From zero to infinity: the use of impact factors and journal rankings in the evaluation of academic economic research in Spain

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Abstract: The research output of economics departments can be measured in many ways. This paper deals with alternatives to evaluate those departments and research centers. Contrary to certain extremes prevailing today, we understand research as a continuos effort in publishing results in a large number of journals as opossed to the use of restricted sets of journals as the only evaluation criteria of academic careers. To illustrate our proposal we present evidence of potential misguidance found when arbitrary assignments of journals leaves outside the picture a large percentage of the world economic research. We also pay attention to shortcomings of the journal impact factor published annually by the Institute for Scientific Information (ISI), Journal of Citation Reports, and the need of careful interpretation and regular updating when used for journal evaluation. Finally, the descriptive analysis of the impact factor of a large number of journals indicates that given the similarities of the average values of the different subgroups, it makes sense to consider a large list of economics journals with related subject fields. Empirical evidence for the Spanish case illustrates our main findings.

Keywords: Research assessment; Economics departments; Impact factors; Journal rankings; Spain

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*Financial support is acknowledged to the Spanish Ministery of Science and Technology, grant contract PB2002-0081.

1 Introduction

In recent years, we have been confronted with an arduous and potentially contentious debate about the quality standards of economics departments throughout the world. Two extreme positions have been advocated. On the one hand, there are many supporters of the idea that research is an alternative task to teaching, and that one should choose between one of those two 'substitutive' duties. On the other extreme, are those who firmly believe that only published research in a reduced core of journals should be considered in the evaluation of academic careers. Behind each extreme there is a valid and logical position that tries to obtain the greatest recognition for what they do or did in the past. There is also a subtle struggle for departmental control, new faculty recruitment and promotion rules, university and state funds, incentive assignments and research policies. As noted by Gomez-Mejía and Balkin (1992), such extreme points of view can clearly lead to the moral hazard situation associated to any agency problem. Likewise, these extreme positions have strong theoretical and institutional foundations as pointed out by Frey and Eichenberger (1993a) in relation to alternative types of academic markets, and by Whitley (2003) in relation to the impact of institutional frameworks on the organisation of academic science.

We claim that, when taken to extreme, this debate is a fallacy that should be avoided. It can generate mediocre research and potential rigidity in teaching standards and may hurt the overall reputation of economics departments in the long run. Some myths that this fallacy creates are easily discredited, simply because of their lack of logical consistency and empirical evidence. Among them, the supposed impossibility of being both a good teacher and a good researcher at the same time. The logic behind this statement relies on the idea that time is scarce and a large research effort implies less time devoted to class duties (Benke and Roof, 1990 and Weis, 1990). Under this paradigm, research and teaching are treated as substitutes rather than complementary activities. Although we lack a reliable systematic procedure to judge teaching quality in faculty evaluation, the international evidence on this issue is overwhelming*:* the teaching/research duo is fully motivated by a feedback mechanism that hardly progresses unless both work simultaneously. The same comments apply to direction of research teams, thesis supervisions, number of grants and contracts, etc. Good graduate students are one of the driving forces behind successful academic departments and, in general, good

professors cannot afford working without them. Also, at the global level, it is widely held that the link between teaching and research is an essential attribute of any university, as research informs the range of advanced options available in the different teaching programs and stimulates the spirit of enquiry that should be a feature of student learning (Reinstein and Lander, 1993). We strongly believe it is essential that research and teaching co-exist in the same institution and that each should inform and support the other.

Myths from the other side are more difficult to dismantle. Following the American slogan of 'publish or perish', there has been an established literary tradition in the economics profession of attempting to rank economics departments throughout the world. This tide has recently reached other shores and it is here to stay. Therefore, it is very important to properly weight the information content found in the alternative qualitative and quantitative rank criteria available in the literature and see its appropriateness to judge other academic markets. As we will see later, the subjective adoption of a restrictive set of journals (irrespective of its logical consistency) can easily lead to some aberrations that may question its general acceptance. Somehow, if we keep using these restrictive ranking rules our conclusions are doomed to end with the usual statement that appears in many papers in the literature, ..."Given the data characteristics, however, our results are somewhat limited in scope. This is an unfortunate, and perhaps inevitable drawback of (*name your source of data*) our information index". Is that so?

A department's research output can be measured in many ways. As a matter of fact, there have been literally hundreds of papers (in particular for the US academic market) devoted to alternative proposals. Some look at outputs that are directly observable such as counts of citations (Liebowitz and Palmer, 1988; Davis and Papanek, 1984), counts of publications (Bairam, 1994), number of pages published (Graves et al., 1982), etc. In most papers following this approach the use of citations as an "objective" measure is based on the idea that a citation indicates not only that the work has passed the barrier of being accepted for publication but that it has been found relevant to someone else's work. Therefore, it makes sense to use it as a *proxy* of the productivity of a department or an individual. Aside from its many advantages, citations are argued to be subject to abuse (Thursby, 2000) and have consequently been criticized, particularly in relation to the self citation and influence issues (Vandermeulen, 1972; Stigler and Friedland, 1975; Liebowitz and Palmer, 1988).

An alternative approach to measuring quality has been based on opinion surveys among individual department members. The National Research Council (1995) report, Thursby (2000) and Van Fleet et al. (2000) are recent examples of the survey approach. Although opinion surveys are also fraught with problems, recent work on this area has gone one step further than mere counting and tried to provide some evidence on statistical differences among departments. [1]

It is very difficult to do full justice to the hundreds of papers published so far on this topic, but we can try to summarize their main conclusions. First, departmental rankings based on alternative variants of citations are fairly consistent with quantitative rankings. Although some studies are separated by nearly three decades, the Harvards, Chicagos and Standfords are all in their usual high places. Second, similar results are obtained when using survey data showing that opinions have not changed markedly over time. Third, marginal "winners" and "losers" appear on the rankings (normally on the middle of the range) depending on what time period the counts have been made. Given the high mobility in US universities, it is not surprising to see a posterior strong comeback of a prestigious department that had rested on its laurels in the previous evaluation. Fourth, most statistical measures used as correlation coefficients or Spearman rank correlations almost always show high coherence between alternative measures in the form of high positive values between 0.8 and 0.95. [2]

The above conclusions are very important, given the wide coverage of centers and the dynamic comparisons among different time periods. What we can learn from them is very relevant to evaluate the recent history of Spanish economics departments. However, we first need to understand the historical background associated to their formation, their heterogenous ways of promotion and recruitment and their diverse backgrounds and eclectic research interests. To this issue, we devote the following section in this paper. In section 3, we analyze the use of impact factors in journal rankings and the potential costs and benefits of adopting restrictive lists of journals in appraising

[1] In the case of the first 104 US economics departments, Thursby (2000) found that Princeton (ranked 5th) is not statistically different from five other departments: those ranked 1st (Harvard), 2th (Standford), 3th (Chicago), 4th(MIT) and 6th (Yale). Also North Carolina State (ranked 42th) is not statistically different from John Hopkins (ranked 33th) and Syracuse (ranked 56th). In general, as we go down to the middle of the range, we find a large number of departments that are not statistically different even from far away neighbours.

[2] Similar empirical results are found by Bergantiños et al. (2002) for a short period of Spanish data in spite of the large differences of their data coverage in relation to the previous US literature.

research output. In section 4 we present a descriptive analysis of the characteristics of the economic journals included on the 2001 *ISI, Journal of Citation Reports* (JCR) and their differences with akin subject fields in social sciences namely, business and finance, management, planning and development, mathematical social sciences and statistics and probability. Section 5 concludes with some policy recommendations.

2 Brief historical background of Spanish economics departments [3]

The history of Spanish economics departments is relatively young. The first schools were founded in the late 1940s and early 1950s and were established in the main public universities. Their original faculties came from different backgrounds that logically influenced the first undergraduate programs where teaching was organized around the following topics: economic theory, mathematics, statistics and econometrics, public economics, economic policy, economic geography, accounting, business administration and certain law courses taught by their law schools faculty. In those early years, graduate courses were scarce and informal and the stock of Ph.Ds was also scarce. Since the number of job openings was reduced, promotion and tenure were rare, tenure was regulated by law and confirmed and signed by national committees on the basis of a large number of public tests. That situation created a faculty structure whose main characteristics were the following. First, professors who got tenure in one particular subject field could only teach the topics included in that particular area. Second, there was a strong dependency between candidates and their thesis advisors (who, given their short numbers, also had a high probability of being a member of the examining committee) that created considerable feedback on the system. Third, research (as we understand it today) counted little in granting promotions and, therefore, its value was economically and socially negligible. Fourth, university teachers were (and still are) considered civil servants and their categories, salaries and incentives were ruled by the state. Once an administrative level was reached, future

[3] Under that name we include all departments associated with teaching and research activities included in economics schools (*Facultades de Ciencias Económicas y Empresariales*) just to avoid continuous repetitions of additional subject fields like business, finance, accounting, applied economics, etc.

pay increases depended on the number of service years. As happened with other European countries during the same period (Portes, 1988), the Spanish system was essentially an academically closed, highly regulated market and strongly protected from outside competition.

With this picture in mind, it is not surprising to see the lack of international research tradition that characterized Spanish economics departments in the course of the following three decades. During those years, only a handful of Spanish economists (either working on foreign centers or educated in good British or US universities) showed up regularly in international meetings and published in respected refereed journals. The large majority, however, restricted their research activity to the preparation of manuscripts (mostly unpublished), books edited by local publishers, teaching notes and invited lectures. Note, however, that those activities that some newcomers scorn were quite consistent with the system's profile of rewards and the demands of academic authorities. [4]

This picture remains unchanged until the early 1980s, when the number of schools dramatically increase, and so did the number of teachers. The *Ley de Reforma Universitaria* (LRU) enforced changes that caused a radical switch in promotion and recruitment procedures and allowed that each professor belonging to a particular historical subject field had the opportunity to reassign him or herself to one of the broader new areas shown in Table 1. While some areas had a well defined interest's profile, others included a smorgasbord of topics representing very heterogenous interests. At the same time, the seeds planted by the early publishing pioneers rooted deeply in some departments with the arrival of a large flow of recent graduates from the best foreign universities, and the creation of new and competitive doctoral programs. The new breed did what they saw in their graduate schools and gradually, a new "culture" of international publications became the rule in judging quality standards. Greater accessibility to some private funds, state research grants and scholarships, granted that hundreds of Spanish economists were able to publish in good journals, present papers at international meetings and became fully involved in the international academic community. Additionally, a research assessment exercise at the individual level was enacted in 1989 with the introduction of mechanisms of evaluation of publicly-sponsored research activity through the National Commission for the Evaluation of Research Activity (CNEAI). As Jiménez-Contreras

[4] A broad and controversial view of the European economics situation can be seen in Frey and Eichenberger (1992,1993b), and a similar historical experience for the Italian case is described in Perotti (2002).

et al. (2003) point out, the creation of the CNEAI marked the start of a system designed to evaluate individual research activity, and gave preference to publications in international journals listed in the ISI's Journal Citation Reports.

Table 1 should go around here.

During the last years we have witnessed an unprecedented growth of Spanish contributions in economics journals that are well documented in Bauwens et al. (2002), Bergantiños et al. (2002), Dolado et al. (2002), and Kalaitzidakis et al. (1999, 2001), among others. Unfortunately, this growth has not been spread evenly among departments, subject fields or individuals, and the current situation shows a growing index of polarization (Villar, 2002). This evidence, however, is not only based on differences among those departments and individuals publishing in international or Spanish journals. The main indicator of polarization appears to be among those departments and individuals that publish regularly, and those that do not publish at all. [5]

Most of the previous studies, however, have focussed only on publications from either a restricted set of economics journals or from journals included on the *Econlit* data base. Somehow, their authors behaved like the person in the old story who was found walking in circles under a street lamp looking for his lost wallet. When asked why he had restricted his search to such a short segment of the mile-long street, he replied, "This is where the light is". The relevant question is: can we make the light's beam wider? In other words, would the current departmental or individual rankings change considerably by enlarging the publications data base? We contend that departments and individuals working on related fields will not feel excluded, criticisms of subjective lists will be easily dismissed and chances of greater acceptance will be enhanced, while changes will marginally affect rankings. Given the eclectic nature of the field, we also contend that a wide range of journals should be considered. This last point is particularly relevant given the individual weights of the different

[5] A recent study (García et al., 1999) that analyses the published output of Spanish economics departments during the 1992-1997 period in the main six Spanish economics journals, provides striking evidence in this regard. The total output comprises 18.000 published pages, which (at the average of 20 pages per paper) are equivalent to 900 papers. Dividing by the total number of economics professors holding a Ph.D (around 2880 at that time), these numbers imply an average productivity of one published paper every tweenty years. What is worse, however, is that only 27 departments are above this average, and 44 (out of 88 departments and research centers) have never published a single paper during this period.

areas in the total number of economics professors presented in Table 1. Although efforts to reach a consensus among areas may prove overly time-consuming and damaging to interpersonal relations, leaving aside certain areas (with a reasonable share of the pie) might have disastrous consequences for the future. If public authorities do not have a clear picture of what 'research in economics' means, there are many chances that the present situation (on average) will remain unchanged.

**Insert Table 2 around here*

An indication that public authorities have provided ambiguous set of rules (in economics) when evaluating and rewarding research activities, can be seen by analysing success rates for publication-linked salary increases awarded to Spanish researchers between 1990 and 2001 (Table 2). At first, only 60% of all applicants were wholly or partially succesful. As a consequence, researchers had to adapt their publication behaviour to the new set of rules that worked as a self-censorship filter for the applicants. When compared to other fields, results from Table 2 indicate that the evaluation process seems not have been assimilated by researchers in the field of Social Sciences, particularly in Economics. Recently, Jiménez-Contreras et al. (2003) have pointed out some reasons for such findings, ranging from the so-called local factor to the lack of internal homogeneity within the field. But if we accept that the evaluation criteria have been equally applied across all fields, these findings suggest that additional efforts are needed to increase economics researchers' familiarity with the CNEAI set of rules.

3 The use of impact factors and journal rankings

3.1 General comments about impact factors

Following the established tradition mentioned earlier, some Spanish economics departments have taken the initiative to develop their own journal rankings. In theory, those lists are designed to reduce uncertainty in research assessments, to help faculty to identify target journals, and reduce the level of uncertainty in planning and evaluation. Although the adoption of explicit lists of journal rankings is not without costs (Van Fleet et al., 2000), each department is perfectly entitled to rely on its own ranking for whatever purposes they have in mind. As many have noted, however, the most serious drawback regarding restricted lists is that they can be highly subjective and subject

to the biases and preferences of those who design the lists. Therefore, it is very likely that other departments who do more highly specialized work, find the lists disadvantageous and unsuitable for their own interests [6] .

One of the main bibliometric indicators measuring the quality of a journal, its research papers, the authors of those papers, and even the institution they work in, is the impact factor (*IF*) published annually by the *ISI, Journal of Citation Reports.* Its international reputation derives from the fact that it includes around 7500 world journals covering all science and social sciences subject fields. Most important, the *JCR* is unique because it is the only source of citation data on journals. In spite of its general acceptance, the *IF* has many shortcomings which have recently been pointed out, among others, by Bauwens et al. (2002) and Amin and Mabe (2000) and that we try to summarize and expand here.

The *IF* follows a curve like that of Figure 1. In general, citations to articles published in a given year rise sharply to a peak between two and six years after publication. As Amin and Mabe (2000) note, the citation curve of any journal can be described by the relative size of the curve (in terms of area under the line), the extent to which the peak of the curve is close to the origin, and the rate of decline of the curve. The *IF* is a measure of the relative size of the citation curve in years 2 and 3. So, for example the 2001 *IF* is the citations in 2001 to articles published in 2000 and 1999 divided by the total number of articles published in the same two years. By looking at Figure 1, we can also understand the basis of other two *ISI* indicators: the immediacy index (*II*) and the cited half-life (*CHL*) index. The *II* provides a measure of the skewness of the curve, that is, the extent to which the peak of the curve lies near to the origin of the graph. It is computed by dividing the citations a journal receives in a current year by the number of articles it publishes in that year, and gives an idea of how quickly articles in that journal get cited upon publication. Finally, the *CHL* is the number of years that the number of current citations takes to decline to 50% of its initial value, and it is a measure of how long articles in a journal continue to be cited after publication.

** Insert Figure 1: Generalized Citation Curve*

[6] Although we lack precise information about the percentage of departments having formal ranking of journals, a recent survey by Van Fleet et al. (2000) found that out of the 496 management departments in the US, only 35 (14% of those responding) indicated the use of formal lists.

Although the combination of the three indexes provides a better picture of the number of citations through time, the *IF* is the most commonly used. In particular, the following characteristics should be mentioned.

1.The impact factor is affected by the subject area, and the average number of authors per paper.

In Table 3, we show the median impact factors of a selected group of subject fields in 2001. In general, fundamental life sciences, neurosciences, clinical medicine and their related empirical fields have higher median impact factors than specialized or applied fields, which reveal a significant variation according to subject field [7] . In a similar vein, Amin and Mabe (2000) found a strong and significant positive correlation between the average number of authors per paper and the average impact factor for a subject area. This is a logical result of the self citation tendency and the differences in the average number of authors per paper between fundamental life sciences (where there are more than four authors per paper) and social sciences (averaging two authors). Note, however, that differences among the seven social sciences group are much smaller.

Table 3 should go around here.

2. Even within the same subject area there will be significant variation according to the journal type or article type.

This is illustrated in Figure 2 and Table 4 where we can see the different behavior of the most common article types: letters (a short and rapid publication journal), full papers and review papers. In some cases, the indexes vary in opposite directions with the type of article and reinforce the argument for weighted rather than individual indexes. Additionally, by focusing solely on the impact factor, review journals always show higher average *IF*s than other journal types. In general, the journal that mostly publishes review articles has an $IF = 6.05$, while the average original article's has an $IF = 2.05$. This is well documented, for instance, in the economics field, for the *Journal of Economic Literature (IF*=7.929 in 2001) and the *Journal of Economic Perspectives (IF*=2.103 in 2001) [8] . Since *IF* measures different proportions of citations for different article types, caution

[7] Even within the same subject field, there is considerable variation. For example, the median *IF* of general physics is 0.681 while the ones corresponding to atomic and particles physics are, respectively, 1.448 and 1.620. Similar differences can be observed between general and experimental psycology, chemistry and many others.

[8] This has been one of the main criticism of the impact factor as a sole measure of citations. In 2001 a new company, **PrestigeFactor,** has started ranking academic journals including information that (apparently) overcomes

should be taken when comparing journals with different editorial policies or journals with diverse combinations of article types.

Table 4 should go around here.

**Insert Figure 2: Impact factors and Journal type*

3. As any average value, the impact factor shows variation due to statistical effects. Both, the size of the journal and the size of the measurement window affect its variability.

Based on a sample of 4,000 journals, Amin and Mabe (2000) examined the mean variation in impact factor from one year to the next. They found a clear correlation between the extent of its fluctuation and the size of the journal. As we will see later in the case of some social sciences journals, small titles (< 35 papers per year) on average vary in impact factor by more than $\pm 40\%$. Although the fluctuation is smaller for larger journals (> 140 papers per annum) they are still affected by considerable variation. Table 5 shows the results for different social science journals during the 1991-2001 period. Two of them (*Journal of Forecasting*, and *International Journal of Forecasting*) share a similar forecasting field and publish a similar, small number of papers. The *Journal of Economic Dynamics and Control* is an intermediate case, publishing between 70-80 papers, whereas the *American Economic Review* is a large journal with more than 160 papers. In the four cases, however, annual variation is considerable, which provide support for the results of the larger sample. Therefore, care should be exercised to avoid inferring too much from small changes in the indexes. This evidence is relevant for the case of journal rankings in situations where the *rankings are not updated regularly*, and this specially applies in the case of intermediate journals.

Also, as Johnson and Podsakoff (1995) demonstrate, journal reputation changes over time. Hence, any such rankings need to be periodically updated. How should we interpret the evaluation of the 1995-2001 research period when using a particular year (say 1998) impact factor? Should we use the mean, or the median period, instead? In general, expanding the size of the measurement window or using simple moving averages can iron out some of the statistical variation, producing a much smoother curve. However, we can witness remarkable changes in rank by simply changing the time

the shortcomings of this index. However, the lack of confirmed information about its future (the company went out of business after *ISI* filed a succesful lawsuit against it), has provided little help in establishing itself as a serious competitor to the *JCR*. Whether new companies will emerge as alternatives to the *ISI* remain to be seen, but, certainly this PrestigeFactor has opened a crack.

frame of measurement [9] . Because of this variability the straight use of an impact factor to measure quality should be strongly avoided. It would be equally foolhardy to penalize authors for publishing in journals with impact factors less than a certain fixed value or below the mean or median of a particular subject field. This is specially relevant when we want to use absolute values outside of the context of other journals within the same or different subject area. For example, *Biometrika* with an $IF = 1.266$ is just the median of the Biology Miscellaneous field while it is ranked on the top of the Statistics & Probability subject field [10] .

Table 5 should go around here.

4. New journals can be penalized since the minimum amount of time for its first appearance on the JCR will be between 4 to 6 years.

Due to the way the impact factor is computed, new journals will not emerge easily on the list regardless of the name and topic of the journal or the names and reliability of its associated editorial board. If a promising new journal started in 1996 does not begin getting cited until at least 1999 and does not show up on the *JCR* until two years later, there are chances that many scholars will prefer other (more secure) options [11] . If this apprehensive feeling is shared by many, we may end up creating a *vicious circle* by which a promising new journal may never take hold. Obviously, this is a risk that every new journal has faced in the past and, despite all, many of them have succeeded in establishing a well deserved reputation today. Perhaps one of the reasons for their success was that initial contributors did not care much about their impact factors, so the journal was able to reach the correct audience and accomplish its initial quality targets.

5. Certain areas without specific ISI categories could be under-represented.

Indexing in the *Journal of Citation Reports*, Social Sciences Edition (SSCI) is not a simple matter

[9] For example, Amin and Mabe (2000) found that out of 30 chemical journal examined, 24 changed in rank by up to 11 positions when changing from a two-year to a five-year impact factor. In economics, changes from year to year are remarkable. For example, *Games and Economic Behavior* was ranked 107th in 2000 and jumped to the 55th position in 2001. Similarly, the *Oxford Bulletin of Economics & Statistics* went from 109th to 47th during the same period.

[10] Impact factors have no percentile range and, therefore, cannot be compared to the results of other journals. Further, a user does not have any way of determining whether a journal quality has improved or declined. In fact, based on impact factor scores, many journals appear to be improving annually when in reality they are not.

[11] *Studies in Nonlinear Dynamics and Econometrics* for instance, was originally published in 1996 and it did not show up in the *JCR* until 2000.

of academic reputation nor does it represent any lack of dynamism in a research field. To illustrate this contention, let us take the case of accounting, a field whose recent Ph.D.s earn the highest salaries offered by the AACSB (American Association of Collegiate School of Business). The profession of accounting academics is well structured through a number of professional associations that report considerable membership: the American Accounting Assn., 11,000 members; the European Accounting Assn., 2,100 members. Yet, there are only six journals indexed in the SSCI: *Accounting, Organizations and Society; The Accounting Review; Auditing; Journal of Accounting and Economics; Journal of Accounting Research* and *Contemporary Accounting Research.* A considerable number of other equally well-regarded journals within the accounting field (i.e., *Accounting and Business Research, Journal of Accounting, Auditing and Finance*), which are regularly used in first tier universities to assess tenure and promotion decisions, strive for being indexed in the SSCI for many years with negative results. This is partly due to the concomitant effects of admission criteria in the SSCI (i.e., journals applying for entering in the SSCI have to report high citation indexes by outlets presently reported in the database) and the lack of categorization for a given area (i.e., accounting journals appear in the SSCI under the overall heading of "Business and Finance"). In short, this criteria imply that given the small number of existing journals that are indexed in the SSCI in subject fields like accounting, citation indexes for applicants are very low and their indexing prospects become uncertain, unless the *ISI* launches a new field under the overall heading of accounting.

In spite of the previous qualifications regarding impact factors, the *JCR* is the main source of international bibliometric information and a larger number of Spanish economists should make an effort to publish in those journals included there. The language barrier is not longer a valid excuse since other subject fields have been able to overcome this hurdle a long time ago. Also, the supply of journals is wide, so it is hard to imagine a single specialized field without a considerable number of alternatives. It is no longer true that working with Spanish data is an added handicap in the publishing process. At present, there are 28 Spanish journals on the Science Citation Index (some of them published in Spanish) and one journal published in Spanish in the economics category in the Social Sciences edition. It is also a duty of the editors of the main Spanish economic journals (that started a serious refereeing process some years ago) to aim at more ambitious targets, and consider

their inclusion on the *JCR* as an strategic medium term goal [12] . It goes without saying that the extended use of restricted lists of journals will not be of great help to them.

3.2 Implications of journal ranking for Spanish economics departments

It is controversial the selection of a sample of economics journals to determine quantitative and qualitative publication information. The adoption of a list by a given department only shows its particular preferences. Those "Top Journals", "Blue Ribbon" or "Diamond Lists" are not pronouncements carved in stone but are opinions -admittedly well-formed ones- that readers should be able to test for themselves. This is one of the reasons why some recent studies do not impose any sort of quality screen on journals (Thursby, 2000; and Van Fleet et al., 2000; among others). In general, the views of numerous colleagues are that they refuse to make such rankings on principle because people end up making body counts of j articles in the top k journals as a substitute for actually reading the work and assessing its quality. Similar comments apply to the use of *acceptance rates* as an indicator of journal quality. Acceptance rates vary across fields and across time (Huettner and Clark, 1997) and as Cabell and English (1994) report, even within a common area considerable variation can exist. Additionally, acceptance rates are not static indicators, they are inaccurate, are uncorrelated with rankings, and their meaning remain unclear [13] .

In spite of the previous comments, we have recently witnessed a myriad of research papers and publications devoted to ranking academic journals and institutions in economics throughout Europe. Perhaps, the most influential ones are those engaged by the European Economic Association as reported in Kalaitzidakis et al. (1999, 2001), who draw on a sample of 30 quality economic journals (from the *JCR* data base) that rank following a complex index. Their results are presented in Table 6 where the first column includes their rank number, and the third column shows the rank number that the same journal has on the 2001 edition of the *JCR*. Differences between both rankings are

[12] The case of the Spanish statistics journal *Test* is a good example of a succesful inititative. Although relatively young, it has been able to appear on the top 50 journals (Statistics & Probability) of the science edition of the *JCR* since 1999 and it maintains a comfortable location at the median of the distribution during the last years.

[13] A detailed summary of the main shortcommings of acceptance rates as indicators of journal quality can be seen in Van Fleet *et al* (2000).

paramount and difficult to rationalize on logical grounds. What is worse, however, it is the fact that if one uses the list suggested by Kalaitzidakis et al. (2001) any publication not included in their journal list will not be considered *at all.* So, we have a case where an *a priori* assignment of categories based on cutoff scores leaves a large percentage of the world economic research outside the picture. How many world class academics in economics would fare according to this list?

Table 6 should go around here.

In order to informally check this contention, we have chosen the cases of three scholars that are widely considered in a class of their own: Arnold Zellner, George C. Tiao and Andrew Harvey. The three of them hold economic degrees, and are or have been associated to economics and business departments. Two of them (Professors Zellner and Tiao) are Americans, while Professor Harvey is Briton. Professor Zellner is recently retired, Professor Tiao is on the edge of retirement, while Professor Harvey is probably at the peak of his career. The three of them, however, are still quite involved on research activities as their respective *web* pages can attest. Table 7 shows Professor Zellner's publishing record up to 2002. His total output includes 230 papers (published in 36 different journals), and 21 books and monographs. In this case, *only* 59 of his total published papers (25% of his research activity) belong to the group of journals included in Table 6. When evaluating his research effort, would anybody leave out the remaining 75% of his production because it does not belong to a particular set of journals?

Table 7 should go around here.

Professor Tiao has published 124 papers (in 26 different journals), and only 5 of them (4% of his production) are published in the Kalaitzidakis list. In spite of that, he has been elected Fellow of the most important academic societes, and has received the most important distinguished service medals and several foreign honorary doctorates. Would any economics department in the world deny him a position?

Table 8 should go around here.

For those who think that the previous cases are, somehow, exceptional due to some special circumstances, we have also included the case of Professor Harvey, working in one of the most prestigious economics departments in Europe. His total output, up to 2002, shown in Table 9 comprises 91 papers published in 37 different journals. Only 32% of his total production (29 papers)

have been published in the restricted Kalaitzidakis list. Again, a larger share of his production has been published somewhere else. In spite of age, site, and field differences, the distribution of his publications is not too different from the one observed in Professor Zellner's case [14] .

Table 9 should go around here.

The previous examples reveal that productive researchers in the field tend to publish widely in many different journals. Further, given the eclectic nature of the field, the growing interrelation of many topics in economics and the increasing supply of journals, it is likely that the present situation will be further exacerbated in the future. Lastly, restricted lists of journals leaves out too much to be useful and creates a strong sentiment for an objective, independent method of assesing journal quality. Why then such a persistence in developing new top-tier journal rankings? The answer is obvious: it makes life easier and counts simpler. A coherent ranking of 30 journals is reasonably easy to achieve, while the same task for 1000-1100 journals and proceedings volumes is a major undertaking [15] . As a matter of fact, the new PrestigeFactor performed this task for 1,468 social sciences journals for the year 2000, where they include information about the new PF index, the ranking of the journal and the percentile associated to each particular journal. A partial list of this ranking is shown in Table 10 where we can observe striking differences with the previous Kalaitzidakis list.

Table 10 should go around here.

In the Spanish case, those promoting the use of restricted lists should not be worried about potential changes when the lists became wider. As Villar (2002) rightly points out, current empirical evidence based on recent studies (using different data coverage) indicates only marginal changes in the rankings of the first 11 Spanish economics departments, confirming the international experience mentioned in previous sections of this paper. We also contend that enlarging the list, by allowing the inclusion of journals where many professors associated to economic departments actually publish

[14] For those thinking that the three examples presented here are, somehow, exceptions confirming the rule, we encourage to check the cases of the two last Nobel Prizes in Economics, namely Clive Granger and Robert Engle. In the case of Professor Granger, the percentage of his large production (247 papers in 42 journals) included in the Kalaitzidakis list is 20%. In the case of Professor Engle (117 papers in 33 journals) the figure rises up to 35%.

[15] These are the numbers provided by Thursby (2000) in the case of economics, and by Van Fleet *et al* (2000) in the case of management.

their work, will not affect average results but, rather, it will restore some degree of fairness to certain groups or individuals who have been left behind without reason.

4 Descriptive analysis of related *ISI* journals

In this section we perform a descriptive analysis of the *ISI* journals found in the *Journal of Citation Reports* 2001*, Social Sciences Edition* under the categories of economics, business, finance, planning and development, management, mathematical social sciences, transportation and the category of statistics and probability of the *Science Edition*. Table 11 resumes the basic characteristics for all the journals under these categories and a joint category named 'all' where all the journals are considered together, excluding the repeated ones. The first column shows the field or category, the second one the number of journals under that category, and in columns 3 to 8 we include the mean, median, maximum and minimum values and root mean squared distance to the mean value of each category (RMSD).

Table 11 should go around here.

To assert that our conclusions are robust to outliers (for instance, journals with a lot of review articles may have a higher impact factor than research papers), we conduct the same descriptive analysis removing the journals with the most extreme impact factors (in fact, we remove those with an IF above or below 3.5 times the root mean squared distance to the mean). When using this criteria, we identify as outliers the *Journal of Economic Literature* and the *Quarterly Journal of Economics* (with impact factors of 7.929 and 3.795, respectively) in the economics category, and the *Administrative Science Quarterly* in management, with and impact factor of 3.980. Similarly, these three journals appear as outliers in the overall joint category. As in Table 11, Table 12 shows the basic characteristics of the journals when these outliers are excluded. By comparing Tables 11 and 12, we can see only minor changes in the basic characteristics of the journals after the removal of outliers. Of course, since outliers were only found in the upper level of the impact factor, means are reduced (for instance, in the economics category it goes down from .741 to .678). The dispersion of the journals (measured through RMSD) is also reduced (also in the economics category from .803 to .521).

Table 12 should go around here.

There are other indexes which are commonly used to rank journals that take into account not only the impact factor but also the cited half-life. One of the most popular indexes, due to its simplicity, is build as follows

$$A_j = IF_j \times CHL_j \tag{1}$$

where IF_j and CHL_j are, respectively, the impact factor and cited half-life of any journal j. Since the *ISI* does not report CHL_j figures for some journals (mostly new ones), when this information is absent, the default CHL_j is taken as 1. By repeating the previous descriptive analysis for this new index we obtain the results shown in Table 13.

Table 13 should go around here.

It can be checked that changes on the rankings of the journals are minor with respect to the use of the IF. Moreover, if we compute the correlation coefficient (ρ) between these two indexes (A_j and IF_j) for all categories, we find that it is greater that 0.9, with the exception of the Transportation subject field that only includes 11 journals. This confirms the high coherence between both indicators of citation (see Table 14).

Table 14 should go around here.

Finally, Table 15 shows the median impact factor from 1991 to 2001 of the different subject fields analyzed in this section, and summarizes impact factors variation through time. Although we can observe some variability differences among individual subject fields, there seems to be a growing trend, in most fields, with the minimum IF values at the beginning of the sample (1991-93) and the maximum values in 2001. These results tend to confirm that the descriptive analysis made for 2001, is consistent trough time.

Table 15 should go around here.

5 Conclusions and policy recommendations

Public authorities in Spain are now in the middle of a contentious debate to establish evaluation rules for public universities and research centers. As usually happens in many policy issues, there

are always two (at least) sides of the story. On the one hand, there are those who strongly advocate the maintenance of the old system based solely on teaching loads and other departmental duties, including all kind of research. For this group research means a smorgasbord of written material ranging from books, internal department reports, descriptive sectoral studies, sponsored regional income or employment data collection, consulting activities and even local newspapers articles. The main characteristic of this type of work is the lack of quality control through the appropriate external anonymous evaluation, so generalized in global research today. If those who support this alternative keep 'missing the boat', their chances to communicate with other colleagues from the rest of the world are nil. They might reinvent the wheel again, but no one will notice. Their attitude will surely affect their teaching quality programs, their thesis directions, their chances to obtain national and international research projects and, what is worse, will negatively influence future generations of their graduate students. On the other extreme of this debate, are those who firmly vindicate that only published research in a restricted set of international journals should be considered in the evaluation of academic performance. Unfortunately, this approach excludes a large part of world research output. If prospective authors must make an effort to publish in *ISI* journals (that supposedly implies research at a global level) why wasting time and ignoring their work with restricted lists?

As with any policy issue, this bone of contention also implies strong disagreements about departmental and school control, new faculty recruitment and promotion rules, university, regional and state funds' control, and incentive assignments. It is not surprising then that both parties are extremely active trying to obtain the greatest recognition for what they do or did in the past. Contrary to both extremes, we understand research as a continuous effort in publishing our output results associated to the discovery, dissemination and interpretation of new knowledge in a (possibly) large number of journals. This view does not exclude, at all, a handful of Spanish and other international journals that started a serious anonymous refereeing process some years ago. As we have tried to show, between the two extreme views described above, there are many intermediate alternatives worth considering.

In this paper we have addressed the controversial issue of how to measure a department's research output, and the costs and benefits associated to the adoption of explicit lists of journal rankings. As many have noted, the most serious drawback regarding restricted lists is that they can be highly

subjective and subject to the biases and preferences of those who design the lists. Rather than the final statement, those lists and rankings of journals need to be seen as well-formed opinions that require a certain degree of consensus if we want to increase their chances of general acceptance. Given the heterogenous nature of the field, we have also contended that a wide (as opposed to a narrow) set of journals should be considered. This last point is very relevant given the individual weights of the different areas in the total number of economics professors in Spain.

We have also analyzed the characteristics of one of main bibliometric indicators measuring journal quality, namely the impact factors published annually by the *ISI, Journal of Citation Reports.* Its international reputation derives from its wide coverage of scientific journals and its uniqueness as the only source of citation data on journals. In spite of its general acceptance, the impact factor has many shortcomings that can create significant distortions when is used carelessly. Among other facts, impact factors are affected by the subject area and the average number of authors per paper, and show significant variation according to the journal type or article type. Also, as any average value, the impact factor shows variation due to statistical effects and both the size of the journal and the size of the measurement window affects its variability. Besides, there is considerable delay (years) for a new journal to get scored. All the previous qualifications are very relevant for the case of journal rankings in situations where the rankings are not modified regularly. Since journal reputation changes over time, any such rankings need to be periodically updated. However, the *Journal of Citation Reports*'s international acceptance should act as an incentive for Spanish economists seeking to publish their research papers in well respected journals. Given the wide supply of journals, it is hard to imagine a single specialized field without a large number of alternatives.

In trying to provide some hints about what those alternatives are, we have performed a descriptive analysis of a large number of journals related to economics and included on the *Journal of Citation Reports* 2001 data base. We have included 386 different journals from the following fields: economics, business, finance, management, planning and development, mathematical methods, and statistics and probability. Although the sample does not cover all journals related to social sciences, it includes a large majority of the *ISI* journals where Spanish professors working on economics schools publish their work. Our analysis indicates the following results. First, there are no big numerical differences among the different subject fields included on the sample. Second, the large sample encompassing

all different subsamples makes sense, and can be used to rank related journals. Third, alternative indicators of citation provide similar information. Finally, if indexes are used to supply information on rankings, they need to be periodically updated.

We have tried to present a clear and realistic picture of Spanish research on economics in recent years, very much in the same spirit as the one presented by Villar (2002) and others. Although tentative and controversial, we strongly believe that this paper would be incomplete if we do not propose a set of policy recommendations for both academic authorities and prospective authors. Some may be seen as mere conjetures based on our own experience while others are simply future lines of research that need further investigation and testing.

1. Academic authorities ought to provide unambigous directions about what research excellence means, so authors can clearly know where to send their darts. To this end, they should provide information regarding national and international journal data bases, journals' refeering processes and changes in journals' quality indexes. While we strongly dissuade the use of restrictive lists of journals as a solely screening device, we are also reluctant to accept that everything should be equally weighted. Any empirical information used to evaluate research output over a certain period of time must be updated regularly.

2. Public funds assignments must be distributed as a function of past performance as well as promising future. During the last years, highly ranked Spanish economics departments have received a generous share of public research funds, but younger promising research groups and individuals have not been left behind. It is important to continue this policy in the future. At the same time, faculty members should be evaluated regularly on the basis of research performance. When the time is right, it would be interesting to asses the relationship between department's sources and characteristics and counts of research output and its quality score very much in the same spirit as in Thursby (2000) for US universities. Once a larger data set becomes available it would be interesting to test questions like 'how well does department A fare, given its resources, in producing research in comparison to other departments?

3. Prospective authors need to identify correctly their initial journal targets. This decission should be a function of both the characteristics of the paper (theoretical or applied, main topic, economic sector, etc.) and the characteristics and orientation of the journal. Leaving aside 'fashionable' or

'hot' topics, a large percentage of rejections are more related to unsuitability to the journal's aims than to the journal perceived prestige. Hence, authors should not base their initial choice either on acceptance rates or journal impact factors. By the same token, a rejection decission from one of the top journals is not the end of the world. There are other alternatives worth considering, as a large number of respected authors can testify.

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6 Tables

Area	Full Professors	Associate Professors
Applied Economics	36.3	37.9
Accounting and Finance	19.1	20.3
Business Administration	14.3	13.3
Foundations of Economic Analysis	13.9	13.9
History and Economic Institutions	7.8	6.8
Marketing and Mkt. Research	4.9	4.4
Economics, Sociology & Agric. Policy	3.7	3.4
Totals	**779**	**1721**

Table 1. Percentages of Professors with tenure among different areas in public economics schools in Spain in 2000.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Math./Physics	59	80	76	78	84	86	90	91	90	90	93	86
Chemistry	70	75	80	84	74	78	89	92	89	93	96	96
Cell/Molec.Biology	80	74	71	86	82	86	90	92	96	94	99	97
Medicine	59	69	68	65	65	78	75	70	75	76	75	78
Social Sciences	46	48	54	70	58	60	64	56	71	62	60	51
Economics	47	66	56	60	65	62	50	50	52	54	53	53
Average across all fields	60	66	65	70	70	71	73	76	78	83	83	78

Table 2. Succes rate in obtaining publication-linked salary increases by selected scientific fields.

Source: CNEAI, 2002.

Sciences	Subject Fields	Median IF
147	Cell Biology	2.186
197	Neurosciences	1.783
305	Biochemistry & M. Biology	1.926
113	Genetics	2.268
59	Hematology	1.535
113	Inmunobiology	1.992
81	Microbiology	1.647
107	Oncology	1.830
56	Chemistry (applied)	0.742
66	Physics (multidisciplinary)	0.746
70	Statistics & Probability	0.487
45	Computer Sciences (hardware)	0.485
Social Sciences	**Subject Fields**	**Median IF**
55	Business	0.841
61	Management	0.607
165	Economics	0.559
93	Sociology	0.474
37	Planning & Development	0.576
55	Social Sciences (interdisciplinary)	0.500
11	Transportation	0.531
33	Business, Finance	0.719
29	Social Sciences, Math Methods	0.610

Table 3. Median impact factor of selected subject fields in 2001.

Indicators of Citation			
Type of Journal	**Impact Factor**	**Imm.Index**	**Cited Half Life**
Letters	Variable	High	Low
Full paper	Low	Low	High
Review paper	High	Low	High

Table 4. Expected index values according to the type of journals

Year	**AER**	**%∇**	**JEDC**	**%∇**	**JF**	**%∇**	**IJF.**	**%∇**
1991	1.588	-	0.309	-	0.550	-	0.465	-
1992	1.669	5.10	0.373	20.7	0.610	10.9	0.600	29.3
1993	1.485	-11.0	0.452	17.5	0.375	-38.5	0.620	3.3
1994	1.657	11.6	0.410	-10.2	0.360	-4.0	0.645	4.0
1995	1.726	4.2	0.469	14.4	0.400	11.1	0.241	-99.9
1996	1.740	0.8	0.529	12.8	0.650	62.5	0.442	83.4
1997	1.630	-6.3	0.312	-41.0	0.320	-50.8	0.493	11.5
1998	1.977	21.3	0.556	78.2	0.420	31.2	0.284	-42.9
1999	1.770	-10.5	0.758	36.3	0.322	-23.3	0.385	35.5
2000	1.795	1.4	0.496	-34.6	0.377	17.1	0.677	75.8
2001	2.087	16.3	0.664	33.9	0.582	54.4	0.672	-0.7
Mean	1.739	8.9^{+}	0.484	30.0^{+}	0.451	30.1^{+}	0.502	38.6^{+}
Median	1.726	8.4*	0.469	27.3*	0.400	27.3*	.479	32.4*

Table 5**.** Impact factor variability of a selected set of journals: 1991-2001. AER stands for *American Economic Review*, JEDC for *Journal of Economic Dynamics and Control*, JF for *Journal of Forecasting* and IJF for *International Journal of Forecasting.* $^{+}$ Mean and * median of the absolute values of the changes.

1	American Economic Review	5
2	Journal of Political Economy	10
3	Econometrica	8
4	Quarterly Journal of Economics	2
5	Journal of Econometrics	28
6	Journal of Economics Perspectives	4
7	Journal of Economic Theory	49
8	Journal of Monetary Economics	30
9	Review of Economic Studies	14
10	Review of Economics & Statistics	26
11	Economic Journal	22
12	European Economic Review	42
13	Games and Economic Behavior	55
14	Journal of Business & Economic Statistics	72
15	Journal of Public Economics	37
16	Journal of Human Resources	35
17	Journal of Economic Literature	1
18	Econometric Theory	76
19	Journal of Labor Economics	38
20	International Economic Review	19
21	Economic Theory	83
22	Journal of Environmental Ec. & Manag.	29
23	Rand Journal of Economics	23
24	Journal of Financial Economics	11
25	Economics Letters	131
26	Journal of Applied Econometrics	39
27	Oxford Bulletin of Econ.& Statist.	47
28	Scandinavian Journal of Economics	97
29	Journal of Economics Dynam. & Control	68
30	Journal of International Economics	9

Table 6. Ranking of academic economic journals of Kalaitzidakis et al. (2001)

Journals on Kalaitzidakis list	**N.Art.**	**Total**
Journal of Econometrics	22	59
Econometrica	13	
Int. Economic Review	7	
Economics Letters	5	
Rev. of Econom.& Stat.	3	
J. of Bus. & Econom. Stat.	3	
Journal of Political Econ.	3	
Review of Ec. Studies	2	
American Ec. Review	1	
Other publications		
J. of the Am. Stat. Assoc.	14	41
American Statistician	4	
J. Royal St. Soc. (Ser.B)	3	
Int. Journal of Forecast.	3	
Journal of Forecast.	3	
American J. Agric. Econ.	2	
Journal of Business	2	
Econometric Reviews	2	
Metroeconomica	2	
Arch. of Bioch. & Bioph.	2	
Other *ISI* journals with 1 paper	16	16
Chaps. of books, handbooks, others	114	114
Books and monographs	21	21

Table 7. Professor Zellner´s publishing record

Journals on Kalaitzidakis list	**N. Art.**	**Total**
Journal of Econometrics	3	5
J. Bus. & Ec. Statistics	2	
Other publications		
Biometrika	21	77
J. Geog. Research	17	
J. Am. Stat. Assoc.	15	
Env. Science & Tech.	4	
Technometrics	3	
J. Roy. Stat. Soc. (Ser.B)	3	
Americ. Statistician	3	
J. Air Poll. Control Assoc.	3	
Annals of Math. Stat.	2	
J. Time Series Anal.	2	
J. Atmosph. Sciences	2	
Annals of Statistics	2	
Other *ISI* Journals with 1 paper	11	11
Chaps. of books, handbooks, others	31	31
Books and monographs	6	6

Table 8. Professor Tiao's publishing record

Journals on Kalaitzidakis et al (2001)	**N. Art.**	**Total**
J. Bus. & Ec. Statistics	7	
J. Econometrics	7	
Economic Journal	3	
Int. Econom. Review	3	
Economics Letters	2	29
J. Ec. Dynam. & Control	2	
Econometrica	2	
J. Appl. Econometr.	2	
Rev. Econ. Studies	1	
Other publications		
J. Time Series Anal.	5	
J. Am. Stat. Assoc.	4	
Applied Statistics	3	18
Biometrika	2	
Int. J. of Forecast.	2	
J. of Forecasting	2	
Other *ISI* Journals with 1 paper	21	21
Chaps. of books, handbooks, others	23	23
Books	3	3

Table 9. Professor Harvey's publishing record.

Social Science Journal	PF	Ranking PF	Percentile
J. of Political Economy	68.8	77	95
Econometrica	60.4	111	93
Am. Economic Review	58.8	117	92
Demography	57.4	123	92
Health Economics	57.2	125	92
Economic Journal	46.8	202	86
J. of Business	44.3	220	85
Review of Econ. & Stat.	39.8	271	82
Biometrics	36.6	313	79
Management Science	33.4	361	75
J. of Econometrics	32.2	385	74
Biometrika	28.7	467	74
Int. Economic Review	29.4	438	70
Int. J. of Forecasting	24.2	580	61
J. of Bus. & Econ. Stat.	22.3	629	57
Urban Studies	22.2	635	57
Am. J. of Agric. Econom.	21.8	652	56
J. of Applied Econometrics	19.8	707	52
J. of Develop. Economics	18.2	769	48
J. of Econ. Dyn. &Control	16.8	817	44
J. of Multivariate Analysis	15.5	881	40
Econometric Theory	14.3	929	37
Canadian J. of Economics	12.5	1011	31
J. of Forecasting	12.3	1018	31
Oxford Bulletin Econ. & Stat.	12.2	1027	30
Games & Economic Behavior	11.3	1070	27
Public Choice	9.2	1176	20
Economics Letters	7.8	1242	15
Economic Modelling	7.5	1251	15
Applied Economics	6.9	1283	13

Table 10. PrestigeFactor partial list of social sciences journals ranking in 2000. (Total nr. of journals in the sample: 1,468). PF stands for Prestige Factor.

FIELD	nr	Impact Factor				
		mean	median	max	min	RMSD
Econ.	165	.741	.559	7.929	.047	.803
Business	55	.964	.841	3.980	.000	.864
Finance	33	.854	.719	2.958	.034	.667
Manag.	61	.900	.607	3.980	.000	.825
Planning	37	.626	.576	1.660	.000	.368
Math Soc	29	.717	.610	1.923	.040	.456
Transport	11	.479	.531	0.778	.156	.222
St. & Pr.*	70	.672	.487	2.000	.110	.492
All**	386	.744	.531	7.929	.000	.710

Table 11. Descriptive analysis of the impact factor of 8 representative areas in economics taken from the Journal of Citation Reports Social Science Edition 2001 and * Science Edition 2001. St. & Pr. stands for Statistics and Probability and RMSD for root mean squared distance to the mean. ** We have removed the repeated journals so the total number of journals is not the sum of the journals in each category.

FIELD	nr	Impact Factor				
		mean	median	max	min	RMSD
Econ.	163	.678	.532	2.577	.047	.521
Business	55	.964	.841	3.980	.000	.864
Finance	33	.854	.719	2.958	.034	.667
Manag.	60	.848	.598	3.157	.000	.725
Planning	37	.626	.576	1.660	.000	.368
Math Soc	29	.717	.610	1.923	.040	.456
Transport	11	.479	.531	0.778	.156	.222
St. & Pr.*	70	.672	.487	2.000	.110	.492
All**	383	.709	.523	3.157	.000	.565

Table 12**.** Descriptive analysis of the impact factor of 8 representative areas in economics taken from the Journal of Citation Reports Social Science Edition 2001 and * Science Edition 2001, after removing outliers. St. & Pr. stands for Statistics and Probability and RMSD for root mean squared distance to the mean. ** We have removed the repeated journals so the total number of journals is not the sum of the journals in each category.

FIELD	nr	A_j				
		mean	median	max	min	RMSD
Econ.	165	5.526	3.610	58.675	.048	6.866
Business	55	7.694	4.822	39.800	.000	8.425
Finance	33	6.794	5.320	27.214	.057	6.554
Manag.	61	6.854	3.610	39.800	.000	7.863
Planning	37	3.806	3.744	9.774	.000	2.426
Math Soc	29	6.161	4.740	19.230	.040	4.705
Transport	11	3.272	3.880	6.326	.156	0.222
St. & Pr.*	70	5.414	3.500	19.230	.185	4.933
All**	386	5.617	3.655	58.675	.000	6.411

Table 13. Descriptive analysis of the index obtained as the product of the impact factor times half cited life of 8 representative areas in economics taken from the Journal of Citation Reports Social Science Edition 2001 and * Science Edition 2001. St. & Pr. stands for Statistics and Probability and RMSD for root mean squared distance to the mean. ** We have removed the repeated journals so the total number of journals is not the sum of the journals in each category. In order to preserve the maximum number of journals, we have multiplied by 1, the impact factor of those journals with a half cited life less than a year.

Field	Econ	Bus	Fin	Man	Plan	Math	Tran	St.& Pr.*	All
ρ	.961	.972	.968	.968	.907	.961	.796	.948	.955

Table 14. Correlation coefficients of the impact factor and the new index A_j defined in (1) of 8 representative areas in economics taken from the *Journal of Citation Reports* Social Science Edition 2001 and * Science Edition 2001. St. & Pr. stands for Statistics and Probability.

IF	Year										
FIELD	01	00	99	98	97	96	95	94	93	92	91
Econ.	.559	.482	.468	.460	.443	.449	.442	.410	.353	.323	.375
Business	.634	.631	.630	.500	.463	.552	.542	.500	.531	.396	.375
Finance	.719	.596	.598	.588	.573	.491	.511	.438	.370	.426	.361
Manag.	.607	.609	.494	.451	.531	.509	.800	.737	.567	.553	.433
Planning	.576	.473	.438	.428	.378	.461	.393	.309	.333	.355	.255
Math Soc	.610	.607	.699	.748	.622	.682	.531	.426	.369	.621	.610
Transport	.531	.442	.351	.550	.491	.447	.365	.282	.226	.302	.385
St. & Pr.*	.482	.459	.451	.377	.445	.471	.470	.442	.392	.411	.468

Table 15**.** Median impact factors of different subject fields from 1991 to 2001.

Figure 1. Generalized Citation Curve

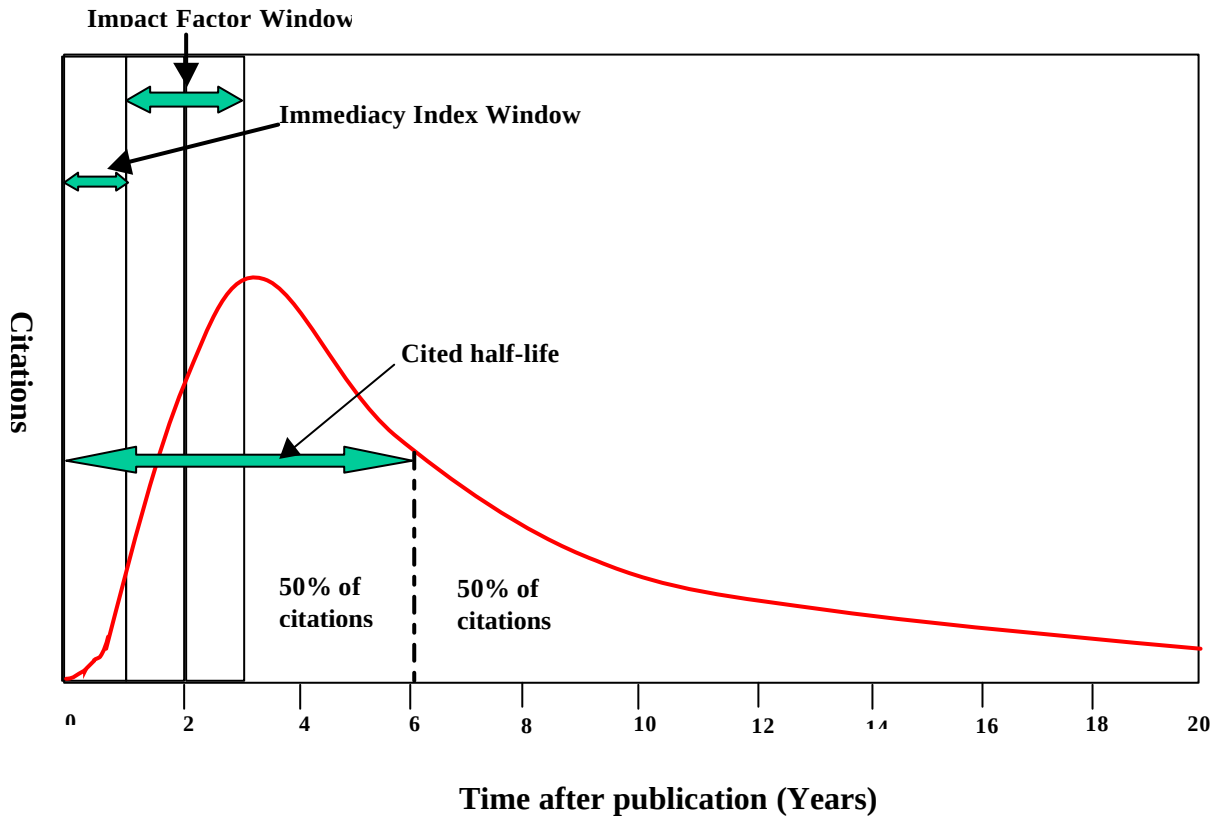

Figure 2. Impact Factors and Journal Type