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Library Catalog Analysis as a tool in studies of social sciences and humanities: An exploratory study of published book titles in Economics

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Abstract:

This paper explores the use of Library Catalog Analysis (LCA), defined as the application of bibliometric or informetric techniques to a set of library online catalogs, to describe quantitatively a scientific-scholarly field on the basis of published book titles. It focuses on its value as a tool in studies of Social Sciences and Humanities, especially its cognitive structures, main book publishers and the performance of its actors. The paper proposes an analogy model between traditional citation analysis of journal articles and library catalog analysis of book titles. It presents the outcomes of an exploratory study of book titles in Economics included in 42 academic library catalogs from 7 countries. It describes the process of data collection and cleaning, and applies a series of indicators and thematic mapping techniques. It illustrates how LCA can be fruitfully used to assess book production and research performance at the level of an individual researcher, a research department, an entire country and a book publisher. It discusses a number of issues that should be addressed in follow-up studies and concludes that LCA of published book titles can be developed into a powerful and useful tool in studies of Social Sciences and Humanities.

Keywords: Library catalogs; scientific-scholarly books; research performance; social sciences and humanities; book publishers; bibliometric indicators; thematic mapping; co-word analysis; economics;.

1. Introduction

Over the years bibliometrics has proven to be a valid tool in the study of scientific disciplines, especially in Natural and Life Sciences. However the bibliometric methodology, based on counting publications in scientific journals covered by Thomson Scientific's Web of Science and the citations they received has not been effective in the Social Sciences and Humanities. The main reason is that these domains of human scholarship have a series of characteristics and practices that make them different from other research disciplines. Moed (2005) has presented evidence that the coverage of the Web of Science is *moderate* in sociology, political science, anthropology and educational sciences, and particularly in humanities. A principal cause of this moderate coverage is the importance of sources other than international

journals, especially books. Moreover, language or national barriers play a much greater role than they do in other domains of science and scholarship. In addition, research activities may be fragmented into distinct schools of thought, each with their own 'paradigms'. He concluded that it would be a great challenge to systematically explore alternative data sources and methodologies for research performance assessments in social sciences and humanities.

Van Leeuwen also concluded that the level of reliability and validity of Web of Science based indicators in these areas is low (Van Leeuwen, 2006). Other authors underline the important role of the national orientation of the research (Hicks, 1999) and differences in citation practices (Glanzel & Schoepflin, 1999). Several citation studies confirm the important role of books in the communication of research findings in Social Sciences and Humanities (e.g., Wolfe Thompson, 2002). Books tend to be more frequently cited than papers in scientific journals, although there are significant differences across disciplines, for instance between Philosophy and the Sociology (Lindolhom-Roman, 1996). A review of six studies on various disciplines in Social Science and Humanities conducted by Hicks (1999) concluded that the average numbers of citations received by the books were always higher than those obtained by other types of scientific publications.

The outcomes of these studies reflect a dual situation. On the one hand they stress the importance and influence of books as media of scientific communication, but on the other hand their assessments were mainly based upon an analysis of citations collected from scientific journals. Another fundamental difference between studies of the role of books as compared to that of scientific journals is that the former tend to be based upon collections of books published by individual scholars in universities (Villagrá Rubio, 1992), small research units (Cherchye & Vanden Abeele, 2005) or small disciplines (Lewison, 2001). There are no studies covering the production of books at the macro level.

Bibliometric studies of books are mainly small scale studies because no databases are readily available that allow a systematic, computerised analysis of large sets of books. Although one can find products such as those developed on a commercial basis by *Bowker* and databases developed by national agencies such as the *ISBN database books published in Spain,* these information sources have several severe limitations from a bibliometric point of view. Their primary purpose is to provide information about books for sale; they do not distinguish between scientific and popular books; their interfaces are not ready for downloading records; and they do not give useful information about the affiliations of the publishing authors.

But other bibliographic information sources are available as well. A most important group is formed by virtual library catalogs or OPACS (*Online Public Access Catalogs*). Since the 90 years after the assimilation of the Z39.50 protocol (further explained in Section 3.1) catalogs complying with this protocol have been combined to become large databases with millions of records. The most obvious example of this trend is *WorldCat*, a global online network of library catalogs created by the OCLC. It is no surprise that research on OPACs and library collections constitutes one of the traditional research fronts in Library Science. These studies have been conducted from multiple perspectives, including that of information retrieval and transactional log analysis. But perhaps the world of bibliometrics is more

familiar with the use of citation analysis for the development and optimization of academic library collections. (Pancheshnikov, 2007; Edward, 1999).

Although the latter research topic marks a common point of interest between Library Science (especially the study of library collections) and bibliometrics (especially citation analysis), the exchange of knowledge and research techniques between these two research areas has been rather unidirectional. To the best of our knowledge, bibliometric researchers have never used at a large scale scientific-scholarly library collections in the study of science, its development, structure and performance.

2. Conceptualization and objectives.

2.1. Conceptualization

Price (1970) conjectured that if a research paper is the expression of one or more persons working at a research front, the papers they produced would be able to provide insight into their research activities and their ties at the time of publication. This premise can be extended to university libraries catalogs in the following way. According to Calhoun (2006) the main mission of library catalogs is to advance the state of knowledge within a library community, and the university library online catalogs reflect a portion of the universe of scholarly information (Calhoun, 2006). Therefore an academic library catalog may provide insight into the state of the scientific-scholarly community at a particular time. Combining various specialized library catalogs in a discipline one may obtain an accurate representation of the production and consumption of information within this discipline. Since the information recorded in the catalogs is adapted to a large number of standards (e.g.,

Anglo-American Cataloguing Rules, *Library of Congress Subject Headings*), one can use the same tools and methods as those applied by bibliometricians to analyze large databases of library catalogs. One could speak of a new type of bibliometric analysis: *Library Catalog Analysis* (LCA).

LCA can be defined as the application of bibliometric techniques to a set of library online catalogs. In this paper LCA is used to describe quantitatively a scientific discipline and its actors, on the basis of an analysis of published book titles. Linmans (2008) explored the use of Worldcat in an assessment of book titles published by Humanities scholars at Leiden University. The current study further develops and extends this approach. Table 1 establishes an analogy between traditional citation analysis of journal articles and library catalog analysis of book titles.

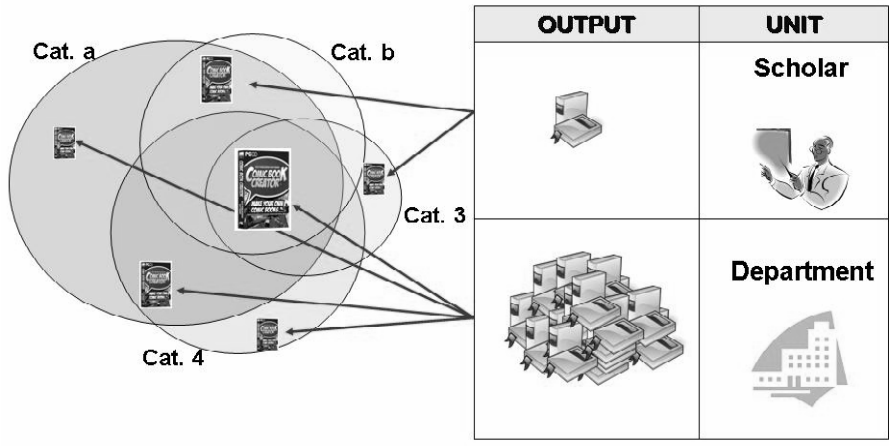
Table 1. Analogy between citation analysis of journal articles and library catalog analysis of book titles

Citation analisis of journal articles		**Library catalog análisis of book titles**
Main Concepts		
Article Author	↔	Book Author/editor
Research article	↔	Book
Publication database	↔	Library catalog
Publication database coverage	↔	Library catalog coverage
Journal Publisher	↔	Book Publisher
Journal´s Prestige	↔	Prestige of book publisher or library's institution
Indicators and methods		
Create a set of papers published by a unit	↔	Create a set of book titles published by a unit
Measure the prestige of a journal	↔	Measure the prestige of a publisher or a library's institution
Numbers of citations received by a paper	↔	Numbers of catalog inclusions of a book title
Number of received citations per paper	↔	Numbers of catalog inclusions per book title
Compare a unit's citations per paper to an overall or world average	↔	Compare a unit's catalog inclusions per book title to an overall or world average
Geographical spread of authors citing the unit's papers	↔	Geographical spread of catalogs containing the unit's book title
Thematic mapping of publication databases (keywords)	↔	Thematic mapping of library catalogs (subject headings)

A comparison between these two types of bibliometric analyses can be established from two points of view, one conceptual, and one methodological. Firstly, both have as a unit of analysis publications directed towards the scientific-scholarly community. Citation analysis is normally based on papers published in scientific-scholarly journals, whereas the library catalog analysis explored in this paper focuses on books. At the methodological level many of the techniques employed in citation analysis can be applied to the analysis of book titles contained in OPACS, including the analysis of the prestige of a particular publisher or the geographical spread of a particular work. Perhaps the most attractive element in this analogy is the parallelism between the number of received citations and the number of libraries in which books are included. If the main mission of a university library is to advance the state of knowledge for its users, the number of inclusions reflects the usefulness of a particular book. Based on this principle one can build indicators similar to those used traditionally to assess the scientific activity (e.g., Moed, De Bruin & Van Leeuwen, 1995).

In order to create a database of book titles in a discipline one should select a set of university libraries specialized in that discipline. The final set of book titles collected is the bibliographic representation of the discipline. If additional information is available about the production of books by a particular university, research department or researcher, one can assess their value within the entire database, as shown in Figure 1.

Fig. 1. *Library Catalog Analysis* as a representation of a research field and as a tool for the analysis of research performance.



2.2. Objectives of the study and structure of the paper

The general objective of the study presented in this paper is to explore the potentialities of Library Catalog Analysis (LCA), focusing on its value as a tool in studies of social sciences and humanities, especially their cognitive structures, main publishers of book titles, and the performance of the researchers active in these domains of science and scholarship. The aim was to identify the main technical problems and theoretical issues involved, to provide solutions and answers, and finally to make an inventory of issues that need to be further addressed in future research.

From the point of view of data collection and handling a major task is the development of a method for massive downloads of bibliographic records from university library catalogs and the subsequent creation of an off-line database. Hence, the *first* objective of the study was to develop such a methodology. This work is described in Section 3.1. It was decided to collect data for one discipline from Social Sciences: Economics. The *second* objective of the study was to develop and apply a series of indicators constructed and interpreted within the framework of the analogy model presented in Table 1. These indicators are defined in Section 3.2.

A *third* objective was to carry out a first bibliometric exploration of the database. Section 4.1 presents a general description of the database, while Section 4.2 analyses the distribution of book titles among catalogs. A series of characteristics of book titles in the database is presented in Section 4.3: their publication language, the number of authors, and the share of authored and edited works. Section 4.4 provides an overview of the research topics covered by the titles in the database, applying a thematic mapping technique based on co-co-word analysis. An analysis of the book publishers is presented in Section 4.5.

Finally, a *fourth* objective was to carry out an exploratory performance assessment study of a particular country, Spain, and the research departments in the field Economics in a particular institution, the University of Navarra (UNav), a Spanish institution located in Pamplona. The case study of national performance is presented in Section 4.6 and that of institutional performance in Section 4.7.

Chapter 5 gives a discussion of the results, draws main conclusions and highlights a number of important issues that await further research.

3. Materials and methods

3.1. Download from catalogs and creation of an off-line database

The methodology consists of the following steps:

- Selection of tools for information retrieval from university libraries catalogs.
- Selection of university libraries.
- Download of bibliographic records and creation of an off-line database.
- Standardization and cleaning of the database.

A well known standard in the library environment is *ISO 23950: Information Retrieval (Z39.50): Application Service Definition and Protocol Specification* and *ANSI/NISO Z39.50* or just *Z39.50*. Its main objective is to specify a client-server protocol for searching and retrieval of information from remote databases, in this case library systems. It enables one to launch searches from a Z39.50 client to a Z39.50 server. A Z39.50 client- allows one to search in a Z39.50 library server through a variety of attributes including the author name, publication title, ISBN, publication date and subject heading. The protocol ensures that these two different systems can exchange information (Evans, 2001a, 2001b). The records retrieved in a search can also be downloaded to a client in the different MARC formats (MARC 21, UNIMARC, IBERMAC, the Library of Congress standards for the representation and communication of bibliographic information in machine-readable form). Therefore,

the final set of retrieved records contains highly structured information. The study presented in this paper used *Bookwhere Academic 6.0.* This software supports searches under subject headings, searches in several libraries at the same time and it exports records in various formats (*xml, txt*). Another information source used in the study is the Copac Library Catalogue, a combined catalog that includes the major university libraries in the United Kingdom and Ireland, including the British Library.

For the selection of university libraries the following criteria were applied:

- *The Z39.50 protocol should be implemented.* Not all university libraries have implemented this protocol in their OPACs. Z39.50 compliance is unevenly distributed across countries. It is frequently used in the Anglo-Saxon world (United States, United Kingdom, Canada).
- *The library should be a part of a university with a leading position in Economics.* Only Universities were selected with a significant article production and citation impact in this field according to the listings in Thomson Scientific's *Essential Science Indicators*.
- *A Spanish Emphasis.* Since the case studies of research performance assessment relate to Spain and the Spanish University of Navarra it was considered appropriate to extend the sample of Spanish university libraries.

Applying these three criteria, the total number of libraries selected was 42. In these catalogs a search was carried out for the string *ECONOM** in the subject headings of book titles. This truncated search retrieved records indexed as *Economist, Economy* or *Econometrics,* but also as *Economic Conditions* or *Medical Economics.* The chronological period of searches was limited to the years 1995-2005. Downloaded records were exported as text files and integrated into a relational database built in MS ACCESS. The main table of the database contains bibliographic descriptions of book titles and the names of the university libraries in which they are included. Records were downloaded during the time period December 2007-January 2008.

In a next step the database was cleaned. Only those records were kept that had a ISBN, i.e., a code given by the various ISBN Agencies to books for sale. The ISBN was used as a unique identifier of a book title, taking into account the different ISBN numbers that books may have according to their format (*paperback, hardback*, electronic, etc...). Two new data fields were created on the basis of information from existing fields: the number of authors, and a field indicating whether or not the book was an edited work. The following data fields were normalized: publisher, publication language and publication year.

Finally, a file was included containing the titles of books and book chapters published by researchers in the departments of Economics at the University of Navarra during the period 1999-2005. This Spanish university hosts three departments that are active in Economics (Economía, Métodos Cuantitativos and Empresa Informativa) and the IESE Business School, an international institute with sites in Madrid, Barcelona and the United States.

3.2. Indicators

Within the framework of the analogy model presented in Table 1 the following indicators were constructed:

Number of Titles (NT): The total number of unique book titles for a particular aggregate Typical examples are the number of titles published by a publisher or by researchers from a particular institute. Even if a catalog contains more than one copy of a particular book title, this title is counted as one in all analyses presented in this paper.

Catalog Inclusions (CI): The total number of catalogs in which (a given set of) book title(s) is included. It indicates the dissemination of a (given set of) book title(s) among university libraries.

Catalog Inclusion Rate (CIR): This indicator calculates for a given set of book titles the average number of catalogs in which a book title from that set is included. It is defined as the ratio of *the number of catalog inclusions* and the *number of titles.*

$$CIR = (CI/NT)$$

Relative Catalog Inclusion Rate (RCIR). This measure facilitates the comparison of *Catalog Inclusion Rates* across different aggregates correcting for differences in the number of book titles involved. Is defined as the ratio of CIR of the aggregate to be assessed and CIR of the aggregate that serves as a benchmark in the assessment. A special case is the calculation of a RCIR in which CIR of an institute under assessment is divided by the CIR calculated for the total database. The latter parameter can be interpreted as a 'word average'. A value above one indicates that an institution's Catalog Inclusion Rate is above world (or total database) average. This indicator can be conceived as the analogon of relative or normalized citation impact indicators often used in citation analysis. It is expressed as

$$RCIR = (CIR_a / CIR_b)$$

Where:
CIR_a= *Catalog Inclusion Rate* of the aggregate to be assessed
CIR_b= *Catalog Inclusion Rate* of the 'benchmark' aggregate used for comparison

Dispersion Rate (DR). The percentage of catalog inclusions of book titles produced by a given aggregate relative to the total number of possible catalog inclusions. The number of possible inclusions is equal to the number of catalogs included into the analysis. DR values range between 0 and 1. A value of 1 indicates that the titles analyzed are present in all library catalogs taken into account. This indicator can be applied to large sets of books or to individual titles, and is defined as:

$$DR = (CI_s/CI_m)$$

Where:
CI_s= *Catalog Inclusions* for a given set of titles
CI_m= Maximum number of possible inclusions that the set of titles can reach

The exploratory study presented in this paper also applied other bibliometric and data-analytical techniques. *Multidimensional Scaling* (MDS) was applied to analyze

the similarity between libraries based on the number of titles a pair of libraries has in common. A second technique is an extension of *co-word analysis* (Callon et al, 1983; Callon, Courtial & Laville, 1991) developed by Bailón-Moreno (2003) in the software *Copalred 1.0*. It was used to uncover the main themes of books as reflected in the subject headings assigned to them in the various library catalogs. *Social Network Analysis* is a third technique applied in this paper. It is used to graphically display and analyze the geographical spread of books published by the University of Navarra.

4. Results

4.1. General database description

Table 2 presents overall statistics of the database created in the study. The total number of university libraries catalogs included in the study was 42. Table 3 shows that they are located in 7 countries belonging mostly to the Anglo-Saxon world. The country with the largest number of catalogs is Spain with 12 followed by United Stated and the United Kingdom with 10.

Table 2. Overall statistics of the database of book titles in Economy

Overall Statistics	
Number of countries	7
Number of host Universities	42
Number of book titles	121,147
Number of catalog inclusions	417,033
Overall Catalog Inclusion Rate	3.4

The total number of titles collected was 121,147, accounting for a total of 417,033 inclusions. Hence, the *Catalog Inclusion Rate* for the total set of titles is 3.4 catalogs per unique book title. Table 3 shows that the USA is the country that has the largest collection with 71,731 titles. In a ranking of libraries according to the size of their collections, eight libraries contain over 20,000 titles, including six US libraries led by *University of Michigan Library* and *Yale University Library*. In Canada *The University of British Columbia Library* and in the United Kingdom the *Library of the London School of Economics and Political Science* exceed these thresholds. Spanish libraries tend to have relatively small collections. Appendix A provides a list of all 42 libraries included.

Table 3. Statistics by country

Country	**Nr Catalogs**	**Nr Titles**	**Catalog inclusions**
Australia	4	25,132	34,500
Canada	4	34,184	52,594
Ireland	1	3,395	3,395
Spain	12	17,164	26,254
Sweden	1	4,074	4,074
United Kingdom	10	44,490	85,696
United States	10	71,731	210,529

A MDS map presented in Figure 2 shows an image of the 42 libraries. The libraries are located in a two dimensional plane according to their similarity among

their collections. Similarity between a pair of catalogs is defined using Salton's Index, i.e., the number of titles they have in common, divided by the square root of the product of the number of titles in each catalog. One can distinguish between the following clusters. At the upper side of the map one finds in cluster I the Spanish libraries; those from universities in Madrid are located on the right side. They are all remote from the Anglo-Saxon libraries. The central cluster II is formed by the libraries with large collections with more than 20,000 titles, most of them from the United States. Cluster III in lower part of the graph consists of a group of medium-sized British libraries. Other libraries are more dispersed and are not linked to a specific geographical area.

Figure 2. Multidimensional Scaling Map based on the overlap among library collections in Economics

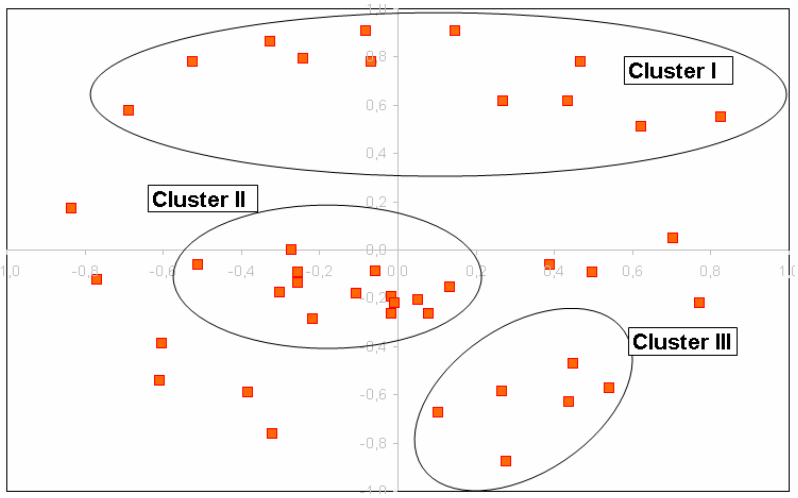


Table 4 shows the global production of book titles in Economics during the time period 1995-2005. The number of titles published annually exceeded 10,000 in all years; the annual average amounts to 11,415. Between 1995 and 2000 there was an increase in the annual number of titles published, followed by a decline as from 2001. The *Catalog Inclusion Rate* exceeded 3.10 in all years. The highest rate was obtained in the beginning of the period (3.6 inclusions per unique book title).

Table 4. Trend in annual number of book titles during 1995-2005

Publication Year	Nr Titles	Catalog Inclusions	Inclusion Rate
1995	11,170	40,296	3.6
1996	11,494	41,784	3.6
1997	11,269	39,011	3.5
1998	11,410	39,376	3.4
1999	11,737	39,016	3.3
2000	12,728	39,970	3.1
2001	12,558	39,077	3.1
2002	11,677	37,101	3.2
2003	10,695	35,829	3.3
2004	10,412	33,701	3.2
2005	10,414	32,539	3.1

Data were downloaded at the end of 2007. No information was available on the date at which titles were included in the catalogs. Hence, it was not possible to estimate the time delay with which published books were included in the catalogs. Therefore, it could not be established whether the decline in number of titles in recent years reflects a genuine decline in the annual number of titles purchased by the 42 libraries analyzed in this study, or whether it is mainly caused by the time delay between publication date and inclusion date.

4.2. Distribution of book titles among catalogs

Table 5 shows for the total database that 45 per cent of the titles appear in one catalog only. There are notable differences between US and European libraries. For US libraries 40 per cent of titles are included in only one catalog, whereas for European libraries it is 57 per cent. Generally, the degree of concentration of book titles among libraries is larger in the US libraries than it is in their European counterparts. This outcome probably reflects a greater cultural and linguistic homogeneity in the US as compared to Europe.

Table 5. Distribution of book titles among catalogs for US, European and all libraries

	General (Nr catalogs=42)			**United States (Nr catalogs =10)**			**European Countries (Nr catalogs=24)**		
Nr Catalog Inclusions	**Nr Titles**	**% Titles**	**Cumm %. Titles**	**Nr Titles**	**% Titles**	**Cumm % Titles**	**Nr Titles**	**% Titles**	**Cumm% Titles**
1	54,978	45	45	28,872	40	40	33,531	57	57
2	19,424	16	61	12,851	18	58	10,703	18	75
3	11,152	9.2	71	8,121	11	70	5,941	10	85
4	7,547	6.2	77	6,193	8.6	78	3,515	6.0	91
5	5,452	4.5	81	4,758	6.6	85	2,171	3.7	95
6	3,915	3.2	85	3,143	4.4	89	1,324	2.2	97
7	3,288	2.7	87	2,558	3.6	93	768	1.3	98
8	2,493	2.1	89	2,034	2.8	96	461	0.8	99
9	2,238	1.8	91	2,016	2.8	98	249	0.4	100
10	1,757	1.5	93	1,185	1.7	100	122	0.2	100
11	1,585	1.3	94				65	0.1	100
12	1,401	1.2	95				21	0.0	100
13	1,240	1.0	96				9	0.0	100
14	1,097	0.9	97				8	0.0	100
15	907	0.7	98				3	0.0	100
16	743	0.6	98				1	0.0	100
17	544	0.4	99				1	0.0	100
18	397	0.3	99						
19	330	0.3	100						
20	245	0.2	100						
21	145	0.1	100						
22	93	0.1	100						
23	69	0.1	100						
24	51	0.0	100						
25	30	0.0	100						
26	12	0.0	100						
27	6	0.0	100						
28	5	0.0	100						
30	2	0.0	100						
33	1	0.0	100						

This difference is also evident in the tail of the distribution. In the total collection the maximum number of inclusions of a title is 33 out of 42 ;only one book reaches this value (see Table 6 for the bibliographic details of this book). In the United States 1.7 per cent of titles appear in each of the 10 libraries analysed in the study. In Europe the maximum number of inclusions is 17 out of 24, and there is only one book that reaches this maximum.

Figure 4 shows a graphical display of these distributions in a double-logarithmic plot. The curve related to the total set of catalogs reveals a configuration of two approximately straight lines with different slopes, representing two power-law distributions with exponents –1.48 and -9.18, respectively. Figure 4 shows that the left part of the curve is largely determined by the US libraries, and the right part by their European counterparts.

Figure 4. Distribution of book titles among catalogs:

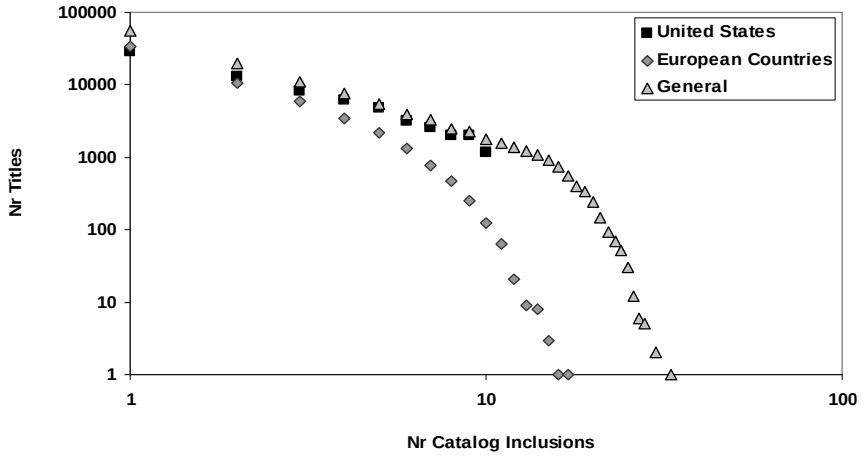


Table 6 presents the book titles in Economics with the largest number of catalog inclusions in the set of 42 analysed in this study. *Numerical Methods in Economics* by Judd Kenneth and published by MIT Press in 1998 ranks on top. It is catalogued in a total of 33 libraries and its *Diffusion Rate* is 0.78. Second and third are *In Defence of Globalization* by J.N. Bhagwatti (Oxford University Press, 2004) and *kicking away the Ladder* by H-J. Chang (Anthem, 2002), both with 30 inclusions. The books in Table 6 tend to have rather general titles. Some provide an introduction to specific sub-disciplines or topics that may play an important role in teaching. Others focus more on research such as handbooks and provide overviews or introductions of specific topics or research methods (e.g., numerical methods, computational economics). Many titles relate to politically relevant issues including globalization, ethics and work and leisure.

4.3. Publication language, number of authors per title, and number of edited works

Books have been published in a total of 89 different languages, but Table 7 shows that the ten most important languages account for more than 90 per cent of all titles. The dominant position of English at least partly reflects the Anglo-Saxon bias in the selection of libraries analysed in the study. In libraries located in Australia, Ireland and the United Kingdom more than 90% of book titles is written in English. However,

USA show a different picture. In the ten libraries from this country included in the study, 68 percent of titles are in English, followed by 7.2% in Spanish and 4.5 per cent in Chinese. In the case of Spanish libraries the situation is different. A majority of 52 per cent of their titles is written in Spanish, but noteworthy is a high share of 38 per cent of books in English. This outcome reflects the importance of English in the field of Economics, but also the openness of Spanish academic institutions towards other cultural and language domains.

Table 6. The 25 book titles with the highest number of inclusions in the set of 42 academic libraries

Author	Title	Publisher	Edited	Date	Nr Inclusions	Diffusion rate
Judd, Kenneth L	Numerical methods in economics	MIT Press	No	1998	33	0,786
Bhagwati, Jagdish N	In defense of globalization	Oxford University Press	No	2004	30	0,714
Chang, Ha-Joon	Kicking away the ladder	Anthem	No	2002	30	0,714
Sen, Amartya Kumar; Basu, Kaushik; Pattanaik, Prasanta K; Suzumura, Kotaro	Choice, welfare, and development: A Festschrift in Honour of Amartya K. Sen	Oxford University Press	Yes	1995	28	0,667
Fujita, Masahisa; Krugman, Paul R; Venables, Anthony	The spatial economy	MIT Press	No	2000	28	0,667
Begg, Iain; Henry, S G B	Applied economics and public policy	Cambridge University Press	Yes	1998	28	0,667
Maddison, Angus	The World Economy: A Millennial Perspective	Development Centre of the OECD	No	2001	28	0,667
Helpman, Elhanan	The mystery of economic growth	Harvard University Press	No	2004	28	0,667
Gershuny, Jonathan	Changing times : work and leisure in postindustrial society	Oxford University Press	No	2000	27	0,643
Brennan, Geoffrey; Pettit, Philip	The economy of esteem: An Essay on Civil and Political Society	Oxford University Press	No	2004	27	0,643
Little, Ian Malcolm David	Ethics, economics, and politics	Oxford University Press	No	2002	27	0,643
Alesina, Alberto; Roubini, Nouriel; Cohen, Gerald D	Political cycles and the macroeconomy	MIT Press	No	1997	27	0,643
Epstein, Gerald A; Gintis, Herbert	Macroeconomic policy after the conservative era	Cambridge University Press	Yes	1995	27	0,643
James, Harold	The end of globalization	Harvard University Press	No	2001	27	0,643
Bonney, Richard	Economic systems and state finance	Clarendon Press	Yes	1995	26	0,619
Clark, Gordon L; ;Feldman, Maryann P;Gertler, Meric S	The Oxford handbook of economic geography	Oxford University Press	Yes	2000	26	0,619
Chang, Ha-Joon; Rowthorn, Bob; World Institute for Development Economics Research	The role of the state in economic change	Clarendon Press-Oxford University Press	Yes	1995	26	0,619
Kay, J A	The business of economics	Oxford University Press	No	1996	26	0,619
Obstfeld, Maurice; Rogoff, Kenneth S	Foundations of international macroeconomics	MIT Press	No	1996	26	0,619
Amman, Hans M; Kendrick, David A; Rust, John	Handbook of computational economics	Elsevier	Yes	1996	26	0,619
McCormick, Michael	The origins of the European economy	Cambridge University Press	No	2001	26	0,619
Castells, Manuel	End of Millenium: The Information Age	Blackwell Publishers	No	2000	26	0,619
Lucas, Robert E	Lectures on economic growth	Harvard University Press	No	2002	26	0,619
Putnam, Hilary	The collapse of the fact/value dichotomy and other essays	Harvard University Press	No	2002	26	0,619
Nelson, Richard R	The sources of economic growth	Harvard University Press	No	1996	26	0,619

Table 7. Publication languages of book titles in libraries located in the various countries

All 42 libraries			% Titles in the country where libraries are located						
Language	**Nr Titles**	**% Titles**	**Australia**	**Canada**	**Ireland**	**Spain**	**Sweden**	**UK**	**USA**
English	75,211	61	93	86.5	92.2	38.1	86.5	89	67.8
Spanish	13,348	10.8	0.9	1.6	2.8	52.4	2.4	1.7	7.2
French	6,209	5.0	0.9	3.8	2.8	4.0	0.7	2.6	3.5
Chinese	5,858	4.8	0.7	3.4	0.0	0.0	0.0	0.1	4.5
German	4579	3.7	0.3	1.0	0.5	0.9	0.4	1.5	3.9
Russian	3104	2.5	0.1	0.4	0.0	0.0	0.1	1.4	2.7
Italian	2344	1.9	0.1	0.3	0.3	1.1	0.0	0.9	1.7
Japanese	2191	1.8	0.8	1.0	0.1	0.0	0.1	0.0	1.7
Indonesian	1167	1.0	1.2	0.8	0.0	0.0	0.0	0.0	1.3
Portuguese	1142	0.9	0.0	0.0	0.0	0.3	0.1	0.2	1.0

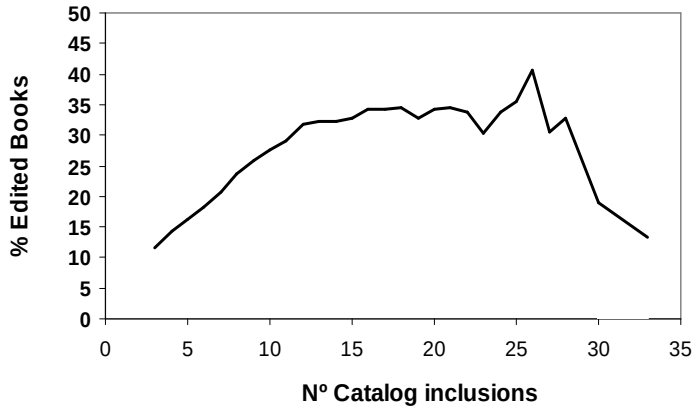
During the time period 1995-2005 the average number of authors per book title amounts to 1.63. This value remained almost constant over time during the time period considered. Therefore the number of authors is not growing in books as in the case in co-authorship in journal articles. Table 8 reveals the importance of single authored books in Economics: 62 per cent of the titles were written by one author only, 20 per cent by two, and 13 per cent by three authors.

Table 8. The number of authors of book titles

Nr Authors	**Nr Titles**	**% Titles**
1	74,952	62
2	24,853	21
3	15,424	13
4	4,208	3.5
5	1,013	0.84
6	507	0.42
7	88	0.07
8	62	0.05
9	16	0.01
10	18	0.01
11	6	0.00
12	7	0.01
13	1	0.00
14	1	0.00

In 90 per cent of the bibliographic records in the database there is an indication whether of not a book is an *edited* work. An editor is responsible for selecting the authors of chapters and ensures the quality of the content. The results indicate that 15 per cent of book titles are edited works. Analyzing this percentage as a function of the number of catalog inclusions it was found that edited words are overrepresented in the set of titles with a large number of catalog inclusions. For instance, among the 240 titles with 20 or more inclusions 36 per cent is an edited work, whereas in the subset of books appearing in one catalog only this percentage drops to 9 per cent. Figure 5 reveals this pattern graphically.

Fig. 5. Percentage of edited books as a function of the number of catalog inclusions

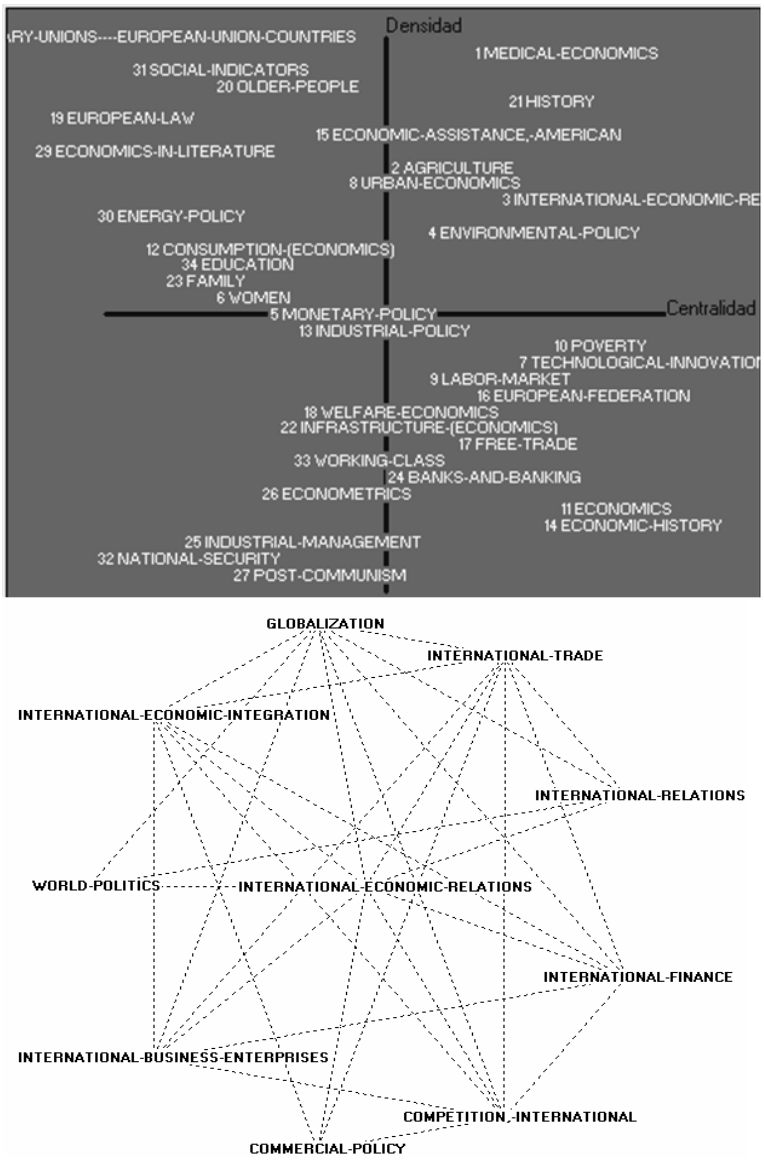


4.4. Thematic mapping using co-word analysis

In the same way as one creates thematic maps based on articles in scientific journals and patents, it is possible to use existing mapping techniques to reveal the topics of book titles in Economy. Figure 6 shows a typical example. It applies co-word analysis to the Subject Headings of book titles in libraries located in USA and UK.

In the strategic diagram presented in Figure 6 the vertical axis measures the density – i.e., the strength of the internal links within a cluster represented by a theme - , and the horizontal vertical axis the centrality – i.e. the strength of the links between the theme and other themes in the map. Hence, the themes with the highest internal coherence and closest relationship to other themes appear in the first quadrant (the upper right part of the graph). In this quadrant the following topics can be found: *Medical Economics*, *History*, *Agriculture*, *Urban Economics*, *International Relations* and *Economics Environmental Policy*. As a further illustration of the co-word technique Figure 6 displays sub-topics and their interrelationships in one particular main theme: *International Economic Relationships.*

Figure 6. Thematic Map of the Subject Headings of book titles in US and UK libraries: Strategic diagram and thematic example.



4.5. Publisher performance

A total of about 22,000 publishers have published at least one book title catalogued in at least one of the 24 catalogs under a Subject Heading directly related to Economics. Figure 7 presents the distribution of the number of book titles amongst publishers. 61`per cent of publishers have published only one book; these are not among the publishers specializing in the field Economics. Only 133 publishers published more than 10 titles per year. The distribution is similar to other bibliometrics distributions such as that relating to the article productivity of individual authors.

Figure 7. Distribution of number of book titles amongst publishers

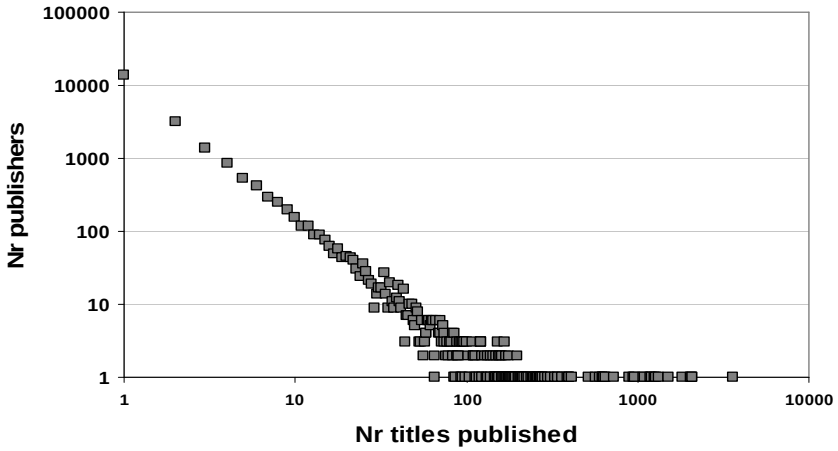


Table 9 shows the names of the 25 most productive publishers. All of them have published more than 400 titles during the time period 1995-2005. It clearly demonstrates that there are two types of publishers: commercial publishers and those associated with national or international organizations or agencies. Within the set of commercial publishers the most important ones are *Routledge*, *Edward Elgar* and *Oxford University Press*. Among the publishing organizations the *World Bank* leads, but the list also includes national organizations or agencies such as *Her Majesty's Stationary Office* in the United Kingdom. The American publisher *St. Martin's Press* obtains the highest *Inclusion Rate (IR)* with 7.7 catalogs per book title, followed by *Palgrave* with 7.5 and *Cambridge University Pres* with 7.2. It must be noted that the standardization of publishers is not complete. Rather recent mergers, such as that of Springer and Kluwer were *not* taken into account.

Publishers' *Diffusion Rate* (DR) was calculated for the aggregate of all libraries but also per geographical area. A high DR value tends to go along with a high value of IR. Calculation of this measure by geographical area allows one to identify the area of influence of the various publishers. Thus the publishers from government offices tend to have only influence in their national territory. *United States GPO* shows an overall DR of 0.16, but one can see that this rate is much higher in the USA than it is in Europe (0.67 versus 0.0). Another example, in the set of commercial publishers, is *St. Martin Press* whose importance is quite remarkable in the United States with a DR of 0.45 but much lower in Europe. The *Diffusion Rate* tends to be smaller in European

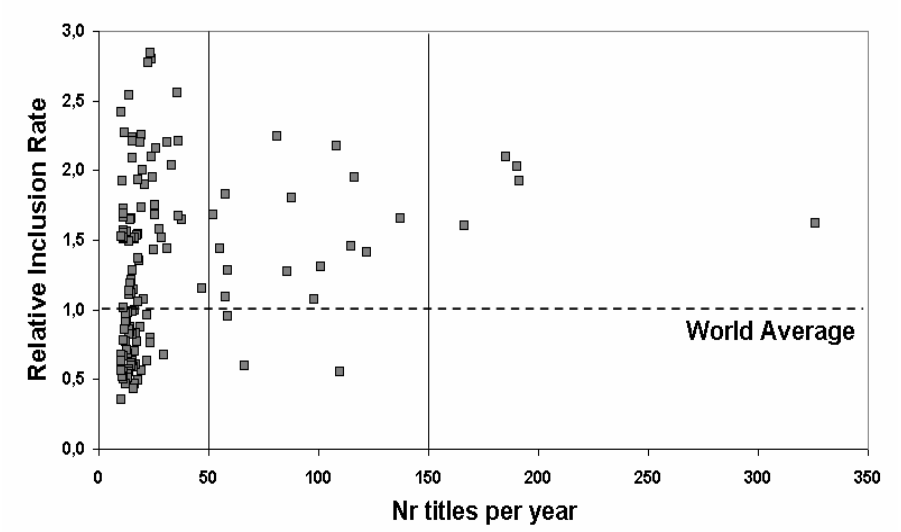
countries than in other countries due to the effect of the 12 Spanish libraries included in the study, in which the number of titles in English is lower and international publishers have a smaller presence. It reflects the situation in Europe which is much more heterogeneous in terms of publishers and where national publishers play an important role.

Table 9. The 25 most productive publishers in Economics

						Diffusion Rates		
Publisher name	**Nr Titles**	**Titles per year**	**Nr Inclusions**	**Inclusion Rate**	**Relative Inclusion Rate**	**All countries DR**	**European Countries DR**	**United States DR**
Routledge	3,589	326	19,985	5.6	1.6	0.13	0.10	0.24
Edwad Elgar	2,102	191	13,922	6.6	1.9	0.16	0.13	0.22
Oxford University Press	2,092	190	14,576	7.0	2.0	0.17	0.14	0.29
Cambridge University Press	2,040	185	14,710	7.2	2.1	0.17	0.15	0.29
Macmillan Press	1,827	166	10,054	5.5	1.6	0.13	0.09	0.25
World Bank	1,509	137	8,612	5.7	1.7	0.14	0.07	0.30
Official Publications of the EC	1,344	122	6,528	4.9	1.4	0.12	0.12	0.17
United States GPO	1,281	116	8,613	6.7	2.0	0.16	0.00	0.67
OECD	1,260	115	6,308	5.0	1.5	0.12	0.09	0.19
Her Majesty's Stationery Office	1,209	110	2,315	1.9	0.6	0.05	0.08	0.02
Palgrave	1,188	108	8,905	7.5	2.2	0.18	0.11	0.37
United Nations	1,109	101	4,993	4.5	1.3	0.11	0.05	0.25
Springer	1,078	98	3,995	3.7	1.1	0.09	0.06	0.12
Ashgate	966	88	5,992	6.2	1.8	0.15	0.10	0.24
Kluwer	944	86	4,133	4.4	1.3	0.10	0.08	0.17
St Martin's Press	894	81	6,904	7.7	2.2	0.18	0.09	0.45
Harmatan	727	66	1,506	2.1	0.6	0.05	0.02	0.15
International Monetary Fund	646	59	2,856	4.4	1.3	0.11	0.09	0.15
McGraw Hill	645	59	2,111	3.3	1.0	0.08	0.10	0.07
Wiley	633	58	2,380	3.8	1.1	0.09	0.08	0.13
MIT Press	632	57	3,984	6.3	1.8	0.15	0.13	0.22
Sage	606	55	2,995	4.9	1.4	0.12	0.09	0.21
Blackwell	574	52	3,318	5.8	1.7	0.14	0.13	0.19
Prentice Hall	518	47	2,060	4.0	1.2	0.10	0.11	0.10
Earthscan	416	38	2,352	5.7	1.6	0.14	0.14	0.19

Figure 8 shows for publishers publishing at least 10 titles per year the number of titles per year (measuring productivity) and their *Relative Inclusion Rate* (RIR, measuring visibility). It clearly shows a group of prominent publishers each with more than 150 titles per year and a RIR exceeding 1.5. A second group contains 18 publishers publishing between 50 and 150 titles, the major part of which has a RIR value above the database or 'world' average. A third group includes publishers with fewer than 50 titles and a variable RIC.

Fig. 8. Number of titles published per year and *Relative Inclusion Rate* for major publishers



4.6. National performance

This section analyzes the book titles produced by Spain in Economics. In this section a Spanish book was defined as a book of which the ISBN starts with the digits 84, the country code assigned to Spain. Applying this criterion, the total number of books produced by Spain during 1995-2005 amounts to 6,704, a number that represents 5.5 per cent of the database total. Of these 6,704 Spanish books, 11 per cent is included in US libraries, and only 2.9 per cent in libraries located in the UK.

The worldwide *Inclusion Rate* for Spanish book titles is 2.2 catalogs per title, which is below the reference value of 3.4 calculated for the entire database. In fact, the Relative Inclusion Rate of Spanish book title is below 1.0 in each geographical area outside Spain. Diffusion Rates are also rather low, except within Spain itself. .

Table 10. Indicators of Spanish book titles in Economics

	Nr Titles	**% Titles**	**Catalog Inclusions**	**Inclusion Rate**	**Relative IR**	**Diffusion Rate**
World	6,704	100	14932	2.2	0.6	0.05
United States	740	11.0	1,494	2.0	0.6	0.02
Spain	6,704	100	13,016	1.9	1.2	0.16
United kingdom	197	2.9	225	1.1	0.5	0.00
North America	763	11.3	1,603	2.1	0.6	0.01
European countries	6,704	100	13,303	1.9	0.9	0.09

Table 11 shows the time evolution of the various indicators of Spanish book title production. The average number of titles per year is 653. During the time period 1995-2005 the annual number of titles follows the same pattern as that for the total collection presented in Table 4: a slight increase up until the year 2000 followed by a

decline as from the year 2001. The *Inclusion Rate* reached a maximum value of 2.5 in the year 2002.

Table 11. Time evolution in indicators of Spanish book production

Year	Nr Tittles	World Share (%)	Nr Inclusions	Inclusion Rate	Diffusion Rate
1995	611	5.4	1,433	2.3	0.05
1996	656	5.7	1,648	2.5	0.06
1997	637	5.6	1,532	2.4	0.05
1998	679	5.9	1,644	2.4	0.05
1999	719	6.1	1,729	2.4	0.05
2000	726	5.7	1,778	2.4	0.05
2001	696	5.5	1,695	2.4	0.05
2002	674	5.7	1,723	2.5	0.06
2003	659	6.1	1,578	2.3	0.05
2004	591	5.6	1,259	2.1	0.05
2005	535	5.1	1,116	2.0	0.05

. Table 12 presents a list of Spanish book titles with more than 8 inclusions. The maximum number of inclusions is 11 and relates to *Un siglo de España. La economia* by L.J. Garcia-Delgado and J.C. Jiménez-Jiménez. It is present in 32 per cent of the libraries. Table 12 also presents diffusion rates within the various countries. All titles have diffusion rates within the USA of at least 0.6. In most cases these rates are higher than those calculated for diffusion within Spain. The book titles listed in Table 12 relate to Spanish America, or to historical topics.

Table 12. Spanish book titles with more than 8 inclusions

		Diffusion Rates		
Bibliographic description	**Nr Inclusions**	**All countries DR**	**United States DR**	**Spain DR**
Luís José García Delgado; Juan Carlos Jiménez Jiménez. *Un Siglo De España. La economía*. Marcial Pons. 1999.	11	0.32	0.60	0.62
Santamaría García. Antonio; Malamud. Carlos. *Sin azúcar no hay país la industria azucarera y la economía cubana (1919-1939).*Universidad de Sevilla. CSIC. 2001	10	0.29	0.60	0.50
Piqueras Arenas. José A. *Cuba. emporio y colonia la disputa de un mercado interferido (1878-1895)*. Fondo de Cultura Económica de España. 2003	9	0.26	0.60	0.37
Orti Gost. Pere. *Renda i fiscalitat en una ciutat medieval*. CSIC. 2000	8	0.23	0.70	0.12
Gutiérrez Escudero. Antonio.; Martínez Ortega. Ana Isabel. *Ciencia. economía y política en Hispanoamérica colonial*. CSIC. 2000	8	0.23	0.60	0.25
Maluquer de Motes Bernet. Jordi. *España en la crisis de 1898 de la gran depresión a la modernización económica del siglo XX*. Península. 1999	8	0.23	0.60	0.25
Vigo Gutiérrez. Abelardo. *Cambistas. mercaderes y banqueros en el Siglo de Oro español*. Biblioteca de Autores Cristianos. 1997	8	0.23	0.60	0.25
Villarías Robles. Juan José R. *El sistema económico del imperio inca*. CSIC. 1998	8	0.23	0.70	0.12

4.7. Institutional performance.

The departments of Economics at the University of Navarra (UNAV) have published during 1995-2005 a total of 211 works, 48 per cent of these were monographs or edited works, and 52 per cent book chapters. 66 per cent of publications carried a Spanish ISBN. In this first exploratory analysis no distinction was made between monographs, edited works and book chapters. All types were

given equal weights. Table 13 presents the results for the total production of UNAV. 44 titles were found in at least one library, 29 are in present in at least one Spanish library and 11 in at least one library located in the USA.

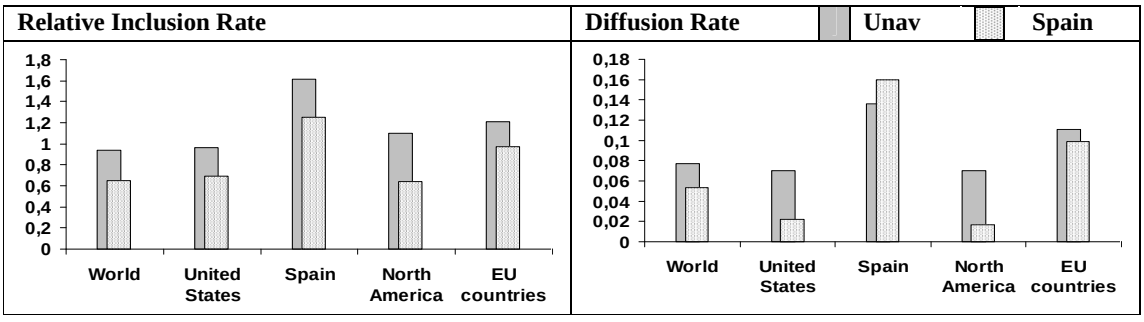
The total number of inclusions is 142 and the *Inclusion Rate* is 3.2, which is slightly lower than this rate calculated for the entire database. In fact, the Relative Inclusion Rate (RIR) amounts to 0.9. The Diffusion Rate within USA is somewhat higher than that within Spain (2.8 versus 2.5) but Spain has the highest *Relative Inclusion Rate* (1.6 versus 0.9).

Table 13. Indicators of the production of book titles in Economics from the University of Navarra

	Nr Titles	**% Titles**	**Catalog Inclusions**	**Inclusion Rate**	**Relative Inclusion Rate**	**Diffusion Rate**
Entire database	44	100	142	3.2	0.9	0.08
United States	11	25	31	2.8	0.9	0.07
Spain	29	66	72	2.5	1.6	0,13
United Kingdom	12	26	20	1.7	0.9	0.04
North America	12	27	43	3.6	1.1	0,07
European countries	40	91	98	2.4	1.2	0.11

Comparing the outcomes for the University of Navarra with those for Spain (see Figure 9) it can be concluded the university's *Relative Inclusion Rate* and the *Diffusion Rate* is always above those for Spain, except the indicator measuring the *Diffusion Rate* within Spain. The largest differences occur in the inclusion and diffusion within North American institutions, where UNAV book titles have a greater visibility.

Fig. 9. Comparison of *Relative Inclusion Rates* and *Diffusion Rates* between the University of Navarra and Spain



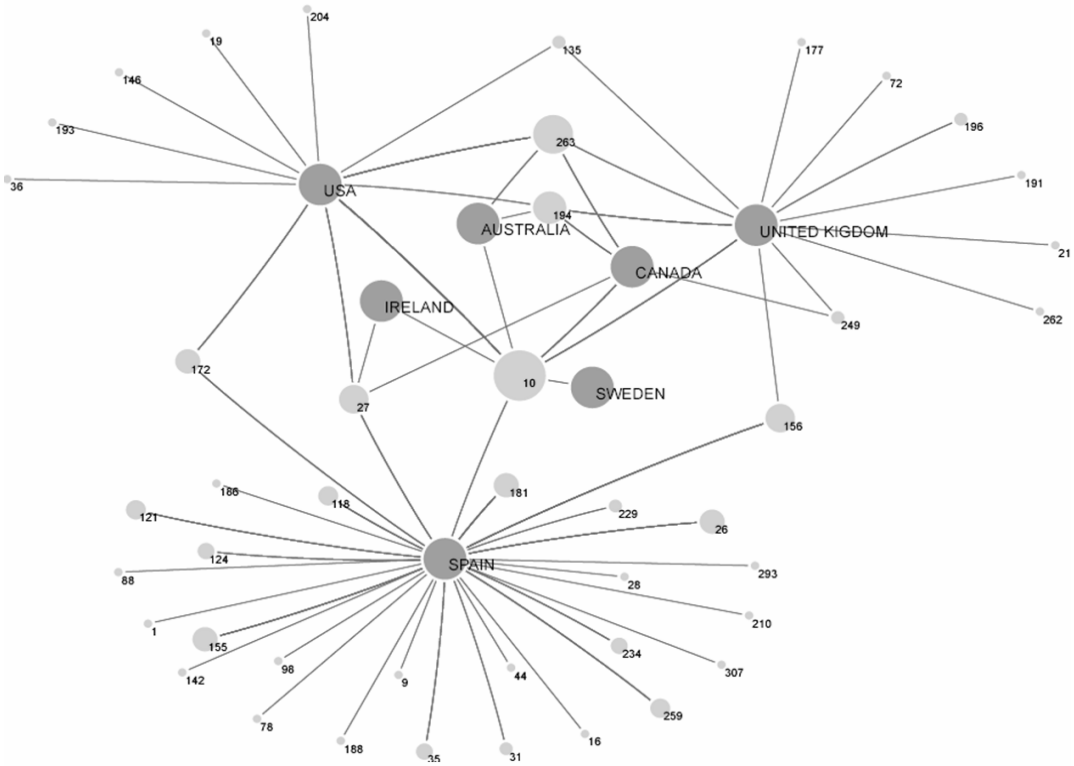
The distribution of the number of inclusions across catalogs is similar to that obtained for the various geographical aggregates presented in Table 5. Table 14 shows that in the case of the University of Navarra 54 per cent of the titles are just in one catalog. The largest number of inclusions a title achieved amounts to 23. From the point of view of visibility in libraries this is the most important title among those published by researchers at UNAV.

Table 14. Distribution of titles from University of Navarra among catalogs

Nr Inclusions	Nr Titles	% Titles	Cumm % Titles
1	24	54,3	54
2	5	11,2	65
3	3	6,8	72
4	3	6,8	79
6	4	9,1	88
8	2	4,5	93
10	1	2,3	95
14	1	2,3	97
23	1	2,3	100

Another way to analyze the geographical spread of book titles is through the use of social network analysis. A typical example is shown in Figure 10. In this figure a small, light gray node represents a single title. Its diameter indicates the number of catalogs in which it is included. Countries are represented by bigger, dark grey circles. An inclusion of a book title in a library located in a particular country is represented in Figure 10 by a link between the node corresponding to that title and the node representing that country. One can distinguish three groups. A first relates to titles that are only included in Spanish libraries (i.e. nodes 31, 44, 9, etc..), a second group consists of titles only included in US or UK libraries (i.e. nodes 204, 19, 72, 21, etc..) Finally, in the central area of the network there is a group of titles that are included in catalogs from various countries (i.e. nodes 263, 194, 10, etc…)

Fig.10. Geographical dispersion of book titles in Economics from the University of Navarra



Finally, Table 15 shows the libraries where the titles of the Unav are catalogued. The production is particularly concentrated in four Spanish libraries located in Madrid. The library at the *Universidad Autónoma de Madrid* has the largest number of books and includes 27 per cent of the total, while at the international level we find that *Yale University* includes 14 per cent of the UNAV titles

Table 15. Number of inclusions per library for book titles in Economics from the University of Navarra

University-Library Catalog	**Country**	**Nr Titles**	**% Titles**
Universidad Autónoma de Madrid	Spain	12	27
Universidad de Alcalá Henares	Spain	11	25
Universidad Carlos III de Madrid	Spain	10	23
Consejo Superior de Investigaciones Científicas	Spain	8	18
Universidad de Granada	Spain	8	18
Yale University	United States	7	16
Universidad Complutense de Madrid	Spain	6	14
Columbia University	United States	5	11
London School of Economics and Political Science	United Kingdom	5	11
King´s College London	United Kingdom	4	9
Massachusetts Institute of Technology	United States	4	9
The University of British Columbia	Canada	4	9
Universidad de Burgos	Spain	4	9
University of Birmingham	United Kingdom	4	9

5. Discussion and conclusions

This paper explored the use of Library Catalog Analysis (LCA), defined as the application of bibliometric or informetric techniques to a set of library online catalogs, to describe quantitatively a scientific-scholarly field on the basis of published book titles. It focused on its value as a tool in studies of Social Sciences and Humanities, especially its cognitive structures, main book publishers and the performance of its actors. It proposed an analogy model between traditional citation analysis of journal articles and library catalog analysis of book titles. It described a process of data collection from online catalogs and the creation and cleaning of an off-line database with book titles. It identified a number of technical problems and showed how these can be solved. And it showed a series of informative analyses of the database created in this way.

However, there are a number of limitations that must be taken into account in the interpretation of the results and, related to this, a number of issues and problems that need to be addressed and solved in a further development of the methodologies explored in this paper.

Firstly, the set of libraries selected in the current study has a rather strong Anglo-Saxon *bias*. 70 per cent of the libraries is located in the United States, United Kingdom, Canada and Australia. This bias may especially affect the identification the national publishers active in countries that are not covered by the off-line database, but it is unlikely that it affects the lists of the major international publishers in the field. Nevertheless, the set of libraries included in the current study cannot be assumed to constitute a sufficiently representative sample of major academic libraries in the world, especially in assessments of research performance in Social Sciences and Humanities.

The bias in geographic coverage is mainly caused by the fact that library catalog systems complying with the Z39.50 client-server protocol are not evenly distributed among countries. But collective catalogs like *Worldcat* or combined catalogs using the *PICA Central Library System* could open new opportunities to include catalogs from countries not yet covered, and thus improve the degree of representativity of the set catalogs included in an analysis. A follow-up study should further explore these possibilities.

A *second* limitation relates to the delimitation a scientific discipline by selecting specific words from subject headings. The current, exploratory study used the truncated string *Econom** .This string may not cover the entire discipline sufficiently well. For instance, book title records catalogued merely with the headings *Business* or *Finance* were not retrieved. This problem is particularly relevant in the assessment of research performance of institutions. This is one of the main reasons why only 19 only of the booktitles from the University of Navarra were found in the off-line database created in the study. The search strings used to retrieve records should in some way be related to the thematic profile of the institution under assessment.

However, application of this principle may not be an easy task, since there may be differences in the subject classification systems among library catalogs. A general solution is to delimitate in a first step a field in a library catalog in a rather broad way,

so that the recall is sufficiently high. In a next step, selected records should be downloaded and an off-line database should be created. Finally, within this off-line database the field can be further delimited in a more accurate way, thus improving the precision.

A *third* limitation relates to a classification of books into 'types'. Journal articles in large publication databases such as Thomson Scientific's Web of Science are categorized into a number of document types, including normal article, review article and letter. But the academic library catalogs from which book titles were retrieved in the current study do not apply a categorization of books into types. Useful types would be: authored versus edited words; books primarily for teaching versus those primarily for research; books for a specialized scientific-scholarly audience versus those for broader audiences within or even outside the scientific-scholarly community. A follow-up study could deal with the development and implementation of such a useful, practical classification system.

Despite these limitations and issues that need to be addressed in future studies, the study presented in this paper has shown that the proposed analogy model between citation analysis of journal articles and library catalog analysis of book titles has proven to be valuable. Within the framework of this model a series of useful indicators and thematic mapping techniques was proposed and applied in the analysis of the database. It was illustrated how LCA can be fruitfully used to assess book production and research performance at the level of individual researchers, research departments, countries and book publishers. The outcomes show that Library Catalog Analysis of published book titles can be developed into a powerful and useful tool in studies of Social Sciences and Humanities.

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Appendix A. University libraries included in the study

University-Library Catalog	Country	Nr Titles	% Titles	% Acum. Titles
University of Michigan	United States	30625	7,3	7,3
Yale University	United States	27114	6,5	13,8
University of Wisconsin-Madison	United States	25465	6,1	20
The University of British Columbia	Canada	23405	5,6	25,6
Cornell University	United States	22598	5,4	31
Columbia University	United States	21248	5,1	36,1
Princenton University	United States	20791	5	41,1
London School of Economics and Political Science	United Kingdom	20010	4,8	45,9
Northwestern University	United States	19660	4,7	50,6
Pennsyvania State University	United States	17545	4,2	54,8
McGill University	Canada	17288	4,1	58,9
Massachusetts Institute of Technology	United States	13283	3,2	62,1
University College of London	United Kingdom	13116	3,1	65,3
Griffith University	Australia	12604	3	68,3
University of Pennsylvania	United States	12192	2,9	71,2
University of Birmingham	United Kingdom	11353	2,7	73,9
University of WarWick	United Kingdom	10183	2,4	76,4
University of Queensland	Australia	8201	2	78,3
University Of Nottingham	United Kingdom	7669	1,8	80,2
Australian National University	Australia	6896	1,7	81,8
La Trobe University	Australia	6799	1,6	83,5
Concordia University	Canada	6467	1,6	85
Bristol University	United Kingdom	6379	1,5	86,5
The University of Edinburgh	United Kingdom	5850	1,4	87,9
Universidad Autónoma de Madrid	Spain	5698	1,4	89,3
University of Victory	Canada	5434	1,3	90,6
King´s College London	United Kingdom	5130	1,2	91,8
University of Strathclyde	United Kingdom	4460	1,1	92,9
Goteborg University	Sweden	4074	1	93,9
Universidad Carlos III de Madrid	Spain	3945	0,9	94,8
Consejo Superior de Investigaciones Científicas	Spain	3471	0,8	95,7
Universidad de Alcalá Henares	Spain	3456	0,8	96,5
National University of Ireland	Ireland	3395	0,8	97,3
Universdad Complutense de Madrid	Spain	1939	0,5	97,8
Universidad de Granada	Spain	1878	0,5	98,2
University of Leeds	United Kingdom	1545	0,4	98,6
Universidad de Málaga	Spain	1366	0,3	98,9
Univerita de les Illes Balears	Spain	1103	0,3	99,2
Universidade de Vigo	Spain	1089	0,3	99,4
Universidad de Sevilla	Spain	1013	0,2	99,7
Universidad Politécnia de Cartagena	Spain	801	0,2	99,9
Universidad de Burgos	Spain	495	0,1	100