



City Research Online

City, University of London Institutional Repository

Citation: Goodall, A. H. (2008). Why have the leading journals in management (and other social sciences) failed to respond to climate change?. *Journal of Management Inquiry*, 17(4), pp. 408-420. doi: 10.1177/1056492607311930

This is the accepted version of the paper.

This version of the publication may differ from the final published version.

Permanent repository link: <https://openaccess.city.ac.uk/id/eprint/12729/>

Link to published version: <https://doi.org/10.1177/1056492607311930>

Copyright: City Research Online aims to make research outputs of City, University of London available to a wider audience. Copyright and Moral Rights remain with the author(s) and/or copyright holders. URLs from City Research Online may be freely distributed and linked to.

Reuse: Copies of full items can be used for personal research or study, educational, or not-for-profit purposes without prior permission or charge. Provided that the authors, title and full bibliographic details are credited, a hyperlink and/or URL is given for the original metadata page and the content is not changed in any way.

City Research Online:

<http://openaccess.city.ac.uk/>

publications@city.ac.uk

**Why Have the Leading Journals in Management (and Other Social Sciences)
Failed to Respond to Climate Change?**

Amanda H. Goodall
Warwick Business School
University of Warwick
UK, CV4 7AL
Amanda.Goodall@wbs.ac.uk

Journal of Management Inquiry
Citations of Excellence winner: 2008.

Abstract

The effect of climate change on business is likely to be substantial. It might be expected, therefore, that the scholarly field of business and management would be centrally engaged with the challenges that global warming will bring. Yet in this paper I show that the most-cited management journals have barely published an article on the topic. Similarly low numbers of papers appear in the prestigious journals in economics, sociology, and political science. Why have the top journals failed to respond? I propose five possible explanations. Among these five, I emphasize the existence of an undesirable delay between ideas appearing first in peripheral publications and then in the elite journals.

Key words: Climate change, global warming, business & management journals, business schools, social science.

I am grateful to the following for very helpful comments: three anonymous JMI referees; the European Editor, Behlul Usdiken, and Neil Adger, Stephen Barley, Warren Bennis, Maxwell Boykoff, Rick Bunch, Peter Cappelli, Robert Dyson, Justin Goldbach, Andrew Hoffman, Richard Howarth, Ans Kolk, David Levy, Peter Newell and Andrew Oswald.

INTRODUCTION

Business and industry have, for at least the last 200 years, adapted to changing political and environmental norms -- from labor reforms and pollution controls enforced in 19th Century London, to the 1970s Clean Air Act in Los Angeles, to acid rain reduction in Switzerland, to ozone depletion in the Antipodes in the 1990s. Many scientists argue that the current problem of climate change is the most serious threat to the planet (Hansen et al., 2006; Intergovernmental Panel on Climate Change 2001, 2007). The existence of global warming can be thought of as an external shock to knowledge. The impact for most of the world is negative, and it is happening outside the control of any nation or government.

Climate change was first discovered in the sciences. Whether society now reacts effectively to the shock, and how it acts to mitigate the effects, is arguably a problem for social scientists rather than scientists. In preparing for climate change, the business sector may be ahead of the academy, as represented by the research journals. In this paper I show that few articles on the topic are appearing in major journals in business and management. Indeed, the most prestigious body in the field, the Academy of Management, has never published a paper on global warming or climate change in its academic journals.

If articles on climate change are rare in management journals, what does that signify? Is it merely due to a time lag in that science leads the social sciences, and the latter will eventually catch up? Have social science researchers been waiting for scientists to agree? Is climate change perhaps simply a practical problem that might be explored in journals of business practice, not in academic journals that examine empirical problems within a theoretical framework? Or is it that management research has become too theory-led? This last question is applicable to those who argue that research has become less relevant to business. Finally, I ask also whether the absence of interest in climate change is merely a temporary historical phenomenon that is now altering.

To address these questions I first collect data from 1970 to 2006 on all mentions of “global warming” and “climate change” in 30 leading English-language management

journals. I then compare the results with those for the top-30 journals in economics, sociology, and political science to identify whether those subject areas have published differently. Second, I attempt to put these numbers into context by identifying how many articles have appeared on this topic in all social science titles. I then contrast this figure with the number of papers published in all science journals. Finally, I try to assess how these data compare with coverage of pollution during the same period.

After presenting the empirical information, I discuss five possible explanations for the low coverage of climate change in management journals.

THE COVERAGE OF CLIMATE CHANGE IN THE TOP JOURNALS

It is necessary to establish an objective measure of research interest in the topic. To do this, I use bibliometric methods. I count how many times the top-30 business and management journals reference the terms “global warming” or “climate change” in their article titles, abstracts, or key words¹. These general expressions have been selected over other word combinations because they are most commonly used to describe the phenomenon; terms such as ‘greenhouse gases’ are too technical, whereas ‘sustainability’ is a little too broad. This paper does not track all research on organizations and the natural environment (see Etzion 2007, which is not directly concerned with climate change) or the more general field of corporate social responsibility (CSR).

At the time of data collection, there were 118 journals² listed in the combined categories of ‘business’ and ‘management’ in the database that I, and most other researchers, use to source journal articles – ISI Web of Knowledge (ISI)³. These journals include technical publications, and also those of a more applied nature, such as *Harvard Business Review*. Journals are ranked in ISI relative to each other. The most common method, the one that journals themselves often publicize, is by impact factor.

A journal’s impact factor is measured by calculating the frequency with which an ‘average article’ has been cited up to two years after publication. Thus, the impact factor

¹ The term “global warming” predates the now more commonly used, and technically correct, term “climate change”.

² Figures for June 2007. Note that new titles are added to the ISI list regularly.

of a journal in 2007 will depend on the number of citations to articles accrued in 2006 and 2005. This citation score is then divided by the total number of articles published in the journal over this two year period⁴. For the purposes of this study, I have used two sets of criteria to create a list of top-30 journals in business and management. The first uses impact factors. The second, named ‘total cites’ in ISI Journal Citation Reports, calculates the total number of citations a journal has received in the previous year – in this case the year was 2006. It is important to note that journal impact factors and citations change regularly.

The main criteria for journals being included in the top-30 list compiled for this study (see Table 1), is that they are ranked highly by both impact factor and total cites. A second decisive factor for inclusion is that the authors who publish in these journals are typically located in business or management schools. To rank journals using citations to articles is open to objections; for example, it has been shown that a circularity exists, in that articles in the top journals tend to get more heavily cited for reasons beyond the actual quality of a paper (for recent discussion of this issue see Clark & Wright 2007, and Judge et al. 2007). The creation of any ranking is an imprecise process, and the one used in this paper is open to criticism; but it allows us some understanding of what is being published at the top end of the discipline.

Identifying whether climate change is mentioned only in a paper’s abstract, title or key words, rather than in the main body of the text, may mean that some articles are excluded. However, it is unlikely that substantial work on global warming is being missed.

Global warming or climate change in the top-30 business and management journals

The two publications that rank highest by impact factor and total number of citations in ISI are the *Academy of Management Journal* and *Academy of Management Review*. Notably, the data, which run from 1970 to 2006, reveal that these two leading

³ There are two categories in ISI – business and management. However, I have used these two terms interchangeably in the text.

⁴ Further information is available in ISI under Journal Citation Reports. It should be noted that not all journals are included in ISI. Those that are less cited, are not in English, or are new tend not to be in ISI.

journals have never published an article mentioning global warming or climate change (in the title, abstract, or key words). In total there are just nine articles that refer to climate change or global warming in the top-30 management journals over that period. This is out of a total number of 31,000 published articles in these journals.

The first article on the subject in these top-30 journals appeared in 1997 in the *California Management Review*, which has published four articles, the highest number of papers on climate change among the top-30 list. Other journals that have published an article include: *Corporate Governance* (1), *Harvard Business Review* (1), *Journal of Management Studies* (1), *Management Science* (1), and *Research Policy* (1). How do these titles compare with other business and management journals?

The number of articles in all business and management journals in ISI

In ISI's Journal Citation Reports there is a subject heading for business and a separate one for management. For the period between 1970 and 2006 there were a total of 44 articles published in these journals that focused on climate change. As mentioned above, nine of these are included in the top-30 journals. Fifteen of the remaining 35 papers were published in the journal *Technological Forecasting and Social Change*, and the next highest number of papers, six, can be found in *Tourism Management*. Both journals are ranked loosely in the top-50. The remaining are in journals ranked outside the top-50. These figures are summarized in Table 2.

Forty-four articles focusing on the changing climate seems low. Also, there is a degree of clustering in that half the total number of articles in business and management journals appear in just two titles. Should we expect more? These numbers are put in context when they are compared with the publishing output on the subject in other social science fields.

Mentions of global warming or climate change in the top-30 economics, sociology and political science journals

Of the four disciplines considered in this paper, economics has published the most articles, and it has done so from the earliest period. However, the journal that has the highest impact factor, the *Quarterly Journal of Economics*, has never published an article that refers to global warming or climate change (in the title, abstract, or key words). In contrast, the journal with the highest total citations, *The American Economic Review* (AER), has published 14 articles. Interestingly, the first paper to refer to a link between economic growth, carbon dioxide and the climate was published in the AER in 1977.

Between 1970 and 2006, 63 articles in the top-30 economics journals mention global warming or climate change⁵. This is out of a total number of 51,000 articles. There are 175 journal titles listed in ISI under the category of economics. The field of economics has thus published on climate change somewhat more consistently: the top-30 journals have produced seven-times the number of papers compared with those in business and management titles (though there were a third extra articles published in economics journals during this period). The figures are presented in Table 3. Next I look at how the subject of sociology compares with management and economics.

It could be argued that sociology, the discipline concerned with the analysis of society, will be of central importance as the world adapts to climatic changes. Again, isolating the top-30 sociological journals, using the same method of ranking, tells us something about how these issues have permeated research. Surprisingly, no articles mentioning global warming or climate change in the title, abstract, or key words between 1970 and 2006 were published in the three leading sociology journals; these are the *Annual Review of Sociology*, the *American Journal of Sociology*, and the *American Sociological Review*. This seems unexpected, especially as 40 articles appear on this subject in the remaining 27 journals in the top-30 list. As can be seen in Table 3, this is out of a total of 25,000 articles. Sociology has published four times the number of papers on climate change when compared to business and management, though the subject is not represented in the top three titles.

⁵ The lists of top-30 journals compiled for this paper can be obtained on request from the author.

Given the potentially key role of policy-makers and governments, a final look through the journals of political science is also revealing. Individual and corporate behavior, in reducing greenhouse gases, is unlikely to change without governmental sticks and incentives. Thus, it is interesting to note that in the two leading journals, the *American Journal of Political Science* and the *American Political Science Review*, no articles were published on the topic of climate change or global warming in the title, abstract, or key words between 1970 and 2006. Indeed, there were only 11 articles in the top-30 political science journals, as can be seen in Table 3. This is out of a total number of 30,000 articles.

What have we learned from this?

The data in Table 3 show that, across all four disciplines, articles that discuss climate change or global warming are scant. Overall, fewer papers have been published in top business and management journals than in those of economics, sociology, or political science; although, when the total number of articles is controlled for, the difference is marginal. With the exception of the *American Economic Review*, one of the top two economics journals, the most prestigious titles as identified by ISI's Journal Citation Reports across four major social science disciplines -- business and management, economics, sociology and political science -- published no articles on climate change between 1970 and 2006.

This may be viewed with concern given that these top journals are, in many cases, produced by the largest and most influential disciplinary associations in the world. For example, the *American Sociological Review* is published by the American Sociological Association, a body that has over 14,000 members, with 6000 attendees at its 2007 conference (www.asanet.org). Similarly, the *American Political Science Review* is published by the American Political Science Association, which describes itself as 'the leading professional organization for the study of political science' with over 15,000 members in over 80 countries (www.apsanet.org). The *American Economic Review*, the only top-rated journal to have published on climate change, is also produced by the largest association in its field, the American Economic Association. Finally, the

Academy of Management, which organizes the largest conference in business education, publishes both the top two management titles.

Does the low number of articles across these four disciplines mean that the social sciences as a whole are not covering climate change? To understand this, it is necessary to assess how many articles are being published in scholarly journals in the social sciences more broadly, and also to contrast this number of papers with those being generated in science journals. Finally, a separate test is done that compares coverage of climate change with previous and current coverage on pollution more generally, both in the social sciences and the natural sciences.

COVERAGE OF CLIMATE CHANGE AND POLLUTION IN THE SOCIAL SCIENCES MORE BROADLY AND THE SCIENCES

In 2006, there were 6,164 science journals listed in ISI, and there were 1,768 social science titles – over a third fewer. In 1998, the earliest time period for which journal numbers are listed in ISI, the number of science to social science journals was 5,467 to 1,679. This also was slightly greater than a 3-1 ratio. If we are to compare the scientific output and the social-scientific output on global warming issues, we need to normalize for this kind of difference between the two underlying scholarly areas.

Figure 1 shows the distribution, between 1970 and 2006, of all documents in science and social science journals that mention the words climate change or global warming⁶. The search term was specified as ‘global warming not climate change not pollution’ so as to isolate the former from the latter. I have attempted to control for the higher number of science journals by normalizing publications. This has been done by dividing the number of science articles in each time period by 3.5, which represents approximately the ratio of science to social science titles. There are other inconsistencies in the publishing practices between the two fields. Not only are there more science journals published, they also tend to include more articles per volume and more volumes per year. Moreover, the turnaround of journals is noticeably faster in the natural sciences. In economics, an extreme example, it can take up to two years between the

⁶ These include ‘all document types’ not solely articles (e.g. book reviews).

acceptance of an article and its eventual publication in a journal (Hamermesh 1994, Ellison 2002.). Consequently, there is always likely to be a discrepancy in the number and speed of articles produced by scientists compared to the social sciences.

Nevertheless, Figure 1 shows that many articles referring to climate change and global warming are being published in the social sciences. Therefore, the small number of papers in management journals, and the other traditional social science disciplines, cannot be explained by a general lack of work outside the hard sciences. It is clear from the evidence that papers on this topic are being written and published.

It seems useful to compare these findings with a benchmark. Here I choose the case of pollution, which was a major public concern, pre-global warming, in the 1970s, and one that has continued to this day. The problem with using pollution as a comparator variable is that, technically, climate change is caused by pollution; therefore the two are interchangeable. However, for the purposes of this study I am treating them as somewhat different concepts, which tends to be the case in the media and science generally. Hence, I used the search term ‘pollution not global warming not climate change’.

Figure 2 documents the number of mentions of “pollution” in all science and social science journals between 1970 and 2006, again controlling for the extra number of science journals. It is interesting to note that there appears to have been an approximately constant ratio, over the 20 year period from 1970 to 1990, in the number of science to social science documents on pollution. The ratio of science to social science publications is closer in output on climate change than on the topic of pollution. In contrast, in the journals under inspection in this paper, more articles have been published on pollution.

Table 4 shows that 45 papers in the top business titles mention pollution -- again in the abstract, title or key words between 1970 and 2006. As can be seen, the disciplines of sociology, political science, and especially economics, have all published more papers referencing pollution compared to climate change.

That the social sciences are behind the sciences in generating articles on global warming and pollution should be expected, as these phenomena were first identified, and continue to be monitored, by scientists. However, it seems that the topic of climate change has been flourishing in the social sciences broadly defined. Where the major publishing differences occur is in the ratio of all social science articles compared with the

proportion reaching the very top journals in business, sociology, economics and political science.

SHOULD THERE BE MORE ARTICLES ON CLIMATE CHANGE IN THE TOP BUSINESS AND MANAGEMENT JOURNALS?

It has been shown above that four core social science disciplines have few articles on global warming; but it could be argued that the field of management studies has a particular relevance to the changing climate and market environments. In 2004, 37% of global energy use was attributed to industry (Intergovernmental Panel on Climate Change IPCC 2007). This figure was down from 40% in 1970 as technologies became more efficient. Most are large businesses though small and medium sized enterprises (SMEs) also make up a sizeable percentage (IPCC, 2007). Many of the world's energy-intensive industries are now located in developing countries, although the per-capita consumption of energy in high income nations is eleven times that of low income ones (International Energy Agency, 2006).

Hoffman (2005) suggests that 60 United States (US) corporations, with, he argues, net revenues of approximately \$1.5 trillion, have adopted voluntary greenhouse gas (GHG) emission reduction targets. Voluntary agreements between companies are increasingly being created with the help of NGOs (Levy & Newell, 2005), for example the Business Leader Initiative on Climate Change, the Carbon Trust, and the Cement Sustainability Initiative, among others. Through the Carbon Disclosure Project (www.cdproject.net), 940 companies report their GHG emissions, which is supported by investors who control around a quarter of the global stock markets (IPCC 2007).

Hoffman (2005, 2007) goes on to argue that many companies are engaging with climate change. They are doing this not through altruism but to ensure the survival of their own businesses. Hoffman states that the reason companies are responding by reducing their emissions is decidedly strategic (2005). Packard & Reinhardt (2000, 2001) suggest that the companies that carefully assess the risks and make wise investments will be the long-term survivors. The strategy literature promotes scenario planning, so this situation should seem natural to management scholars.

Lash and Wellington (2007), of the World Resources Institute, identify six categories of risk related to the changing climate: those created through government regulation, the research and development of new products and services, litigious actions against environmental harm, reputational and branding effects, rising supply chain costs, and a greater prevalence of environmental disasters, such as hurricanes. There are numerous articles in management journals that cover these areas -- just, it appears, few that focus empirically on climate change.

It might be argued that it is not the top journals blocking the passage of papers; it is instead the result of a general drought in the field. As has been shown, papers in quite large quantities are being generated in the social sciences. Another piece of evidence is that books are being written by a number of business school scholars. Authors such as Hoffman (2005, 2007), Kolk & Pinske (2005, 2007), Levy & Newell (2000, 2005), and Packard & Reinhardt (2000, 2001) have published in both arenas, but mostly they have published books.

The Academy of Management

Papers are usually submitted to journals after they have been through a cycle of conferences. Thus, an interesting next step is to examine whether articles on this subject were presented at the 2007 Academy of Management (AOM) conference, which is the largest and oldest in the field in the world.

The AOM conference in 2007 was titled 'Doing Well By Doing Good'. The conference website stated: 'This year's theme demonstrates how firms can be financially successful while at the same time trying to accomplish some positive social goals and make life better for their employees and the communities where they operate'. Hence, one might expect to find a considerable number of presentations about global climate change. There were 1,664⁷ different sessions at the 2007 conference representing, approximately, 4,000 – 6,000 academic papers. Around seven thousand participants attended. Of the 1,664 conference sessions, approximately 25 focused generally on climate change. Nearly all were organized by the AOM division Organizations and the

⁷ A small proportion of these were social events and AOM meetings.

Natural Environment (ONE) or the division Social Issues in Management (SIM). Notably, there were substantially more sessions on climate change at the 2007 conference compared to all previous meetings. For example, there was only one session that mentioned climate change at AOM's 2003 conference, two sessions at the 2004 conference, and three at the AOM conference in 2005 and 2006 (see Academy of Management website).

There are 24 divisions and interest groups in the Academy of Management. Within the traditional business and management divisions -- for example, Business and Policy Strategy, Organizational Behavior, International Management, Entrepreneurship, and Organizational Development and Change -- there were no sessions that focused on the impact of environmental change. This implies that the issue is peripheral to the core subjects within the discipline.

The AOM conference statement stresses financial success for firms as well as improving life for employees and communities. The Pew Global Attitudes Project (Spring 2007) surveyed a total of 45,000 people across 46 countries and reported on how a range of current topics are viewed by different populations (report available at www.pewglobal.org). Environmental problems were identified as the top global threat by 37% of those surveyed in the United States, 51% of Italians, 66% of Swedes, and 53% of Argentineans. Whilst research agendas cannot be led entirely by public opinion, these figures seem of some relevance. It could be argued that this is especially true in an academic field, like ours, that presents itself as appealing also to the real world of business.

Possibly more worrying is that my calculations show the four prestigious and highly ranked AOM journals⁸ have never published an article that refers to global warming or climate change.

Might the ongoing debates about the relevance, or not, of business schools tell us something about the low number of climate change papers? AOM states that it is 'Dedicated to advancing the scholarship and practice of management'. Some

⁸ In the abstract, key words or title in Academy of Management Executive that became Academy of Management Perspectives, Academy of Management Journal, Academy of Management Learning and Education and Academy of Management Review (between the years 1970 and July 2007 in ISI Web of Knowledge).

commentators argue that the top journals advance the former but increasingly ignore the latter. One of the challenges for business schools has been to try to straddle two communities – research and practice. Publishing is expected to be both scholarly and relevant (Augier & Teece, 2005). Recently, some have protested that research has become overly ‘scientific’ and no longer appropriate to the sector that business schools were created to serve (Pfeffer & Fong 2002, Bennis & O’Tool 2005, Khurana 2007). A further claimed criticism is that empirical, real-world evidence is used merely to support theory (Hoffman, 2004), and is presented in papers written to satisfy the demands of the discipline only (Khurana & Marquis, 2006).

On the issue of global climate change, the academy should presumably be ahead of the wave. The impact on businesses may be the greatest since globalization, a subject heavily featured in the top-30 management journals (over 200 articles since the 1980s). The first and most-cited paper, ‘The Globalization of Markets’ by Theodore Levitt, was published in *Harvard Business Review* in 1983.

POSSIBLE EXPLANATIONS

It is important to attempt to understand the low number of published papers on climate change in management journals. I now consider five potential explanations. I focus specifically on the discipline of business and management, and to a limited degree economics. However, some of the arguments presented are relevant to other social science fields. It is likely that each of the accounts below will carry some weight. Despite this, in the paper’s conclusion I attempt to identify the main reason for the dearth of climate change articles.

Explanation 1: The science of climate change has only just been confirmed.

If evidence of climate change has only recently been established, then it is natural that published articles in social science journals will lag. But has it really only recently been confirmed by science, or has there been a ‘culture of denial’ (Cohen 2001)? Also, what is an acceptable lag?

Many social scientists found the evidence convincing some time ago. In 1977, William Nordhaus published an article titled, 'Economic Growth and Climate: The Carbon Dioxide Problem', in the highly cited journal the *American Economic Review*. In it he writes: 'In contemplating the future course of economic growth in the West, scientists are divided between one group crying "wolf" and another which denies that species' existence. One persistent concern has been that man's economic activities would reach a scale where the global climate would be significantly affected. Unlike many of the wolf cries, this one, in my opinion, should be taken very seriously' (1977, p. 341). Nordhaus, a professor at Yale, has continued to publish articles and books on the greenhouse gas effect.

In a 1991 issue of the distinguished *Economic Journal* the economist David Pearce wrote: 'scientific opinion continues to differ on the extent to which global warming is 'real', although the IPCC (Intergovernmental Panel on Climate Change) report (1990) poses a formidable challenge for anyone choosing not to believe it' (1991, p. 938). In the same issue of the *Economic Journal*, William Cline argued that scientific uncertainties should not be grounds for inaction given the enormity of the potential damage to humanity (1991). Put simply, the bad outcome is so bad that insurance must be the preferred option. This is an old idea. Business cycles, strategic planning, the assessment of potential threats and opportunities -- these have always been high on the research agenda in management.

Explanation 2: There is a time lag between the discovery of scientific knowledge, its interpretation in the social sciences, and its eventual publication in top journals.

This explanation, which is twofold, seems likely to form part of the answer. The first part suggests that there is a natural lag between knowledge discovery in the sciences and how that knowledge is understood and interpreted in the social sciences. It is helpful here to return to Figure 1 which shows the number of papers on climate change published in the sciences and social sciences since 1970. Although science journals are more numerous -- this is controlled for in Figure 1 -- the data demonstrate that in both fields an equivalent number of papers have been published across similar time periods. The same

pattern is found in Figure 2 which compares coverage of pollution between the social and natural sciences. These findings imply that the lags in the two branches of knowledge may not be greatly different.

The second part of the explanation points to a further lag -- between the development of a research question in the social sciences, and its evolution into print. This happens partially because of the time required to collect and analyze data; but, importantly, the lag-effect is exacerbated in the social sciences because the turnaround period of an article from its inception, through the review cycle into an eventual publication, can be as long as three-to-four years. The process is typically much shorter in the sciences, as discussed above. Yet, again, the data presented in Figures 1 and 2 would suggest that even with longer publishing lags in the social sciences, many articles on climate change were in print some time ago.

The most likely explanation for the absence of climate change research in the leading journals is that the major lag is taking place within the core of the social sciences. Publishing is happening in journals that are peripheral to the main social science disciplines. For example, 2200 journal articles are listed in ISI Web of Knowledge as having been published in social science journals between 1970 and 2006⁹. But of these, the overwhelming majority, 70 per cent, are reported as coming in the subject categories of 'Environmental Sciences' and 'Environmental Studies'. Arguably, these fields are not traditional social science disciplines. They exhibit signs of interdisciplinarity, which might explain why some of the journals are listed in ISI in both science and social science categories. Interestingly, the subject category of economics -- one of the oldest social science disciplines -- is reported as publishing the next highest number of social science papers at 22 per cent of the total. When the journal titles for economics are analyzed, a similar pattern emerges; the highest number of articles can be attributed to specialist peripheral journals (i.e. those with either environmental, ecological or energy in the title).

Thus a specialization or 'ghettoization' has occurred. The data presented earlier confirm that relatively few articles on climate change and global warming have broken into the top journals of the main disciplinary fields in social science. Part of the reason may be that it is more difficult for reviewers in the elite core of a subject, who are not

⁹ In ISI, some of the environmental journals are classified as 'social science' and also 'science'.

familiar with embryonic fields of research, to judge the quality of articles. This may further slow the emergence of an issue like climate change and its proliferation into top journals. If this is the case then it might be possible for journal editors to produce special issues and to invite guest editors to take the intellectual lead. These editors could be selected from peripheral or specialist fields and journals.

This last argument suggests that the flood of business and management publications is only now beginning to reach the gates. A plethora of grant proposals may be sitting on desks in funding bodies. Change, perhaps, is imminent¹⁰.

Explanation 3: Climate change is a practical problem not a conceptual one.

The social sciences are organized around their distinctive theories. Conceptual structures often lead intellectual inquiry, and the empirical facts are, to some extent, fitted around theoretical frameworks. Environmental change may be viewed as non-theoretical, and simply a case-study of a practical problem. The fragmented nature of the business and management discipline may make it harder still to incorporate the emerging themes of climate change, because there may be no obvious home for the topic. For example, for economists, energy is a natural research area. However, it could be argued that the field of particular relevance to the changing climate, and, concomitantly, changing business, is the field of strategy -- as suggested above.

Possibly, unlike science, we do not have the theoretical models available that would facilitate an easy transition into a form capable of empirical analysis. If an alien arrived on earth tomorrow, a scientist could immediately start investigating its properties. A social scientist, on the other hand, might require some action before embarking on research. But it would seem odd if we decided the alien could not be studied because we did not have the appropriate theory.

Presumably issues of gender and race could have been interpreted as merely practical problems. Yet conceptual work on these topics exists in business and

¹⁰ As mentioned earlier, a number of business school faculty have written books on climate change, which may have been their main publishing option because the topic was peripheral to the major journals. Many of these authors were also centrally involved in establishing the AOM Division, Organizations and the Natural Environment (ONE).

management journals, one assumes because the world deemed them important. Maybe because debates about the legitimacy of scientific claims have rumbled on for years, the subject of climate change is viewed as being relevant only to activists. Thus, when all doubts have been dispelled and the claims legitimized, then scholarship can begin. Yet, in contrast, the discipline of economics legitimated climate change many years prior to today's public accord.

Ans Kolk, who has written about environmental issues, including climate change, from a business school since 1997, suggests that it is still difficult to collect the type of data necessary to publish empirical papers. She adds that those using a case-study methodology find it more difficult to get work published. With regards to conceptual papers, she believes that the phenomenon is not widespread enough to make a convincing argument¹¹.

Finally, it may be that assimilation occurs via the applied titles. As has been noted above, among the top-30 list, *Harvard Business Review* and *California Management Review* published papers on climate change before the more theoretically rigorous publications.

Explanation 4: It is a reflection of political bias.

A fourth possible reason for the lack of exposure in management journals may be that there is political bias. This is not an easy hypothesis to test. A resistance to climate change could be political in that it is right-leaning or pro-industry, or it could be related to differences in nations' political ethos. One of the most high-profile politicians both to maintain a position of climate change-denial, and to continue to oppose the 1997 Kyoto Protocol, was US President George Bush. Bush held out despite the fact that US scientists contributed close to half of all scientific papers about the changing climate (listed in ISI Web of Knowledge). The US has in recent decades been the world's most powerful nation and also the largest emitter of greenhouse gases. Accusations that the President is pro-oil industry have been based on his family's, and Vice President Dick Cheney's, links with oil companies, his past as an oil executive and his strong support for

¹¹ In personal correspondence (June 2007).

drilling in Alaska¹². The US government's reluctance to acknowledge global warming was, arguably, supported by major corporations that viewed talk of climate change as 'anti-business'. Consequently, American business communities have been slower to respond when compared with their European counterparts (Levy & Newell 2000). This situation is changing (Hoffman 2007); for example, at the recent UN talks on climate change held in Bali (December 2007), many industrialists were vocal in calling for long-term emissions targets, to allow businesses to set future investment strategies (Pearce 2007).

It is not easy to assess how much the Bush administration's stance might have contributed to the lack of coverage in business and management journals, but, arguably, this may be a significant background factor. The existence of a pro-industry bias in business schools has also been suggested by some: specifically, they are overly focused on wealth creation, economic growth, and shareholder returns. It is argued that they err towards the conservative, particularly in US-based schools. This can mean that research topics that might challenge these ideals, including, for example, social responsibility, economic inequality, environmental damage and so on, may be marginalized (Walsh et al. 2003, Hoffman 2004, Khurana 2007).

The Princeton economist Angus Deaton (2007) compares nations' reactions to the *Review on the Economics of Climate Change* authored by the economist Nicolas Stern and funded by the British Government (Stern 2007). Deaton suggests that the *Stern Review*, which has generated a great deal of debate around the world, went relatively unnoticed in the US. Among the community of American economists (Nordhaus 2007, Weitzman 2007) Stern has been criticized because in his modeling he fails to incorporate discounting for the future; in other words, for me to save for the future requires incentives in the form of interest rates. Similarly, I require inducements to change my behavior now to benefit future generations. Stern underplays this factor. But the arguments about the *Stern Review* may be a reflection of the differences between US and European political structures (Deaton 2007), in that the US tends towards an individualistic approach to taxation and consumption, whereas Europe has traditionally been viewed as more collective. Climate change is, arguably, an extreme form of externality that requires

¹² For an interesting discussion on climate change and the oil industry, see Levy and Kolk 2002.

collectivity at a level not previously imaginable. To argue that the climate is changing largely as a result of intensive growth also challenges the tenets of neo-classical economics, which is still the norm within the discipline despite the recent interest in non-pecuniary wellbeing (Easterlin 1995, Oswald 1997, Rehdanz & Maddison 2005).

Deaton (2007) points to the low number of mentions the *Stern Review* received in the New York Times, and, somewhat more predictably, the Wall Street Journal. It is interesting then to look at how other non left-leaning media cover the broader issue of climate change¹³. In a simple way I attempt to do this by counting the number of times global warming and climate change appeared in the on-line versions of the Financial Times, Forbes, Time magazine and The Economist between 1997 and 2007 (also see Table 1.1 in the Appendix¹⁴). The results below seem not to support a right wing conspiracy theory. For example:

- Since 1997, the *Financial Times* has mentioned global warming 2669 times and climate change 4592 times;
- *Forbes* has mentioned global warming 258 times and climate change 205 times;
- *Time* magazine has mentioned global warming 960 times and climate change 698 times;
- *The Economist* has mentioned global warming 472 times and climate change 410 times

There is evidence that attitudes to global warming are correlated with an individual's political beliefs. For example, those who express greater skepticism about the anthropomorphic, or human, contribution towards the changing climate are disproportionately right-leaning (Heath & Gifford 2006). But what of the political left -- is there evidence to show that left-leaning management scholars have pursued a climate change agenda? The evidence suggests not.

¹³ For further information on the media and climate change, see Boykoff and Rajan 2007.

¹⁴ Table 1.1 in the Appendix looks for a correlation in the number of times that key business terms are mentioned in the Economist magazine and the top 30 management journals. It shows that except in the case of "climate change" and "global warming" there is a strong association in the use of these terms.

Critical Management Studies (CMS) is a branch of management theory that began in Europe in the 1970s, and is recognized as being associated with the left. It is an established field that is taught in business schools and it has ‘interest group’ status within the Academy of Management. Critical Management Studies “is critical of established social practices and institutional arrangements, and challenges prevailing systems of domination” (www.criticalmanagement.org). With this perspective it might have been thought that the CMS interest group would have been associated with sessions on climate change at the AOM 2007 conference. However, this was not the case. Also, at the last Critical Management Studies conference in 2007, which ran for two days with over 500 delegates, there were no sessions on either climate change or global warming¹⁵. This suggests that the omission of climate change from the scholarly agenda of business and management is not merely the product of right-wing attitudes.

Explanation 5: Promotion incentives are skewed in business schools towards incremental additions to known knowledge.

Another possible reason for the low number of articles about climate change may be that young researchers’ promotion incentives are skewed. It is easier, some might say, to become a good technician, proficient in theory development, rather than to initiate new fields or new ways of thinking -- which may be required in response to climatic changes. For example, in general to progress one’s career in a business school requires articles in the top journals, not, say, books (that some suggest are more open to new ideas). It may be easier for a young author’s paper to be accepted at a top journal if he or she builds on pre-existing knowledge from the same top titles (Judge et al 2007). There may also be an age-of-faculty factor that could compound the problem, insofar as older researchers might be less likely to adapt to new scientific knowledge.

A difficulty with this line of argument, however, is that it is unclear why analyses of climate change should not be attractive to ambitious young researchers and the leading journals in the field. The repercussions of environmental change will affect younger

¹⁵ For CMS Conference 2007 see www.mbs.ac.uk/research/organisationstudies/cms5/index.aspx.

generations the most. This argument is thus more a reflection of the problem discussed in the paper, rather than a separate explanation for it.

CONCLUSION

Have the top business journals failed to respond to the shock to knowledge we now call climate change? This paper's evidence suggests that the answer is yes. It considers five possible explanations. Although open to genuine debate, when choosing among these five I emphasize one in particular. It is the existence of a kind of 'ghettoization' that has led to an undesirable lag in social science between articles appearing in peripheral publications and elite journals.

The data show that, over the last few decades, only 9 articles on "global warming" or "climate change" have appeared in the top-30 business and management titles (out of approximately 31,000 articles in all). The four Academy of Management journals have never published a paper on the topic. When scanning all journals in the field -- a total of 118 titles -- only 44 published articles can be found. The impact of environmental change on businesses will be substantial. Given the dual focus of business schools, namely to produce both scholarly research and work relevant to business practice, more published articles would have been expected.

There also appears to be a paucity of work on the subject in other core social science disciplines. I show that the top journals in sociology, political science, and economics have published little on climate change. Next I go on to examine the frequency of articles in all social science titles, and compare the findings with those in science journals. It is apparent from the evidence that a substantial number of papers on environmental change have been written in the social sciences. However, they are not integrated into the mainstream disciplines; instead they are in specialist and peripheral fields and journals.

To try to explain why climate change has had such a low profile in management journals, the paper suggests five possible hypotheses. Each explanation will have some relevance; however, I attempt to conclude the paper with the argument I believe carries the most weight.

The first of the paper's five possible explanations argues that the low number of management articles is to be expected because the science has only just been confirmed. I have questioned this. For example, it is noticeable that scholars in the sister field of economics were publishing articles on the effects of greenhouse gases in top journals as early as 1977. Moreover, strategic planning and risk assessment are the stock-in-trade of much business scholarship.

As another potential explanation I have considered whether climate change may be viewed as a practical problem rather than a conceptual one. The social sciences are formed around particular theoretical perspectives whereas environmental change might be regarded as a case-study. Yet, other issues of social relevance (for example, gender) and of economic relevance (for example, globalization) have been extensively covered in business journals. The environmental field may still be too undeveloped either to allow the collection of interesting empirical information or to produce conceptual work. The data in this paper show, by contrast, that considerable work on the subject is being published outside the mainstream disciplines in the social sciences. Thus, this is unlikely to explain the drought.

A further possible explanation raised in the paper is that promotion incentives in business schools are skewed: young faculty are encouraged to publish material that does not differ too far from the norm. Papers are more likely to be accepted if they build on to pre-existing knowledge instead of initiating new ways of thinking. However, this argument seems to be a statement about facts rather than a conceptual explanation for the facts.

The fourth explanation I suggest is political bias. That so few articles on climate change appear in business and management publications might lead to claims of conspiracy. Business schools may be prioritizing wealth creation and favoring business elites; they may be marginalizing issues, such as environmental damage and social responsibility, that appear to conflict with this. The skeptical attitude of the Bush administration, linking climate change with 'anti-business' sentiments, may, I suggest, have contributed. It seems noteworthy that across all the social science disciplines covered in this paper -- namely management, economics, sociology and political science - - with the exception of the *American Economic Review*, the two top journals in each

discipline are all American and none have mentioned climate change. Some critics would suggest that this is a reflection of the dominant political voice in the United States. Arguably, the US has been slow to accept the scientific evidence, despite the fact that American universities and scholars have contributed hugely to our understanding of the changing climate. Nevertheless, right-leaning political bias cannot, I argue, be the main explanation. Even in the left-leaning management field of Critical Management Studies, the data show that global warming has a low profile, which weakens conspiratorial claims. Also, I run a simple test on some of the right-leaning media, such as the *Financial Times* and *Forbes*, and find that there is a high number of mentions of climate change.

Finally, whilst there is an inevitable delay between the generation and publication of knowledge, this time lag cannot wholly explain the dearth of articles on climate change in the top management journals. Instead the major explanation for the phenomenon documented in the paper appears to be the following. The data show that work on climate change is being generated in the social sciences, but it is in fields that are generally viewed as peripheral to the central disciplines of business, economics, sociology, and political science. As explained earlier in the paper, over two thousand journal articles are listed by the ISI Web of Knowledge as having been published in social science journals since 1970. Yet the majority are attributed by ISI to the subject categories of environmental sciences and environmental studies. Thus the analysis of climate change has, if only unconsciously, been sidelined intellectually -- into an area outside the journals in which the leading business scholars and other social scientists publish. This, I suggest, has led to a lag between the study by social scientists of climate change and the appearance of articles in the elite social-science journals.

This paper cannot say why the lag has been so long. Perhaps the core subject areas, including management, have become used to 'acceptable' methodologies that may not lend themselves to new intellectual areas; data collection for studies on global warming may be more challenging because its effect on humans remains unclear; the top journals demand top quality, and it is possible that the field has not yet become sufficiently rigorous. Nevertheless, because of the likely importance of climate change, to businesses and human society more generally, one might have expected less delay

within the leading disciplinary fields. That they are the top journals suggests that they should lead, not lag, intellectually.

In the much-cited paper by Barley and Kunda (1992), the authors argue that the focus of managerial research and theory is heavily influenced by the economic climate of the day. It may be that the costs we are beginning to incur, caused by increasingly severe weather, may prove to be the ultimate driver of change.

References

- Augier, M. & Teece, D. J. 2005. Reflections on (Schumpeterian) leadership: A report on a seminar on leadership and management education. *California Management Review*, 47 (2): 114-136.
- Barley, S. R. & Kunda, G. 1992. Design and devotion: Surges of rational and normative ideologies of control. *Administrative Science Quarterly*, 37: 363-399.
- Bennis, W.G. & O'Toole, J. 2005. How business schools lost their way. *Harvard Business Review*, 83 (5): 96-104.
- Boykoff, M. T. & Rajan, S. R. 2007. Signals and noise: Mass-media coverage of climate change in the USA and the UK. *European Molecular Biology Organization Reports*, 8 (3): 1-5.
- Clark, T. & Wright, M. 2007. Reviewing journal rankings and revisiting peer reviews: Editorial perspectives. *Journal of Management Studies*, 44 (4): 612-621.
- Cline, D. 1991. Scientific basis for the greenhouse effect. *Economic Journal*, 101 (407): 904-919.
- Cohen, S. 2001. *States of denial: Knowing about atrocities and suffering*. Cambridge: Polity Press.
- Deaton, A. 2007. On transatlantic vices, or Stern in America. *Royal Economic Society Newsletter*, 139: 3-4.
- Easterlin, R. A. 1995. Will raising the incomes of all increase the happiness of all? *Journal of Economic Behavior & Organization*, 27 (1): 35-47.
- Ellison, G. 2002. The slowdown of the economics publishing process. *Journal of Political Economy*, 110: 947-993.
- Etzion, D. 2007. Research on organizations and the natural environment, 1992-present: A review. *Journal of Management*, 33 (4): 637-664.
- Hamermesh, D.S. 1994. Facts and myths about refereeing, *Journal of Economic Perspectives*. 8 (1): 153-163.
- Hansen, J., Sato, M., Ruedy, R., Lo, K., Lea, D. W. & Medina-Elizade, M. 2006. Global temperature change. *Proceedings of the National Academy of Sciences of the United States of America*, 103: 14288-14293.
- Heath, Y. & Gifford, R. 2006. Free-market ideology and environmental degradation – The case of belief in global climate change. *Environment and Behaviour*, 38 (1): 48-71.
- Hoffman, A. 2004. Reconsidering the role of the practical theorist: On (re) connecting theory to practice in organization theory. *Strategic Organization*, 2 (2): 213–222.
- Hoffman, A. 2005. Climate change strategy: The business logic behind voluntary greenhouse gas reductions. *California Management Review*, 47: 21-46.
- Hoffman, A. 2007. *Carbon strategies: How leading companies are reducing their climate change footprint*. Ann Arbor, MI: University of Michigan Press.
- Intergovernmental Panel on Climate Change (IPCC). 1990. First Assessment Report. Scientific assessment of climate change, Working Group I. www.ipcc.ch.
- (IPCC) 2001. Climate change: The scientific basis, Working Group I, Intergovernmental Panel on Climate Change (IPCC), www.ipcc.ch.
- (IPCC) 2007. Climate change: Mitigation of climate change, Working Group III Fourth Assessment Report, www.ipcc.ch.

- International Energy Agency (IEA) Statistics Division. 2006. *Energy balances of OECD countries (2006 edition)* and *energy balances of non-OECD countries (2006 edition)*. Paris: IEA.
- Judge, T. A., Cable, D. M., Colbert, A. E. & Rynes, S. L. 2007. What causes a management article to be cited – article, author, or journal? *Academy of Management Journal*, 50 (3): 491–506.
- Khurana, R. & Marquis, C. 2006. Diagnosing and dissolving our "translation gap". *Journal of Management Inquiry*, 15 (4): 406-409.
- Khurana, R. 2007. *From higher aims to hired hands: The social transformation of American business schools and the unfulfilled promise of management as a profession*. Princeton: Princeton University Press.
- Kolk, A. & Pinske, J. 2005. Business responses to climate change: Identifying emergent strategies. *California Management Review*, 47 (93): 6-20.
- Kolk, A. & Pinkse, J. 2007. Multinationals' political activities on climate change. *Business and Society*, 46, (2), 201-228.
- Lash, J. & Wellington, F. 2007. Competitive advantage on a warming planet. *Harvard Business Review*, 85 (3): 94-102.
- Levitt, T. 1983. The globalization of markets. *Harvard Business Review*, 61 (3): 92-102.
- Levy, D.L. & Kolk, A. 2002. Strategic responses to global climate change: Conflicting pressures on multinationals in the oil industry. *Business and Politics*, 4 (3): 275-300.
- Levy, D.L. & Newell, P.J. 2000. Oceans apart? Comparing business responses to the environment in Europe and North America. *Environment*, 42 (9): 8-20.
- Levy, D.L. & Newell, P.J. 2005. *The business of global environmental governance*. Cambridge: MIT Press.
- Nordhaus, W.D. 1977. Economic growth and climate: The carbon dioxide problem. *American Economic Review*, 67 (1): 341-346.
- Nordhaus, W.D. 2007. The Stern review on the economics of climate change. *Journal of Economic Literature*, 45 (3): 686-702.
- Oswald, A. J. 1997. Happiness and economic performance. *Economic Journal*, 107: 1815-1831.
- Packard, K.O. & Reinhardt, F. 2000. What every executive needs to know about global warming. *Harvard Business Review*, 78 (4): 129-135.
- Packard, K.O. & Reinhardt, F. 2001. A business manager's approach to climate change. In E. Claussen (Ed.), pp. 269-280, *Climate change: Science, strategies, and solutions*. Leiden: Brill Academic Publishers.
- Pearce, D. 1991. The role of carbon taxes in adjusting to global warming. *Economic Journal*, 101 (407): 938-948.
- Pearce, F. 2007. How climate drama unfolded in Bali. *New Scientist*, December 22, 196: 6-7.
- Pfeffer, J. & Fong, C. 2002. The end of business schools? Less success than meets the eye. *Academy of Management Learning and Education*, 1 (1), 78-96.
- Rehdanz, K & Maddison, D. 2005. Climate and happiness. *Ecological Economics* 52 (1): 111-125.
- Stern, N. 2007. *The economics of climate change: The Stern review*. Cambridge: Cambridge University Press.

- Walsh, J. P., Weber, K. & Margolis, J. D. 2003. Social issues and management: Our lost cause found. *Journal of Management*, 29 (6): 859-881.
- Weitzman, M. L. 2007. The Stern review of the economics of climate change. *Journal of Economic Literature*, 45 (3): 703-724.

Table 1.

Top-30 Business and Management Journals Listed in ISI Web of Knowledge by Impact Factor and Total Citations*

ACADEMY OF MANAGEMENT JOURNAL
ACADEMY OF MANAGEMENT REVIEW
ADMINISTRATIVE SCIENCE QUARTERLY
CALIFORNIA MANAGEMENT REVIEW
CORPORATE GOVERNANCE
DECISION SCIENCE
HARVARD BUSINESS REVIEW
HUMAN RELATIONS
HUMAN RESOURCE MANAGEMENT
INFORMATION SYSTEMS RESEARCH
JOURNAL OF BUSINESS VENTURING
JOURNAL OF CONSUMER RESEARCH
JOURNAL OF INFORMATION TECHNOLOGY
JOURNAL OF INTERNATIONAL BUSINESS STUDIES
JOURNAL OF MANAGEMENT INFORMATION SYSTEMS
JOURNAL OF MANAGEMENT STUDIES
JOURNAL OF MANAGEMENT
JOURNAL OF MARKETING
JOURNAL OF OPERATIONS MANAGEMENT
JOURNAL OF ORGANIZATIONAL BEHAVIOR
JOURNAL OF PRODUCT INNOVATION MANAGEMENT
JOURNAL OF THE OPERATIONAL RESEARCH SOCIETY
LEADERSHIP QUARTERLY
MANAGEMENT SCIENCE
MIS QUARTERLY
ORG. BEHAVIOR & HUMAN DECISION PROCESSES
ORGANIZATION SCIENCE
ORGANIZATION STUDIES
RESEARCH POLICY
STRATEGIC MANAGEMENT JOURNAL

* These journals are a combination of those listed in the categories of ‘business’ and ‘management’ in Journal Citation Reports in ISI Web of Knowledge. Only those listed in ISI are included, meaning, inevitably, that some titles will be excluded. Journals have been selected using two measures from ISI Journal Citation Reports – ‘Impact Factor’ and ‘Total Cites’ (data collected in June 2007). The journals are presented alphabetically, not in order of rank. One journal, the *Academy of Management Executive*, recently renamed *Perspectives*, has not been included because of its name change. Some titles are listed in a number of categories. Only those journals where the central contributors are from business schools have been included. For example, the *Journal of Environmental Economics and Management* is also listed as an economics publication. Here it has been counted as economics because most contributors are located in economics departments not business schools.

Table 2.

A Summary of Management and Business Journals that Published Articles on “Global Warming” or “Climate Change” 1970-2006

<i>Number of articles mentioning “global warming” or “climate change”</i>			
Publication dates	Top-30 journals by impact factor and total citations	Journals ranked in or below the top-50	All management & business journals
1970 - 2006	9	35	44

Table 3.

A Summary of the Top-30 Journals that Mention “Global Warming” or “Climate Change” in the Title, Abstract or Key Words in the Disciplines of Management & Business, Economics, Sociology and Political Science between 1970 and 2006

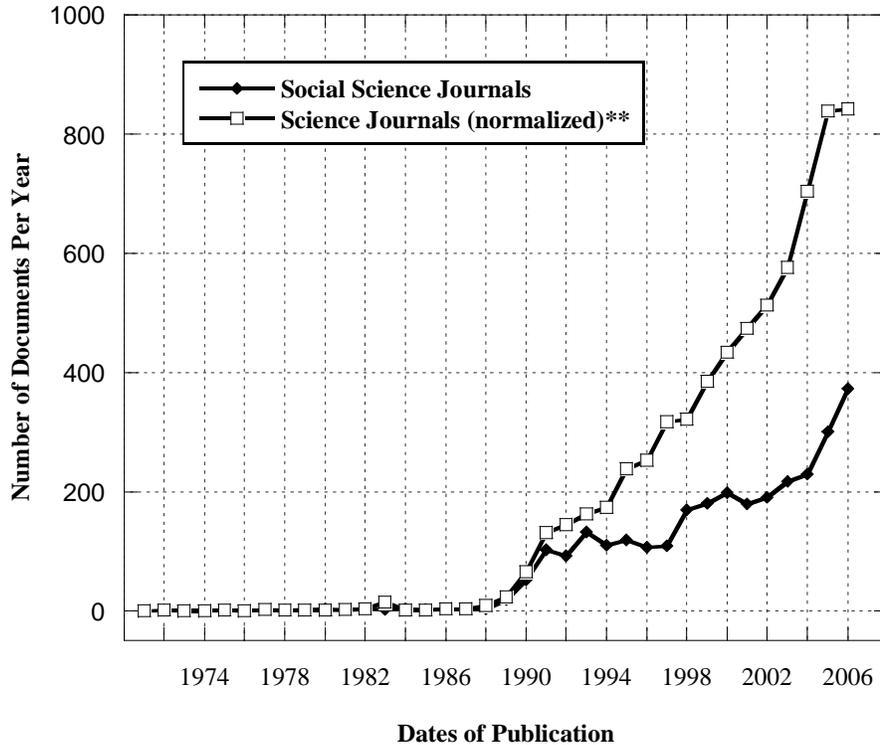
Academic discipline	Number of articles mentioning “global warming” or “climate change”	Total number of articles published 1970 - 2006
Business & Management	9	31,000
Economics	63	51,000
Sociology	40	25,000
Political Science	11	30,000

Table 4.

A Summary of the Top-30 Journals that Mention “Pollution” not “Global Warming” or “Climate Change” in the Title, Abstract or Key Words in the Disciplines of Management & Business, Economics, Sociology and Political Science between 1970 and 2006

Academic discipline	Number of articles mentioning “pollution” not “GW” not “CC”	Total number of articles published 1970 - 2006
Business & Management	45	31,000
Economics	286	51,000
Sociology	55	25,000
Political Science	67	30,000

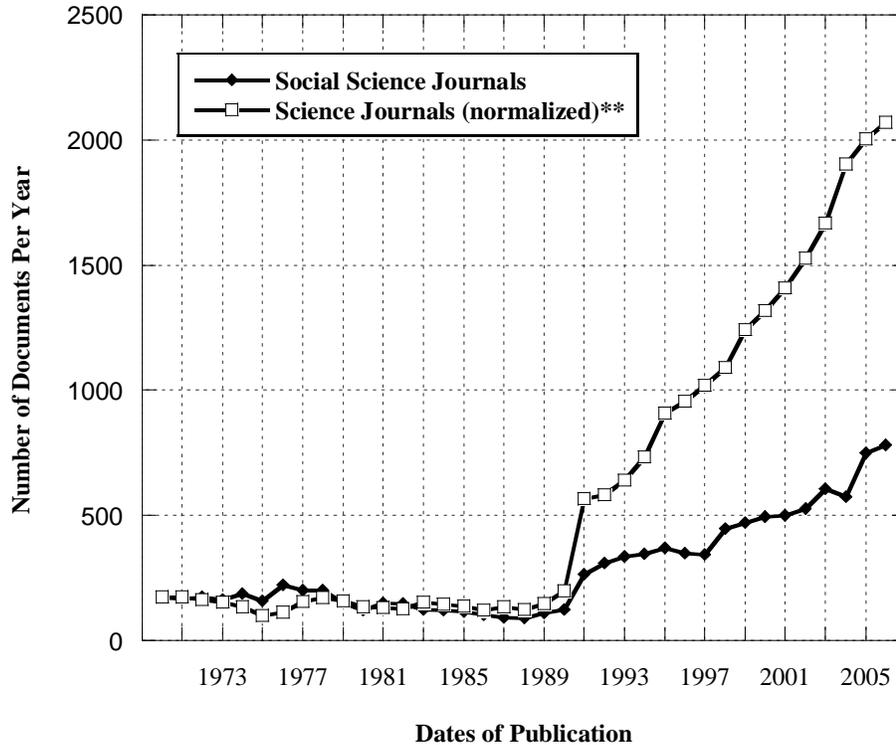
Figure 1.
Papers Published Annually in Social Science Journals and
in Science Journals (Normalizing for the Total Number of
Publications) that Mention Global Warming or Climate
Change Between 1970 and 2006*



*Mentions are in the title, abstract or key words. They include all document types not solely articles. Journals are those listed in ISI Web of Knowledge.

** Science journals have been normalized by dividing the number of documents published in each time period by 3.5. This has been done because there is just over a third more science journals than social science journals listed in ISI.

Figure 2.
Papers Published Annually in Social Science Journals and in
Science Journals (Normalizing for the Total Number of
Publications) that Mention Pollution Between 1970 and 2006*



* Mentions are in the title, abstract or key words. They include all document types not solely articles. Journals are those listed in ISI Web of Knowledge.

** Science journals have been normalized by dividing the number of documents published in each time period by 3.5. This has been done because there is just over a third more science journals than social science journals listed in ISI.

Appendix

Table 1.1

Terms that Appear in The Economist and in the Top 30 Management Journals in the ISI Web of Knowledge over Ten Years between January 1997 and June 2007

Business Terms	<i>Number of mentions in all documents to:</i>	
	Economist Magazine (Approximately 500 issues)	Top 30 Management Journals in ISI (Approximately 1,500 issues)
1. “Business strategy”	77	104
2. “Human resources”	158	152
3. “Corporate governance”	534	451
4. “R&D”	384	307
5. “Supply Chain”	300	333
6. “Corporate social responsibility”	34	65
7. “Innovation”	2044	1928
8. “E-business”	101	61
9. “ <i>Global warming</i> ”	472	5
10. “ <i>Climate change</i> ”	410	11