year with one author. Over ten years, the minimum level per institution is 100.

8.4 What can feasibly be quantified

We have chosen the copyright definition, even if we would have preferred the human capital definition, the one in which our PhD student is interested. The human capital definition of an institution implies that we can have the member list of each institution for $t = 2000$ which is the last year of our sample. Major institutions have a web site where it could be possible to obtain such a list. We have done this exercice for IFS and tried to compare that list to a member list obtained from the JEL CD-ROM corresponding to all the persons that have declared an IFS affiliation in the past. IFS in its Web site declares that it has about 30 researchers, but give a list of 60 people (not counting the administrative staff). Among those 60 people, 35 do not appear in our JEL data base. And 24 who gave in the JEL an IFS affiliation do not appear in the IFS list. The dates of publication (first and last with an IFS affiliation) could explain a departure for 5 of them (a last date of publication lower than 1996 for instance), but not for the others. We concluded that it is difficult, if not impossible, first to deduce the real affiliation of a person in year 2000 from the data contained in the JEL and second that institutional lists available in 2002 are not fully consistent with claimed affiliations over the years 1998-2000. So we restrict ourself to the copyright definition, for lack of a better feasible solution.

9 Ranking economic departments in Europe

We start this section by analysing the degree of visibility of economic departments when seen through the filter of the JEL data base. We then give a collective ranking. In a last subsection, we give some details about the choice we made where necessary.

9.1 Some statistics

We have selected departments using a certain filter, the journal publications reported in the JEL CD-ROM and we have excluded authors having a total score below $z = 7.07$ (score obtained within a country, independent of the institutional affiliation). In Table 9, columns 2-5, we report the type of selection produced by this filter on the visibility of economic departments and in the last two columns on the visibility of central banks. Note that the JEL reports all publications in the journals it covers, even those by members of non-economic departments. For instance, Netherlands has officially 12 economic departments. But 4 economic departments do not appear in our list while 4 other non-economic departments have authors who have published economic articles. Table 9 is based on the full list of journals covered by the JEL.

Table 9: JEL visibility of European countries

	Economic Departments				Central Banks	
Country	Depts	JEL	Ranked	Authors	JEL	Ranked
Austria	12	11	4	68	no	no
Belgium	16	13	6	182	yes	no
Denmark	8	5	4	95	no	no
Finland	18	14	2	27	yes	no
France	70	57	19	467	yes	yes
Germany	98	53	17	327	yes	no
Greece	12	11	5	89	yes	no
Ireland	8	7	1	16	yes	no
Italy	72	49	15	265	yes	yes
Netherlands	12	12	11	501	yes	no
Norway	7	7	5	111	yes	yes
Portugal	15	5	2	25	yes	yes
Spain	48	28	12	252	yes	yes
Sweden	21	14	8	202	yes	no
UK	96	77	55	1881	yes	yes
California	52	31	18	1001	yes	yes

Column 2 indicates the official number of economic departments, column 3 give the number of departments appearing in the JEL, column 4 the number of ranked departments (those having a score greater than 100) and column 5 the corresponding number of authors (which can be compared to the total number of authors given in Table 5. Column 6 indicates if the Central Bank appears in the JEL and the last column if it is ranked

The visibility of economic departments in the JEL varies a great deal across countries. On average it is 75%, but goes down to 33% for Portugal. Note that it is below average for California. The average percentage of ranked departments is 36%. It is over average for Netherlands, Norway, THE UK, Denmark, Greece, Sweden and Belgium. It is below average for California, Austria, France, Spain, Italy, Germany, Portugal, Ireland and Finland. Column 5 approximates the number of authors present in the ranked departments. This is only an approximation because the same author may have moved from one place to the other over the period 1991-2000.

Central Banks are in general visible in the JEL. But not all of them reach a significant score greater than 100 needed to enter the ranking. Except Norway and THE UK, Central Banks are more visible in the south of Europe than in the north.

9.2 Collective ranking for the fifteen countries

Let us start our ranking using the full list of journals. Among the total of 512 economic departments in Europe, we found 152 (30%) with a score of at least 100 and at least 10 active members. We indicated research centers under their mother institution when this was appropriate. We added central banks having a score greater than 100.

Table 10: European ranking based on the full list of journal

Institution	total score	authors	papers	average score
LSE	2637.33	150	726	17.58
Tilburg U	2433.27	108	618	22.53
U Oxford	2074.31	119	641	17.43
Nuffield College	*660.66*	*31*	*163*	*21.31*
Institute of Econ and Stat	*225.41*	*19*	*61*	*11.86*
U Cambridge	1919.53	101	660	19.01
Trinity College	*258.33*	*7*	*70*	*36.90*
Erasmus U	1692.40	92	545	18.40
Catholic U Louvain	1611.94	73	489	22.08
CORE	*1195.94*	*48*	*345*	*24.92*
IRES	*184.46*	*10*	*68*	*18.45*
U Amsterdam	1435.42	68	429	21.11
U Warwick	1378.41	70	430	19.69
U Toulouse	1331.90	43	352	30.97
GREMAQ	*1123.06*	*30*	*293*	*37.44*
U Wales	1276.04	94	485	13.57
U Paris I	1229.64	79	438	15.57
EUREQUA	*551.36*	*39*	*204*	*14.14*
CERMSEM	*172.17*	*10*	*35*	*17.22*
U College London	1224.10	62	364	19.74

Institution	total score	authors	papers	average score
U Nottingham	1169.51	43	412	27.20
U York	1102.71	53	343	20.81
Stockholm School of Econ	1066.09	56	310	19.04
Maastricht U	1064.94	60	350	17.75
INSEE, Paris	1004.77	59	314	17.03
CREST	*899.68*	*46*	*272*	*19.56*
U Essex	988.45	37	234	26.71
U Autonoma Barcelona	970.69	47	247	20.65
Stockholm U	935.42	50	227	18.71
U Bonn	896.68	57	217	15.73
CERAS, Paris	885.94	14	209	63.28
London Business School	883.44	53	281	16.67
Free U of Amsterdam	852.47	47	319	18.14
U Manchester	844.95	72	305	11.74
Free U Brussels	844.28	33	228	25.58
ECARES	*617.53*	*19*	*140*	*32.50*
U Copenhagen	824.28	41	211	20.10
Catholic U Leuven	800.26	41	317	19.52
EHESS-PARIS	792.40	35	209	22.64
DELTA	*695.23*	*27*	*171*	*25.75*
U Pompeu Fabra	785.33	40	197	19.63
U Groningen	780.62	44	301	17.74
U Carlos III	757.00	40	186	18.93
U Aix-Marseille	752.47	29	219	25.95
GREQAM	*716.42*	*26*	*202*	*27.55*
U Reading	701.64	43	275	16.32
CEPREMAP, Paris	694.55	30	238	23.15
U Southampton	670.62	49	181	13.69
U Oslo	669.56	38	174	17.62
National Institute of Econ (UK)	667.35	34	353	19.63
Birkbeck College	659.92	34	201	19.41
U E Anglia	645.12	34	228	18.97
U Newcastle	642.29	44	228	14.60
U Vienna	618.06	37	169	16.70
U Bristol	612.43	41	152	14.94
U Aarhus	599.74	28	177	21.42
U Mannheim	585.00	38	194	15.39
Uppsala U	574.61	39	177	14.73
U Strathclyde (UK)	570.05	36	213	15.83
U Glasgow	563.21	44	174	12.80

Institution	total score	authors	papers	average score
U Exeter	555.52	25	160	22.22
Norwegian School of Econ	514.56	33	163	15.59
INSEAD, Paris	508.03	22	140	23.09
U Alicante	483.91	19	121	25.47
U Birmingham	479.83	33	162	14.54
U Bologna	476.61	25	178	19.06
European U Institute (Italy)	471.57	29	121	16.26
U Bocconi	460.79	38	165	12.13
U Lancaster (UK)	436.18	26	157	16.78
Athens U Econ	422.67	32	159	13.21
U Leeds	420.38	36	169	11.68
Lund U (Sweden)	412.56	27	135	15.28
U Edinburgh	405.56	23	132	17.63
U College Dublin	400.50	16	121	25.03
U Kiel	390.64	31	161	12.60
U Loughborough	384.18	23	169	16.70
U Aberdeen	373.91	33	167	11.33
U Konstanz	372.60	26	151	14.33
U Helsinki	371.33	14	104	26.52
Queen Mary and Westfield College	368.75	26	111	14.18
Free U Berlin	366.95	20	121	18.35
U Rome "La Sapienza"	365.24	32	180	11.41
U Pais Vasco	345.07	25	124	13.80
U Stirling	343.59	23	145	14.94
U Leicester	332.35	27	114	12.31
U Kent	317.98	19	111	16.74
U Sheffield	315.97	27	154	11.70
Wageningen (Netherlands)	313.03	24	132	13.04
U Paris X	312.87	24	144	13.04
THEMA	*295.86*	*19*	*86*	*15.57*
U Linz	310.14	13	110	23.86
Umea U (Sweden)	308.77	18	109	17.15
Wissenschaftszentrum Berlin	306.72	20	110	15.34
U Nova de Lisboa	306.02	14	75	21.86
U Torino	304.22	17	119	17.90
U Dortmund	298.91	18	99	16.61
U Venezia	295.11	15	82	19.67
U Bergen	289.46	15	80	19.30
Queen's U. Belfast	284.79	21	120	13.56
U Bielefeld	284.45	21	81	13.55

Institution	total score	authors	papers	average score
U Bath	273.88	16	93	17.12
U Liverpool	259.74	21	91	12.37
U Cergy (France)	259.29	17	71	15.25
U Antwerp	258.29	20	89	12.91
U Utrecht	254.50	21	81	12.12
U Portsmouth	253.34	14	101	18.10
Kiel Institute of World Econ	252.68	20	106	12.63
Copenhagen Business School	251.81	17	88	14.81
U Surrey	251.37	17	96	14.79
Leiden U	249.34	14	74	17.81
Bank of England	248.28	30	80	8.28
HEC, Paris	245.70	16	71	15.36
U Valencia	242.72	19	154	12.77
Heriot-Watt U	238.02	19	93	12.53
U Cyprus	235.36	15	79	15.69
U Durham	233.47	16	101	14.59
Inst.for International Econ (Sweden)	232.63	23	51	10.11
U Technical Vienna	232.36	10	78	23.24
Bank of Italy	229.12	17	85	13.48
Imperial College	222.72	14	74	15.91
City U Business School (UK)	218.00	20	84	10.90
U Brescia	217.07	12	77	18.09
CEMFI, Madrid	216.56	12	63	18.05
U St Andrews	212.78	16	73	13.30
IGIER (Italy)	209.44	18	57	11.64
Statistics Norway	208.98	15	52	13.93
U Nijmegen	208.11	17	57	12.24
U Hamburg	204.25	15	63	13.62
EBRD (UK)	198.29	10	59	19.83
Catholic U Portugal	198.21	11	53	18.02
Research Institute of Indust. (Sweden)	197.11	15	58	13.14
Humboldt U Berlin	195.32	16	68	12.21
Ecole Polytechnique, Paris	194.05	20	55	9.70
U Crete	192.80	16	109	12.05
U Hull	190.99	16	66	11.94
U Canterbury	190.39	13	57	14.65
U Paris 9	185.81	24	85	7.74
U Complutense, Madrid	183.47	17	96	10.79
U Dundee	181.98	16	73	11.37
U Ulster	173.26	16	68	10.83

Institution	total score	authors	papers	average score
Brunel U (UK)	163.50	20	63	8.18
U Athens	157.53	17	82	9.27
U Zaragoza	156.40	10	67	15.64
Central Planning Bureau (Netherlands)	154.91	14	51	11.06
U Osnabruck (Germany)	154.71	10	50	15.47
Royal Holloway (UK)	154.45	13	53	11.88
Norwegian School of Managemen	154.23	13	41	11.86
IEP, Paris	148.30	13	70	11.41
OFCE	*109.45*	*10*	*55*	*10.95*
U Modena	148.20	10	41	14.82
London City U	146.06	16	62	9.13
Manchester Metropolitan U	143.03	16	60	8.94
U Bradford	142.69	10	76	14.27
Bank of Portugal	142.33	6	36	23.72
U Siena	138.25	12	59	11.52
Bank of France	136.84	16	52	8.55
U Catholic Milan	130.58	11	65	11.87
Bank of Norway	126.73	9	32	14.08
Helsinki School of Econ	125.30	13	43	9.64
U Regensburg (Germany)	122.95	11	44	11.18
U Padova	121.84	13	52	9.37
U Augsburg	118.79	13	76	9.14
Bank of Spain	114.92	11	65	10.45
U Salford	114.58	12	49	9.55
U Lille	112.31	11	50	10.21
Trade Union Institute (Sweden)	108.25	12	34	9.02
Goteborg U	105.11	12	50	8.76
U Tubingen	102.94	13	43	7.92

When we take into account only the 67 top journals, we have only 92 department left (a drop of 40%) and a global ranking which is slightly modified. Essentially, LSE drops below Tilburg, and Oxford and Cambridge below Toulouse. Paris I is now below Maastricht and roughly at the same level as Aix-Marseille. Erasmus falls below Amsterdam.

Table 11: European ranking based on top list journals

Institution	total score	authors	papers	average score
Tilburg U	1870.7	83	538	22.54
LSE	1696.0	93	535	18.24
Catholic U Louvain	1088.4	52	403	20.93
CORE	915.51	37	318	24.74
IRES	86.99	8	52	10.87
U Toulouse	1033.3	34	319	30.39

Institution	total score	authors	papers	average score
GREMAQ	890.69	25	268	35.63
U Oxford	1015.2	54	355	18.80
Nuffield College	486.64	23	138	21.16
Institute of Econ and Statistics	151.04	14	54	10.79
U Amsterdam	943.29	45	317	20.96
Erasmus U	934.91	52	364	17.98
U Cambridge	860.75	51	340	16.88
Trinity College	213.53	6	66	35.59
U Warwick	803.35	46	315	17.46
U Autonoma Barcelona	792.31	39	220	20.32
U Essex	756.92	33	225	22.94
U College London	752.61	32	253	23.52
Stockholm School of Econ	739.67	43	267	17.20
Stockholm U	731.25	37	195	19.76
CERAS	724.19	13	207	55.71
U York	679.98	32	225	21.25
INSEE	647.95	40	254	16.20
CREST	625.22	35	240	17.86
U Bonn	630.80	42	170	15.02
U Copenhagen	627.44	32	181	19.61
U Pompeu Fabra	619.44	35	171	17.70
Free U Brussels	602.22	20	164	30.11
ECARES	503.50	17	133	29.62
U Carlos III	589.77	32	161	18.43
EHESS-PARIS	589.50	25	174	23.58
DELTA	539.50	22	161	24.52
Maastricht U	571.03	33	215	17.30
U Paris I	545.24	32	223	17.04
EUREQUA	177.09	15	116	11.81
CERMSEM	152.78	10	35	15.28
London Business School	532.68	39	236	13.66
U Nottingham	523.43	29	326	18.05
U Aix-Marseille	503.95	17	180	29.64
GREQAM	495.09	17	173	29.12
U Oslo	494.56	29	147	17.05
Free U of Amsterdam	463.27	28	229	16.55
U Vienna	442.45	26	135	17.02
U Southampton	424.26	30	113	14.14
Birkbeck College	422.53	25	161	16.90
U Alicante	401.90	19	121	21.15

Institution	total score	authors	papers	average score
CEPREMAP	395.14	21	156	18.82
Uppsala U	391.77	27	144	14.51
INSEAD	377.53	19	115	19.87
U Wales	373.76	31	197	12.06
U Aarhus	370.58	20	164	18.53
U Exeter	365.63	18	131	20.31
U Bristol	365.02	24	107	15.21
U Mannheim	364.30	28	167	13.01
Catholic U Leuven	363.48	25	218	14.54
European U Institute	320.61	23	106	13.94
U Groningen	318.81	24	179	13.28
U Glasgow	315.50	28	124	11.27
Norwegian School of Econ	287.23	20	120	14.36
U Helsinki	286.74	11	92	26.07
U Bologna	264.26	17	113	15.54
Free U Berlin	255.00	13	98	19.62
U Bocconi	249.52	24	100	10.40
U Nova de Lisboa	243.83	12	70	20.32
U Reading	240.00	18	136	13.33
U Newcastle	238.81	17	108	14.05
U Birmingham	233.50	17	104	13.74
U Manchester	226.70	22	82	10.30
U College Dublin	220.21	10	84	22.02
U Venezia	218.86	12	69	18.24
U Pais Vasco	217.90	19	92	11.47
Institute for International E	207.40	21	47	9.88
U Dortmund	203.39	14	72	14.53
U Bielefeld	202.50	13	64	15.58
U Bergen	202.31	10	57	20.23
U Cergy	200.11	11	60	18.19
THEMA	208.37	12	70	17.36
Queen Mary and Westfield Colleg	185.83	15	83	12.39
Umea U	184.22	12	95	15.35
Lund U	180.33	10	76	18.03
Athens U Econ	179.00	13	64	13.77
HEC	175.24	14	53	12.52
Wissenschaftszentrum Berlin	174.71	13	81	13.44
U Nijmegen	172.97	12	40	14.41
Bank of England	170.10	24	65	7.09
CEMFI	166.53	12	63	13.88

Institution	total score	authors	papers	average score
U Edinburgh	164.77	12	84	13.73
IGIER	157.52	15	52	10.50
U Leicester	147.10	11	57	13.37
Imperial College	142.76	13	72	10.98
Statistics Norway	141.31	11	43	12.85
U Kent	132.15	13	71	10.17
Copenhagen Business School	129.12	11	70	11.74
U Konstanz	128.75	14	104	9.20
U Strathclyde	124.05	11	98	11.28
U Cyprus	123.09	10	63	12.31
U Paris X	122.78	11	65	11.16
Norwegian School of Managemen	119.64	12	35	9.97
City U Business School	118.66	13	56	9.13
Ecole Polytechnique	116.78	13	31	8.98
U Lancaster	114.52	11	73	10.41
National Institute of Econ	109.61	16	189	6.85
U Liverpool	108.42	10	44	10.84
U Stirling	107.75	10	94	10.77
Royal Holloway	106.77	10	44	10.68

Clearly, the restricted list favours departments which are theory oriented at the expense of more applied departments.

9.3 Some institutional details

9.3.1 Belgium

Affiliations are drawn from the JEL as given there. We made some corrections. As soon as somebody declared CORE or ECARES as an affiliation, we checked and added if necessary UcL or ULB respectively, because CORE and ECARES are considered as subgroups of UcL and ULB. If in a 10 year curriculum, it appeared than one affiliation was evidently wrong (Louvain instead of Leuven) or something was missing, we made the correction in order to arrive at reasonable trajectories. But we did not use insider information. For instance, we know from outside information that Ton Barten is a CORE member. But he always signs KUL. We respected that choice and did not alter his declared affiliations. This is another example of the discrepancy existing between JEL declared affiliations and affiliations found in official lists.

Many authors had multiple affiliations. For instance Pierre Pestiau declares CORE-UCL and ULg for Belgium and DELTA for France more recently. We credited both Belgian institutions for all his papers. Another example: Jacques Thisse declares French and Belgian affiliations. We counted for Belgium all the papers where a Belgian institution appears (CORE-UCL in this case).

9.3.2 France

It is rather difficult to give an accurate sketch of the different institutions in France, partly because of the overlapping affiliations of their members. Universities correspond to the concept illustrated elsewhere in Europe. However, between the end of the middle ages and the mid nineteen century they had completely disappeared except for medicine and law. The French revolution created the famous "Grandes Ecoles" which are relatively small and specialised (contrary to a full university). Universities had a rebirth during the nineteen century. Because scientific research was not flourishing inside universities, the French government created various research institutions after world war II. We already mentioned the CNRS, saying that it could not enter our ranking. The EHESS dates back to the same period. At that time, the concept of research groups or laboratories emerged. They even affected large government departments and this is the reason why the INSEE is included in our ranking. To summarize, we have partitioned France into Universities, "Grandes Ecoles" (Normale Supérieure, ENPC, INSEAD, HEC, Ecole Polytechnique, IEP), large government departments, mainly the INSEE and the Banque de France. The case of the EHESS deserves special attention. On one hand, this institution is similar to CNRS as it is composed of different research centers, located in different towns (Paris, Marseille, Toulouse, Lyon). Those centers are run in collaboration with the CNRS, universities and Grandes Ecoles (essentially Normale Supérieure). But on the other hand, most of the activity is located in Paris. So we decided to consider EHESS-Paris as a separate entity and DELTA as a sub group.

U Toulouse covers everything located in this town, including INRA members. GREMAQ is the main contributor to the total score of Toulouse. We did not rank IDEI as a separate group, because most of the time authors indicate the double affiliation. Paris I houses two main research centers, EUREQUA and CERMSEM which account for 60% of its total score. Note that EUREQUA is a recent creation formed by the aggregation of former smaller centers. We updated older affiliations to achieve consistency. Note that in the ranking exercice made several years ago by Kirman and Dahl (1994), Paris I was first in France. This is no longer the case.

INSEE, Paris is the third institution in France in term of its production of economic papers and CREST is its main contributor. It is the second in France by the number of productive authors. CERAS is identical with ENPC (Ecole Nationale des Ponts et Chaussées). It has very few authors compared to its rank and thus the greatest mean per author of the whole sample (including California). EHESS-Paris houses various research centers, the most important one being DELTA. The difference between the EHESS score and that of DELTA is due to smaller centers and individuals giving EHESS as a generic affiliation without any other mention. We consider Aix-Marseille as a whole because 95% of its total score come from GREQAM which include members with many different main affiliations. And it would have been no sense to split that research group into its sponsoring institutions. GREQAM was formerly GREQE. We updated that affiliation. Note that there are two economic departments, one at Aix-Marseille II and one at Aix-Marseille III and that recently

Aix-Marseille II became Université de la Méditerranée.

Paris X and Cergy are close to each other. THEMA is the main research center, common to both universities, contributing to 52% of the score of these two universities taken together.

Lille includes all the state institutions. The catholic university is treated separately and does not appear in the ranking despite its high productivity per active author.

9.3.3 Germany

The sample period is 1991-2000 and thus start after the reunification. But apart from Humbold University, no department from the former east Germany is present in the final ranking. This is likely to change as many departments in the East have recruted professors from the West. The first Max Plank Institute in economics has been established in Dresden / (Leipzig?) and should generate substantial research output. The overall scores of institutions in the East are penalised by their very low scores in the first part of the period.

9.3.4 Italy

The odd man out in Italy is the European University Institute in Florence which is sponsored by the government of the European Union and has only staff on fixed term contracts. This means that the correlation between attribution and time at the EUI is less strong than for other institutions. IGIER is a research institute in Milan which has some permanent associates, who have jobs elsewhere and many temporary members. A number of the economists who give Bocconi as an affiliation are full time professors elsewhere and only part-time at Bocconi.

9.3.5 Netherlands

Maastricht University was formerly the University of Limburg. We adopted the more recent denomination and corrected the data accordingly. Erasmus University in Rotterdam contained many research centres which were later grouped together into larger groups. We treated them as one to avoid the complication of this transition.

9.3.6 Spain

Spain is a country which has clearly encouraged a policy of developing few "centers of excellence". As a result, three university departments are well placed when the criterion is publication in top journals. CEMFI is an independent research institution sponsored by the Bank of Spain.

9.3.7 Sweden

This country houses many independent research institutions in economics, including one managed by the trade unions.

9.3.8 UK

We have excluded IFS and CEPR from the ranking. IFS is an independent institution receiving a private funding. It employs research assistants, but most of its members are affiliated to different main institutions. It is impossible to consider it as a subgroup of University College London even if IFS is basically composed mainly of members of UCL. CEPR is a research network.

There have been two important developments in the period we cover. The "research assesment" exercise which conditions financing on research performance has led to havier concentration of publishing in the top universities. Secondly the decision by the government to rename the former "polytechnics" as "universities" has led to a doubling in the number of universities in the UK, almost all of the old polytechnics with new names. Some of these institutions have made an investment in productive researchers, but the effect has yet to show up in the ranked departments although many of these new departments already figure in the JEL.

10 California and top European departments

What is the place of European economic departments in the world, or more modestly how can it be compared to Californian departments? From the previous section, we have extracted the top department of each country to plug it into the californian ranking. We then have tried to make some statistical inference on the distribution of the scores of departments in order to test country dominance.

10.1 Economic departments in California

In section 5, we identified 52 economic departments in California. From the JEL data base, we recover the presence of 37 institutions, but only 31 had at least one author above the minimum productivity level z. We finally ranked 18 of these institutions, excluding those which had a total score less than 100. We inserted in this ranking the top economic department of each European country (adding the European University Institute for Italy and Oxford and Cambridge for the UK). Let us first examine the ranking obtained when using the full list of journals.

Table 12: California ranking based full list of journals

Institution	total score	authors	papers	average score
U CA, Berkeley	4936.06	182	1191	27.12
Stanford U	4719.60	189	1028	24.97
UCLA	3582.45	154	812	23.26
LSE	2637.33	150	726	17.58
U CA, Davis	2491.72	86	627	28.97
Tilburg U	2433.27	108	618	22.53
U Oxford	2074.31	119	641	17.43

Institution	total score	authors	papers	average score
U CA, San Diego	2037.36	60	409	33.96
U Cambridge	1919.53	101	660	19.01
U Southern CA	1725.77	91	455	18.96
Catholic U Louvain	1611.94	73	489	22.08
U Toulouse	1331.90	43	352	30.97
U CA, Irvine	1134.20	47	276	24.13
Stockholm School of Econ	1066.09	56	310	19.04
CA Institute of Technology	1008.14	36	221	28.00
U Autonoma Barcelona	970.69	47	247	20.65
U CA, Santa Barbara	954.01	36	233	26.50
U Bonn	896.68	57	217	15.73
U Copenhagen	824.28	41	211	20.10
U Oslo	669.56	38	174	17.62
U CA, Santa Cruz	664.01	19	182	34.95
U Vienna	618.06	37	169	16.70
U CA, Riverside	605.88	33	185	18.36
Federal Reserve Bank of San Fran	603.86	30	170	20.13
U Bologna	476.61	25	178	19.06
European U Institute	471.57	29	121	16.26
Athens U Econ	422.67	32	159	13.21
U College Dublin	400.50	16	121	25.03
Santa Clara U	372.07	22	99	16.91
U Helsinki	371.33	14	104	26.52
U Nova de Lisboa	306.02	14	75	21.86
CA State U, Fullerton	267.30	17	101	15.72
CA State U, Northridge	169.56	8	61	21.20
CA State U, Los Angeles	137.34	6	44	22.89
San Diego State U	121.12	9	36	13.46
CA State U, Hayward	110.36	6	39	18.39

We can note several remarkable features. Only 34% of the Californian institutions are ranked, only 60% have at least one author with a score above z and only 71% appear in the JEL. The variance is extremely high among the ranked institutions. The two top economic department (Stanford and Berkeley) have a score which will never be reached by any European department. But the departments which follow have scores which decrease very rapidly. The local Central Bank has a very high score (compared to European Central Banks).

The position of the top departments of each European country is very instructive. LSE, which is first in Europe is far behind the first three and most famous Californian departments. Note that its number of authors is of the same order as its Californian predecessors, but that the average score of LSE authors is lower. We have three (plus two) departments above the truncated californian mean μ (LSE, Tilburg, Louvain plus Oxford and Cambridge). Between μ and $\mu/2$, we have five departments Toulouse,

Stockholm, Barcelona, Bonn and Copenhagen. Seven (plus one, the European U Institute) top European departments are below $\mu/2$.

When we turn to the list of 67 top journals, 15 Californian departments remain in the ranking (which means that they keep a score greater than 100).

Table 13: California ranking based on top list

Institution	total score	authors	papers	average score
U CA, Berkeley	3944.73	149	1076	26.47
Stanford U	3943.51	166	919	23.76
UCLA	2806.20	130	717	21.59
U CA, Davis	1972.24	76	578	25.95
Tilburg U	1870.71	83	538	22.54
U CA, San Diego	1811.47	56	389	32.35
LSE	1696.05	93	535	18.24
U Southern CA	1293.51	72	374	17.97
Catholic U Louvain	1088.42	52	403	20.93
U Toulouse	1033.33	34	319	30.39
U Oxford	1015.23	54	355	18.80
CA Institute of Technology	895.61	34	217	26.34
U CA, Irvine	871.01	35	237	24.89
U Cambridge	860.75	51	340	16.88
U Autonoma Barcelona	792.31	39	220	20.32
Stockholm School of Econ	739.67	43	267	17.20
U CA, Santa Barbara	709.92	30	160	23.66
U Bonn	630.80	42	170	15.02
U Copenhagen	627.44	32	181	19.61
U Oslo	494.56	29	147	17.05
U Vienna	442.45	26	135	17.02
U CA, Santa Cruz	418.64	14	160	29.90
U CA, Riverside	364.59	21	123	17.36
European U Institute	320.61	23	106	13.94
Federal Reserve Bank of San Fran	294.07	14	103	21.00
U Helsinki	286.74	11	92	26.07
U Bologna	264.26	17	113	15.54
Santa Clara U	255.04	17	77	15.00
U Nova de Lisboa	243.83	12	70	20.32
U College Dublin	220.21	10	84	22.02
Athens U Econ	179.00	13	64	13.77
CA State U, Fullerton	149.59	11	72	13.60
CA State U, Northridge	104.69	5	48	20.94
CA State U, Los Angeles	*75.13*	*4*	*39*	*18.78*

Institution	total score	authors	papers	average score
San Diego State U	*70.04*	*6*	*20*	*11.67*
CA State U, Hayward	*46.14*	*4*	*32*	*11.54*

There is no change in the Californian list, except that now Caltech is above U CA, Irvine. All the ranked economic departments lose less than one half of their score, except the Federal Reserve Bank, but its final ranking is not modified.

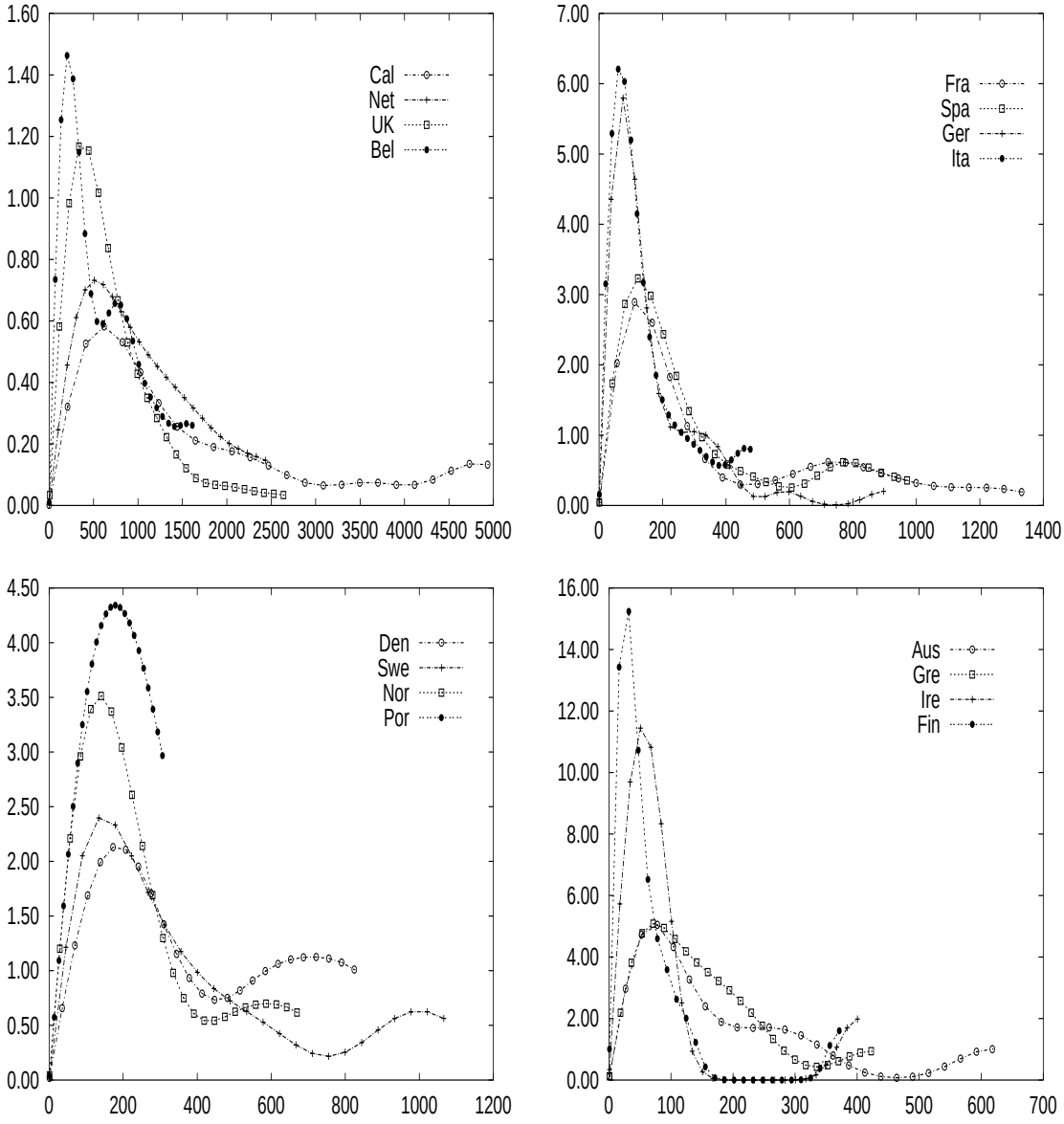
There are significant changes for the position of some European departments. The most spectacular is the fall of the LSE which is now below Tilburg, but is also now below Davis and San Diego. And Oxford and Cambridge are now below Toulouse. For Italy, Bologna is now below the European U Institute. We have now only two European departments above the truncated californian mean μ (Tilburg and LSE). There are six departments (plus Oxford and Cambridge) between μ and $\mu/2$ (Louvain, Toulouse, Barcelona, Stockholm, Bonn and Copenhagen) and seven departments (plus Bologna) below $\mu/2$. Clearly, restricting the list of journals is not favourable to European departments when they are compared to Californian departments .

10.2 Density inference for economic departments

As we emphasied earlier, there is randomness both in the production of research articles and in the attribution of authors. In particular, an academic system can be viewed as a stochastic function which maps authors into institutions. We want now to study this stochastic function and make comparisons between countries. Basically, we are going to estimate the densities of scores achieved by institutions for a given country. We know that this distribution is a particular transformation of the distribution of scores reached by authors, but we have not managed to find a way to integrate this information. Basically it is a particular type of concentration curve, but the function relating authors to institutions is not one to one. So despite the fact that we have now very few observations (the number of departments), we have adjusted a distribution over these data, using a non-parametric smoothing method. The adjusted distributions are displayed in Figure 1. All distribution present a high mode and a long right tail. But beyond this general common shape, there are huge differences, first in the location of the main mode and second in the length of the right tail. We have divided our estimates in four figures for convenience of presentation.

The first group has a main mode located around 500 on the x axis . It includes California which has the lowest mode (on the y axis), the longest and highest tail. So that the distribution of departments of not far from being uniform. Netherlands display a roughly similar shape. The UK and Belgium have higher modes, located below on the score axis. Note the bimodality of the Belgium distribution which implies an heterogeneity of its academic system: a group of high level departments and a marked group of lower quality departments.

The second group concerns large European countries like France, Spain, Germany and Italy. The mode is located roughly around 120. But France and Spain on one



Ordinates have to be divided by 1000 so that the densities integrate to 1.

Figure 1: Density estimates for departments' scores using full list of journals

side and Germany and Italy on the other side form two distinct subgroups. France and Spain have far longer tails even if secondary modes are not very marked. The academic system is very heterogenous in these two countries.

The third group shows small countries like Denmark, Sweden, Norway and Portugal. It has a mode located around 200. But in this group, Denmark and Sweden have marked secondary modes and longer tails, indicating the presence of isolated good departments.

The last graph regroups the remaining small countries: Austria, Greece on one

side and Ireland and Finland on the other side. The mode is located around 50. The first group has long tails while the second group has the highest modes, a zero density between 150 and 300 and essentially one department around 400.

10.3 Inequality indices

We have emphasized the peculiarities of the densities, but we have now to judge if they are statistically so different. We apply the methodology exposed in section 7 to the samples of institutions of countries. These tests provide a direct evaluation on the different ways bright individuals are regrouped in few institutions having a critical mass. The first column of Table 14 indicates the proportion of institutions above the critical level of $z = 100$. With this criterion, California is not at all the first, showing the great diversity of institutions in this US State. Netherlands, Denmark, THE UK, which are all above California with this criterion, have a long tradition of favouring highly productive departments. Column two takes into account the mean productivity gap ($\alpha = 1$). With this criterion, California recovers its dominant position. Increasing α does not modify the ranking as it did with individual authors in Table 7.

Table 14: Inequality indices for departments with $z = 100$

	$\alpha = 0$		$\alpha = 1$		$\alpha = 2$
Net	0.87	Cal	769.06	Cal	2339767.57
Den	0.80	Net	557.53	Net	788691.77
UK	0.71	UK	321.81	UK	325246.72
Cal	0.58	Den	287.47	Bel	269124.90
Nor	0.54	Bel	276.17	Den	160231.01
Por	0.50	Fra	157.66	Fra	120532.90
Bel	0.50	Swe	138.21	Swe	92041.80
Spa	0.45	Spa	113.82	Spa	65931.89
Swe	0.41	Nor	111.51	Nor	42699.65
Fra	0.40	Aus	74.05	Aus	27571.05
Aus	0.33	Ger	57.79	Ger	22978.35
Gre	0.31	Por	57.76	Ita	12403.72
Ger	0.31	Ita	46.47	Ire	10033.36
Ita	0.31	Gre	38.97	Por	8980.21
Ire	0.11	Ire	33.39	Gre	8411.97
Fin	0.11	Fin	15.61	Fin	3908.42

Table 15 gives some statistical insight into the second column of Table 14. Using a critical level of 10% (i.e. a critical value of 1.66), we find that California and Netherlands are not statistically different, but that California manages to dominate all the other countries.

Table 15: Normal tests of dominance for departments with $z = 100$

	Cal	Net	UK	Den	Bel	Fra	Swe	Spa
Cal	0.00	0.71	1.84	1.80	1.90	2.54	2.58	2.72
Net	-0.71	0.00	1.27	1.24	1.36	2.19	2.24	2.42
UK	-1.84	-1.27	0.00	0.26	0.40	2.62	2.40	3.14
Den	-1.80	-1.24	-0.26	0.00	0.07	1.00	1.09	1.32
Bel	-1.90	-1.36	-0.40	-0.07	0.00	1.08	1.16	1.45
Fra	-2.54	-2.19	-2.62	-1.00	-1.08	0.00	0.28	0.78
Swe	-2.58	-2.24	-2.40	-1.09	-1.16	-0.28	0.00	0.34
Spa	-2.72	-2.42	-3.14	-1.32	-1.45	-0.78	-0.34	0.00
Nor	-2.71	-2.41	-3.01	-1.32	-1.44	-0.76	-0.36	-0.04
Aus	-2.88	-2.63	-3.74	-1.62	-1.80	-1.48	-0.89	-0.66
Ger	-2.99	-2.78	-4.90	-1.82	-2.08	-2.41	-1.33	-1.20
Por	-2.97	-2.76	-4.47	-1.79	-2.02	-2.08	-1.23	-1.07
Ita	-3.04	-2.85	-5.24	-1.92	-2.20	-2.80	-1.55	-1.49
Gre	-3.06	-2.89	-5.18	-1.97	-2.25	-2.80	-1.62	-1.58
Ire	-3.07	-2.89	-4.85	-1.98	-2.24	-2.56	-1.60	-1.52
Fin	-3.17	-3.03	-5.85	-2.17	-2.49	-3.60	-2.07	-2.19

	Nor	Aus	Ger	Por	Ita	Gre	Ire	Fin
Cal	2.71	2.88	2.99	2.97	3.04	3.06	3.07	3.17
Net	2.41	2.63	2.78	2.76	2.85	2.89	2.89	3.03
UK	3.01	3.74	4.90	4.47	5.24	5.18	4.85	5.85
Den	1.32	1.62	1.82	1.79	1.92	1.97	1.98	2.17
Bel	1.44	1.80	2.08	2.02	2.20	2.25	2.24	2.49
Fra	0.76	1.48	2.41	2.08	2.80	2.80	2.56	3.60
Swe	0.36	0.89	1.33	1.23	1.55	1.62	1.60	2.07
Spa	0.04	0.66	1.20	1.07	1.49	1.58	1.52	2.19
Nor	0.00	0.58	1.04	0.94	1.29	1.38	1.36	1.91
Aus	-0.58	0.00	0.35	0.31	0.61	0.74	0.76	1.30
Ger	-1.04	-0.35	0.00	0.00	0.48	0.67	0.66	1.80
Por	-0.94	-0.31	-0.00	0.00	0.33	0.51	0.55	1.25
Ita	-1.29	-0.61	-0.48	-0.33	0.00	0.30	0.38	1.54
Gre	-1.38	-0.74	-0.67	-0.51	-0.30	0.00	0.15	0.94
Ire	-1.36	-0.76	-0.66	-0.55	-0.38	-0.15	0.00	0.52
Fin	-1.91	-1.30	-1.80	-1.25	-1.54	-0.94	-0.52	0.00

A careful reading of Table 15 points out a first group of equivalent European countries on top of the ranking: the Netherlands, the UK, Denmark and Belgium. There are followed by an intermediate group: France, Sweden, Spain, Norway and Austria. The bottom group is formed of Germany, Portugal, Italy, Greece, Ireland. Finland is isolated at the end.

There are some marked differences between these results and those obtained from Table 8. The Netherlands confirms its top position because it has chosen to regroup

all his good academics in a small number of institutions. THE UK now manages to enter the top group. France and most noticeably Spain enter the intermediate group. Portugal goes to the bottom group. Finland occupies significantly the last position because it has chosen to scatter its authors over numerous small institutions.

11 Conclusion

We have managed to obtain a ranking of European economic departments and to compare the top European departments to Californian departments. We showed that the reference set of journal may have a crucial influence on this ranking. This ranking is not random, and more precisely it is the long term fruit of particular educational policies, which may have been taken a very long time ago. Sometimes, it may be the fruit of recent event or decisions (the German reunification for instance). Educational systems have different organisations. Some countries have developed separate research institutions of various importance. In Belgium, FNRS is rather small and mainly distributes funds. In France, CNRS plays a major role and employs 11 000 full time researchers (200 in economics). Germany has the Max Plank Institute, Italy the "Consiglio Nazionale delle Ricerche" or CNR, England the "Economic and Social Research Council" or ESRC which distributes funds. Some countries organise promotion and department funding on the basis of publication: Netherlands, the UK and more recently Spain. In most countries, academics get an immediate tenure. In California, the UK, academics get their tenure after a rather long time. Wages are fixed in some countries or negotiated in others. All these principles of organisation do have an impact on the output performance of the academic system. We plan to answer this type of question in future work.

12 Appendices

12.1 Searching the JEL CD-ROM by names

Despite the difficulties above mentioned, searching over affiliations seems a fairly adequate way of finding all the researchers having once had an affiliation in a given country. In many cases, several keywords are present in one affiliation field so that the search is rather robust. Hence this search provides a rather good idea of the papers published in a given country.

The second way of searching the data base is to use names. This search is more delicate as there are problems of misspelling. To quote a few examples, we have found *van Thisse* instead of *Thisse*; *Lebreton* or *Le Brenton* instead of Le Breton). As there are several persons with the same family name, it is important to use the information contained in the first name. But here again, there are variations in the data base. For instance *Le Breton Michel* and *Le Breton M.*; *Laffont Jean-Jacques, Laffont J.J*, and *Laffont Jean-Jacques M.* In each case, it is the same person, but the computer is unaware of this.

Thus it is difficult to search by names and the first difficulty is to have a list of names. We should note that searching by names has a different meaning than searching by affiliations. A person may change affiliation during the period in question. We shall come back to this very important question later on. Working on affiliations will give us list of names that will be used to search again the data base.

12.2 Data processing

We have decided to organise the search as follows:

- For each country, we constitute a file containing keywords on affiliations in order to search the JEL data base using Winspirs[15]. Given this information, we download records country by country so as to build an ascii **country.jel** file. It contains articles references with four fields: authors, affiliation, source, publication year. This file is processed and corrected for internal errors in names, in first names, in bad delimiters in affiliations and so on. This phase of correction is very time consuming as it is done by hand. But is very important to have good quality data.

- Processing this file gives a list of all the journals that have been used by the authors of each country, **country.rev**. This gives an indication on the publication habits of each country, its fields of specialisation, the use of national journals and so on.

- Processing this file again gives a file containing names of persons, **country.rnk** (when the data bank contains article references). To each person, we associate a score based on the number of papers, weighted by the number of co-authors and the quality of the journal. This helps to build a file which is used to estimate the distribution of scores (as the number of persons with one paper, two papers and so on) , a first basis for comparing countries using stochastic dominance criterion.

- Up to this point, we have no information on institutions. But for each author, we can find a list of affiliations within a country. We store this information in **country.af**. By visual inspection, this helps to constitute a list of relevant institutions.

- Processing the country files of names allows us to track the persons who have moved from one country to another and those who have inter-country affiliations. This information is contained in **country.mig**.

At this point, data processing is not yet finished. Working on institutional affiliations is the most important task now.

[15] Winspirs is the name of the search program sold with the JEL CD-ROM.

12.3 The accuracy of affiliation data

This is a delicate question. There are various sources which do not necessarily coincide. We base our analysis mainly on the CD-ROM of the JEL. There are two problems:

- For a given year, all affiliations do not necessarily coincide, because of misspelling or lack of data. This can be easily corrected by cross checking. We suppose that two papers published at the same time have the same author affiliation.

- Affiliations are given at the time of submission of a paper. There is a difference then between that data and the present affiliation of the authors.

12.4 The precise importance of migrations

In order to appraise the difference between the two concepts for an institution (copyright and human capital), it is interesting to have an idea of the importance of migrations between countries inside Europe. We have files of names per countries. We just have to identify which persons are present in two countries.

Table 16: Migrations within Europe

Country	Authors	Migrants	Relations with
Austria	64	8 (13%)	ger, uk, net, nor
Belgium	171	55 (32%)	fra, net, ger, uk, spa, den, irl, por, swe
Denmark	74	11 (15%)	ita, uk, bel, ger
Finland	44	2 (5%)	swe, uk
Greece	80	7 (9%)	uk, spa
Ireland	39	2 (5%)	bel, uk
Netherlands	383	30 (8%)	bel, uk, fra, ger, spa, swe
Norway	103	5 (5%)	ger, swe, aus
Portugal	28	2 (7%)	bel, uk
Sweden	175	10 (6%)	uk, nor, bel, fin, net, spa
France	396	36 (9%)	bel, uk, ger, spa, net, ita
Germany	301	24 (8%)	bel, uk, aus, fra, net, nor, den
Italy	248	26 (10%)	uk, den, bel, spa, fra
Spain	223	21 (9%)	uk, bel, fra, ita, net, gre, swe
UK	1 468	67 (5%)	ita, net, fra, bel, gre, spa, ger, den, swe, aus, fin, irl, por
Europe	3 797	306 (8%)	

In Table 16, we indicate for each country the number of productive authors (those who have a score greater than 7.07), the total score of the country and the number of authors who have migrated or have a double affiliation. We cannot specify the direction of change.

A crude assessment indicates that 8% of European authors have migrated or have multiple affiliations. Individuals from small countries migrate more than large ones and this is especially the case for Belgium, Denmark and Austria. A very small fraction of UK researchers are concerned with migrations or double affiliations, but this is the country which has the largest number of partners.

13 References

Amir R. (2001) Impact-adjusted citations as a measure of journal quality. Mimeo, CORE, Université catholique de Louvain.

Atkinson A.B. (1987) On the measurement of poverty. *Econometrica* 55 (4), 749-764.

Bauwens L. (1998). A new method to rank university research and researchers in economics in Belgium. Mimeo. CORE, Université catholique de Louvain.

Bauwens L. (1999) Economic Research In Belgian Universities. http://www.core.ucl.ac.be /econometrics /Bauwens /rankings /rankings.htm

Burton M.P. and E. Phimister (1995) Core journals: a reappraisal of the Diamond list. *The Economic Journal* 105, 361-373.

Combes P.P. and L. Linnemer (2001) La publication d'articles de recherche en économie en France. Annales d'Economie et de Statistique 62, 5-47.

Conroy M. and R. Dusansky (1995) The productivity of economic departments in the US: publications in the core journals. *Journal of Economic Literature* 33, 1966-1971.

Coupé Tom (2000) Revealed Performances Worldwide Rankings of Economists and Economics Departments. Mimeo, ECARES Université Libre de Bruxelles.

Cribari-Neto F., M. Jensen and A. Novo (1999). Research in Econometric Theory: Quantitative and Qualitative Productivity Rankings. *Econometric Theory*, 15, 719-752.

Dusansky R. and C.J. Vernon (1998) Ranking of US economic departments. *Journal of Economic Perspectives* 12, 157-170.

Feinberg, R. M. (1998). Correspondence. Ranking economics departments. *Journal of Economic Perspective* 12(4), pp. 231-232.

Foster J., J. Greer and E. Thorbecke (1984) A class of decomposable poverty measures, *Econometrica* 52 (3), 761-766.

Griliches Z. and L. Einav (1998). Correspondence. Ranking economics departments. *Journal of Economic Perspectives* 12(4), 233-235.

Jean W.H. (1984) The harmonic mean and other necessary conditions for stochastic dominance. *The Journal of Finance* 39 (2), 527-534.

Kakwani N. (1993) Statistical inference in the measurement of poverty. *The Review of Economics and Statistics* 75, 632-639.

Kalaitzidakis P., T.P. Mamuneas and T. Stengos (1999) European economics: an analysis based on publications in the core journals. *European Economic Review* 43, 1150-1168.

Kirman, A. and Dahl, M. (1994) Economic research in Europe. *European Economic Review* 38, 505-522.

Laband D. and M. Piette (1994) The relative impact of Economics Journals. *Journal of Economic Literature* 32, 640-666.

Liebowitz S. and J. Palmer (1984) Assessing the relative impacts of economics journals. *Journal of Economic Literature* 22, 77-88.

Lubrano M. and C. Protopopescu (2000) Density Inference for Ranking European Research Systems in the Field of Economics. Mimeo, GREQAM. http://durandal.cnrs-mrs.fr/PP/lubrano/papers/wp-lotka.ps.

van Damme Eric (1996). Measuring Quality of academic journals and scientific productivity of researchers. Unpublished mimeo, CenTer, Tilburg University.

Watts H.W. (1968) An economic definition of poverty. In *On Understanding Poverty*, ed. by D.P. Moynihan. New-York: Basic Books.