Evaluating the Performance of UK Research in Economics

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Summary

This paper reports on available bibliometric evidence on the performance of UK research in economics. It examines some standard and non-standard sources of bibliometric evidence and in particular evidence from the ISI and EconLit databases and the Research of Papers in Economics (RePEc) public-access database. It also reports on research capacity of UK economics and some non-bibliometric sources of evidence including data from JSTOR..

The main conclusions to be drawn from the reports are as follows:

1. On nearly all bibliometric measures such as the number of publications and the number of citations the UK comes ahead of all countries apart from the US. On some per capita measures the UK performance is comparable with that of the US.

2. There is some evidence of growth of publications in economics by UK researchers over the previous decade and in citations of these publications and with some improvements on these measures relative to the US. There is, however, some evidence of faster growth rates from some other European nations although starting from a lower base.

3. There is evidence from traditional bibliometric analysis to show that the UK on average publishes in average-quality journals but that the citation rates for UK papers is somewhat higher than expected for these journals. The US performance shows publications on average in higher than average quality journals and with citation rates above that expected. Other European countries tend to perform badly on these measures. Rates of non-citation for UK publications are amongst the lowest anywhere and lower than for the US.

4. A study commissioned for the ESRC on evaluating the research performance of UK social science on the basis of traditional bibliometric indicators shows that the performance of UK economics is amongst the best when compared with other social science disciplines.

5. Evidence from a limited range of sub-fields within economics shows that the UK is strong in all areas compared with the rest of Europe. There is evidence of particular strength in labour and demographic economics, development economics, econometrics and especially applied econometrics. It would be desirable to gather evidence from other sub-fields.

6. Bibliometric analysis based on traditional sources such as the ISI and EconLit databases is often outdated and therefore it is desirable to use more up-to-date evidence from working papers archives and other non-traditional sources. Evidence from RePEc however tends to confirm the results from traditional publication and citations analysis. It shows the UK ranked second to the US on all measures but ranked above all other countries. Shares of works in RePEc between the US and the UK are comparable in per capita terms but citation rates are somewhat higher for US authors. This may be due to the relatively low registration rate of UK authors with RePEc.

7. There is healthy evidence of a strong internationalisation of the research community in economics in the UK with a large number of US-trained researchers and a large number of non-UK but UK-trained researchers particularly at the junior level.

1 Introduction

The purpose of this report is twofold. Firstly to assess the available information on the performance of UK research in economics and secondly to consider what other types of information might be considered in making such an evaluation. This is timely for two reasons. First the ESRC is sponsoring an international benchmarking review of UK research in economics to be undertaken during 2007-08, aimed at highlighting strengths and weaknesses. It will examine research quality, research impact, research capacity and priorities for the future development of the discipline in the UK. Secondly, the UK government's *Science and innovation investment framework 2004-2014: next steps* document published in March 2006, and the subsequent response to the consultation, indicates a clear intention to place more weight on metric information in future research assessments.

There is a large literature on measuring research performance in economics. Most of this literature has concentrated on measuring research performance at the institution or research institute level. These evaluations are typically based on traditional bibliometric evidence, including the number of publications and citation counts, and most of this bibliometric evidence comes from the Social Science Citation Index published by Thomson Scientific (formerly known as Thomson Institute for Scientific Information or ISI) or from other bibliometric sources, such as EconLit published by the American Economic Association. Of particular relevance are the studies commissioned by the European Economic Association aimed at assessing the state of economics research in Europe. These studies culminated in a special issue of the Journal of the European Economic Association in 2003. In addition, the European Commission produced a report on "mapping of excellence in economics" in 2004. Both are extremely valuable in assessing UK research performance in economics.

There are some well-known problems with using only standard bibliometric evidence on publications and citation counts and with the use of the ISI database in particular. Firstly there is some evidence that the ISI journal list is not representative. There is evidence of a bias in favour of journals published in the US (see Schoepflin [1990]) and there are some peculiarities in the coverage of economics journals in the ISI database which have been documented, for example, in Klein and Chiang [2004]. These biases are again probably unimportant in assessing relative changes in cross-country standings but may be important in assessing absolute standings. Secondly most recent studies still end with outputs published in 2000 or 2001 and citations are lagged over a window of the previous two or five years. Factoring in publication lags, most of these recent studies are actually measuring research produced more than ten years ago. This would be less of a concern if relative standings were unchanging. However, this is not necessarily the case as there have been structural changes in research in economics in many European countries in the last ten years. Thus, in assessing current standings and potential future developments more up-to-date information is required. Thirdly, even when a fuller and representative set of journals can be used, publication and citation data is highly positively skewed and although

it may provide useful information on research quality it gives less than the full picture of research impact and research capacity.

This raises some questions about how research performance should be measured and evaluated.[1] Firstly, what is the evidence of existing studies using publication counts and citations as measures of output? Secondly, are there other measures of output (non standard bibliometric indicators) such as working papers, downloads from journal or working paper repositories that can provide additional or potentially leading information on publication and citation counts and therefore provide either a fuller or more up to date picture of output performance? Thirdly, are there other non-bibliometric indicators of research esteem such as election to learned societies, honours and awards, conference participation, contributions to government commissions and policy debates that have been used in peer evaluation and which may provide additional quantitative information?[2] Fourthly what is the evidence on research capacity in economics in the UK and how is this linked to research quality and impact?

The report reviews some of the basic sources of standard bibliometric information and discusses some stylised facts on publication and citation counts in Section 2. Information about cross-country comparisons which can be obtained from these studies is presented. In particular we shall present some evidences of particular strengths in some sub-fields where data is available. Section 3 discusses some of the non-standard sources of bibliometric information and Section 4 and 5 consider evidence from data from JSTOR and the public-access database Research Papers in Economics (RePEc). Section 6 considers some non-bibliometric indicators of research impact and quality and Section 7 provides some information on UK research capacity in economics. Section 8 concludes. Appendix A reviews the standard methods of assessing journal and article quality and the main contributions to the literature. Appendices B and D provide some further information from RePEc data.

2 Traditional bibliometric indicators

The traditional bibliometric indicators are publications and citations. Publications and citations may also be quality adjusted or weighted by the impact factor of the journals in which they are published, or cited, to produce weighted measures of publications and citations. The standard sources of information for measuring publications and citations in economics are Thomson's ISI and EconLit.[3] This section discusses the structure, context, strengths and weaknesses of these two databases, the stylised facts about publication and citation rates, the methods of adjustment that are used and the evidence from cross-country comparisons.

[1] Some of the issues about measuring relative performance are considered in Appendix A. For further discussion of the use of citation analysis in research evaluation see e.g. Moed [2005].

[2] There are other impact indicators such as commissioned reports, linkages with government bodies etc. that can be might quantitatively used to measure research performance. However they are omitted from the report as the necessary information is not readily available.

[3] Access to ISI data can be made through the Web of Knowledge and EconLit is available as part of CSA Illumina.

2.1 The traditional data sources

The EconLit database contains information on around 700 journals in economics, with more than 750,000 total entries. It provides a wealth of bibliographic information for journal articles, abstracts, book chapters and doctoral dissertations, with data dating back to 1969. EconLit records are updated on a monthly basis and can be used to draw data on: names of authors, names and affiliations (at the time of publication), name of publishing journal or editor(s), year of publication, number of pages, and JEL classification for each item listed. The vast majority of journals listed in EconLit are English language journals. There are also some known problems related with EconLit data, e.g. EconLit does not identify authors and institutions uniquely so that John Smith, from Neverland Business School and J Smith from NBS will show up as two different individuals and therefore careful cross-checking of the data has to be carried out manually.[4]

The ISI database is part of the *ISI Web of Knowledge*, a subscription-based service provided by *Thomson Scientific*, providing access to a wide range of information on articles, abstracts and usage statistics. The available data is then classified in three main sub-categories. (i) The *Science Citation Index - Expanded*, containing bibliographic information from 1970 onwards and abstracts from 1991 onwards covering more than 150 science-related disciplines or sub-disciplines and drawing its data from more than 5,900 science and technical journals. (ii) The *Social Science Citation Index* (SSCI) covers 50 disciplines from 1975 onwards and a total of 1,700 journals (it includes 202, mostly English language journals, in its economic category);[5] (iii) The *Arts and Humanities Citations Index* containing information from 1975 to present, focusing on research in humanities.

All ISI datasets are searchable by author, title of article and/or journal and users can trace all items that cite a particular article. The ISI provides a series of metrics for the journals covered in each dataset. These metrics include total citations, impact factor, immediacy index, number of articles and cited half-life of journals.[6] The ISI also provide freely available information on the most highly-cited authors through its website *highlycited.com*.

As a subset of the ISI database, Thomson also produces its National Science Indicators (NSI) which provides citation and publication measures for around 170 nations and four regions (Asia Pacific, Asia Pacific (excluding Japan), the European Union and Latin America) from 1981. Data is available for 24 broad subfields (including economics and business) or 105 more narrowly defined fields (including economics).

Despite its popularity in bibliometric exercises, ISI's representativeness has been questioned for two main reasons. Firstly, because the vast majority of journals indexed in their database are in English-language journals, thus excluding in certain cases a significant part of literature that

[4] See also Coupé [2003] for some further comments on this point.

[5] For a complete list of journals visit "http://sunweb.isinet.com/cgi-bin/jrnlst/jlresults.cgi?PC=J&SC=GY".

[6] We elaborate on the meaning and the mechanics of these concepts over the next sections.

may be published other languages. Yitzaki [1998], for instance, finds that authors tend to over-cite scholarly research published in their own languages, with American and British authors citing English language papers 99% of the times.[7] Secondly, there is a concern that the ISI may tend to over-represent US journals, which in turn tend to publish a higher proportion of US-based research. If this is the case, a certain degree of bias should be expected in all rankings and cross-country research assessments based on ISI data. Schoepflin [1990], for instance, compared the (then) SSCI journal coverage with UNESCO's [1986] which at that time listed 3,515 journals, about two and a half times the size of ISI. Schoepflin's findings confirmed that, at that time, US journals were over-represented in SSCI [1990], containing a total of 852 US journals compared to 611 listed in UNESCO [1986]. When shares were considered, this misrepresentation became even more apparent, with US journals claiming a share of 60% in SSCI versus a 17% in UNESCO. UK journals were also over-represented but to a lesser degree, with a share of 18% as opposed to 10% in UNESCO. Table 1 provides a summary of Schoepflin's findings. Thirdly, the criteria which the ISI uses to determine whether to include a journal title or not is somewhat opaque and may exhibit some evidence of ideological bias (see Klein and Chiang [2004]).[8] Furthermore, not all journals listed adhere to the same strict standards of peer reviewing.

Table 1: SSCI [1990] Vs. UNESCO [1986]: A Comparison of Coverage

	Number of Journals			**Percentage Share**		
	SSCI [1986]		UNESCO [1990]	SSCI		UNESCO
USA	852	>	611	60.13	>	17.38
UK	256	<	334	18.07	>	9.5
GERMANY	48	<	184	3.39	<	5.23
FRANCE	25	<	269	1.76	<	7.66
REST OF THE WORLD	236	<	2117	16.65	<	60.23
Total	1417	<	3515	100		100

Source: Schoepflin [1990]. Reproduced in Hicks [2004], p.10

The situation in economics is that most journals are covered by the ISI but by no means all. About 14% of the journal articles submitted to the Economics and Econometrics panel at RAE2001 were papers in journals not listed in the Economics category by the ISI. Examples of such journals include the European Journal of Political Economy and the Bulletin of Economic Research.[9]

[7] A counter argument is that higher visibility of research work depends not on language but on being published in international journals, where the vehicular language is English, which carry higher impact factors (see for instance Nederhof et al. [1989].

[8] The general principle for inclusion within the ISI list is that it is determined *internally* by the journals which are frequently cited by articles already within the database.

[9] A more complete list of journals which were represented at the last RAE and not listed in the Economics category by the ISI can be found at http://www.keele.ac.uk/depts/ec/cer/resources_journals.htm.

2.2 Citations and publication rates: Stylised facts

Before considering publication and citation rates in detail it is useful to consider first some stylised facts. The most important fact is that publications and citations are asymmetrically distributed. A somewhat useful rule of thumb which illustrates this asymmetry is the 80-20 rule. That is 20% of the authors (publications) generate 80% of the publications (citations) and 80% of the authors (publications) generate 20% of the publications (citations).

Coupé [2003] uses data from EconLit for the period 1969-2001 to study the overall characteristics of publication and citation rates in economics. He finds that out of 131,000 listed authors during that period, 71,983 contribute only one article, 4,052 authors contribute 2-5 articles and 1,230 authors contributed 6-10 articles. The distribution of citations for the same sample follows a similar pattern: around 70-80% of total articles are cited at least once, about 20% get more than 10 citations and only 5% receive 50 or more citations over the period.

The positive skewness of the distribution of research output is a phenomenon that has been observed, described and discussed extensively in the area of bibliometrics. One of the most famous empirically tested regularities in bibliometrics, Lotka's law, postulates that the number of authors making n contributions should be approximately proportional to n^{-2} of those making one, whereas about 60% of the authors will only have one publication in the period considered. Coupé's findings match quite closely to this rule. He estimates Lotka's law empirically over three different time periods[10] for a series of sub-samples of journals drawn from EconLit (with 10, 20 and 50 journals). His estimates suggest n is within the range of -1.75 to -3.5. Coupé also finds that widening the sample of journals reduces the concentration of publication rates and so does weighing for coauthorship and quality differences and shortening the time interval. This is consistent with the work of Cox and Chung [1991], using articles in 20 top journals over a period of 26 years, who estimate the exponent to be -1.84 and Sutter and Kocher [2001] who report an exponent of -3 for a stricter selection of the top 15 journals. Similar findings are also reported for the distribution of citations by Laband and Piette [1994] who use a Herfindahl index to measure concentration rates across journals. They use Lorenz curves (one for each of their examined periods) to test for the (in)equality in the distribution of citations across journals.

The positive skewness of the distribution of publications across institutions is also evident in Table 2, showing the average number of articles per institution and per country for the period 1991-2000. The upper panel of the table contains all available information from the ISI for that period. The lower panel focuses on the institutions that have 10 or more publications in each of the four research fields. In both instances, the median falls short of the average number of publications per institution, suggesting that the distribution is skewed to the right so a small number of institutions is responsible for a greater number of publications. It can also be seen

[10] In practice, Coupé estimates the model $\ln \frac{\alpha_n}{\alpha_1} = c + \beta \ln n + \epsilon$ for the periods 1996-2000, 1990-2000 and 1969-2000, where α_1 is the number of authors making one contribution; and α_n the number of authors making n contributions.

from the table that in all the sub-fields examined (corresponding to JEL codes, C, L, J and O where C is *Mathematical and Quantitative Methods*; L is *Industrial Organization*; J is *Labour and Demographic Economics*; and O is *Economic Development, Technological Change and Growth*) the difference between the median and the mean value increases as one moves from the lower to the upper panel. Thus the distribution of the total population is more skewed towards the left tail than the one which excludes the institutions with less than ten publications.

Table 2: Articles per Institution, 1991-2000 (EconLit)

All Institutions	**C**	**J**	**L**	**O**
Number of Institutions	418	468	496	487
Total number of publications	4657	6978	7686	7143
Average number of publications per institution	11	15	15	15
Median	5	7	8	7
Institutions with more than 10 Publications in each field				
Number of Institutions	115	176	205	176
Total number of publications	1529	5771	6321	5769
Average number of publications per institution	13	33	31	33
Median	11	23	23	23

Source: DG-Research, p.102 (C), 119(J), 137(L) and 156 (O).

Mathematical and Quantitative Methods (C); *Industrial Organization* (J); *Labour and Demographic Economics* (L); *Economic Development, Technological Change and Growth* (O)

Another factor of importance is distribution of authorship across journals. Although approximately 20% of publications originate from Europe and 60% from the US, not all journals reflect exactly this average. Some, like Econometrica, the Review of Economic Studies, the Journal of Economic Theory, Economic Theory, the Review of Economics and Statistics do. Other leading journals do not. For example, the Journal of Financial Economics has 92% authorship from the US and only 4% from Europe whereas the Economic Journal has 60% authorship from Europe and 30% from the US. This means that in evaluating research performance across countries there will be some sensitivity to how the quality of journals is evaluated.

2.3 Evidence from bibliometric indicators: Journal publications

This section and the next apply some of the measures discussed in Appendix A to examine cross-country performance of research output in economics. Most of the evidence presented is based on data available in the literature (e.g. Coupé, Kalaitzidakis, Mamuneas and Stengos, etc.) or from other public sources (the European Commission's DG-Research Division, ISI). The main focus lies mostly on country comparisons across with the EU[11] and the US but will shall also consider some other cross-country comparisons too.

Most international comparisons on published research output in all disciplines show the dominance of the US on most or all of the measures of research productivity. This fact is re-

[11] Where we refer to the EU we shall mean the EU-15, that is 15 countries of the European Union before the expansions on 1 May 2004 and 1 January 2007. The EU-15 consists of: Austria; Belgium; Denmark; Finland; France; Germany; Greece; Ireland; Italy; Luxembourg; Netherlands; Portugal; Spain; Sweden; United Kingdom.

flected in data on economics publications too. Table 3, for instance, uses the ISI NSI data on the unadjusted number of publications by country of affiliation for the periods 1994-1998 and 1996-2000.[12] From the table it can be seen that the US and EU (excluding Greece, Luxembourg, Portugal and Spain) together accounted for 87.6% and 89.1% of total published articles for the periods 1994-98 and 1996-2000 respectively. The share of the US during the two time periods fell by slightly more than 2.8%. The UK, on the other hand increased its share by more than 9%. The other EU member states (EU - excluding UK and Greece, Luxembourg, Portugal and Spain) experienced a similar increase, raising their share from 17.4% for 1994-98 to 19.2% for 1996-2000. This is also consistent with the evidence presented by Nederhof, Van Leeuwen and Tijssen in their report on international benchmarking for the ESRC.

Table 3: Publications in Economics Journals by Country 1994-2000 (%)

Country	1994-1998	1 996-2000
US	58.3	56.7
UK	13.7	15
NETHERLANDS	3.3	3.5
FRANCE	2.9	3.1
GERMANY	2.3	2.9
ITALY	1.6	1.9
SWEDEN	1.5	1.7
BELGIUM	1.4	1.5
DENMARK	0.9	1
FINLAND	0.7	0.7
AUSTRIA	0.5	0.6
IRELAND	0.5	0.5

Source: DG-Research, p.19

Table 4 provides a more disaggregated view of the distribution of articles across countries and time, for the period 1991-2001. At the end of 2001, the combined share of UK and US in economics world publications was 67.4%. The UK's share increased during that decade by an average annual rate of 3.11%. The fastest growth rate was experienced by Spain which increased its share from 0.4% in 1991 to 2.7% in 2001 - exhibiting an average annual growth rate of more than 20%. The EU's share of output during the same period climbed from 21.8% in 1991 to 39.6% in 2001, exhibiting an annual growth rate of 5.43%.

[12] DG-R draw their data from EconLit SSCI and NSI, considering solely economics journal publications. More specifically, the construction process of their dataset involved two stages: In stage 1 they used the EconLit database to identify 23,850 journal economics articles. In stage 2, they cross-referenced this data with the information available from SSCI. During the merging process 44% of the initial observations had to be disregarded as they were not listed in both repositories. As a result their final using sample contained 13,345 EconLit/SSCI economics journal articles.

Table 4: Yearly Publications in Economics Journals by Country 1991-2001 (%)

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Growth rate (%)
World Total (no. papers)	6201	6265	6105	6184	6452	6869	6948	7171	7066	7482	7823	2.35
US	66.5	65.6	65.7	63.1	60.8	59.2	59.1	56.4	55.6	54.1	53	−2.23
JAPAN	1.6	1.7	1.6	1.8	1.3	1.7	1.7	1.8	2.2	2	2.2	3.11
UK	9.8	10.5	10.3	10.8	12.2	12.3	12.5	13.2	13.9	14.7	14.4	3.9
GERMANY	2.1	2.2	2.5	2.2	2.5	2.5	2.6	3.5	3.9	4	4.4	7.86
NETHERLANDS	2	2.7	3.1	2.8	3.2	3.2	3.9	4	3.3	3.8	3.9	6.82
FRANCE	1.8	1.8	2.2	2.4	2.7	3.1	3	3.3	3.6	3.8	3.6	7.29
ITALY	1.2	1.1	1.5	1.7	1.7	1.9	1.8	1.8	2.1	2.3	2.8	8.9
SPAIN	0.4	0.7	0.9	1.2	1.3	1.4	1.8	2.2	2.3	2.6	2.7	20.29
BELGIUM	0.9	1.4	1.1	1.3	1.5	1.6	1.7	1.6	1.8	2.1	1.7	6.96
SWEDEN	1	1	0.9	1.3	1.1	1.5	1.6	1.7	1.9	1.9	1.7	4.88
DENMARK	0.7	1.5	0.7	1	0.8	1.3	0.8	1.3	1.1	1	1.2	6.23
FINLAND	0.5	0.6	0.6	0.6	0.5	0.7	0.5	0.9	0.8	0.8	1	7.22
AUSTRIA	0.6	0.4	0.4	0.6	0.6	0.8	0.5	0.7	0.6	0.6	0.7	0.93
GREECE	0.4	0.5	0.3	0.3	0.4	0.4	0.5	0.6	0.5	0.8	0.6	5.63
IRELAND	0.2	0.3	0.5	0.4	0.7	0.5	0.6	0.5	0.5	0.7	0.5	6.64
PORTUGAL	0.1	0.1	0.3	0.2	0.3	0.4	0.2	0.2	0.3	0.3	0.4	19.51
LUXEMBOURG	0.1	0.1	0.1	0.1	0	0	0	0	0	0	0	−7.16
EU-15	21.8	24.9	25.4	26.9	29.5	31.6	32	35.5	36.6	39.4	39.6	5.43%
UK/EU-15	45.0	42.2	40.6	40.1	41.4	38.9	39.1	37.2	38.0	37.3	36.4	−2.19%

Source: DG-Research [2004] p.20

Table 5: Journal Publications by Country and Discipline 1981-98 (%)

COUNTRY	COM	ECO	EDU	ENV	LAW	INFO	MNG	POLPS	PSY	PUBH	SOCP	SOCAN
WORLD TOTAL (no. papers)	11217	105416	45773	41314	33478	30371	38436	63445	229536	83663	32982	73515
US	84.5	64.8	66.0	45.4	90.3	63.1	68.8	57.7	63.4	66.6	69.7	59.4
UK	5.5	10.7	12.4	23.1	3.9	10.9	12.7	12.0	7.9	10.7	10.0	7.4
FRANCE	0.5	2.1	0.5	1.1	0.2	1.1	1.5	1.9	1.6	0.6	0.6	4.1
GERMANY	1.2	2.2	2.3	2.1	1.3	5.2	1.1	4.8	4.9	1.5	0.8	3.1
NETHERLANDS	1.0	2.3	1.2	2.8	0.4	1.4	1.4	1.0	2.4	1.5	0.9	1.8
CANADA	2.7	6.9	6.0	8.5	1.4	5.0	7.1	6.5	8.0	7.0	5.3	5.5
AUSTRALIA	1.2	3.3	4.3	4.5	0.5	1.4	1.9	4.8	3.1	3.7	4.4	2.9
EU-15	9.9	22.8	18.0	32.6	7.0	21.5	19.7	22.5	20.5	18.3	14.4	19.6

Source: (COM) Communication (ECO) Economics (EDU) Education (ENV) Environmental Studies and Geography (LAW) Law (INFO) Library and Information Sciences (MNG) Management (POLPS) Political Studies and Public Administration (PSY) Psychology (PUBH) Public Health and Health Care Science (SOCP) Social Work and Social Policy (SOCAN) Sociology and Anthropology

Source: Katz [1999] pp. 7-11

Table 5[13] shows the distribution of articles (as percentage of world publications) over twelve disciplines for the earlier period 1981-1998. The dominance of the US across all disciplines is immediately apparent. The share of UK economics is above 10% and is one of the better performing disciplines on this measure. A closer comparison of those figures with those presented in Table 4 further illustrates the expanding share of economics in the UK, France, Germany and the Netherlands. Indeed, the average share of world economics publications between 1981 to 1998 for the UK was 10.7%, compared to 14.4% for the period 1991-2001. A more remarkable increase is experienced by the Netherlands with their total share in 2001 rising to almost twice that for the period 1981-98. Also shown are UK publications as a proportion of the EU total. This shows a small relative fall. It will be interesting to see if this rate of catch-up has continued or slowed down and some more recent evidence will be presented below.

Table 6 provides information on the share of publications during the period 1991-2000 across countries (as a % of the EU excluding Luxembourg) for four different economic sub-fields. These four sub-fields correspond to JEL codes, C, L, J and O where C is *Mathematical and Quantitative Methods*; L is *Industrial Organization*; J is *Labour and Demographic Economics*; and O is *Economic Development, Technological Change and Growth*. The table shows that the UK contributes more than 30% of European output in all fields. The UK share is over 40% in the two categories of labour and demographic economics and economic development, indicating that the UK is particularly strong in these areas.[14]

Tables 7 and 8 show a similar pattern of UK strength in econometrics and econometric theory. These rankings based on an standardised or adjusted page count in the main econometrics journals over the period 1989-2005 are taken from Baltagi [2007]. The UK competes well with the US in terms of adjusted pages per author in both econometrics and econometric theory. As a proportion of the total EU (excluding Greece, Ireland, Luxembourg and Portugal) output, the UK accounts for 38% in econometric theory and 47% in all econometrics, indicating the UK's particular strength in applied econometrics.

As mentioned the distribution of publication rates is highly skewed so that the average output performance of countries may be influenced significantly by the output of a small number of top authors. In Table 9 we give the distribution of top authors across countries (four countries having at least two authors on the list) using Coupé's "Top-1000 Economists: Publications 1990-2000". Also for comparison, the results are given for the top 20 US states. Coupé [2003] constructs his rankings of top economists as the arithmetic average of the rankings returned by 11 alterna-

[13] There are some differences in the figures for this table and the previous two because of the use of slightly different data sets.

[14] Judgements of this sort need to be drawn with some care. A country make particularly strong in a particular sub-field but this may mean that this sub-field is not particularly highly valued by the rest of the scientific community. Thus it is necessary to make a judgement not only on the *internal* merit of a country within a sub-field but also the *external* merit of that sub-field of research within the discipline or within the scientific community as a whole. Weinberg [1962] draws this distinction between internal and external scientific merit.

Table 6: Share of Journal Publications across Fields per Country

	C	J	L	O
Belgium	3.08	2.19	3.53	2.30
Denmark	1.56	2.35	2.44	1.89
Germany	11.83	12.86	12.08	9.96
Greece	1.60	1.00	2.28	1.76
Spain	10.12	4.49	7.68	4.80
France	9.58	8.71	13.56	11.84
Ireland	0.54	1.53	0.99	0.65
Italy	8.34	8.87	9.69	9.75
Netherlands	13.30	7.76	6.41	9.15
Austria	2.60	1.54	1.64	1.31
Portugal	0.76	0.39	0.80	0.41
Finland	1.95	1.70	2.08	1.39
Sweden	3.96	4.42	3.72	3.71
UK	30.78	42.20	33.09	41.07

Source: DG-Research [2004], pp. 103-111 (C), 120-128 (J), 139-147 (L) and 157-166 (O)

Table 7: Publications in Econometrics, 1989-2005

Rank	**Country**	**Adj. Pages**	**Articles**	**Authors**	**Centres**	**Adj. Pages/Authors**
1	USA	85,025	4,916	3,240	328	26.24
2	UK	22,669	1,482	926	101	24.48
3	CANADA	8,966	626	340	40	26.37
4	NETHERLANDS	5,258	362	190	13	27.67
5	AUSTRALIA	4,098	313	207	27	19.80
6	FRANCE	3,187	202	153	62	20.83
7	SPAIN	2,801	198	141	36	19.86
8	GERMANY	2,657	211	170	46	15.63
9	ITALY	2,645	208	130	58	20.35
10	JAPAN	1,947	137	92	39	21.16
11	CHINA	1,797	123	86	17	20.89
12	DENMARK	1,465	99	45	5	32.56
13	KOREA	1,382	97	50	23	27.64
14	SWEDEN	1,361	101	91	12	14.96
15	ISRAEL	1,104	98	71	9	15.54
16	BELGIUM	1,067	102	69	11	15.46
17	SWITZERLAND	983	70	45	13	21.85
18	FINLAND	848	56	19	10	44.62
19	NEW ZEALAND	822	79	34	8	24.19
20	AUSTRIA	756	52	37	12	20.44

Source: Baltagi [2007].

tive measures.[15] Coupé reports only the first (main) affiliation of each author and, therefore, any secondary/multiple affiliations that some of these authors may have are ignored. The figures

[15]The measures include publications; adjusted number of articles; number of pages; adjusted number of pages; simple Impact Factor; Bawens; Kalaitzidakis et al.; Hirsch et al.; Scott and Mitias.

Table 8: Publications in Econometric Theory, 1989-2005

Rank	Country	Adj. Pages	Articles	Authors	Centres	Adj. Pages/Authors
1	USA	31,250	1,641	851	182	36.72
2	UK	7,828	513	218	54	35.91
3	CANADA	3,773	273	145	31	26.02
4	NETHERLANDS	2,540	175	89	11	28.54
5	AUSTRALIA	2,354	178	108	19	21.79
6	FRANCE	1,799	102	77	41	23.37
7	SPAIN	1,666	101	73	22	22.82
8	GERMANY	1,555	116	81	38	19.20
9	JAPAN	1,406	92	51	29	27.58
10	CHINA	1,382	81	50	12	26.56
11	ITALY	1,254	90	57	30	22.01
12	KOREA	1,099	66	33	16	33.29
13	DENMARK	820	54	28	3	29.30
14	FINLAND	646	39	9	7	71.77
15	SWEDEN	598	38	27	7	22.16
16	NEW ZEALAND	543	55	20	5	27.14
17	AUSTRIA	522	33	21	7	24.85
18	SWITZERLAND	488	34	21	12	23.26
19	BELGIUM	458	47	30	5	15.27
20	TAIWAN	441	31	24	11	18.38

Source: Baltagi [2007].

suggest the dominance of the US (when viewed as a country), with 743 out of 998 top authors claiming as their primary affiliation a US institution.[16] The UK is second with a share of 9.82 per cent. It can be seen that the UK is comparable with the best US states whereas the top 6 US states are ahead of all other countries apart from the UK.

2.4 Evidence from bibliometric indicators: Citations

A similar picture emerges when citation evidence is examined. We first present evidence from Nederhop, Van Leeuwen and Tijssen in their report for the ESRC on international benchmarking and bibliometric monitoring of UK research performance. They present comparisons for a range of disciplines for citation counts from 1997 publications over a five-year citation window based on ISI data. The results for the Economics and Business category.[17] The first three columns of Table 10 give the number of publications, citations and citation rate. The next two columns give the mean journal and mean field citation scores obtained by dividing by the Journal Citation Score (JCS) and Field Citation Score (FCS) respectively. Thus scores above 1.0 in the last

[16] For the two missing authors, their recorded affiliation was multi-regional private companies and therefore their exact location could not be confirmed.

[17] The ISI data on citation is often disaggregated to Economics and Business level. This includes economics (207 journals), business (76 journals), business finance (48 journals), industrial relations & labor (15 journals) and agricultural economics and policy (9 journals). It excludes management journals which are included in the Management and Planing category.

Table 9: Country Shares in Coupé's List of Top Authors

	Country	No of Authors	% in Total		US States	No of Authors	% in Total
1	US	743	74.42	**1**	CA	113	11.32
2	UK	98	9.82	**2**	MA	109	10.92
3	FRANCE	27	2.71	**3**	IL	78	7.82
4	CANADA	23	2.3	**4**	NY	78	7.82
5	ISRAEL	17	1.7	**5**	DC	42	4.21
6	HOLLAND	11	1.1	**6**	PA	37	3.71
7	SPAIN	11	1.1	**7**	NJ	27	2.71
8	ITALY	9	0.9	**8**	TX	25	2.51
9	GERMANY	8	0.8	**9**	MI	23	2.3
10	HONGKONG	7	0.7	**10**	MD	22	2.2
11	JAPAN	7	0.7	**11=**	MN	20	2
12	AUSTRALIA	6	0.6	**11=**	WI	20	2
13=	BELGIUM	5	0.5	**13**	CT	19	1.9
13=	SWEDEN	5	0.5	**14**	NC	16	1.6
15=	DENMARK	4	0.4	**15**	OH	15	1.5
15=	SWITZERLAND	4	0.4	**16**	RI	12	1.2
17=	ARGENTINA	2	0.2	**17**	VA	11	1.1
17=	CHILE	2	0.2	**18**	FL	10	1
17=	GREECE	2	0.2	**19=**	GA	7	0.7
17=	IRELAND	2	0.2	**19=**	IN	7	0.7

Source: Data from Coupé [2003] ("Top 1000 Economists - Publications 1990-2000)).

two columns indicate performance that is above the average. On this comparison the UK performs better than other comparator countries apart from the US. For the US the comparison is ambiguous depending on which measure is used.[18] The information is also depicted graphically in Figure 1 which plots the actual citation score against the journal citation score or impactor factor. The South-West quadrant of the diagram corresponds to average publications in low impact factor journals and low citation rates. The North-East quadrant corresponds to average publications in high impact factor journals and high citation rates. Points above the 45^0 line indicate that a country gains more citations from its publications than would be expected on average. As can be seen the UK is almost at the average in terms of the journal impact factors but given this, UK publications produce more than the world average in terms of citations. The US also performs better than expected and publishes in better than average journals. Other countries including France, Canada and Australia perform worse than expected and although Germany performs better than expected, it is, on average, publishing in lower quality journals.

Nederhop, Van Leeuwen and Tijssen also look at the top 10% of most highly-cited papers and the share of each country of this 10%. The results for Economics and Business are reproduced in Table 11. The expected value is calculated from the world distribution of cited papers so is not exactly 10% of the papers published in each country. The ratio of actual to expected gives

[18] The UK performs slightly better than the US when the journal citation score is used as a reference but worse when using the overall field citation score. This indicates that the UK performs slightly better on a journal by journal basis than the US.

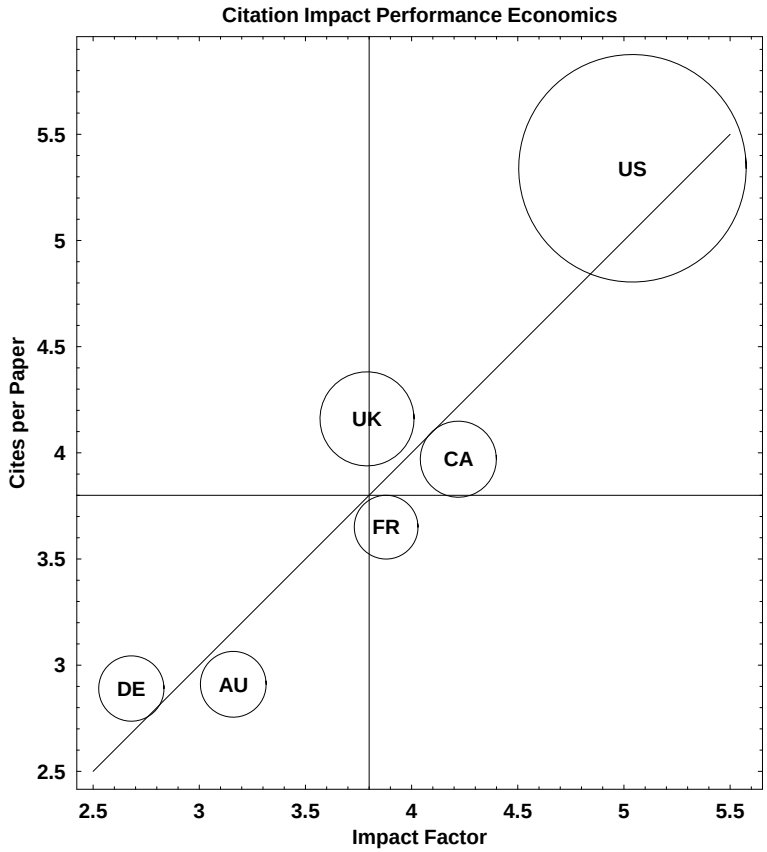

Figure 1: Citation Scores against Impact Factors 1997-2002 - Economics and Business

a measure of whether the country has a greater than average share of top-cited authors. As can be seen from the table the US and the UK both have a greater than expected share of top-cited authors whereas other countries have below the expected share.

Nederhop, Van Leeuwen and Tijssen also present similar evidence from nine other social science categories. Their general conclusion is that four of these categories perform better than the world average, (Interdisciplinary Social and Behavioural Sciences,[19] Economics and Business Language and Linguistics and Psychology), and that Economics and Business is second in relative performance behind Interdisciplinary Social and Behavioural Sciences. Of the other social sciences in the UK, Educational Sciences, Law & Criminology and Management & Planning are considered partially above the world average, Political Science & Public Administration and Sociology & Anthropology at the world average and Information & Communication Sciences below the world average.

Another method of examining the skewness of the distribution is to examine the lower rather than upper tail. Nederhop, Van Leeuwen and Tijssen consider the proportion of articles that are not cited in the relevant citing window. In the Economics and Business category the UK has the lowest non-citation rate (27%) of the other countries considered.[20] There is an issue of whether these differences are statistically significant, but the Economics and Business category is the only one of the social science categories examined which has lower non-citation rates than all other countries.[21]

Further evidence on country citations can be found from the ISI top 20 cited countries. This is presented in Table 12 which includes publications and citations in the business and economics category for the period January, 1995 to August, 2005. The US has the highest citation rate followed by England with an average of 4.34 citations per paper.[22]

In a recent NBER paper Kim, Morse and Zingales [2006] use the ISI's "Most highly-cited" rankings to identify the authors of papers in economics for the period 1970-99 which have been cited 500 times or more. Restricting attention to 41 journals they identify 146 such classic papers. They collected information on author affiliations and the institutes from which each author in their list completed their doctoral training. Their findings are summarised in Table 13. The US dominates with 91 per cent of the total listed authors holding a doctoral degree from a US insti-

[19] This includes Demography, Social Issues, Interdisciplinary Social Sciences and Biomedical Social Sciences.

[20] The non-citation rates for the other countries considered are: US – 28%; Canada – 31%; Australia – 37%; Germany – 37%; France 31%.

[21] In principle it is also possible to examine where units or research institutions in the UK say, fit within the distribution (of bibliometric indicators) of institutions from a wide set of countries. This would give information on UK performance within this world-wide distribution. However, this would require a much more detailed analysis and since the purpose of this report is to examine the UK as a whole this is not something addressed here.

[22] The data for Table 12 is based on the latest bimonthly update of Thomson ISI-Essential Science Indicators. It is designed to identify the top twenty publishing countries out of a total of 76 countries comprising the top 50% as ranked by total citations count in this field. Unfortunately the breakdown is not for the UK and therefore excludes Scotland (which is 13th on the list), Wales and Northern Ireland.

tution. The UK is second with an average share over the period of 5.4%, which is comparable to the rest of the world excluding the US and UK. The combined share of the rest of Europe and all other areas are 1.6% and 1.3%, respectively.[23]

[23]The number of citations varies with the size of the research field. Thus the most highly-cited articles will occur predominantly in areas where there is a large research field. This bias against small or developing fields must be kept in mind when considering only highly-cited articles or authors.

Table 10: Comparative Citation Rates - Economics and Business 1997-2002

	1997 publications (p)	1997-2002 citations (c)	$I = c/p$	$CI_J = I/JCS$	$CI_J = I/FCS$	JCS	FCS
US	5,901	31,524	5.34	1.06	1.50	5.04	3.56
UK	1,143	4,756	4.16	1.10	1.14	3.78	3.65
Canada	611	2,425	3.97	0.94	1.08	4.22	3.68
Australia	304	884	2.91	0.92	0.76	3.16	3.51
Germany	291	842	2.89	1.08	0.78	2.68	3.71
France	245	895	3.65	0.94	1.02	3.68	3.58

Source: Nederhof, Van Leeuwen and Tijssen.

Table 11: Top-10% Most highly-cited - Economics and Business 1997-2002

	publications 93-99	Actual	Expected	Actual/Expected
US	35,590	5,791	3,981	1.45
UK	7,463	895	756	1.18
Canada	4,205	370	428	0.87
Australia	2,045	141	209	0.68
Germany	2,131	127	218	0.58
France	2,015	164	208	0.79

Source: Nederhof, Van Leeuwen and Tijssen.

Table 12: Top 20 Most Cited Countries in Economics and Business 1995-2005

RANK	**COUNTRY**	**PAPERS**	**CITATIONS**	**CITATIONS PER PAPER**
1	USA	62,633	392,238	6.26
2	ENGLAND	15,012	65,196	4.34
3	CANADA	7,307	31,642	4.33
4	NETHERLANDS	4,208	16,831	4.00
5	FRANCE	4,251	15,569	3.66
6	AUSTRALIA	4,493	12,611	2.81
7	GERMANY	4,694	12,388	2.64
8	ISRAEL	1,725	9,130	5.29
9	SWEDEN	1,956	8,506	4.35
10	ITALY	2,468	7,488	3.03
11	SPAIN	2,609	7,430	2.85
12	BELGIUM	1,742	7,240	4.16
13	SCOTLAND	1,646	5,894	3.58
14	SWITZERLAND	1,333	5,634	4.23
15	HONG KONG	693	5,222	7.54
16	JAPAN	2,019	4,713	2.33
17	PEOPLES R CHINA	1,820	4,572	2.51
18	SOUTH KOREA	1,181	3,861	3.27
19	DENMARK	1,222	3,805	3.11
20	NORWAY	1,043	3,324	3.19

Source:Thomson's http://www.in-cites.com/countries/top20eco.html

Table 13: PhD Awarding Institutions for Authors of "Highly-Cited" Journal Articles - Business & Economics 1970-97

	1970-4	1975-9	1980-4	1985-9	1990-4	1995-9	Total
Harvard/MIT	34.4	21.3	34.5	22.0	30.0	36.1	29.7
Chicago/Northwestern	34.4	17.0	12.1	15.3	18.3	11.5	16.7
Stanford/Berkeley/UCLA	6.3	14.9	13.8	13.6	16.7	4.9	12.0
Princeton/YaleCornell/Rochester/Carnegie-Mellon	0.0	17.0	12.1	5.1	11.7	11.5	10.1
Michigan/Wisconsin/Iowa/St Louis	6.3	10.6	1.7	10.2	6.7	6.6	6.9
Rest of the US	6.3	6.4	10.3	13.6	8.3	23.0	12.0
UK	6.3	4.3	5.2	5.1	5.0	6.6	5.4
Rest of Europe	3.1	2.1	1.7	1.7	1.7		1.6
Rest of the World		2.1		5.1			1.3

Source: Han Kim, Morse and Zingales [p.26, 2006]

Table 14 reviews the research performance of the US, UK, France, Netherlands and Germany using an adjusted comparative impact score index. This index is designed to measure the impact achieved by individual countries adjusting for country size. As discussed in Appendix A the figures shown in Table 14 do not measure average number of citations per paper, but the overall country performance as captured by the ratio between the observed and expected impact, in line with Katz's ACI indicator. Thus for instance, the figure of 1.2 attached to the UK for the time period 1991-95 should be interpreted as potential evidence that the UK performed during that period 20% better than expected, given the country's publishing size. The US and UK (together with France, after the first sub-period) appear again to be on average and relative to their capacity the most highly-cited countries for 1991-95. Over the two sub-periods, the score for the US falls from 1.4 to 1.2; whereas both France and the Netherlands exhibit a marginal increase in their ACI score index between the first and the last sub-periods, from 1.1 to 1.2, respectively.

Table 14: Katz's ACI Index for Economics Journal Publications 1991-98

	1991-5	1992-6	1993-7	1994-8
US	1.4	1.4	1.3	1.2
UK	1.2	1.2	1.2	1.2
France	1.1	1.3	1.2	1.2
Netherlands	1.1	1.2	1.2	1.2
Germany	1.0	1.1	1.0	1.0
EU-15	1.0	1.0	0.9	0.9

Source: Katz [1999]

Table 15 is similar to Table 6 in examining a breakdown by sub-field. This is important since if publication and citation rates are different in different sub-fields, any tendency of countries to specialise on certain fields could influence their ranking.[24] The table uses data on citations between 1991-2000 for the four different research fields (represented by the JEL code): *Mathematical and Quantitative Methods* (C); *Industrial Organization* (J); *Labour and Demographic Economics* (L); and *Economic Development, Technological Change and Growth* (O). The results are mixed: certain countries from this sample tend indeed to specialise in certain fields by publishing a significantly greater number of papers on one or two fields (see, for instance, UK and the Netherlands); and in other countries the total number of publications tends to be more uniformly distributed across the four fields - see for instance Finland and Denmark. However, the uniformity (or lack of it) of this distribution will only matter if different fields tend to attract different numbers of citations. To examine whether this could be the case we also include the average number of citations per paper, adjusted for journal quality, for each of the four research fields for a series of sub-periods and the entire period between 1991 and 2000 (see the last row of Table 15). As one can see, there is some variation across the number of citations that different research

[24] The same argument could apply when one attempts to make interdisciplinary comparisons on research productivity. Indeed, Katz [1999] raises the issue of differences in journal publishing cultures that tend to characterise different disciplines. His argument is that the appeal of other forms of publications (other than journal publications) differs significantly across different areas of practice. From that viewpoint, attempts to formulate and compare journal-based measures of research productivity may give rise to misleading results. See also discussion in Section 2.5.

Table 15: Citations per Paper Adjusted by Journal Quality 1991-2000

	C	J	L	O
1991-95	1.22	0.98	0.88	1.34
1992-96	1.24	0.93	0.97	1.48
1993-97	1.06	0.95	1.01	1.32
1994-98	0.99	0.93	1.02	1.27
1995-99	0.93	0.95	1.08	1.16
1996-2000	0.96	0.98	1.03	1.15
1991-2000	1.18	0.96	1.00	1.31

Source: DG-Research [2004], pp. 112 (C), 129 (J), 148 (L) and 167 (O)

Mathematical and Quantitative Methods (C); *Industrial Organization* (J); *Labour and Demographic Economics* (L); *Economic Development, Technological Change and Growth* (O)

fields attract with O always above one and J always below one. Thus, country research specialisation may have some influence on measured research performance. Of course, this conclusion is based on a small and non-representative sample of the total population of articles and research fields. It may, though, suggest that a further and more detailed investigation is warranted.

2.5 Book publications in the UK

So far, our discussion of research productivity has focused on scholarly material published in the form of peer-reviewed journal publications. However, books, monographs and book chapters also represent a proportion of the research output of economists. Burnhill and Tubby-Hide [1994], find the share of book publications to be around 10% of total publications. For other social science disciplines the figure can be much higher. According to their findings, political science and sociology have shares of 29% and 24%, respectively (see Table 16). However, the impact of book publications and chapters published in books has received less attention than journal publication, probably because of the relative lack of ready bibliometric information compared with journal publications.

Despite a relative paucity of easily accessible data the *Research School for Resource Studies and Development* (CERES) in the Netherlands, has developed a research evaluation procedure that includes a ranking of publishers in economics and allied social science disciplines into five categories A-E. The allocation of books to each of the five categories is decided on the basis of the reputation and publishing practices of the publisher. Specifically, "A" is reserved for refereed book publications, published by publishers of world-class reputation; "B" is given to refereed book publications published by the world's semi-top publishers; "C" is for refereed book publications published by "other" (i.e. non "A" or "B") publishers; and finally, "D" and "E" are allocated to non-refereed book publications, with "D" given to books targeting an academic audience; and "E" when the targeted audience is the general public.[25] This represents a potential for evaluation book or monograph contributions. But, for the moment, it is difficult to obtain data from

[25]Further details of the CERES system together with lists and rankings for journal and book publications are available from their web-address: "http://ceres.fss.uu.nl"

Table 16: Publication Cultures Across Social Sciences: Books vs. Journal Articles

	Peer-reviewed journals (%)	Book publications (%)
Psychology	87	11
Statistics/Computational Methods	75	8
Geography and Planning	73	7
Political Science	64	29
Economics	64	10
Social Anthropology	63	22
Management and Business studies	60	10
Education	48	14
Sociology/social administration	48	17
Economic and Social History	44	24
Linguistics	23	20
All Social Science	62	15

Source: Burnhill and Tubby-Hille [1994]. Reproduced in Hicks [2004], p.13

any reliable source that provides good coverage of book/monograph publications and reliable affiliation data that could be used in any bibliometric exercise.[26]

3 Non-traditional sources of bibliometric information

Although the ISI and EconLit databases have been widely used for many years there are other emerging sources of bibliometric information. These include working paper repositories, commercial online journal repositories and specialised internet search facilities. These emerging sources have the potential to provide both more up to date information on research production and citations but also information on usage. Many of these sources of information have only recently begun to be exploited for measuring research outputs and performance.

Information from these other non-traditional sources of bibliometric informations on usage and citation rates may provide more up-to-date information or be a leading indicator for future journal citations or may provide relevant and different information on research impact. Therefore examination of these sources may provide a useful direction for future study.[27,28]

[26] We contacted a small number of publishers but none kept a record of author affiliations meaning that any analysis would have to labouriously check authors against affiliations from other sources.

[27] The correlation between, say, downloads and future citations may be low. Bollen et al [2006] argue in this direction: using data on article downloads from the Los Alamos National Laboratory library, they construct and compare (correlate) a usage and impact factor indicator. They find no correlation (in certain instances the two measures exhibit striking differences), but they acknowledge the locality of the usage measure - defined as the number of downloads from a local library network - versus the much more global character of the other.

[28] Hajjem et al's [2004] find that providing open access to research manuscripts increases citations in a range of different disciplines. Similarly Lawrence [2001] finds that open access results to "..[an] average of 336% more citations to online articles compared to offline articles published in the same venue". Harnad [2006] justifies this as an effect of the resulting "earlier uptake" enjoyed by online articles, thus increasing their cumulative effect on the research cycle. This bias should

3.1 Open source repositories

Perhaps the most important potential source of freely available metric information for economics is the RePEc (Research Papers in Economics) public-access database. RePEc currently provides access to more than 191,000 working papers, 237,000 journal articles, 2,300 book and chapter listings and 1,400 software components. Moreover, RePEc's directory databases provide contact information for more than 13,000 registered economists and 10,250 economics research organisations. In total the RePEc lists more than 433,000 items, 326,000 of which are available online.[29]

The LogEC and CiteEc projects produce usage and citation information from RePEc data. LogEc collects access statistics from several services (EconPapers, IDEAS, New Economic Papers) which use the RePEc data. The statistics are updated monthly when the server logs from participating sites are collected and merged. The aim is to produce a measure of the number of people showing an interest in a paper by reading the abstract page or downloading the full text file. The count is robust to accesses by robots or spiders and eliminates double counting of views or downloads from a single IP address. Although there will remain some imperfections in accurately measuring usage the statistics produced are likely to provide a good estimate of the actual number of relevant views and downloads. CiteEc (Citations in Economics) provides citation analysis for documents available from RePEc. For each paper made available in electronic format CiteEc extracts and parses its list of references so that a record is kept of which documents have been cited, how many times and by which papers. CiteEc is however, at a very early stage of development and only a fraction of the available documents have been analysed.[30] Therefore care should be taken in using them for evaluation purposes.

Using the available data RePEc constructs rankings of authors, journals, countries and institutions. The journal rankings that are presented are based on citation counts using both simple and recursive impact factors.[31] RePEc provides weighted and adjusted (to eliminate self-citations) number of citations, number of articles and a simple citation count; information on top working papers, journal articles, software components, chapters and books as determined by number of downloads and abstract views; information on top authors, including top women economists, top authors by region and top authors by country;[32] and country rankings in which a series of measures for research output are presented compared across countries and individ-

of course be expected to vanish (at least in relative terms) as the number of open-access papers approaches 100% of the total.

[29] RePEc emerged from the NetEc group, which received support for its WoPEc project between 1996-1999 by the Joint Information Systems Committee (JISC) of the UK Higher Education Funding Councils, as part of its Electronic Libraries Programme (eLib).

[30] As of May 2007, over 100,000 documents have been analysed with approximately 2.5 million references and over 700,000 citations.

[31] It currently covers around 380 journals (it excludes journals with less than 50 articles listed).

[32] It is reminded that the rankings are using RePEC's data on citations and publication rates and, therefore, they are essentially restricted solely to registered authors, institutions, articles and journals.

ual US states.[33] As with the ISI, most of the journals listed are English language publications.[34] Download statistics are also available for each listed article. These statistics include total number of abstract views and paper downloads per month.

One of the main strengths of RePEc's database is its use of "metadata",[35] to uniquely identify and represent its collections. Krichel [1998] discusses how the use of a customised metadata framework named Research Documents Information Format (ReDIF) facilitates the unique characterisation of each author listed in the database. Following upon Krichel's [1998] examples, each author listed in RePEc's database is allocated a unique ReDIF ID number. When an author changes or adds an affiliation their ID remains unchanged and, as Krichel [1998] puts it "*..all we need to update is his email address and his homepage in the second template and the information will be updated in the description of all the papers that [the author] has written*". This reduces the possibility of incorrect counts due to minor changes in the name of the author or their affiliation and gives RePEc and is an advantage over more traditional sources of bibliometric information, such as EconLit and ISI.

The Social Science Research Network (SSRN) is another open access database specialising on the dissemination of working papers. SSRN currently maintains information on more than 137,000 abstracts and 107,000 full text articles on the areas of accounting, economics, law, management and marketing. Other services include the provision of rankings for authors, papers and institutions, based on the number of downloads from the SSRN database.

The International Bibliography of the Social Sciences (IBSS) is a database freely available to UK HE Institutions. It indexes material from journal articles (including research notes, letters and short essays), books, reviews and selected chapters for a wide range of disciplines in social sciences, including anthropology, economics, politics and sociology. As of December 2006, IBSS was covering 675 economics journals with a total number of 660,000 bibliographic records, including 200 journals which are no longer published. IBSS' records start from as early as 1951. It also has a wide international coverage with more than 50% of its journals published outside the UK or US and 25% of the references in a language other than English.

3.2 Commercial archives

There are now a large number of commercial archives providing electronic journal access.

[33] The alternatives measures considered include: number of total works submitted by authors, number of distinct works, number of distinct works weighted by simple/recursive impact factors, weighted and unweighted citation counts, weighted and unweighted number of journal pages and usage data (number of downloads and article views for individual pieces of work). The overall score is then estimated as the harmonic mean of all measures.

[34] For a summary of the listed journals in RePEc see: "http://ideas.repec.org/top/top.journals.recurse.html".

[35] Following Howe [2000] the term "metadata" is used to describe "*..definitional data that provides information about the context, quality, and condition of characteristics of the data..[It may] document data about data elements or attributes (name, size, data type etc) and data about records or data structures (length, fields, columns etc) and data about data (where it is located, how it is associated, ownership etc)..*" [Howe, 2000].

JSTOR is a not-for-profit organisation providing an archive of many scholarly journals. It operates a "moving wall" policy, so that most of the journals are archived with a time lag of between three and five years.

Other electronic archives include for example SwetsWise and ScienceDirect. SwetsWise provides access to more than 10,000 journal titles with 22 million searchable references covering a variety of scientific disciplines. Items in SwetsWise can be searched and browsed by title, author, keywords and abstract. Usage statistics are also available and updated monthly.[36] ScienceDirect (part of Elsevier) provides access to abstracts and full article details (including citations) for more than 70 economics journals in economics.[37] Elsevier also launched Scopus at the end of 2004 which provides for easy indexing of these contents to enable author and other searches so that search results can be easily manipulated or downloaded into a variety of different formats. It is, however, limited to Elsevier journals and requires a subscription for access.

CSA Illumina is an outgrowth of Cambridge Scientific Abstracts and enables commercial access to a range of nearly 100 scientific databases including IBSS and EconLit.

For the most part these archives maintain access statistics but information is unlikely to be made freely available. However, JSTOR have provided us access to data on four economics journals and an analysis of this data is presented in Section 4.

3.3 Internet search facilities

OAIster is a project focusing on enabling access to "hard-to-get" scholarly papers. As of the end of November 2006, OISter contained information for 9,786,228 items covering a total of 712 research institutions. OAIster operates in a manner similar to RePEc but covers all discipline areas.

Google Scholar (GS) became available in November 2004 and provides a web-based search engine specialising on the indexing of scholarly literature.[38] GS is powered by google's technology and at the moment provides bibliographic information, including total (unweighted) number of citations for each article and information on author(s)/affiliation(s). However, it is difficult to collect or manipulate search information and therefore its use for bibliometric analysis is somewhat limited.

[36] Swetswise is not a vendor in the sense that they do not store the information requested by their users. This is turn implies that they do not maintain their own bibliographic database.

[37] Some titles in economics in this database are covered from as early as 1967, for the majority of articles coverage begins from the mid-1990s.

[38] GS is currently available as a "beta version", indicating that some problems may remain unfixed. The GS database currently covers most of the peer-reviewed journals that are available online, except those published by Elsevier. GS can be accessed online from "http://scholar.google.com".

4 Evidence from JSTOR

JSTOR provides not-for-profit access to many scholarly journals including journals in economics. JSTOR was able to provide us with monthly data for downloads and abstract views for four economics journals; *American Economic Review* (AER), *Econometrica* (ECMA), the *Economic Journal* (EJ) and the *Journal of Industrial Economics* (JIE) covering a period 1997–2007 and articles published 1990–2004 for AER and ECMA; and 1990–2001 for EJ and JIE. We match the information from Jstor with the information available from the Web of Knowledge. Hence we are able to attribute to each article its number of citations to date as well as other article characteristics (further information is found in Appendix C).

Table 17 gives information on downloads and abstract views in the data by country of origin of the first author. It can be seen that the numbers for abstract views and downloads are quite similar. In addition the proportions are quite similar to the proportions of citations in the data. The correlation between downloads, views and citations in this data is given in Table 18

Table 17: JSTOR Downloads and Views by Country

Country	Downloads.	Share of Downloads	Views	Share of Views
AUSTRALIA	20064	0.64%	22002	0.68%
CANADA	93925	3.00%	95724	2.96%
FRANCE	44236	1.41%	40914	1.26%
GERMANY	27784	0.89%	29241	0.90%
ISRAEL	39805	1.27%	38649	1.19%
ITALY	18138	0.58%	19062	0.59%
NETHERLANDS	22663	0.72%	22328	0.69%
REST of WORLD	176077	5.62%	169424	5.24%
SPAIN	23349	0.75%	22002	0.68%
UK	269350	8.60%	307548	9.51%
USA	2396387	76.52%	2468535	76.30%
Total	3131778	100.00%	3235429	100.00%

Source: JSTOR and Web of Knowledge. Observations 4441.

Table 18: Raw Correlations of Citations with JSTOR Abstract Views and Downloads

	Cites	Downloads	Views
Cites	1		
Downloads	0.7056	1	
Views	0.5274	0.8781	1

Source: JSTOR and Web of Knowledge. Observations 4441.

Figure 2 plots average downloads per article for the four countries US, UK, Germany and Spain for each of the four journals.[39] Because of differences in the periods covered in the JSTOR data, the downloads per article are not directly comparable across journals. However, differences between countries within a particular journal are relevant for country comparisons. The ranking

[39]The country is determined by the affiliation of the first author.

of countries for the three journals, EJ, AER and ECMA are the same with the US ranked first, the UK second, Germany third and Spain fourth. The ranking for the JIE is somewhat different, with Spain ranked first and the UK second. This suggests that there may be significantly different rankings for some journals or some types of journals and that an analysis based only the leading journals may not provide a complete picture of country rankings.

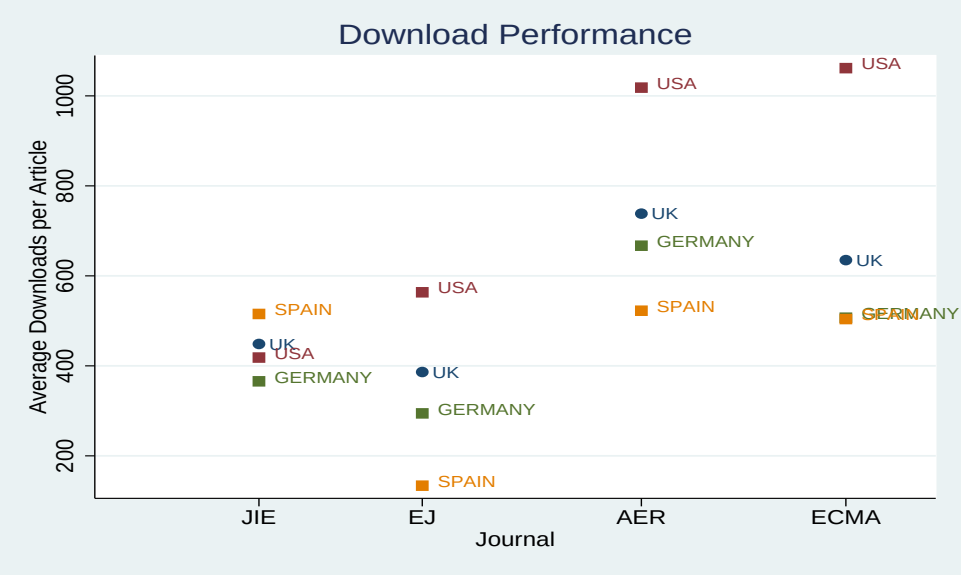

Figure 2: JSTOR Download Rates by Journal

Figure 3 provides the same information for the number of citations by country. In this figure each axis measures the average five-year impact factor. Each journal is mapped to its average impact factor on the horizontal axis and the solid line is a 45° line. Thus countries placed above the line have citation performance above the average for the journal and countries below the line have citation performance below that of the journal. As can be seen the UK is consistently above the average performance for each journal. Again the rankings of countries are similar for the top three journals, but is somewhat different for the JIE where the UK is ranked first.

To examine the data further we ran a number of regressions to explain citations in terms of JSTOR usage (downloads or abstract views) and other paper characteristics.[40] Regressions run were of the the form

$$\ln \text{CITES}_i = \alpha_0 + \alpha_1 \ln \text{USAGE}_i + \alpha_2 \ln \text{PAGES}_i + \alpha_3 \text{TIME}_i + \alpha_4 (\text{no. of authors dummies})_i + \alpha_5 (\text{journal dummies})_i + \alpha_6 (\text{country dummies})_i + \epsilon_i$$

[40] We report here only the results for downloads. The results for abstract views are very similar.

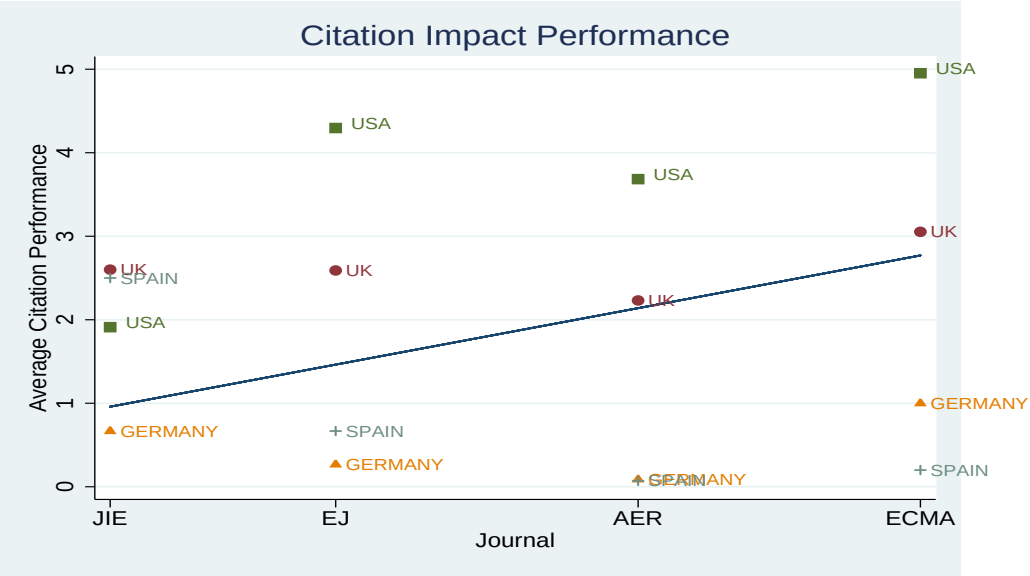

Figure 3: Citations Rates by Journal

where "CITES" is the total number of ISI citations for each journal article; "USAGE" measures the total number of JSTOR downloads or abstract views; "PAGES" is the length of the article;[41] and "TIME" is the number of years since the publication date. Table 19 reports the results of the regression of the log of total citations on downloads and paper characteristics. Three specifications are considered. The first with journal dummies, the next with country dummies added and a third with adds squared terms for usage and time since publication. In each case the coefficient for each variable is reported in the first line and the t-statistic is reported below. The country dummies are generally statistically insignificant. However, the US is marginally positively statistically significant while Canada and Italy are negative and statistically significant. The effect of the number of authors is positive and statistically significant up to five authors. Although the squared terms in the third specification are statistically significant, the difference in fit is relatively small.

Table 20 reports similar regressions by journal. As is expected from the previous result, the country effects are imprecisely measured and none of the country dummies are statistically significant. Somewhat surprisingly the author effect is much weaker for ECMA than for the other journals. The difference in the explained variance for the EJ and the JIE, compared to ECMA and AER perhaps suggests that the EJ and the JIE publish papers of more variable appeal. The conclusion to be drawn from the analysis of the JSTOR data is downloads seem to predict citation significantly however the extent of its precision varies by journal. It is more precise for the AER

[41] As is standard procedure in similar studies, articles of less than five pages are eliminated as such papers exhibit significantly weaker citation performance.

and ECMA and less so for the other two journals. Downloads vary by country of the author and this may account for much of the variation between countries and hence why the country dummies are imprecisely measured. Usage statistics and downloads seem to provide confirmation of the results using citation data. In terms of usage the papers of US authors are more downloaded/viewed than the average for each of the journals examined, but the UK also shows higher usage levels than the other major countries except Spain in the case of the JIE.

5 Evidence from RePEc

One of the difficulties of using publications and citations data from the ISI and EconLit is the time lags involved. For example, with a five-year citing window and publication lags of 3–5 years, citations are being used to evaluate research undertaken 8–10 years previously. To be sure that the conclusions of any analysis remain robust it is important to consider more recent evidence and here data from RePEc can provide a useful adjunct to traditional bibliometric information.

We have undertaken an analysis of citation data and data on downloads from RePEc which shows evidence that downloads can predict future citations. We collected data from the articles published between the years 2000 and 2006, in the first issue for each of the seven journals: American Economic Review, Econometrica, European Economic Review, Economic Journal, Journal of Industrial Economics, Journal of Public Economics and Oxford Bulletin of Economics and Statistics. We then compared citation rates from the ISI with data from downloads of the working paper versions of the articles where these could be identified. Thus in this section we consider information both from the available RePEc citation data and download data. It should however, be remembered that RePEc has its own biases: not all active authors are registered with RePEc and the propensity to register with Repec is possibly not exogenous. Some authors may have more incentives to register than others and in some cases, institutions may register authors by default. There may thus be systematic difference in registration across countries and between groups.

Table 21 uses the data from RePEc on the top-20 research active countries/regions, measuring research activity by a number of alternative definitions. The inclusion of US states (instead of US as a single entry) facilitates comparability with other countries by to some extent removing size and population differences. The overall ranking of each entrant is shown in the second column (the harmonic mean of the rankings obtained by twenty other alternative definitions).[42] "Ranking-works (citations)" provides the ranking of each region on the basis of her number of to-

[42] These are: number of distinct works; number of distinct works weighted by a simple IF; number of distinct works weighted by a RIF, number of distinct works weighted by number of authors; number of distinct works weighted by number of authors and simple IF; number of distinct works weighted by number of authors and RIF; number of citations, number of citations weighted by simple IF; number of citations weighted by simple RIF; number of citations weighted by number of authors; number of citations weighted by simple IF and number of authors; number of citations weighted by simple RIF and number of authors; h-index, where h is the number of papers an author has written that have each been cited at least h times; number of journal pages; number of journal pages weighted by simple IF; number of journal pages weighted by RIF; number of journal pages weighted by number of authors; number of journal pages weighted by number of authors and simple IF; number of journal pages weighted by number of authors and RIF; views of abstracts; and number of downloads of full-text.

tal works (citations to works) listed in RePEc. "Ranking-IF (RIF)" uses the simple (recursive) impact factor to journal articles. And "abstracts"/"downloads" employ data on usage. The UK scores second after Massachusetts in the overall ranking, exhibiting a slightly weaker performance on citation-based measures of output (for all of which UK shows up as third). The final column, titled "No of Authors", reports the number of RePEc-registered authors per country of affiliation.[43] The UK ranks higher than all other countries other than the US on every measure.

[43] RePEc allocates equal credit to each country where multiple affiliations are given.

Table 19: JSTOR: OLS Regression of Log Citations

Variables	Basic	Country	Country and Squares
ln Usage (Downloads)	0.670	0.666	−0.706
	45.653	45.238	−8.608
Time since publication	0.042	0.042	−0.021
	11.783	11.915	−1.100
ln Pages	0.614	0.620	0.541
	25.469	25.735	22.794
Two authors	0.178	0.185	0.177
	6.319	6.583	6.519
Three authors	0.318	0.327	0.290
	7.371	7.578	6.975
Four authors	0.344	0.360	0.354
	3.326	3.485	3.560
Five authors	0.579	0.581	0.683
	1.819	1.827	2.232
Six authors	−0.029	0.002	0.052
	−0.035	0.003	0.065
Eight authors	0.602	0.582	0.721
	0.716	0.695	0.893
AER	−0.030	−0.047	−0.089
	−0.724	−1.118	−2.224
ECMA	0.000	0.000	0.000
EJ	−0.139	−0.114	−0.128
	−3.213	−2.473	−2.807
JIE	−0.474	−0.461	−0.423
	−8.041	−7.773	−7.319
USA DUMMY		0.090	0.061
		1.934	1.361
UK DUMMY		−0.002	0.018
		−0.040	0.316
CANADA DUMMY		−0.176	−0.115
		−2.192	−1.482
AUSTRALIA DUMMY		−0.077	0.103
		0.611	0.844
FRANCE DUMMY		−0.027	−0.004
		−0.248	−0.043
GERMANY DUMMY		0.175	0.143
		1.353	1.142
ISRAEL DUMMY		−0.027	−0.036
		−0.243	−0.332
ITALY DUMMY		−0.251	−0.237
		−1.860	−1.823
NETHERLANDS DUMMY		0.112	0.110
		0.886	0.909
SPAIN DUMMY		−0.183	−0.148
		−1.280	−1.078
ln Usage (Downloads)^2			0.119
			17.481
ln Time since publication^2			0.003
			3.586
CONSTANT	−3.630	−3.677	0.662
	−35.461	−33.918	2.548
N	4232.000	4232.000	4232.000
r^2	0.549	0.552	0.585
F	428.386	236.094	247.468
df_m	12.000	22.000	24.000

Source: JSTOR and Web of Knowledge.

Table 20: JSTOR: OLS Regression of Log Citations by Journal

Variables	**AER**	**ECMA**	**EJ**	**JIE**
ln Usage (Downloads)	0.745	0.767	0.509	0.595
	35.694	25.083	17.033	9.074
Time since publication	0.047	0.040	0.018	−0.044
	10.557	5.595	1.737	−2.287
ln Pages	0.639	0.391	0.490	0.490
	21.751	7.615	6.557	3.536
Two authors	0.221	0.008	0.283	0.101
	5.846	0.146	4.374	0.863
Three authors	0.421	0.020	0.308	0.348
	7.135	0.240	3.114	1.952
Four authors	0.621	0.009	−0.342	−0.541
	5.042	0.039	−1.176	−0.760
Five authors	0.737	0.000	0.529	0.000
	1.285		1.302	
Six authors	0.000	0.000	−0.058	0.000
			−0.064	
Eight authors	0.691	0.000	0.000	0.000
	0.852			
USA DUMMY	0.020	0.113	0.065	0.293
	0.266	1.478	0.647	1.810
UK DUMMY	−0.171	−0.101	0.106	−0.076
	−1.260	−0.819	1.104	−0.400
CANADA DUMMY	−0.349	0.074	−0.112	0.205
	−2.924	0.548	−0.586	0.590
AUSTRALIA DUMMY	−0.179	0.057	0.318	0.434
	−0.895	0.202	1.454	0.919
FRANCE DUMMY	−0.169	0.054	−0.077	0.722
	−0.930	0.376	−0.291	1.101
GERMANY DUMMY	0.032	−0.148	0.525	0.130
	0.152	−0.562	1.916	0.408
ISRAEL DUMMY	−0.143	−0.076	0.021	0.119
	−0.852	−0.404	0.087	0.250
ITALY DUMMY	−0.394	0.278	−0.071	−0.438
	−1.662	0.654	−0.300	−1.375
NETHERLANDS DUMMY	0.055	0.392	−0.047	−0.435
	0.247	1.852	−0.217	−0.668
SPAIN DUMMY	0.083	−0.278	−0.719	−0.116
	0.323	−1.400	−1.361	−0.350
CONSTANT	−4.267	−3.461	−2.350	−2.415
	−30.317	−17.968	−7.927	−4.550
N	2221.000	788.000	931.000	292.000
r^2	0.607	0.677	0.317	0.328
F	189.144	101.171	23.530	8.406
df_m	18.000	16.000	18.000	16.000

Source: JSTOR and Web of Knowledge.

Table 21: RePEc Rankings (as of April, 2007)

Country/Region	Ranking	Rank (works)	Rank (citations)	Rank (IF)	Rank (RIF)	Abstracts	Downloads	No of Authors (in RePEc)
Massachusetts (US)	1.26	3	1	1	1	2	2	523
United Kingdom	1.56	1	3	3	3	1	1	1376
California (US)	2.67	4	2	2	2	4	4	409
Germany	4.45	2	7	8	8	3	3	1165
New York (US)	4.97	9	4	4	4	9	7	356
Canada	6.49	5	9	10	10	6	8	646
District of Columbia (US)	6.53	8	6	6	6	5	5	532
Illinois (US)	6.74	13	5	5	5	12	12	199
Italy	8.84	6	11	11	11	7	6	990
France	10.08	7	12	12	13	10	10	827
New Jersey (US)	10.26	21	8	7	7	16	15	83
Pennsylvania (US)	11.54	14	10	9	9	15	16	155
Spain	12.43	11	13	14	14	8	9	699
Netherlands	14.59	10	14	17	17	11	11	440
Australia	15.16	12	22	27	28	13	13	363
Connecticut (US)	15.84	20	19	16	16	19	19	113
Missouri (US)	17.03	17	21	19	19	20	20	78
Switzerland	18.07	15	17	21	22	14	14	222
Michigan (US)	18.12	22	18	18	18	21	21	146
North Carolina (US)	20.57	28	16	15	15	25	22	77

Source: RePEc

Tables 22 and 23 examine the relative performance for the 20 largest countries/states in terms of the number of works and citations per author respectively. The definition of "works" is rather broad, covering working papers, journal articles, book chapters and software. This data is then used to calculate the average individual performance, by constructing (average) works and citations per author. It is important to remember that, for this data, only authors who are registered with RePEc are counted in these rankings.[44]

Table 22: RePEc Registered Works and Work per Author -Top 20 (as of April 2007)

Country or State	No. of Works	Authors	Works/author
United Kingdom	28828.34	1190.58	24
Germany	18771.97	946.63	20
MA (US)	16365.38	374.54	44
CA (US)	13876.13	371.98	37
Canada	13235.33	631.33	21
Italy	11195.1	951.96	12
France	10223.94	793.4	13
DC (US)	10007.69	482.23	21
NY (US)	9020.08	322.66	28
Netherlands	8318.36	418.79	20
Spain	8313.71	713.96	12
Australia	7378.05	355.81	21
IL (US)	5123.83	171	30
PA (US)	4582.46	142.16	32
Switzerland	4151.16	204.31	20
Sweden	3835.16	233.66	16
Missouri (US)	3784.33	83.16	46
Belgium	3781.11	277.64	14
Iowa (US)	3500.16	55.11	64
CT (US)	3304.33	101.66	33

Source: RePEc (Top Countries and States as of April 2007).

From Table 22 it is apparent that the US is the largest contributor of works in RePEc. The total share of all works accounted for by the US is 41.8%. The share for the UK is 15.37%, for France 5.45%, Spain 4.43%, Netherlands 4.43%, Germany 10.01%, Canada 7.06% and Australia 3.93%. However, when output per author is estimated, the UK's rank drops to ninth, following the US states of Iowa, Missouri, Massachusetts, California, Connecticut, Pennsylvania, Illinois and New York. It should be noted that, for the first two states, their indicated high performance may be driven by the small number of registered authors. Therefore this measure should be treated with caution.

[44] These rankings are therefore sensitive to differences in registration practices across countries and states. One potentially relevant factor would be different practices with regard to the registration of graduate students (with no or a low number of outputs listed) in addition to regular faculty.

Table 23: RePEC Total Citations and Citations per Author - Top-20 (as of April 2007)

Country or State	No. of Citation	Authors	Citations/author
MA (US)	106903.5	374.54	285
CA (US)	59343.03	371.98	160
United Kingdom	56491.95	1190.58	47
NY (US)	41065.16	322.66	127
IL (US)	34179.25	171	200
DC (US)	31256.55	482.23	65
Germany	26375.12	946.63	28
NJ (US)	21192.48	71.88	295
Canada	17861.39	631.33	28
PA (US)	15551.51	142.16	109
Italy	14779.25	951.96	16
France	13213.84	793.4	17
Spain	10648.69	713.96	15
Netherlands	10067.91	418.79	24
MI (US)	7841.66	48.33	162
NC (US)	7632.33	74.16	103
Switzerland	7458.68	204.31	37
MI (US)	7392.43	122.08	61
MO (US)	7309.33	101.66	72
RI (US)	7233.83	31.33	231

Source: RePEc (Top Countries and States as of April 2007).

Equally, from Table 23, the UK is third best performer in total citation rankings with a total of 54,332 citations, preceded only by Massachusetts and California. However, when per author values are calculated, the UK is found to lag behind all of the US states that are included in this list. The highest average number of citations per author is achieved by New Jersey and Massachusetts, although New Jersey has a relatively small number of registered authors. It should be noted, however, that the UK is the top performer among the European countries, followed by Switzerland with an average of 37 citations per author. Appendix D contains the complete rankings for total output and citations (and their corresponding average values) for all the countries listed in RePEc. It is worth noting that, using the same figures, the per author number of (RePEc-registered) output was 16.11 for the EU, 29.34 for the US and 14.15 for EU (excluding UK). The impact of the UK on EU performance was even more noticeable when average citations per author is considered. EU authors have a total of 24.04 citations, compared to the US and EU (excluding the UK), which have 114.86 and 18.48 total citations, respectively. The corresponding figures for the UK alone were 24 registered works and 47 citations, per author. In calculating the world-wide average, the number of citations per author is approximately 47, i.e. exactly the UK average. Thus measuring the citations per author relative to the world average, we see that the US has 2.3 times the world average whereas the figure for the UK is 1.0, and for other countries the figures are: France 0.35, Spain 0.32, Netherlands 0.49, Germany 0.58, Canada 0.61 and Australia

0.37. This shows the UK performing at the world-wide average but that these citation rates are dominated by the US performance.

Table 24 uses RePEc data on individual performance to give the distribution of RePEc's top-5% authors across countries.[45] The table ranks countries and US states by author affiliation.[46] The results that are obtained show the US in a dominant position but the UK is dominant over all other countries. These results are broadly in line with those presented earlier (Table 9) using Coupé's [2003] data on top economists.

Table 24: RePEc's Top 5% Authors (as of April 2007)

	Country	**Representation in (1st affiliation)**		**US State**	**Representation in (1st affiliation)**
1	US	418	**1**	CA	80
2	UK	59	**2**	MA	73
3	CANADA	21	**3**	NY	51
4	FRANCE	11	**4**	IL	42
5=	GERMANY	9	**5**	NJ	23
5=	ITALY	9	**6**	DC	19
5=	SWITZERLAND	9	**7**	PA	18
8=	AUSTRALIA	8	**8**	MI	13
8=	ISRAEL	8	**9**	CT	11
10	SPAIN	6	**9=**	MO	11
11	DENMARK	3	**11**	NC	10
11=	HOLLAND	3	**12**	OH	8
13=	ARGENTINA	2	**13=**	MD	7
13=	CHILE	2	**13=**	WI	7
13=	JAPAN	2	**15**	IA	6
16=	AUSTRIA	1	**16=**	MN	5
16=	BELGIUM	1	**16=**	RI	5
16=	CHINA	1	**18=**	AZ	4
16=	COLOMBIA	1	**18=**	TX	4
16=	HUNGARY	1	**18=**	VA	4
16=	IRELAND	1	**21=**	KY	3
16=	SOUTH KOREA	1	**21=**	NH	3
16=	SWEDEN	1	**21=**	SC	3

Source: Data from RePEc.

[45] Our results are based on performance measured as the harmonic average of 24 sub-measures of performance provided by RePEc, including number of works, (simple and recursive) impact factors, number of distinct works and popularity as captured by total downloads/abstract views.

[46] To determine the prime affiliation acquire we looked through the CVs and web pages of each of the listed authors. We used as prime affiliation either the one that carried the highest weight (when weights were specified by the author) or the one that was closest to his/her home address.

Table 25: RePEc Downloads and Abstract Views (as of April 2007)

		Downloads				Abstract Views			
Country	**Obs**	**1 month**	**3 months**	**12 months**	**Total**	**1 month**	**3 months**	**12 months**	**Total**
Australia	61	89	253	1064	3562	307	4051	883	16860
Austria	13	106	289	1213	4586	346	4448	982	17623
Belgium	39	99	289	1082	3550	301	3689	879	13891
Canada	95	95	272	1113	4529	360	4526	1038	23770
Denmark	24	88	270	1130	5412	271	3767	838	19800
Finland	8	64	195	814	2461	205	3155	635	9855
France	75	109	316	1256	4640	334	4310	993	19188
Germany	249	115	327	1324	4908	370	4912	1094	21661
Ireland	10	239	668	2611	9364	607	7689	1755	33815
Israel	26	117	347	1344	4732	377	5101	1146	22199
Italy	107	111	312	1205	4176	315	4010	925	15578
Japan	8	102	283	1144	4139	291	3806	846	17274
Luxembourg	3	114	315	1259	4341	287	3793	888	14069
Netherlands	95	98	285	1191	5274	282	3912	847	18575
New Zealand	11	138	379	1552	5995	418	5206	1185	22237
Norway	21	72	219	889	3339	249	3566	774	15289
Portugal	14	71	213	1154	2760	206	3113	625	9474
Spain	61	135	387	1551	6779	450	5892	1294	26668
Sweden	38	87	266	1074	4537	292	3935	877	18962
Switzerland	51	141	389	1603	5429	382	5015	1110	18934
UK	367	121	346	1404	5449	371	4915	1096	22115
US	999	153	439	1766	6942	458	5967	1346	27587

Source: Data from RePEc.

The UK's leading position in Europe is also confirmed when data on RePEc downloads is examined. For Figures 4–8, we have used RePEc data on total downloads for the period April 2006–April 2007. This data captures the total number of times the works (working papers, journal articles and chapters) for each of the listed author have been downloaded during the sample period. After grouping the authors according to the host country of their main affiliation, we kept only those who had 525 or more total downloads over the last 12 months. It should be noted here that some of the authors in our sample claim more than one main affiliation, in which case credit is given to all of the related host countries.

In the figures that follow we plot for each country the (scaled) total number of each author's downloads over last 12 months against their rank. For country groups[47] it should be noted that Germany & Austria appear to follow closely the UK's performance. It is likely that the performance of this group may have benefitted substantially from the presence of IZA and the great number of fellows affiliated with the research institute. The impact of multiple affiliations may be seen more clearly when the performance of EU (excluding Greece and UK) is examined. To construct this group we first eliminated all multiple entries (i.e. authors who appeared to enter twice or more, through different member-states, due to multiple affiliations). After these adjustments were carried out it can be seen from Figure 8 that the EU (excluding Greece and the UK) marginally dominates the UK in the number of downloads of scholarly work over the last 12 months. More detailed information about individual country performances can be found in Appendix B, showing the survival function of total downloads for each individual country. For the UK, for instance, these plots indicate that less than 20 per cent of the sampled elite authors earned more than 2,000 downloads over the last twelve months; whereas the corresponding share for the US was just over 2,500 downloads.

Table 25 provides an overview of the performance of each country, measured as the average per author number of downloads/abstract views over the last 1, 3 and 12 months and total.[48]

[47] The Scandinavian group uses the combined output of Denmark, Finland, Norway and Sweden.

[48] We define as total downloads and abstract views the number of downloads/abstract views an author has earned over the entire period their work remained registered with RePEc.

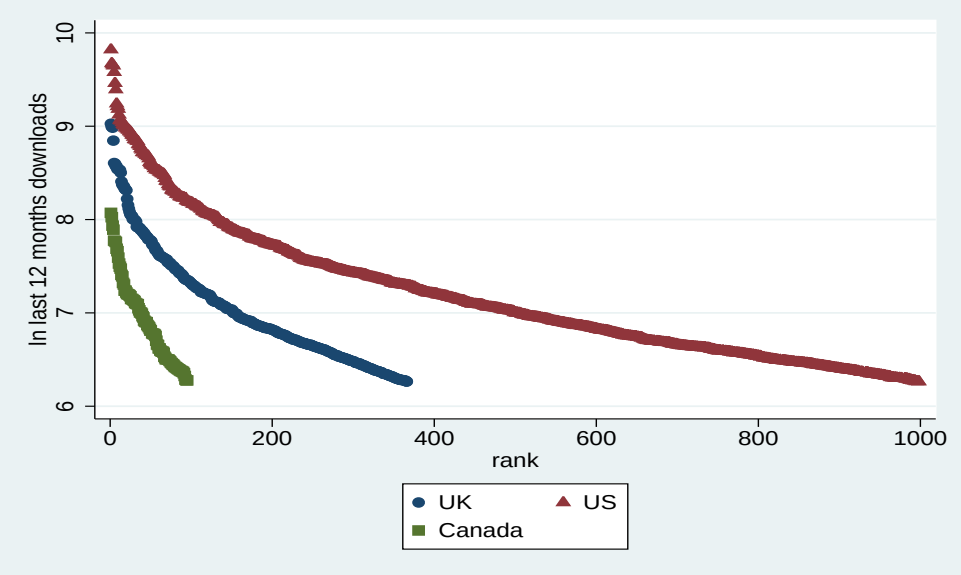

Figure 4: Twelve-month Downloads from RePEC Ranked by Author: Canada, UK and US

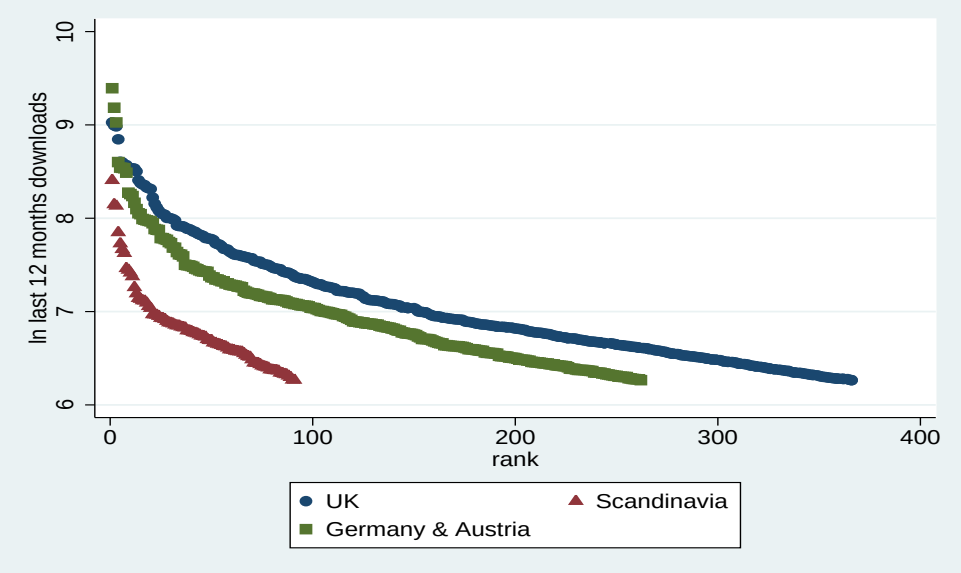

Figure 5: Twelve-month Downloads from RePEC Ranked by Author: Germany & Austria, Scandinavia and UK

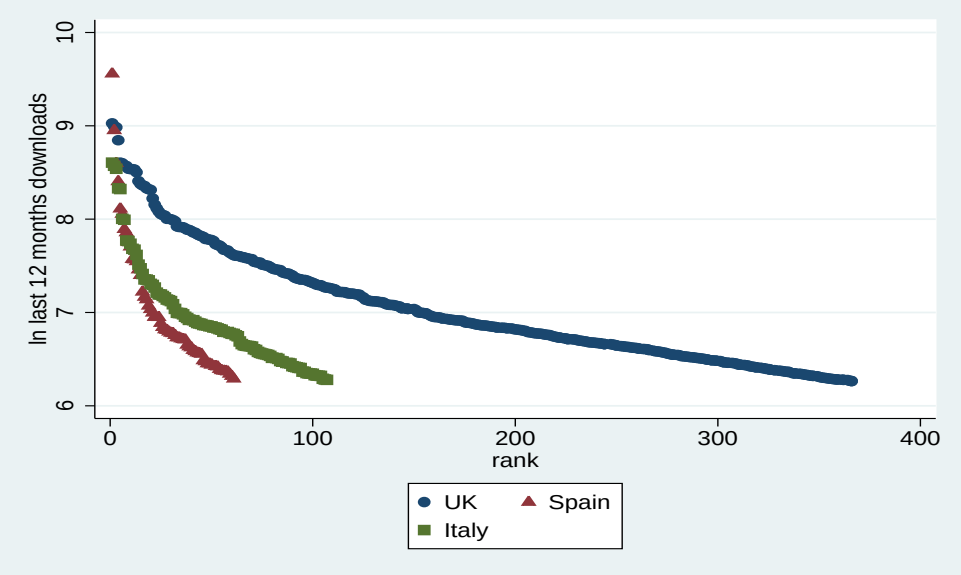

Figure 6: Twelve-month Downloads from RePEC Ranked by Author: Italy, Spain and UK

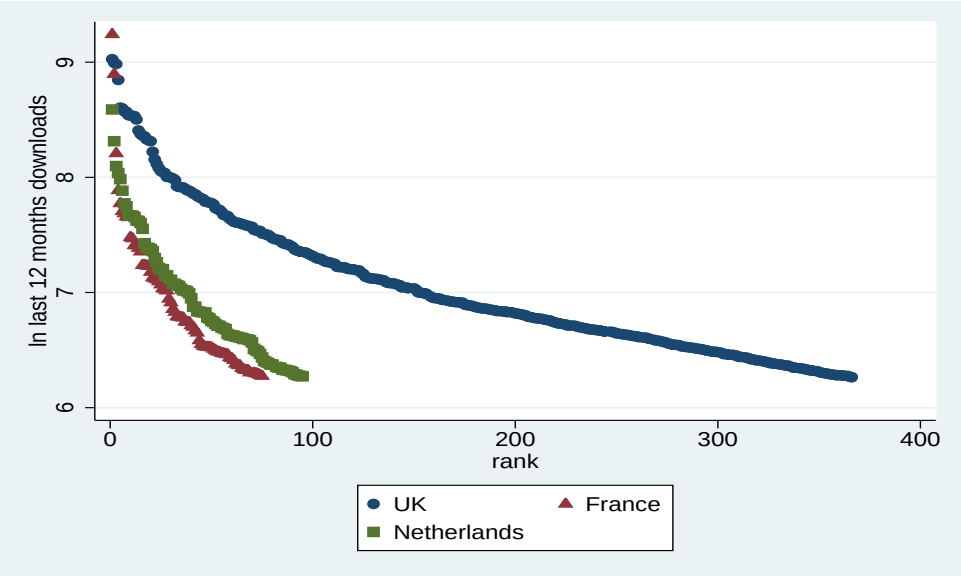

Figure 7: Twelve-month Downloads from RePEC Ranked by Author: France, Netherlands and UK

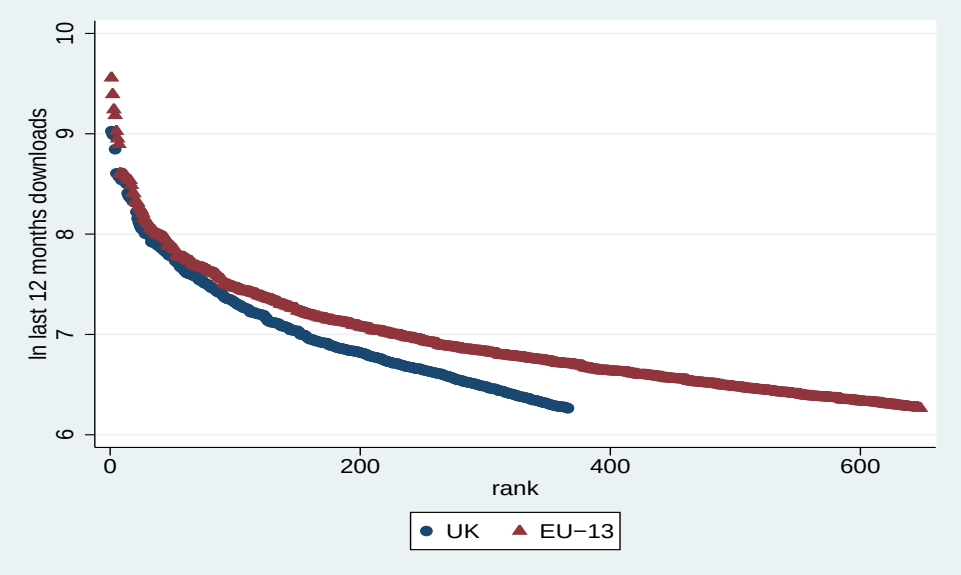

Figure 8: Twelve-month Downloads from RePEC Ranked by Author: EU (excluding Greece and UK) and UK

6 Non-bibliometric indicators

Traditional bibliometric indicators have been widely used in assessing research institute and individual research performance and have been used as criteria on deciding institutional rankings, journal ratings and individual hires and promotions.[49] Nevertheless other esteem indicators are also widely used in assessing research performance. Assessing prestige and esteem is clearly more subjective but some indicators can be quantified and may be used for comparison purposes. In this category might be honours, awards, grants and prizes, election to learned academies and academic professional associations, office bearers in learned academies and academic professional associations, conference participation and service to journals. Before considering this information we briefly consider available information on UK capacity in economics.

6.1 Evidence from non-bibliometric indicators

There are many potential non-bibliometric indicators and here we include just two (that are readily available) (i) the Marie Curie scholarships as awarded to individual researchers and their affiliated institutions across the EU (excluding Luxembourg, Ireland and Finland) during the period 1990-2002 (Table 26); and (ii) the distribution of fellowships to the Econometric Society (ES) from 1944 to 2005 (all available data - up to end of November 2006- has been included) - see Table 27. Table 26 shows that most fellowships were held in UK universities (about 30% of the total). Table 27 presents the number of Econometric Society fellows across years and countries. Once again the US is found to be dominant, with an average share of active members very close to 70%. The UK comes second again but with an expanding share. The average share of UK-base Econometric Society fellows for the period 1944-2005 is 8.88%.

7 Research capacity

This section provides some brief statistical and demographic information about the research capacity of UK economics. Economics within the UK higher education sector is undertaken both within self-standing department of economics and within wider schools of Business or Social Science. The Conference for Heads of University Departments of Economics undertook a survey in 2004 which showed that the mean size of an economics unit was about 20 full-time equivalent staff (with a median of 16). Around 20-30 economics groups are within self-standing departments of economics with the majority of other groups within business schools. There has been a recent tendency to incorporate economics within wider schools in recent years and of the 54 respondents to the survey 17 indicated that the position had changed in the previous three years. This was usually because of a wider and more general University reorganisation.

One implication of this structure is that a number of economists within business schools are submitted to the business and management panel for research assessment purposes rather than

[49] See Holcombe [Econ Journal Watch, 2004] for a more detailed discussion of the impact of metrics on research planning in US economics.

Table 26: Marie Curie Bursaries by Country 1999-2002 (%)

Country	Awards
AUSTRIA	1
BELGIUM	15
GERMANY	2
DENMARK	2
SPAIN	14
FRANCE	7
GREECE	2
ITALY	4
NETHERLANDS	15
PORTUGAL	1
SWEDEN	2
UK	27
TOTAL	92

Source: Data from DG-Research [2004], pp.187-188.

the economics and econometrics panel. This means that looking purely at outcomes from the economics and econometrics panel can be misleading in assessing UK research performance in economics. A second implication is that data collected by the Higher Education Statistics Agency (HESA) and by the Economic and Social Research Council (ESRC) can use slightly different definitions of what constitutes a unit or economics group and therefore the data is not always comparable or consistent.

In addition there are many economists working in the public sector but outside the universities. Over 1000 economists work for the Government Economic Service (GES) in over 30 different departments and the GES hires around 100 new graduate economists each year. Equally the Bank of England employs many economists in its research departments and runs its own highly-esteemed centre for central banking studies. The importance of evidence based policy research to which economics contributes is clearly significant for government and the public good. However, this significance is difficult to quantify so that the remainder of the section will concentrate mainly on the higher education sector.

Table 28 provides information on UK Social Sciences. It is based on the returns to Research Assessment Exercise (RAE) 2001 and data from the Higher Education Statistics Agency (HESA). HESA collects data each year grouped according to RAE discipline categories.[50] Column (1) presents the total number of research active academic staff per discipline, column (3) shows

[50] In principle the HESA data and RAE data are comparable but the data is based on self-reporting of staff in each category and this may lead to some inconsistencies. These inconsistencies may be quite marked as economists may be submitted either to the economics and econometrics or the business and management panels for the research assessment exercise.

Table 27: Econometric Society: New Fellows by Country up to 2005 (%)

	<1960	1960-1969	1970-1979	1980-1989	1990-1999	2000-2005	all years
UK	4.35%	7.32%	7.41%	9.35%	7.14%	8.89%	7.89%
USA	69.57%	58.54%	61.48%	69.78%	75.00%	67.78%	68.29%
Brazil	0.00%	0.00%	0.00%	0.72%	0.00%	1.11%	0.34%
Spain	0.00%	0.00%	0.74%	0.72%	0.60%	3.33%	1.01%
Israel	0.00%	4.88%	5.19%	4.32%	2.38%	3.33%	3.69%
Belgium	0.00%	4.88%	1.48%	2.16%	1.19%	0.00%	1.51%
France	21.74%	9.76%	3.70%	3.60%	4.17%	4.44%	5.03%
Australia	0.00%	0.00%	0.74%	2.16%	0.60%	0.00%	0.84%
Denmark	0.00%	0.00%	0.00%	0.00%	0.60%	1.11%	0.34%
Netherlands	0.00%	2.44%	2.22%	0.00%	0.60%	1.11%	1.01%
Austria	0.00%	0.00%	0.00%	0.72%	0.60%	0.00%	0.34%
Canada	0.00%	0.00%	1.48%	0.00%	1.79%	1.11%	1.01%
Japan	0.00%	7.32%	1.48%	1.44%	2.98%	1.11%	2.18%
Germany	0.00%	2.44%	2.96%	0.72%	0.60%	2.22%	1.51%
Switzerland	4.35%	0.00%	0.00%	1.44%	0.00%	0.00%	0.50%
Hungary	0.00%	2.44%	2.96%	0.72%	0.00%	0.00%	1.01%
Sweden	0.00%	0.00%	0.74%	0.00%	1.19%	0.00%	0.50%
Russia	0.00%	0.00%	2.22%	0.72%	0.00%	0.00%	0.67%
Ireland	0.00%	0.00%	0.00%	0.72%	0.00%	0.00%	0.17%
Korea	0.00%	0.00%	0.00%	0.00%	0.00%	1.11%	0.17%
India	0.00%	0.00%	1.48%	0.00%	0.00%	1.11%	0.50%
Finland	0.00%	0.00%	0.00%	0.00%	0.60%	0.00%	0.17%
Turkey	0.00%	0.00%	0.00%	0.00%	0.00%	1.11%	0.17%
Italy	0.00%	0.00%	1.48%	0.72%	0.00%	1.11%	0.67%
Poland	0.00%	0.00%	1.48%	0.00%	0.00%	0.00%	0.34%
Norway	0.00%	0.00%	0.74%	0.00%	0.00%	0.00%	0.17%

Source: Econometric Society's list of members.

the total number of A and A* researchers submitted to RAE2001[51] and columns (2) and (4) give the corresponding shares. This shows a relatively low proportion of economics staff submitted to the economics and econometrics panel at the research assessment exercise. This is probably an underestimate given that many economists will have been submitted to the business and management panel.

The distribution of academic staff across academic grades, as well as the new hires and promotions are presented in Table 29, based on data drawn from the *RES Survey on Gender and Ethnic Balance 2004* [Burton and Humphries, 2006]. The survey collected responses from a total of 79 economic departments, business and management schools in the UK. This shows approximately 1400 economics research staff in UK universities. Approximately 30% are at professorial or reader level. Roughly 10% of the total staff were new lectureship hires in 2004.

There is also strong evidence that economics in the UK is becoming increasingly internationalised. The ESRC Demographic Review of the Social Sciences in the UK reports that in their survey 40% of UK academic economists had obtained their highest degree from a US institution and less than half of the staff under 35 were UK nationals. There is also evidence that around 40% of new appointments have first degrees from EU member states other than the UK. Typically these individuals study for higher degrees in the UK and then stay on in UK academia.

Tables 30 and 31 provide some international comparisons. They use information from the Economics Departments, Institutes and Research Centers (ERDIC) database at RePEc on the number of research centres in economics in each country or US state. The construction of the tables involved three stages: we first identified the top-20% of each country's research institutes, based on the research performance of the authors who are listed as affiliated with each institute. Then we obtained for each of the top-20% institutes the total number of staff who are registered with RePEc. These two series were then used to estimate the average size of Economics institutes for each of the examined countries. A summary of the findings is presented in Table 30. Table 31 provides a more complete ranking. The information is dominated by the large research centres such as CEPR, NBER and IZA which host many research associates and affiliates from other institutions. Washington DC also features prominently as it includes international organisations, such as the World Bank and the IMF. This may make the data less useful for comparison purposes.

[51] The category A are staff in post at and prior to the time of the exercise and the category A* are the staff who have recently joined or left at the time of the exercise. The category A* has been abandoned for the current RAE2008.

Table 28: RAE 2001: Researchers in Social Sciences

	Total FTEs (HESA 2003/4)	**% - FTEs** (HESA 2003/4)	**Staff: A & A*** (2001 RAE)	**% of staff submitted** (2001 RAE)
Business and Management	6049	24.91%	2412	45.80%
Education	5094.5	20.98%	1963	42.50%
Psychology	2871.4	11.83%	1234	64.40%
Social Policy and Administration	1773.1	7.30%	926	68.40%
Geography	1759.8	7.25%	1151	73.60%
Economics and Econometrics	1530.7	6.30%	798	57.00%
Politics and International Studies	1407.4	5.80%	1077	79.30%
Sociology	1400	5.77%	822	63.10%
Social Work	812.8	3.35%	364	44.80%
Town and Country Planning	677.9	2.79%	351	51.70%
Linguistics	574.8	2.37%	210	87.40%
Anthropology	331	1.36%	216	92.70%
Total	24282.4		11524	

Source: ESRC, "Demographic Review of the UK Social Sciences". pp.20-21

Table 29: UK Economics Staff by Grade (2004)

	No of Staff		**Promotions**		**New Staff**
Grade	Total	%	Total	%	
Professors	316	22.60%	41	23.70%	23
Readers	101	7.22%	43	24.86%	9
Senior Lecturers	266	19.02%	60	34.68%	16
All Lecturers	535.5	38.29%	29	16.76%	126.7
All researchers	180	12.87%			
Total	1398.5		173		**174.7**

Source: Burton and Humphries [2006], pp.6,7,15,16

Table 30: Country Shares in ERDIC's Top-20% Economics Institutes (as of April 2007)

Country/State	Top -20	Size - Staff	Average Size
Australia	17	261	15
Austria	5	67	13
Belgium	11	261	24
Canada	23	522	23
Denmark	6	92	15
Finland	5	32	6
France	38	722	19
Germany	40	1079	27
Ireland	3	39	13
Israel	4	52	13
Italy	37	851	23
Japan	13	73	6
Luxembourg	3	10	3
Switzerland	12	163	14
Sweden	11	172	16
Spain	30	500	17
Portugal	8	144	18
Norway	4	73	18
New Zealand	5	47	9
Netherlands	16	433	27
UK	45	1215	27
CA	15	271	18
CT	4	92	23
DC	13	449	35
NY	15	268	18
MA	10	494	49
US	82	1938	29

Source: Data from ERDIC/RePEc.

Table 31: ERDIC's Top Research Centres and Institutes (as of April 2007)

	Country/State	No of Institutes		Country/State	Staff registered		Country/State	Average Size
1	US	82	**1**	US	1938	**1**	MA	49
2	UK	45	**2**	UK	1215	**2**	DC	35
3	Germany	40	**3**	Germany	1079	**3**	US	29
4	France	38	**4**	Italy	851	**4**	Netherlands	27
5	Italy	37	**5**	France	722	**5**	UK	27
6	Spain	30	**6**	Canada	522	**6**	Germany	27
7	Canada	23	**7**	Spain	500	**7**	Belgium	24
8	Australia	17	**8**	MA	494	**8**	Italy	23
9	Netherlands	16	**9**	DC	449	**9**	CT	23
10	CA	15	**10**	Netherlands	433	**10**	Canada	23
11	NY	15	**11**	CA	271	**11**	France	19
12	Japan	13	**12**	NY	268	**12**	Norway	18
13	DC	13	**13**	Australia	261	**13**	CA	18
14	Switzerland	12	**14**	Belgium	261	**14**	Portugal	18
15	Belgium	11	**15**	Sweden	172	**15**	NY	18
16	Sweden	11	**16**	Switzerland	163	**16**	Spain	17
17	MA	10	**17**	Portugal	144	**17**	Sweden	16
18	Portugal	8	**18**	Denmark	92	**18**	Australia	15
19	Denmark	6	**19**	CT	92	**19**	Denmark	15
20	Austria	5	**20**	Japan	73	**20**	Switzerland	14
21	Finland	5	**21**	Norway	73	**21**	Ireland	13
22	New Zealand	5	**22**	Austria	67	**22**	Israel	13
23	Israel	4	**23**	Israel	52	**23**	Austria	13
24	Norway	4	**24**	New Zealand	47	**24**	New Zealand	9
25	CT	4	**25**	Ireland	39	**25**	Finland	6
26	Ireland	3	**26**	Finland	32	**26**	Japan	6
27	Luxembourg	3	**27**	Luxembourg	10	**27**	Luxembourg	3

Source: Data from ERDIC/RePEc.

Table 32 uses HESA data on the number of research students in economics and other social sciences for the period 2003/04 to 2004/05. As of 2004/05 there were 1175 full time and 835 part time economics research students registered with UK universities.[52] Over the same period, the number of research students increased by more than 7 per cent although part-time numbers remained unchanged. Economics is the second most popular subject in the Social Studies for full time research students with greater numbers only in Politics. As of 2004/05 Economics accounted for 21.5 per cent of the total Ph.D. training courses offered by the Social Studies.

There has however been a longstanding concern with the low percentage of registered PhD students who are of British citizenship. This has been documented and commented upon by Machin & Oswald [2000] who ascribed most of the problem to the higher pay for economists in the private sector. The ESRC has since done much to improve PhD stipends and develop a postdoctoral fellowship programme to enable good students to be retained within the academic sector. Many universities are now offering better PhD training in line with US practice. There does, however, remain a worry about the size of the future generation of British-born economists.

Research income comes from two main sources: from the funding councils through the Quality Related (QR) income and from research grants from research councils, government bodies, charities and other sources. The importance of both sources is roughly comparable. In economics QR funding accounts for approximately 60% and research grant income for about 40% of the total although there is some variability in these figures over time. Table 33 shows total research grant income in each of the social science disciplines for the period 2000-5 ranked by average funding per department. Table 34 presents information on research income and funding sources for the period 1995-2001 using information from the 2001 RAE returns. The upper panel of this table shows the total inflows of research funding for all UK Economics. Total research funding increased over the period 1996-2000 by 4.38% to £5,695,922. The main source of research funding for economics is the research councils, predominantly the ESRC, which account for more than 40% of total funding. The lower panel of the table presents the same set of information for all UK Economics excluding Oxford, Cambridge and LSE. These three departments receive on average more than 30% of total research income over the period 1996-2000. Table 35 shows the actual QR funding allocation for 2006/07 for a number of social science disciplines from the Higher Education Funding Council for England.[53] Income is distributed on the basis of the number of full-time equivalent staff submitted at RAE2001 and the grade achieved.[54] Therefore Table 35 gives the total funding for the discipline and the amounts distributed per member of staff submitted in 2001 for each grade 4, 5 and 5*.[55]

[52] The figures include students reading for the degrees of M.Phil. and Ph.D. in Economics or an Economics related subject. This number may also include some Business School students.

[53] Slightly different rates apply in Wales, Scotland and Northern Ireland. Also note differences are due to the funding method and that HEFCE does not have a policy of funding differentially the various social sciences.

[54] There is also a small weighting given on the basis of the current number of research fellows and research assistants.

[55] Note that grades are awarded separately by each discipline and are therefore not necessarily comparable across disciplines.

Table 32: FT and PT Research Students Across UK Social Sciences and Business: 2003-2005

	Higher degree (FT research)		**Higher degree (PT research)**	
	2004	**2003**	**2004**	**2003**
Social studies	**5445**	**5130**	**5120**	**5260**
Broadly-based programmes within social studies	5	0	10	0
Economics	1175	1130	835	835
Politics	1435	1385	1140	1105
Sociology	920	860	1150	1175
Social policy	430	455	560	645
Social work	95	85	350	420
Anthropology	495	420	310	315
Human & social geography	590	580	450	435
Others in social studies	300	220	315	330
Business & administrative studies	**2475**	**2335**	**3120**	**3065**
Broadly-based programmes within business & administrative studies	0	0	0	0
Business studies	1310	1270	1765	1790
Management studies	720	645	930	855
Finance	145	140	80	95
Accounting	165	160	130	120
Marketing	50	45	65	60
Human resource management	40	35	65	70
Office skills	0	0	0	0
Tourism, transport & travel	35	30	50	50
Others in business & administrative studies	10	10	25	25

Source: Data from Higher Education Statistics Agency Ltd. [2004,2005]

Table 33: ESRC Accreditation and Income across the Social Sciences 2000-5.

	Accredited Depts.	PhD Completions	Research Inc.	Ave. per annum	Ave. per dept. per annum
Demography	4	113	20,033,000	3,338,833	834,708
Planning	18	368	78,855,000	13,142,500	730,139
Advanced Quantitative Methods	12	156	47,635,985	7,939,331	661,611
Education	35	1773	136,629,000	22,7771,500	650,614
Psychology	58	1588	171,544,000	28,590,667	492,943
Social policy	44	857	125,484,000	20,914,000	475,318
Human Geography	39	1094	11,039,000	18,506,500	474,526
Management	67	2523	182,767,000	30,461,167	454,644
Science, Technology and Innovation	16	503	40,281,000	6,713,500	419,594
Sociology	57	1156	95,321,000	15,886,833	278,716
Economics	**40**	**966**	**62,826,000**	**10,471,000**	**261,775**
Politics	57	1528	88,127,000	14,687,833	257,681
Social Work	23	284	28,732,000	4,687,667	208,203
Socio-legal Studies	25	349	29,968,000	4,994,667	199,787
Economic and Social History	25	582	28,244,000	4,704,000	188,160
Social Anthropology	16	511	17,304,000	2,884,167	180,260
Linguistics	18	512	18,097,000	3,016,167	167,565
All Social Sciences (exc. Law)	554	15245	1,282,867,985	213,811,331	385,941

Source: Mills [2006], p.14, based on ESRC recognition data from 2005.

Table 34: Sources of Research Income in the UK 1995-2001 (in £s)

All UK						
Source of income (Net VAT)	**Partial 1995-96**	**1996-97**	**1997-98**	**1998-99**	**1999-2000**	**Partial 2000-01**
OST research councils et al	3,658,550	5,580,449	5,550,103	5,807,354	5,695,922	2,748,593
UK-based charities	405,255	1,149,288	1,055,856	1,385,827	1,623,553	798,780
UK central government bodies	621,087	1,215,466	1,608,631	1,834,984	1,671,089	767,521
UK industry, commerce and public corporations	133,022	174,595	297,098	376,135	300,280	240,791
EU government bodies	1,139,721	1,979,215	1,811,023	1,374,023	1,314,092	415,381
Other	653,187	1,638,261	1,246,267	1,108,655	1,803,392	1,573,173
Total	**6,610,822**	**11,737,274**	**11,568,978**	**11,886,978**	**12,408,328**	**6,544,239**

Excluding Oxbridge and LSE						
Source of income (Net VAT)	**Partial 1995-96**	**1996-97**	**1997-98**	**1998-99**	**1999-2000**	**Partial 2000-01**
OST research councils et al	2,368,061	3,451,509	3,212,944	3,281,145	3,120,649	1,834,491
UK-based charities	257,759	727,494	704,881	1,099,869	1,132,671	620,105
UK central government bodies	369,179	665,219	851,707	1,022,620	1,168,563	419,412
UK industry, commerce and public corporations	132,059	174,595	265,071	312,765	254,588	240,791
EU government bodies	686,689	1,035,182	911,538	805,876	679,770	230,797
Other	212,587	366,482	316,310	341,761	499,741	174,085
Total	**4,026,334**	**6,420,481**	**6,262,451**	**6,864,036**	**6,855,982**	**3,519,681**

Source: Department-level data from RAE01. Author's standardisations and aggregations.

Table 35: QR Funding from HEFCE 2006/07.

	Total Funding	**4**	**5**	**5***
Economics	14,386,496	9,752	30,452	38,500
Anthropology	4,9991,667	8,135	25,379	32,114
Politics & IR	17,736,600	9,867	30,784	38,954
Social Policy and Administration	13,078,760	11,525	35,957	45,500
Social Work	2,664,362	8,073	25,186	31,870
Sociology	12,303,316	9,230	28,786	36,438
Business & Management	29,866,239	9,752	30,452	38,500
Accounting & Finance	2,713,803		22,195	28,086
Education	26,544,213	12,097	37,741	47,758
Psychology	22,932,424	11,511	35,912	45,443

Source: HEFCE Funding Data.

8 Conclusions

It is difficult to gauge research quality and impact with a single measure. Evidence is often only partial and the distributions of publication and citations are highly skewed and therefore require careful interpretation. This report therefore concentrates on bringing together available information from a variety of sources to establish if any broad conclusions can be drawn. Furthermore, in assessing comparative research performance, one would like to measure productivity as well as research quality and research impact. There are, however, many difficulties in making such an assessment. The report has discussed some of the difficulties in measuring research quality and impact and has discussed the need for using up-to-date information. We have considered some measures of UK research capacity including research income but it is difficult to make meaningful cross-country comparisons of research productivity because of the difficulties in separating teaching and research activities and because of the use of different funding methods across countries.

Nevertheless it is possible to reach some broad conclusions on the basis of the evidence. The existing bibliometric evidence shows UK economics in a healthy state. Although there is evidence of US dominance, the UK is well placed and the recent evidence from the ISI citations, JSTOR usage data and RePEc data is that the UK is second after the US. There is healthy evidence of a strong internalisation of research capacity in economics in the UK with a large number of US trained researchers and a large number of non-UK but UK trained researchers particularly at the junior level. There is some evidence from bibliometric data of a stronger growth in UK citations and publications relative to the US. The UK publishes on average in average quality journals but these UK publications on average generate more citations than would be expected from these quality of journals. There is also some evidence that the UK is particularly strong in labour and demographic economics, econometric theory, economic development and in applied econometrics when compared with other EU countries.

There is, however, some other evidence suggesting that capacity building for the future will remain important. Firstly, there is some evidence in the bibliometric data which shows a significantly improved position for some European countries, notably, Spain, the Netherlands and Portugal and these countries are likely to provide increased competition for the UK in the future, in addition to the competition from the more established European competitors of France and Germany. Secondly, evidence from RePEc suggests some increased US dominance. This may be an artefact that the RePEc data is censored by self-registration but the dominance of the US is somewhat surprising given that RePEc developed out of the UK WoPEc and NetEc projects which was partially ESRC sponsored. Thirdly, the capacity of UK economics looks somewhat weak compared to other UK social science disciplines when one considers the number of researchers sub-

mitted to the economics and econometrics panel at the Research assessment Exercise and the relatively small number of 5 and 5* rated departments.[56]

The report also raises some issues for future evaluations of research performance. The evidence we have presented shows a strong correlation between publications, citation and usage data from a variety of sources. This suggests that at least at an aggregate level, using either a basket of measures or a measure least subject to manipulation, such as weighted publications, may produce reliable and robust evidence for evaluation purposes. However, there is evidence that citation and publication practices differ across sub-disciplines and hence there is the possibility that using a single measure may undervalue some fields relative to others. Furthermore, citations are inherently backward-looking and hence risk giving less weight to current and new research.

[56]There are some reasons why this weakness is more apparent than real. Firstly, a number of economics departments submit to the business and management panel at the research assessment exercise. Secondly, the Research Assessment Exercise has standard criteria across disciplines for the award of each grade but grades are not necessarily comparable across disciplines.

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A Measuring relative research quality

This appendix outlines some of the issues involved in measuring relative research performance across countries and measuring research quality. Section A.1 considers some of the issues and scale effects of measuring relative research performance, Section A.2 examines how impact factors are measured and used Section A.3 discusses some statistical properties of bibliometric indicators.

A.1 Measuring relative performance

The usual method for assessing research performance is to calculate the relative or comparative impact factors. Thus measuring impact as the ratio of citations to publication, the impact of country i is given by the citation rate $\mathrm{I}_i = c_i / p_i$ where c_i is citations and p_i is publications and the comparative impact of country i is $\mathrm{CI}_i = \mathrm{I}_i / \mathrm{I}_r$ where I_r is the reference citation rate.

There are many ways to construct reference measures. It could just be average world citation rates or each article can be measured relative to the average citation rates for publications in that journal in that year or relative to a broader citation rate for a set of journals in the field. By plotting the observed citation rate for a country against the reference level, it can be seen whether a country is on average publishing in higher impact journals and whether the country is generating more than average citation rates from the journals in which it is publishing.

There are a number of issues that arise in the use of these relative measures. First publications and citations tend to be related by a power law so that there may be scale effects in measurement. Secondly, the relative measures give only means and therefore do not fully reflect the skewness of the distribution.

In a series of papers[57] Katz has suggested that the relationship between citations and publications exhibits a *cumulative advantage* or *Matthew effect*. That is the relationship between citations and publications exhibits increasing returns. Thus individuals, groups or countries that have more publications will tend to have disproportionately larger numbers of citations.[58] Katz shows that the growth rate in citations is higher than the growth rate of publications. To see that this implies a power-law relationship between citations and publications suppose that publications and citations follow approximately exponential growth functions:

$$p = a\,e^{\alpha t}; \qquad c = b\,e^{\beta t}.$$

It therefore follows from that

$$c = k p^n$$

[57] See e.g. Katz [2000] and Katz [2005].

[58] The term Matthew effect was coined by Robert K. Merton [1968] after the verse in the Gospel of Matthew: "For unto everyone that hath shall be given, and he shall hath abundance: but from him that hath not shall be taken away even that which he hath".

where

$$k = a^{-\frac{\beta}{\alpha}} b \qquad \text{and} \qquad n = \frac{\beta}{\alpha}.$$

If $\beta > \alpha$ then $n > 1$ and there are increasing returns. Alternatively the citation rate $c/p = kp^{n-1}$ is increasing in p if $n > 1$. This appears to be the case in most data analysed.[59] Katz therefore proposes estimating k and n from a double log regression of p on c and computing an expected impact factor from this equation. The expected impact factor of a country with publication level p_i is $\mathrm{EI}_i = \hat{k} p_i^{\hat{n}-1}$. An adjusted comparative indicator of performance is therefore given by

$$\mathrm{ACI}_i = \frac{\mathrm{I}_i}{\mathrm{EI}_i} = \frac{c_i}{\hat{c}_i}$$

where $\hat{c}_i = \hat{k} p_i^{\hat{n}}$. This is essentially a forecast error for citations. Thus it is necessary to interpret the ratios with some case as the standard errors will depend on the publication size. Katz [1999, p.6] estimates $c = 1.31 p^{1.06}$, where both coefficients are statistically significant at the 5% confidence interval. Thus if a country i has a total number of 1,000 publications during that period, Katz's model suggests that the expected number of citations for that country is $\hat{c}_i = 1.311000^{1.06} \simeq 1983$. If the country's actual number of citations is $c_i = 2500$ then the countries comparative research performance will be reflected by the $\mathrm{ACI}_i = 2500/1983 = 1.26$.[60]

A.2 Quality adjustments

Publications and citation counts are raw indicators of quality. There is a need to make adjustments to these raw measures in order to assess quality more accurately. In this section we outline the definitions and mechanics of these adjustments for quality and we also briefly discuss how these measures have been applied in the literature, emphasising the methodological issues that arise.

The number of citations that a specific piece of research work (article) attracts is in itself some measure of quality. Articles that attract more attention (which might be proxied by being cited more often, for instance) have a greater impact on the overall stock of knowledge by influencing the work of a greater number of other researchers. From this viewpoint, citations are often considered as "votes of confidence" in the contribution of individual articles or authors.

An equally important measure of quality is the quality of journal in which articles appear.[61] The most common index used to measure the popularity (and implied quality) of journals is the

[59] Katz also reports that the scaling relationship is true $n > 1$ when one looks at cross section data. As a rule of thumb doubling the number of publications leads to a tripling in the number of citations.

[60] A counter argument is sometimes made that successful research groupings are able to attract funding and hence more research and hence a larger number of publications and this tends to reduce the relative citation ratios of larger groups. It is however unclear why the citation ratio would fall as more and better researchers are attracted to the group.

[61] Seglen [1997] and others have highlighted the increasing use of journal prestige ratings as a measure of impact for articles published in these journals and as part of routine evaluation of individual and group research performance across the range of disciplines.

impact factor. To understand the impact factor consider a database of of a set of n journals over $T+1$ years $0,1,2,\ldots,T$. Let c_{ij} denote the number of references made by publications in journal i (the citing journal) to publications in journal j (the cited journal). The sum $R_i = \sum_{j=1}^{n} c_{ij}$ then gives the total number of references made by journal i to journals in the set (including itself) and the sum $C_j = \sum_{i=1}^{n} c_{ij}$ is the total number of citations received by articles published in j from journals in the set. Typically citations will be counted by specifying a *cited window* of d years and a *citing window* of r years so that comparisons across years can be made. Denoting the number of references made by publications in journal i (the citing journal) at time τ to publications in journal j (the cited journal) at time $s \leq \tau$ by $c_{i_\tau j_s}$, citations from i to j at time t are measured as

$$c_{ij}^{t}(d,r) = \sum_{\tau=t}^{t-1+r} \sum_{s=t+1-d}^{t} c_{i_\tau j_s}.$$

Sometimes the cited and citing windows are taken to be disjoint and citations are only measured for $s < \tau$. We shall denote citations excluding current year citations as $\tilde{c}_{ij}^{t}(d,r)$ where the summation over s is from $t-d$ to $t-1$. There are usually two main approaches to measuring citations. The *synchronous* approach takes a fixed citing year ($r = 1$) and a longer cited window ($d \geq 1$) and the *diachronous* approach takes a fixed cited or publication year ($d = 1$) and considers a longer citing window ($r \geq 1$).

Journal impact factors measure the citations of a journal relative to the number of publications in the journal during the cited window. Let p_j^s denote the number of publications in journal j at time s. Let $p_j^t(d) = \sum_{s=t+1-d}^{t} p_j^s$ be the number of publications in journal j in the cited window. Similarly define $\tilde{p}_j^t(d) = \sum_{s=t+1-d}^{t} p_j^s$ to be the number of publications when the cited window excludes the current period. The impact fact of journal j at time t is therefore measured as

$$IF_j^t(d,r) = \frac{\sum_{i=1}^{n} c_{ij}^{t}(d,r)}{p_j^t(d)}. \tag{1}$$

The most well known and most often quoted impact fact is that given in the ISI Journal Citation Report which has a one year citing window and a two year cited window with no overlap so[62]

$$JCRIF_j^t = \frac{\sum_{i=1}^{n} \tilde{c}_{ij}^{t}(2,1)}{\tilde{p}_j^t(2)}.$$

This measures the total number of citations received at date t to papers published in journal j at dates $t-2$ and $t-1$. Another impact factor quoted by the JCR is the *immediacy index* which is defined as

$$II_j^t = IF_j^t(1,1) = \frac{\sum_{i=1}^{n} c_{ij}^{t}(1,1)}{p_j^t(1)}$$

[62] It is therefore an example of a synchronous impact factor.

which measures the number of citations received at date t to papers published in journal j at date t, *i.e.* current citations.

There are of course a number of difficulties with the use of impact factors in measuring journal quality. First, the quality of the citing journal is not considered. Secondly it does not distinguish between the different types of article or page counts or differences in number of characters per page for different journals. Thirdly impact factors will be sensitive to the choice of citing and cited windows.

The standard impact factor measure assumes that all citations are equally valuable. However, citations in more prestigious journals (as weighted by impact factors) are likely to be deemed more valuable and more influential than citations in lesser journals. *Weighted impact factors* are then used to control for quality differences among citing journals. When such weights are used, the impact factor of equation (1) takes the more general form:

$$\text{WIF}_i^w = \frac{\sum_{i=1}^{n} W_i c_{ij}^t(d,r)}{p_j^t(d)} \tag{2}$$

where W_i is a weight describing the importance that is being attached to citations originating from journal i. Notice that in the case of the unweighted impact factor $W_i = 1 \ \forall i$. Several methods have been suggested in the literature for the computation of the set of weights W_i. The most popular method considers quality weights as direct functions of the number of citations of the journal they refer to and weighing each citation by the impact factor of the citing items. This impact factor being itself computed recursively in the same fashion.[63] The latter class of weighted impact factors is known as *Recursive Impact Factors* (RIF) as there have to computed iteratively through a recursive process. After obtaining the list of RIF, it is common practice to normalise them according to some benchmark, that usually being the weight that is allocated to the average citation in the dataset (see RePEc's RIF for instance), in which case the average citation receives a weight of 1.

It is also common to adjust impact factors to take account of the type of article cited, standard article, review article, letter etc. and to adjust for page size, number of pages and characters. For a brief discussion of how character-adjustments may affect specific journal rankings see Liebowitz and Palmer [1984] and Laband and Piette [1994].

Adjustment is also sometimes made for citation timing. The idea is that contemporaneous and more immediate citations should be weighted more heavily as a measure of impact they have on the profession. Adjusting for time can also correct for the biases that may arise from

[63] Bauwens et al [2003] construct a scale of 1 to 5, where a weight of 5 is given to the most important and a weight of 1 to least important cohort of journals.

differences in citing windows so that older articles have more chance to build up citations. For an application of time-adjusted impact factors see Coupé [2003].[64]

Another issue arises when impact factors are used for evaluating authors rather than journals. That is how to adjust for co-authorship. If the quality of an article is a function of the effort of the author(s) committed on writing it, then it should be expected that co-authored articles would on average have a comparative advantage in the absence of any further adjustments.[65] Two common practices have been to treat all authors with weight 1 or when there are n authors to treat each with weight $1/n$. These practices have been occasionally challenged on the grounds of non-zero co-ordination costs. That is the cost of writing a paper with n co-authors may be greater than $1/n$ times the cost writing one single authored paper.[66] Finally, when institutional or country-wide rankings are constructed, the number of affiliations of each author may also be of relevance. Again, in the absence of other information, it is common practice to allocate equal credit to all of an authors' affiliations.

A.3 Some statistical properties of bibliometric indicators

This section considers some statistical properties relating to bibliometric indicators. Katz and other have studied the linear regression of log citations on log publications. Mardia [1962] shows that if citations and publications are drawn from a particular bivariate Pareto distribution (type II), then the parameter estimates of this regression are simply related to the (five) parameters of the joint distribution. Moreover, the distribution of the parameter estimates is asymptotically normal so that standard test procedures can be applied. Although this is convenient, it remains an empirical question as to whether the distribution of citations and publications above a certain threshold is bivariate Pareto. Furthermore, even if the marginals are Pareto, the form of the dependence may not be as simple as the one implied by Mardia's construction.

As has been explained the distribution of all bibliometric data (i.e. number of citations per paper, number of publication per author etc.) is highly skewed. Hence the mean may not be such a good measure of central tendency. We may then want to supplement the analysis by looking at medians as well as means or the third moment of the distribution. It is also traditional to look at the tails of the distribution either by considering a sub-set of highly-cited journal or a sub-set of highly-cited authors to consider the upper tail or to consider the proportion of uncited articles to examine the thickness of the lower tail. In general, the distributions of bibliometric data

[64] Notice that such an adjustment will only be effective in correcting age biases, only if citations are uniformly distributed across years. If, however, the distribution of new citations per annum is concave as one might expect, Z_3 as defined here would not suffice to remove time biases, since it would under-penalise articles located on the left hand side of the point in time which the distribution obtains its maximum value and over-penalise those on the other side. To the best of our knowledge, this issue is not considered in the related literature.

[65] A common and well-reported source of concern in rankings of individual researchers in earlier studies has been the award of the entire credit for multi-authored articles to the author whose name appeared first on the name list (see for instance Garfield [1990] and Medoff [1996]).

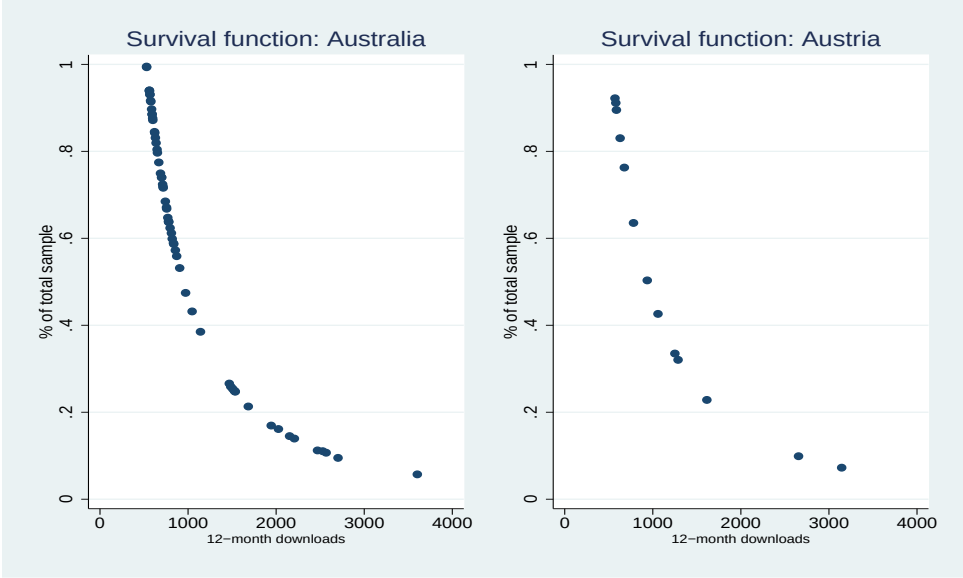
[66] Lubrano et al. [2003], for instance, proposes $1/\sqrt{n}$ as an adjustment factor for co-authorship.

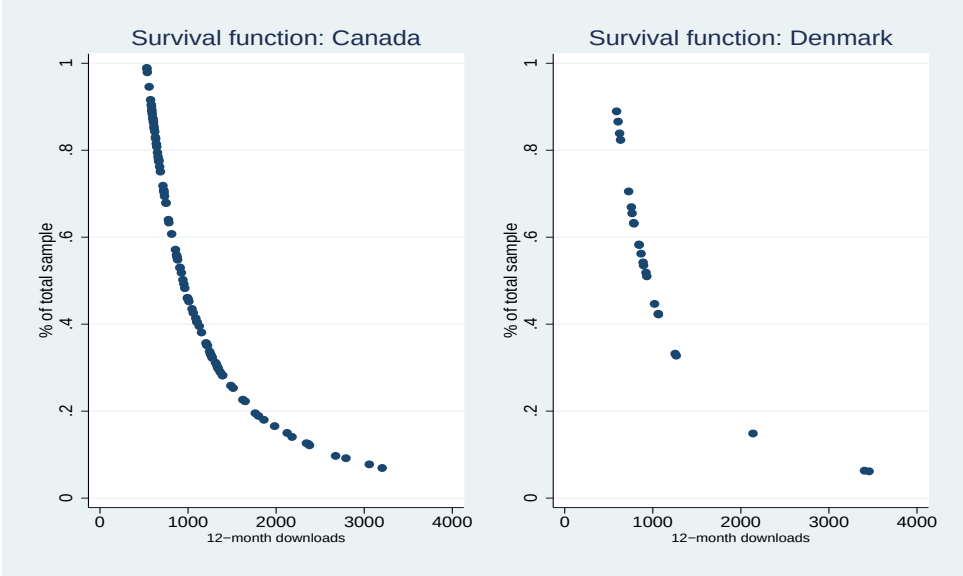
across countries A and B with distribution functions F and G say, may be compared straightforwardly using Lorenz curves or Gini coefficients. Given the two distribution F and G, assessing the position of the pth-quantile of F in G (i.e. assessing the position of the most cited country A papers among its country B peers) is a more demanding statistical exercise. For a given percentile p, $F^{-1}(p)$ gives the location of the pth-quantile according to F. Taking the composition with G (i.e. calculating the quantile comparison function $Q(p) = G\left(F^{-1}(p)\right)$ with $p \in [0,1]$) gives the percentile in G of the pth-quantile of F. For example Li, Tiwari and Wells [1996] provide the asymptotic distribution for the empirical estimate of $Q(p)$ on the basis on two samples (one for G one for F) and propose different testing strategies to compare the two distributions. In particular, they show that the estimator is asymptotically normal with a well defined mean and a variance so that appropriate tests can be conducted.

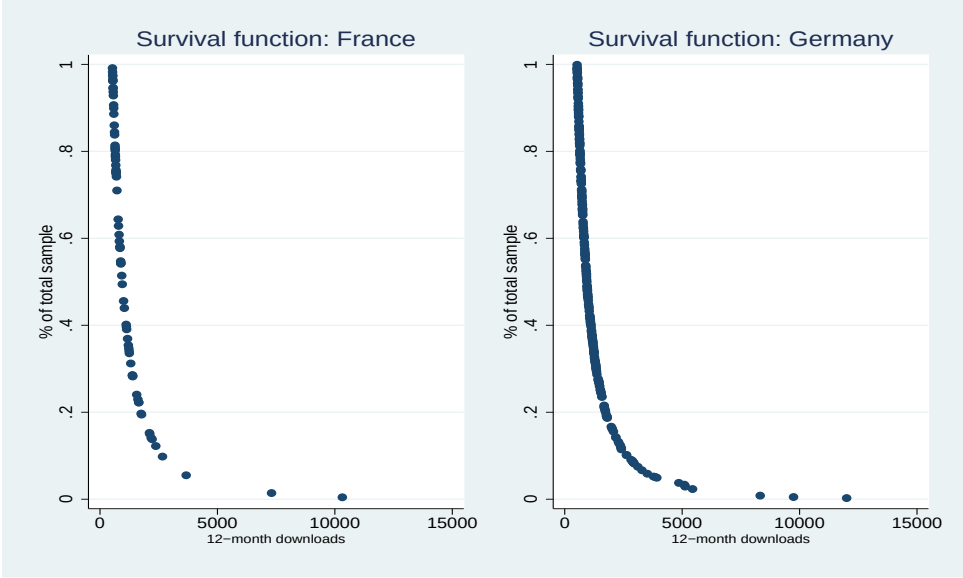
In comparing citation rates across countries it is reasonable to apply the central limit theorem so that the average citation rate is approximately normal with standard deviation inversely proportional to the square root of observations. Thus standard tests for differences in average citation rates across countries can be applied (see Glänzel and Moed [2002]).

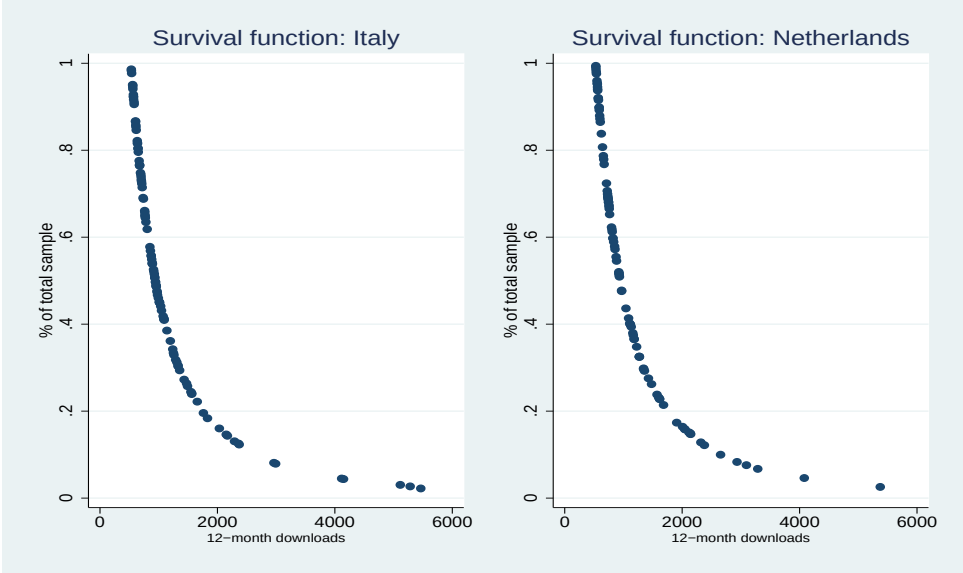
B Survival functions for LogEc data

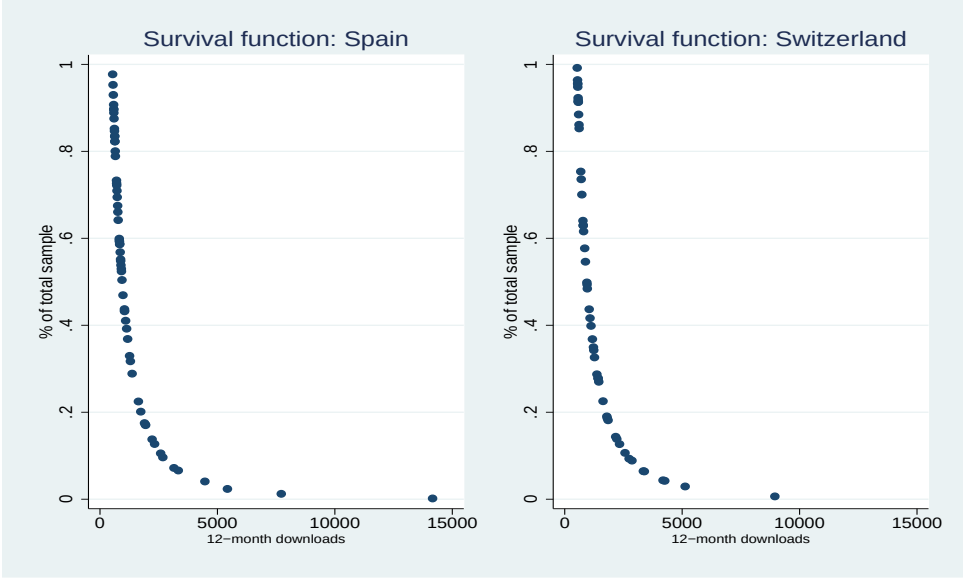
The following figures illustrate the survival functions for authors with 525 RePEc downloads or more over the last 12 months (as of March, 2007) for each of several countries. The survival functions show the proportion of authors who have more than d downloads. All curves are steeply downward sloping reflecting the asymmetry in the distribution of downloads. The UK performs well on this measure compared to all other European countries but the high end of the distribution is dominated by authors mainly located in the US.

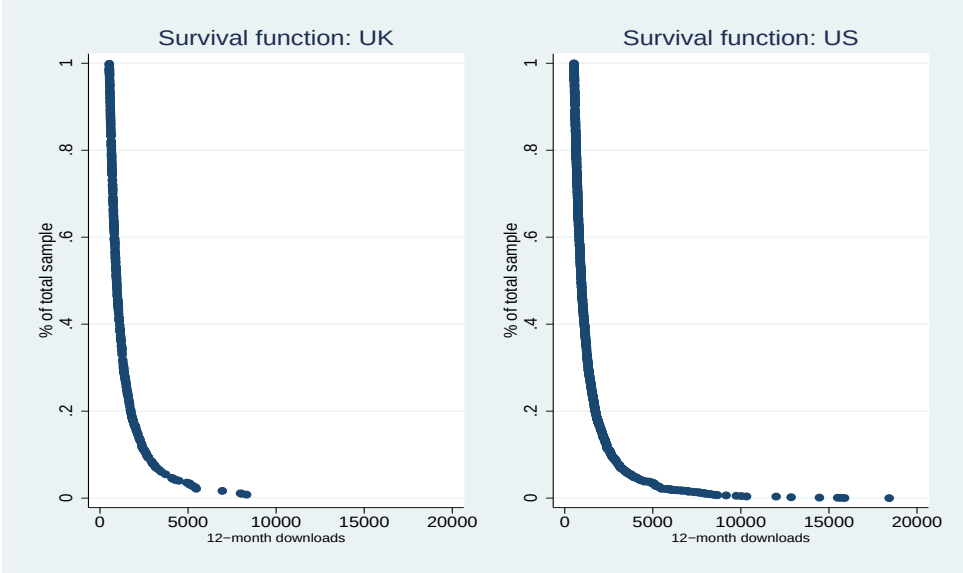

Survival function: Australia
% of total sample
0
.2
.4
.6
.8
1
0
1000
2000
3000
4000
12−month downloads
Survival function: Austria
% of total sample
0
.2
.4
.6
.8
1
0
1000
2000
3000
4000
12−month downloads

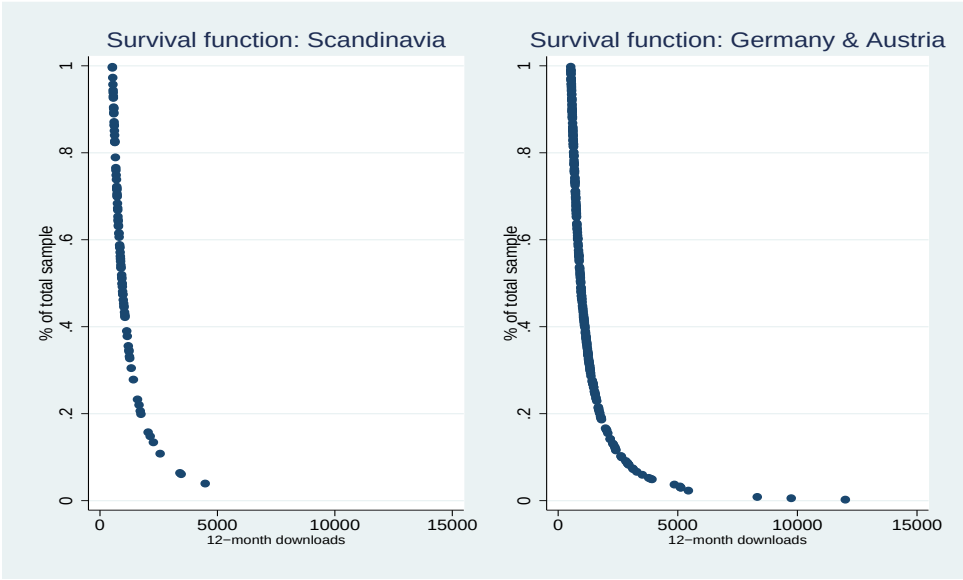

Survival function: Canada
% of total sample
0
.2
.4
.6
.8
1
0
1000
2000
3000
4000
12−month downloads
Survival function: Denmark
% of total sample
0
.2
.4
.6
.8
1
0
1000
2000
3000
4000
12−month downloads


Survival function: France
% of total sample
0
.2
.4
.6
.8
1
0
5000
10000
15000
12−month downloads
Survival function: Germany
% of total sample
0
.2
.4
.6
.8
1
0
5000
10000
15000
12−month downloads


Survival function: Italy
% of total sample
0
.2
.4
.6
.8
1
0
2000
4000
6000
12−month downloads
Survival function: Netherlands
% of total sample
0
.2
.4
.6
.8
1
0
2000
4000
6000
12−month downloads


Survival function: Spain
% of total sample
0
.2
.4
.6
.8
1
0
5000
10000
15000
12−month downloads
Survival function: Switzerland
% of total sample
0
.2
.4
.6
.8
1
0
5000
10000
15000
12−month downloads


Survival function: UK
% of total sample
0
.2
.4
.6
.8
1
0
5000
10000
15000
20000
12−month downloads
Survival function: US
% of total sample
0
.2
.4
.6
.8
1
0
5000
10000
15000
20000
12−month downloads


Survival function: Scandinavia
% of total sample
0
.2
.4
.6
.8
1
0
5000
10000
15000
12−month downloads
Survival function: Germany & Austria
% of total sample
0
.2
.4
.6
.8
1
0
5000
10000
15000
12−month downloads

C JSTOR downloads and abstract views

This Appendix provides some more details on the JSTOR data on downloads and abstract views for the four journals *American Economic Review* (AER), *Econometrica* (ECMA), the *Economic Journal* (EJ) and the *Journal of Industrial Economics* (JIE). Data covers downloads and abstract views over the period 1997–2007 and articles published 1990–2004 for AER and ECMA and 1990–2001 for EJ and JIE. As explained in the text, further article information including citation performance was obtained from the Web of Knowledge. Table 36 gives an overview of the downloads, views and cites per article for each of the four journals.

Table 36: JSTOR Usage Statistics and Citations

Journal	No. of Articles	Downloads per Article	Views per Article	Cites per Article	Coverage (by pub. year)
ECMA	803	803.91	586.82	40.31	1990-2004
AER	2345	847.59	918.01	25.39	1990-2004
EJ	982	439.00	546.68	15.70	1990-2001
JIE	311	425.25	443.92	12.51	1990-2001

Source: JSTOR and Web of Knowledge.

The difference in the coverage of the four journals is due to the different lengths of JSTOR's "Moving Wall" across journals. To eliminate this effect, Table 37 replicates the same information restricting attention to articles published 1990–2001. This adjustment leads to significant increases in most of the measures for AER and ECMA. Notice that in both tables, AER articles appear to perform better than ECMA ones in terms of downloads and abstract views. However, ECMA articles are found to have earned on average more cites over the sample period [67].

Tables 38 and 39 provide information on annual downloads per article for each of the four journals. As can be seen, there has been a steady increase in JSTOR usage over time. ECMA and AER have a higher usage rates than the EJ or JIE. There is however, some evidence that the EJ and JIE are catching up with usage rates for more recent articles.

Table 37: JSTOR Usage Statistics and Citations: 1990-2001

Journal	No. of Articles	Downloads per Article	Views per Article	Cites per Article	Coverage
ECMA	597	980.96	712.62	50.33	1990-2001
AER	1842	985.45	1060.20	30.00	1990-2001
EJ	982	439.00	546.68	15.70	1990-2001
JIE	311	425.25	443.92	12.51	1990-2001

Source: JSTOR and Web of Knowledge.

[67] In general, our estimations indicate that AER tends to perform better in the short run than ECMA. In the long run, however, ECMA tends to outperform AER in most measures.

Table 38: JSTOR Annual Downloads per Article (AER and ECMA)

	Access Year (AER)									
Pub.Year	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
1990	4.73	22.79	39.44	62.55	91.92	115.67	139.75	155.73	168.27	173.45
1991	5.69	20.54	33.06	51.01	77.71	92.49	117.66	130.08	134.52	150.59
1992		20.55	33.84	47.56	72.25	83.77	99.42	117.99	126.31	144.78
1993			50.81	70.86	103.01	119.57	136.28	162.40	159.61	188.30
1994				76.11	111.07	135.30	160.61	179.72	199.86	224.42
1995				67.97	102.88	116.29	140.11	155.87	178.55	184.64
1996				91.41	126.88	139.82	163.04	180.31	192.82	205.91
1997					135.55	149.48	172.46	188.24	203.32	216.36
1998						194.25	190.77	198.20	203.71	265.50
1999							228.14	213.10	207.10	257.99
2000								262.19	222.34	271.02
2001									252.43	285.47
2002									181.17	293.27
2003										278.67

	Access Year (ECMA)									
Pub.Year	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
1990	8.59	30.08	46.53	65.84	103.51	129.24	164.59	175.43	191.86	202.90
1991	8.92	25.79	40.87	62.41	93.69	121.11	153.97	174.10	189.33	209.89
1992		18.11	53.73	69.47	117.80	154.31	189.80	215.78	228.44	270.82
1993			68.88	88.71	147.60	185.33	240.21	262.81	273.45	305.71
1994				101.26	123.18	167.36	209.69	231.90	243.54	248.49
1995					131.60	139.49	185.86	182.58	222.91	225.81
1996						168.88	172.05	182.95	195.96	196.20
1997						21.06	169.64	167.55	162.42	192.04
1998						22.35	212.63	192.12	187.14	231.33
1999								139.20	131.31	149.55
2000								226.94	189.12	230.61
2001								48.11	170.23	226.08
2002									198.38	196.36
2003										247.37

Source: JSTOR and Web of Knowledge.

Table 39: JSTOR Annual Downloads per Article (EJ and JIE)

					Access Year (EJ)					
Pub.Year	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
1990		2.48	13.63	22.44	33.43	40.75	51.46	55.31	60.60	71.60
1991		2.73	17.24	29.77	47.36	57.55	68.10	77.24	92.74	99.63
1992		2.69	14.92	25.48	36.47	45.08	50.99	51.51	67.54	66.35
1993			19.64	31.33	44.49	54.45	63.59	68.28	79.22	85.93
1994				32.81	43.26	52.56	62.68	67.53	68.03	79.39
1995					69.26	75.84	85.37	96.85	99.38	120.18
1996						110.15	117.21	122.02	127.15	169.13
1997							124.12	121.75	116.84	151.19
1998								149.39	129.90	151.61
1999									125.26	138.05
2000										173.05

					Access Year (JIE)					
Pub.Year	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
1990		11.28	14.16	24.92	34.56	50.36	55.88	63.08	69.28	79.32
1991		10.41	16.53	26.63	45.13	48.84	58.31	69.13	77.94	102.50
1992		13.76	32.79	47.52	67.72	78.34	90.31	102.34	109.21	135.69
1993			22.97	28.55	40.66	48.41	57.31	64.21	77.38	94.66
1994				39.86	53.25	50.36	61.96	65.36	78.00	122.79
1995					75.71	73.79	80.54	84.46	86.42	138.96
1996						68.21	77.52	81.45	78.10	127.52
1997							86.92	82.88	78.60	90.00
1998								146.79	120.88	153.96
1999									116.05	137.25
2000										254.62

Source: JSTOR and Web of Knowledge.

D RePEc publications and citations

Tables 40 and 41 present output and citations for all listed countries using data from RePEc.

Table 40: RePEc Total Registered Output and Output per Author : All Listed Countries (as of April 2007)

	Country or State	Works	Authors	Output/author		Country or State	Works	Authors	Output/author		Country or State	Works	Authors	Output/author
1	United Kingdom	26911.2	1116	24.1149	**60**	Wyoming (US)	401.5	7.5	53.5333	**119**	Puerto Rico	12	1	12
2	Germany	16528	873.4	18.9238	**61**	Kentucky (US)	388	11.91	32.5777	**120**	Tanzania	10	3	3.33333
3	Massachusetts (US)	15616.4	362.78	43.0466	**62**	South Carolina (US)	365.7	14.33	25.5171	**121**	Ecuador	8.75	3.75	2.33333
4	California (US)	13173.5	357.11	36.8891	**63**	Mexico	349.3	44.83	7.79233	**122**	Morocco	8.33	1.66	5.01807
5	Canada	12456.2	597.16	20.8591	**64**	Hawaii (US)	331.6	18.41	18.0109	**123**	Saudi Arabia	8	1	8
6	Italy	9789.04	838.21	11.6785	**65**	Hungary	331.5	42	7.89286	**124**	Macao	8	2	4
7	District of Columbia (US)	9419.48	446.03	21.1185	**66**	Utah (US)	314	34	9.23529	**125**	Montana (US)	7	1.5	4.66667
8	France	9390.63	736.99	12.7419	**67**	Louisiana (US)	311	17	18.2941	**126**	Burkina Faso	6.33	0.33	19.1818
9	New York (US)	8406.41	304.66	27.5928	**68**	Alabama (US)	296	13.5	21.9259	**127**	Lebanon	6.3	1.9	3.31579
10	Netherlands	7531.1	389.56	19.3323	**69**	Nevada (US)	287.5	15	19.1667	**128**	Belarus	6	3	2
11	Spain	7347.88	664.38	11.0598	**70**	New Hampshire (US)	273.2	10.16	26.8858	**129**	Malta	6	1	6
12	Australia	6364.78	316.21	20.1283	**71**	Poland	270	41	6.58537	**130**	Guatemala	5.5	1.25	4.4
13	Illinois (US)	4711.16	161.91	29.0974	**72**	Cyprus	229.5	10.5	21.8571	**131**	Viet Nam	5	1.5	3.33333
14	Pennsylvania (US)	4412.38	139.25	31.6868	**73**	Kansas (US)	228.5	6.5	35.1539	**132**	Sri Lanka	5	2	2.5
15	Switzerland	3956.73	195.91	20.1967	**74**	Nebraska (US)	219	9.5	23.0526	**133**	Armenia	4.5	0.83	5.42169
16	Missouri (US)	3632.99	80.16	45.3217	**75**	China	212.9	29.41	7.23937	**134**	Monaco	4	1	4
17	Sweden	3433	215.5	15.9304	**76**	Vermont (US)	203.5	7	29.0714	**135**	Botswana	4	2	2
18	Iowa (US)	3410.13	53.86	63.3147	**77**	Malaysia	191.5	24.5	7.81633	**136**	Ghana	4	1	4
19	Belgium	3245.38	257.14	12.6211	**78**	South Africa	185	29	6.37931	**137**	North Dakota (US)	4	1	4
20	Connecticut (US)	3120.16	95.99	32.5051	**79**	Taiwan	169.3	35.16	4.81598	**138**	Kuwait	4	1	4
21	New Jersey (US)	3094.19	69.88	44.2786	**80**	Mississippi (US)	166	11	15.0909	**139**	Lithuania	3.5	1.5	2.33333
22	Michigan (US)	2595.09	107.88	24.0553	**81**	Uruguay	158.5	10.5	15.0952	**140**	Uganda	3	1	3
23	Norway	2237.58	124.41	17.9855	**82**	Oklahoma (US)	130	14	9.28571	**141**	Slovakia	3	2	1.5
24	Israel	2095.25	67.66	30.9673	**83**	West Virginia (US)	126.5	8.5	14.8824	**142**	Iraq	2.5	0.25	10
25	Denmark	1877.08	101.31	18.5281	**84**	Peru	106.2	24.58	4.31896	**143**	Kyrgyzstan	2.5	0.25	10
26	Texas (US)	1869.59	98.9	18.9038	**85**	New Mexico (US)	91.66	3.66	25.0437	**144**	Nepal	2	2	1
27	North Carolina (US)	1807.33	71.66	25.2209	**86**	Slovenia	82.5	13.5	6.11111	**145**	R?union	2	1	2
28	Virginia (US)	1694.16	79.18	21.3963	**87**	Estonia	77	17	4.52941	**146**	Uzbekistan	2	1	2
29	Japan	1613.66	143.33	11.2584	**88**	Luxembourg	72.33	8.91	8.11785	**147**	Montenegro	2	1	2
30	Wisconsin (US)	1585.66	46.99	33.7446	**89**	Indonesia	64.16	15.16	4.23219	**148**	Oman	2	1	2
31	Austria	1466.04	99.53	14.7296	**90**	Fiji	59	5	11.8	**149**	Qatar	2	1	2
32	Georgia (US)	1455.78	72.45	20.0936	**91**	Pakistan	54.45	12.85	4.23735	**150**	Algeria	2	1	2
33	Indiana (US)	1442.53	80.19	17.9889	**92**	Iceland	46.66	3.33	14.012	**151**	Namibia	1	1	1
34	Portugal	1429.73	192.38	7.4318	**93**	Delaware (US)	46.33	5.33	8.69231	**152**	Palestinian Authority	1	1	1
35	Ohio (US)	1356	49.33	27.4883	**94**	Bulgaria	46	13	3.53846	**153**	Niue	1	0.5	2
36	Brazil	1285.83	160.66	8.00342	**95**	Tunisia	36.33	13.33	2.72543	**154**	Afghanistan	0.25	0.25	1
37	Minnesota (US)	1284.58	43.83	29.3082	**96**	Nigeria	35	1	35					
38	Florida (US)	1271	80.16	15.8558	**97**	Croatia	34	9	3.77778					
39	Maryland (US)	1230.5	56.5	21.7788	**98**	United Arab Emirates	32.5	5.5	5.90909					
40	New Zealand	1046	79.4	13.1738	**99**	Arkansas (US)	32	4	8					
41	Tennessee (US)	970.99	37.16	26.13	**100**	Maine (US)	30	3.5	8.57143					
42	Rhode Island (US)	946	28.83	32.813	**101**	Jamaica	28	2	14					
43	India	930.83	105.41	8.83057	**102**	Ethiopia	28	3	9.33333					
44	Finland	926.13	61.6	15.0346	**103**	Idaho (US)	27	2	13.5					
45	Greece	909.66	91.08	9.98748	**104**	Philippines	24.83	8.66	2.86721					
46	Ireland	761	40	19.025	**105**	Serbia	23.66	5.66	4.18021					
47	Singapore	751.33	61.66	12.1851	**106**	Iran	23	6	3.83333					
48	Turkey	746.83	102.83	7.26276	**107**	Ukraine	20	7	2.85714					
49	Colombia	725.66	67.15	10.8066	**108**	Barbados	18	2.5	7.2					
50	Arizona (US)	701.83	22.16	31.671	**109**	Romania	17	6	2.83333					
51	Chile	699.5	53.36	13.1091	**110**	Venezuela	17	3	5.66667					
52	Czech Republic	621.76	69.23	8.98108	**111**	Egypt	16.16	4.16	3.88462					
53	Argentina	616.99	68.89	8.95616	**112**	Alaska (US)	16	2	8					
54	Oregon (US)	586	19	30.8421	**113**	Guadeloupe	16	1	16					
55	Washington (US)	584.83	26.33	22.2116	**114**	Bolivia	14.5	3.5	4.14286					
56	South Korea	556.83	50.75	10.972	**115**	Latvia	14	2	7					
57	Hong Kong	497.16	32.33	15.3777	**116**	Thailand	13	4	3.25					
58	Colorado (US)	488.5	29.66	16.47	**117**	Malawi	13	2.33	5.5794					
59	Russia	453.7	47.66	9.51951	**118**	Jordan	13	3	4.33333					

Source: RePEc (Top Countries and States as of March 2007).

Table 41: RePEc Total Citations per Country and per Author : All Listed Countries (as of April 2007)

Rank	Country or State	citations	Authors	citations per author	Rank	Country or State	citations	Authors	citations per author	Rank	Country or State	citations	Authors	citations per author
1	Massachusetts (US)	103,066	365	282	**61**	Czech Republic	346	70	5	**118**	Belarus	1	2	1
2	California (US)	58,193	366	159	**62**	Cyprus	343	12	30	**118**	Malawi	1	2	0
3	United Kingdom	54,332	1,154	47	**63**	New Mexico (United States)	328	3	109	**118**	Palestinian Authority	1	1	1
4	New York (US)	39,834	321	124	**64**	Colombia	295	70	4	**118**	Tanzania	1	3	0
5	Illinois (US)	32,666	168	195	**65**	Wyoming (United States)	284	9	33	**125**	Iraq	1	0	3
6	District of Columbia (US)	30,062	463	65	**66**	China	283	34	8	**125**	Kyrgyzstan	1	0	3
7	Germany	24,478	892	27	**67**	Taiwan	279	37	8	**127**	Burkina Faso	1	0	2
8	New Jersey (US)	20,177	70	287	**68**	Russia	255	48	5	**128**	Lebanon	0	2	0
9	Canada	17,556	611	29	**69**	Mexico	245	50	5	**129**	Uganda	0	2	0
10	Pennsylvania (US)	15,093	140	108	**70**	Alabama (United States)	218	14	16	**129**	Barbados	0	3	0
11	Italy	14,133	907	16	**71**	Hungary	207	44	5	**129**	Monaco	0	1	0
12	France	12,704	771	16	**72**	Louisiana (United States)	201	17	12	**129**	Afghanistan	0	0	0
13	Spain	10,325	690	15	**73**	Nevada (United States)	180	16	11	**129**	Botswana	0	2	0
14	Netherlands	9,443	406	23	**74**	Puerto Rico	168	1	168	**129**	Romania	0	10	0
15	North Carolina (US)	7,409	72	103	**75**	Hawaii (United States)	150	18	8	**129**	R?union	0	1	0
16	Michigan (US)	7,284	119	61	**76**	Kansas (United States)	148	6	25	**129**	Slovakia	0	2	0
17	Minnesota (US)	7,274	47	154	**77**	West Virginia (United States)	126	9	15	**129**	Lithuania	0	2	0
18	Switzerland	7,235	202	36	**78**	Vermont (United States)	120	7	17	**129**	Uzbekistan	0	1	0
19	Connecticut (US)	7,045	99	71	**79**	Nebraska (United States)	116	10	12	**129**	Montana (United States)	0	2	0
20	Missouri (US)	6,308	79	80	**80**	Oklahoma (United States)	101	14	7	**129**	Namibia	0	1	0
21	Rhode Island (United States)	6,148	30	206	**81**	South Africa	97	30	3	**129**	Guatemala	0	2	0
22	Israel	6,009	68	89	**82**	Iceland	88	3	27	**129**	Jamaica	0	3	0
23	Australia	5,697	327	17	**83**	Slovenia	86	14	6	**129**	Montenegro	0	1	0
24	Wisconsin (United States)	5,488	51	107	**84**	Delaware (United States)	85	7	12	**129**	Malta	0	1	0
25	Maryland (United States)	5,168	58	90	**85**	Uruguay	69	12	6	**129**	Ghana	0	1	0
26	Sweden	4,784	228	21	**86**	Thailand	67	8	9	**129**	North Dakota (United States)	0	1	0
27	Belgium	3,952	261	15	**87**	Luxembourg	64	8	8	**129**	Costa Rica	0	1	0
28	Ohio (United States)	3,722	50	74	**88**	Pakistan	52	17	3	**129**	Croatia	0	10	0
29	Texas (United States)	3,432	103	33	**88**	Malaysia	52	25	2	**129**	Macao	0	2	0
30	Arizona (United States)	2,953	28	107	**90**	Maine (United States)	47	3	19	**129**	Latvia	0	2	0
31	Virginia (United States)	2,909	84	35	**91**	Peru	43	26	2	**129**	Niue	0	1	0
32	Indiana (United States)	2,880	86	33	**92**	Alaska (United States)	41	2	21	**129**	Oman	0	1	0
33	Denmark	2,458	104	24	**93**	Poland	40	41	1	**129**	Qatar	0	1	0
34	Japan	2,312	154	15	**94**	Bulgaria	37	14	3	**129**	Algeria	0	1	0
35	Norway	2,286	127	18	**94**	Mississippi (United States)	37	11	3	**129**	Jordan	0	3	0
36	New Hampshire (United States)	2,159	10	212	**96**	Ethiopia	30	3	10					
37	Ireland	2,136	40	53	**97**	Estonia	26	17	2					
38	Florida (United States)	2,116	81	26	**98**	Venezuela	21	4	5					
39	Georgia (United States)	1,970	73	27	**99**	Arkansas (United States)	16	4	5					
40	South Korea	1,855	55	34	**100**	United Arab Emirates	15	6	3					
41	Tennessee (United States)	1,745	40	44	**101**	Philippines	11	9	1					
42	Iowa (United States)	1,606	55	29	**102**	Kuwait	10	1	10					
43	New Zealand	1,412	78	18	**103**	Ukraine	9	8	1					
44	South Carolina (United States)	1,407	17	81	**104**	Bolivia	9	8	1					
45	Portugal	1,160	201	6	**105**	Egypt	6	6	1					
46	Finland	1,128	64	18	**106**	Sri Lanka	5	2	3					
47	Chile	1,067	59	18	**107**	Indonesia	4	19	0					
48	Singapore	1,015	63	16	**108**	Nepal	4	3	1					
49	Kentucky (United States)	985	11	86	**108**	Ecuador	4	4	1					
50	Colorado (United States)	969	32	31	**110**	Fiji	3	6	1					
51	Austria	936	103	9	**111**	Idaho (United States)	2	2	1					
52	Oregon (United States)	837	19	44	**111**	Tunisia	2	13	0					
53	Washington (United States)	740	24	30	**111**	Iran	2	6	0					
54	Turkey	660	121	5	**111**	Vietnam	2	2	1					
55	Greece	565	100	6	**111**	Saudi Arabia	2	1	2					
56	Hong Kong	545	34	16	**111**	Morocco	2	2	1					
57	Brazil	498	167	3	**117**	Armenia	2	1	2					
58	Utah (United States)	436	33	13	**118**	Nigeria	1	2	1					
59	Argentina	428	70	6	**118**	Serbia	1	5	0					
60	India	417	110	4	**118**	Guadeloupe	1	1	1					

Source: RePEc (Top Countries and States as of March 2007).