A CONTENT ANALYSIS OF SOURCE-MESSAGE HETEROGENEITY IN MASS MEDIA COVERAGE OF AGROBIOTECHNOLOGY

by

Leonie A. Marks[1]

Nicholas Kalaitzandonakes

and
Lucy Zakharova

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[1] Leonie A. Marks is Program Director of EMAC, Nicholas Kalaitzandonakes is Associate Professor of Agribusiness, and Lucy Zakharova is Graduate Research Assistant in the Department of Agricultural Economics, University of Missouri-Columbia, Columbia, Missouri 65211, respectively.

A Content Analysis of Source-Message Heterogeneity in Mass Media Coverage of Agrobiotechnology

It is often argued that the media is selective in its coverage of scientific risk, more interested in politics than science, simplicity rather than complexity, and danger rather than safety (Hoban, 1995). In a recent survey of 250 businesses in the United Kingdom (UK), more than half of those questioned felt that pressure group activity significantly affected the way they did business and that such groups were more likely to gain media coverage and sympathy (PR Week, May 2, 1997, p.5).

In the case of biotechnology, established environmental groups, along with the newer activist groups have actively sought publicity in order to influence government policy, raise public and consumer awareness, and to garner additional funding for their campaigns (Davis, 2000). These groups have engaged in various publicity efforts, such as ripping up transgenic corn from farmers' fields or dumping grain on the front steps of 10 Downing Street in London. A few studies (Abbot & Lucht, 2000; Preist Hornig, 1994), conducted at discrete points in time, have concluded, however, that the extent to which these events are reported by the media, and the extent to which these groups are quoted or "sourced" – is less than commonly perceived.

In this paper, we use content analysis to analyze the use of biotechnology information sources by US and UK newspaper reporters from 1990 to 1999. United States papers include the Washington Post, Wall Street Journal, and USA Today. The Washington Post and Wall Street Journal are elite newspapers reflecting the business and government communities. USA Today is a more popular US newspaper serving a broader national audience. United Kingdom papers include the Daily Telegraph and the London Times -- two elite broadsheet papers. Our period of coverage is more extensive than previous studies, allowing for a cross-country comparison between two countries that have had quite different outcomes in terms of acceptance of agrobiotechnology.

Positive (e.g., benefit) or negative (e.g., risk) messages are correlated with the type of source (government, industry, scientists, environmental and consumer groups, farmers, activists, and so on) in order to determine the degree of source and message heterogeneity in such media reporting. Specifically, the following research questions are addressed,

- The degree to which different societal groups have been sourced by the media in the agricultural biotechnology debate.

- The degree to which experts versus non-experts have discussed the relative benefits vs. risks of agricultural biotechnology.

- The extent to which reporting of biotechnology is more balanced (as measured through source and message heterogeneity) in the US than in the UK.

- The extent to which source heterogeneity increased at the height of technological controversy (1998/99) and how this affected the debate.

REVIEW OF THE LITERATURE

The media is often criticized for its coverage of "technological controversies" like biotechnology (Hoban, 1995). Scientists and industry often level the criticism that the media is too sensationalistic in its coverage, arguing that the media gives too much weight to activist groups, particularly at the height of a technological controversy, when these groups are ramping up their campaigns. Yet previous research on the use of sources in the coverage of biotechnology (medical and agricultural applications) has demonstrated that both scientists and industry sources dominate the news (Hornig Preist & Talbert,1994; Pfund and Hofstadter, 1981) found that industrial rather than academic interests set the terms of discussion in media coverage of recombinant DNA in the 1970s. In reporting of genetics news in several US papers, Conrad (1999, p.295) found that 49% to 80% of sources used were either scientists or researchers depending on coverage.

A considerable amount of research has also confirmed that institutional sources consistently outnumber all other types of news sources used (Davis, 2000; Tunstall, 1971; Gans, 1979; Blumler & Gurevitch 1986, 1995; Tiffen, 1989). Institutional expert sources are likely to be higher for science than non-science related stories by default. In all likelihood science writers will use more experts (non-regular sources) as they seek to "explain" the latest scientific developments. Science journalists also like sources that add prestige, authority and legitimacy to the story (Conrad, 1999).

Sources of Risk Communication

For all the above reasons, experts (and the institutions to which they belong) are more likely to be quoted than non-experts (NGOs and activist groups) in the making of the news. However, such a reliance on experts may be viewed as problematic when one approaches technological controversies from a risk communication perspective. Public perceptions of the risks associated with a new technology often do not coincide with technical conceptions of risk (Krimsky & Plough, 1988). This gap has tended to baffle scientists and regulators. Yet it is increasingly evident that communication about the risks, as well as the benefits of new technologies has a strong bearing on the institutional credibility of regulatory authorities, universities, and scientists; and the public's overall level of trust and acceptance (*ibid*.).

Risk communication is increasingly being viewed as an interactive process of information and opinion exchange among individuals, groups, and institutions (National Research Council, 1989, p.2). From this perspective the objectivity of expert risk assessment gives way to understanding risk as being "socially constructed;" where non-expert interpretations of risk based on other values, socio-economic, ethical, religious, moral and so on are equally important (Preist Hornig, 1994).

In practical terms, broad media coverage of scientific controversies that reflects a range of issues and a range of interested voices is an indication of "information equity" (Preist Hornig, 1994).

The more divergent the sources quoted, the more information equity exists. The degree to which different "voices" have been heard in the press, therefore, can be used as an indicator of the degree to which public discourse on a technology has taken place. The more interest groups have a chance to have their voices heard in the media, the more experts have a chance to respond to public concerns.

METHODOLOGICAL APPROACH: MEDIA ANALYSIS

Analysis of media sources can be systematically conducted using content analysis. "Content analysis is a systematic method for analyzing and quantifying message content and message handling. It is a tool for observing and analyzing the overt communication behavior of selected communicators" (Budd *et al.*, 1967, p.2). Instead of soliciting people's behavior directly (through interviews), or measuring response to specific events or stimuli, content analysis may be used to analyze communications that people have produced as accounts of behavior (Kerlinger, 1964).

Our objective is to uncover trends in information equity as reflected in reporting of agricultural biotechnology in UK and US papers. Our period of coverage is more extensive than other studies, such as Preist Hornig & Talbert (1994) and Abbot & Lucht, (2000). Our period of analysis runs from January 1, 1990 through to December 31, 1999—a total of 120 months of continuous coverage. This dataset allows us to investigate trends and potential shifts in coverage from pre-commercialization through specific commercialization events (such as bovine growth hormone (BGH) in milk and transgenic crops) to the agricultural biotechnology controversy that erupted across the Atlantic.

Sampling Technique

A comprehensive database of all articles related to agricultural and food applications of biotechnology, published in the selected media, was developed based on an exhaustive list of keywords. Electronic data sources were searched. Both animal and plant biotechnology applications are included in the population of articles.

Figure 1 details coverage of agbiotech by newspaper for the period of coverage 1990-1999. All newspapers have trended upward over time, however, coverage of agricultural biotechnology issues increased dramatically in UK newspapers since 1998, reflecting the intense debate that has taken place about the technology. The data set consists of 2,123 articles across the five newspapers.

Categorization and Coding of the Data

In this research, nine coding categories were developed to reflect the different societal groups actively involved in the agricultural biotechnology debate. These "voices" were defined as follows:

- *Industry sources* inclusive of scientists working in industry; industry analysts; CEOs; industry spokesmen, and so on. All parts of the supply chain (excluding farmers & their

organizations) were included. Hence, statements by biotechnology firms, input suppliers, grain handlers and processors, and food retailers were all included.

- *Government sources* including scientists working for the National Institutes of Health (NIH), the Environmental Protection Agency (EPA), the Agricultural Research Service (ARS), the United States Department of Agriculture (USDA), English Nature (UK government oversight), and the Ministry of Agriculture Food and Fisheries (MAFF); Congressmen and Senators (US); Ministers (UK); government spokespersons, and so on.

- *Scientists at Universities & Research Institutes* including not-for-profit institutions within the United Kingdom and the United States. Land Grant universities, Colleges, PolyTechnics, other universities, and other public research institutes were included.

- *Industry Organizations* include organizations such as the Biotechnology Industry Organization (BIO) (US), the Biotechnology Industry Association (UK), or any organization that represents the views of industry collectively at the national level. Indirect attributions that represented a consensus view of the industry as a whole, such as "the biotechnology industry is today proposing" or "the biotechnology industry is now lobbying," were included in this category.

- *Farmers and Farmer Organizations* include farmers, growers or other producers, and their representative organizations, such as the National Farmers Organization, National Farmers Union (UK), American Corn Growers Association, American Soybean Association, American Farm Bureau, National Corn Growers Association (US) and so on.

- *Environmental Groups* include Greenpeace, Friends of the Earth, Environmental Health Fund, Foodfirst, Countryside Restoration Trust, National Wildlife Federation, Natural Resources Defense Council, Sierra Club, and so on.

- *Consumer Groups* include Consumer Alert, Consumers Association, Consumers Organization, Consumers Union, the Food Commission, Foundation for Economic Trends, Organic Consumers Association, consumer reports, and so on.

- *Concerned Scientists* including Union of Concerned Scientists, Physicians for Social Responsibility, Physicians and Scientists for Responsible Application, or any scientist that has voiced concern over the food and environmental safety of biotechnology (e.g., Arpad Pusztai; John Losey et al.).

- *Opinion Leaders* include high profile individuals, such as Prince Charles and prominent individuals in the media spotlight (actors, musicians), but also novelists (e.g., Rachel Carson), community leaders, chefs, and the lay public (e.g., parents).

EMPIRICAL RESULTS

Sourcing of Societal Groups

Figures 2 and 3 report results for all five newspapers as a percentage of total articles for the period 1990–1999 that use various groups as sources of information on agricultural biotechnology. In comparing the figures—one striking result is that the use of sources is considerably higher across all US papers than the UK newspapers. This result has been found elsewhere. In general, therefore, through the use of more sources in the reporting of agricultural biotechnology, there is more chance for a broader public discourse and viewpoints to be heard in US newspapers. Likewise, the debate started earlier in the United States than in the United Kingdom. Daily Telegraph coverage did not start until 1991, while the London Times was not discussing agricultural biotechnology issues until 1992. In all three US papers there was some level of coverage from 1990 onwards and this level increased steadily throughout the entire time period (figure 1).

The relative use of sources is similar across all newspapers. In the US, industry sources are the most frequently used—46% of articles quoted at least one industry source in the Wall Street Journal, with 41% and 30% quoted for the Washington Post and USA Today, respectively. The high use of industry sources by the Wall Street Journal is expected given its target audience is business and commerce. These results are also consistent with the earlier studies of US coverage of biotechnology where industry sources are usually ranked in the top 3 groups (by frequency). The government is the next most frequently used source—ranging from 39% of articles for the Washington Post to 27% for the USA Today. Scientists and university sources came in third place for the Washington Post (30%) and the USA Today (23%). Industry organizations were quoted in 24% of the Washington Post articles, almost twice as frequently as in the USA Today where 13% of articles sourced industry organizations.

In terms of UK coverage, again institutional sources have dominated the debate. Government sources were most frequently used in the London Times (29% of articles) and the Daily Telegraph (28%). This is partly a result of the heavy coverage that agbiotech received in 1999 when the Labor government came under increasing criticism for its mishandling the GM food crisis. Nearly 45% of articles quoted government sources during 1999 compared to less than 10% of articles in the previous year. Messages from UK government sources are therefore more heterogeneous than those in the United States—as political parties engaged in conflicting viewpoints in the media. University scientists played a large role in the London Times coverage (29%), as did industry sources (26%). However, again industry sources are a more heterogeneous group in the UK, as retailers sent mixed messages about GMFs as they maneuvered for market position.[1] Industry organizations have played a much diminished role in the UK (quoted in 4.5% of articles) than in the United States.

Other groups have played a role in overall coverage of agbiotech. Opinion leaders, environmental groups, and farmers and farmer organizations were the next most frequently sourced groups, respectively. Farmers from both sides of the debate were quoted in the UK

[1] Such market positioning did not occur until 1999, with "negative" quotes making up a very small fraction of the total volume of attributions. Nevertheless, industry representatives, such as the CEO of Iceland Foods, Malcolm Walker, did come out actively against GM foods.

papers—organic farmers expressed concerns about "genetic contamination" and commercial farmers expressed general support for GM crops. Consumer groups were surprisingly less frequently quoted in both the UK and the US than one would expect given the degree of trust that US and UK consumers presumably place in such groups.

Message Heterogeneity

From figures 4, 5, and 6, there is strong evidence to suggest throughout the 1990s that the debate about agricultural biotechnology has been dominated by experts (industry, government, scientists) as opposed to non-experts (consumer groups, environmental groups, opinion leaders, concerned scientists, farmers and other activists) on both sides of the Atlantic. This holds not only for the Washington Post and Wall Street Journal that cater to an industry and government audience but also to more popular newspapers, such as the USA Today. Indeed, the USA Today has increasingly come to rely on "experts" as opposed to "non-experts" in its coverage (see figure 6). This would seem to confirm results of earlier studies.

Figures 7, 8, and 9 break down the different source groups by the types of messages that they convey. Based on previous findings (Preist Hornig & Talbert, 1994) and the way that the different source categories were coded, the nine sources can be broken down into three sub-groups—sources that have conveyed predominantly "negative" or "risk" messages (i.e., consumer advocate groups, environmental groups, and concerned scientists), sources that have conveyed predominantly "positive" or "benefit" messages (i.e., industry, industry organizations, & scientists), and sources that may have conveyed more "mixed" messages by country and over time (i.e., government, farmers & farmer groups, opinion leaders). Farmers and farmer organizations are by no means a homogeneous group. The National Corn Growers Association has come out in support of agbiotech while the American Corn Growers Association has been less supportive. Organic farmers have expressed concerns about the environmental consequences of transgenic crops, while others have praised the economic and environmental benefits. Some farmers have been sued in court for infringement of intellectual property rights by private firms, such as Monsanto, with concomitant consequences for farmer support. Similarly, opinion leaders, such as Prince Charles -- himself an organic farmer, have been openly critical of the technology in the UK media, while other opinion leaders, such as his father and sister (Prince Phillip and Princess Ann) have been more favorable towards agrobiotechnology.

On the basis of this categorization, the debate has been much more heterogeneous across the US and UK and appears to have been driven by specific events. For example, the debate was more broadly based early on in both countries, albeit starting at a later point in time in the UK, when the safety of bovine somatotropin (BST) was heavily discussed. Later on, however, and following the promising commercialization of biotechnology crops in 1996 – the debate become more narrowly focused on industry and scientific arguments and news. By late 1998/1999, at the height of the scientific controversy, the debate broadened again. This result does not lend support to Hornig's prediction that a broad public debate early on necessarily ensures long-term acceptance of a controversial technology, such as agbiotech. UK support for agbiotech collapsed in 1998/99 despite early-on discussion by alternative voices. In other words, factors other than media coverage (and lack thereof), such as the BSE crisis, may have played a more significant role in consumer rejection of the technology in 1999. In other work (see Marks et al., 1999;

Marks et al. *in press*) we have found that the BSE crisis did have an impact on reporting of food biotechnology in general and on the public debate. Hence, press coverage has been cyclical in nature depending on specific events suggesting message and source heterogeneity and debate during the 1990s.

Technological Controversy

Our results support the hypothesis that source heterogeneity increased at the height of technological controversy – during 1998 and 1999. For example, from figures 7, 8, and 9 sourcing of alternative voices did occur from 1997 onwards in both the United States and the United Kingdom. Some groups, such as environmental groups, had reasonably high access to the media early on and throughout the 1990s. This access seems to be event driven for all three newspapers. Likewise, consumer groups and concerned scientists played an increasing role during 1998 and 1999 in most of the papers. There are some exceptions, however. Consumer groups did not fair as well in the USA Today, we found a significant decline in their sourcing throughout the entire time period. Pop stars and princes also gained significant access to the UK media during 1998 and 1999. One would expect this type of access to be less sustained (more transitory) than that of the more mainstream advocacy groups.

CONCLUSIONS

In this paper, the heterogeneity of sources was used as an indicator of information equity in the public discourse of agricultural biotechnology in the United States and the United Kingdom. US and UK media coverage were similar in that expert voices were more often heard in the press than those of non-experts (for example, environmental groups). And we have found support for the hypothesis that the public sphere broadened as the debate became more contentious during 1998 and 1999. However, even when UK coverage exploded in 1999, institutional sources still dominated the debate, although their messages became more mixed. One surprising result was the decline in the use of consumer advocacy groups over time in the USA Today, and the much lower level of such voices in the UK media during the debate. Given that consumers presumably place a high level of trust in such groups their apparent silence (at least in mainstream newspapers) should be of concern to those trying to build consensus around the technology.

Although the UK entered the debate later than the United States, the discussion has been much more heterogeneous across the US and UK than perceived (on the basis of message heterogeneity). This result does not lend support to Hornig's prediction that a broad public debate early on necessarily ensures long-term acceptance of a controversial technology, such as agbiotech. UK support for agbiotech collapsed in 1998/99 despite early-on discussion by alternative viewpoints in the media. In other words, factors other than media coverage (and lack thereof), such as the BSE crisis, may have played a more significant role in consumer rejection of the technology in 1999.

Finally, a word of caution. These results are specific to elite and national broadsheet newspapers. We cannot generalize how the debate evolved in the tabloid press which is typically cited as being more sensationalistic in its coverage. Analysis of such media is a fertile area for further research.

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Figure 1: Coverage of AgBiotech by Paper, 1990-1999.

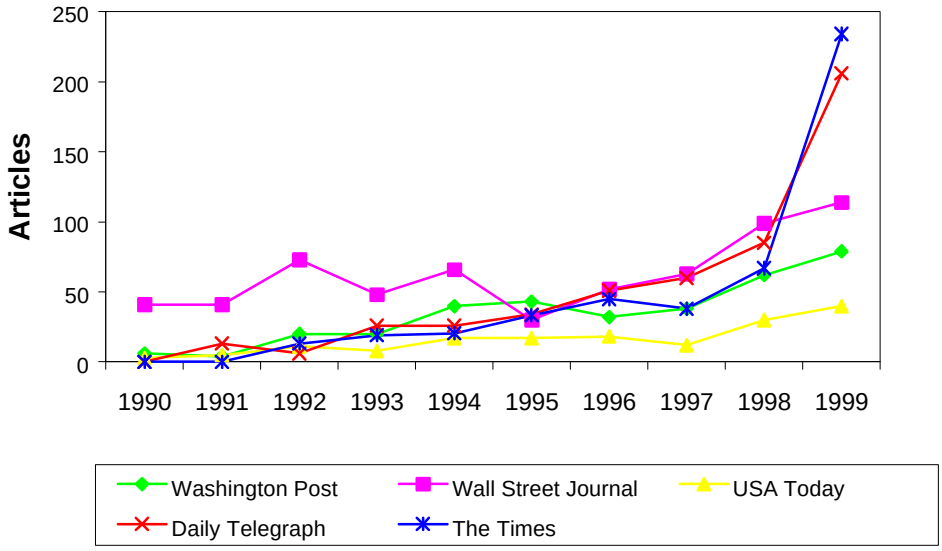

Figure 2. Use of Information Sources in the UK, 1990-1999.

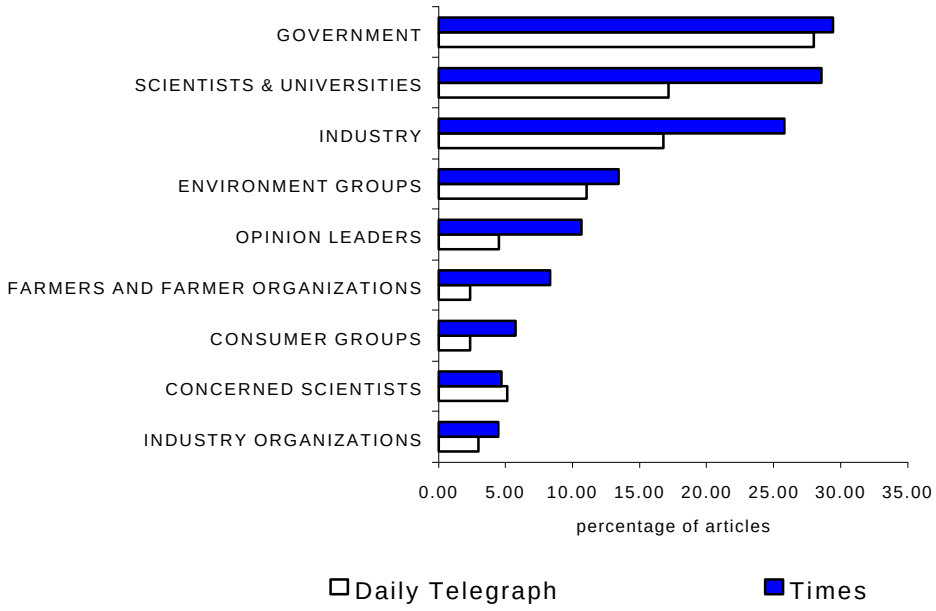

Figure 3. Use of Information Sources in the US, 1990-1999.

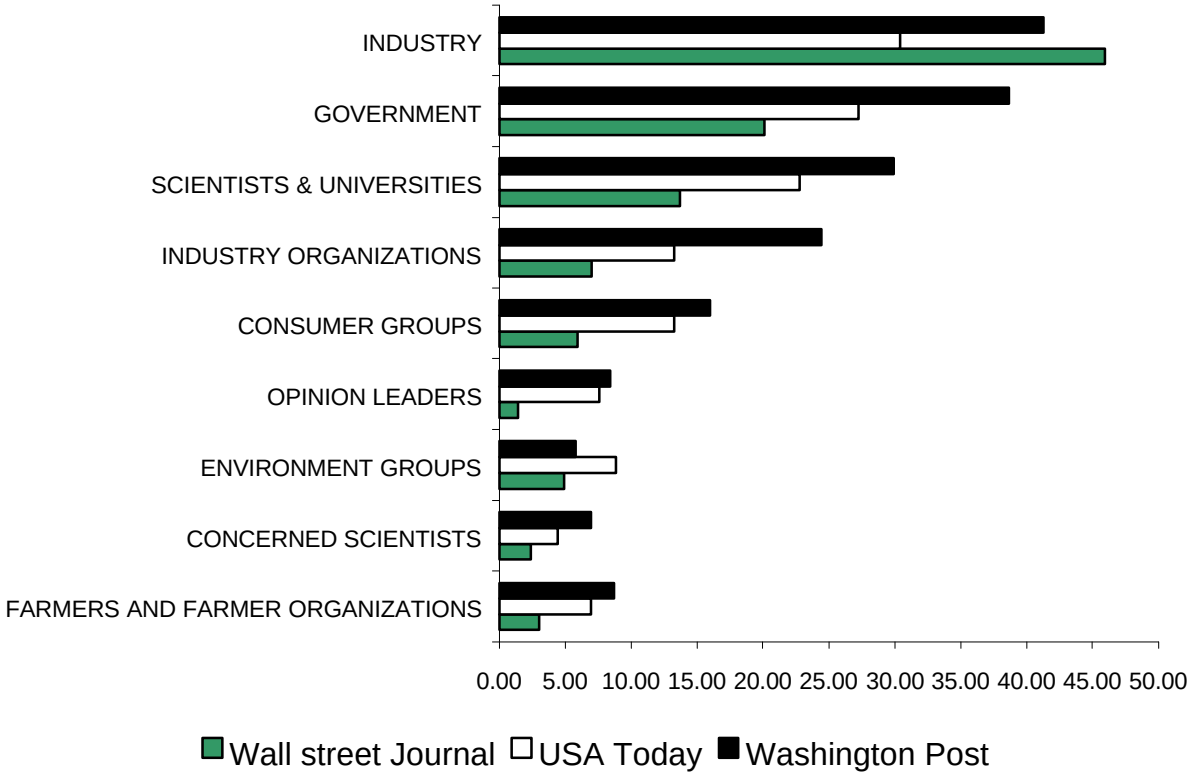

Figure 4. Washington Post Use of Expert vs. Non-Expert Sources, 1990-1999.

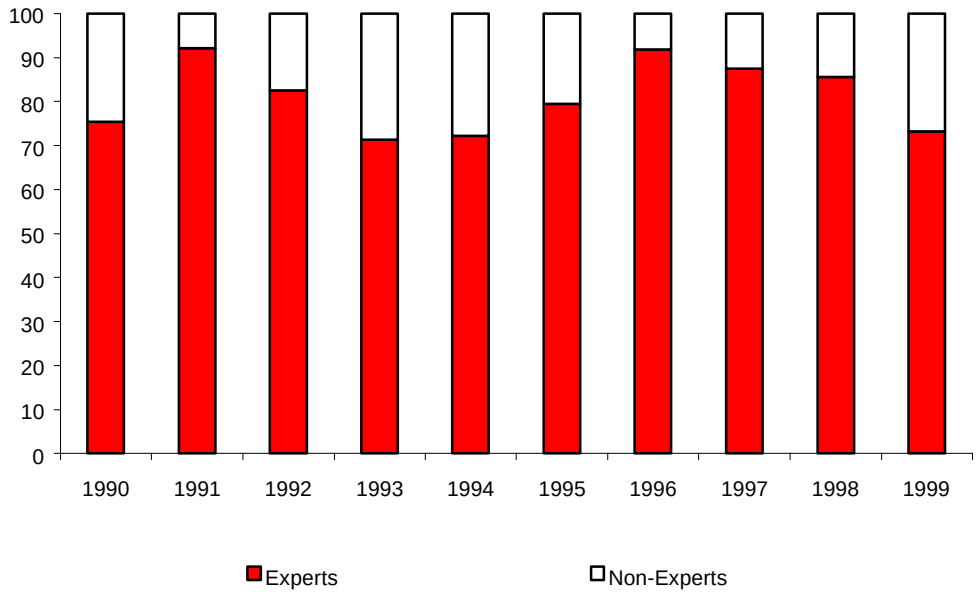

Figure 5. London Times Use of Expert vs. Non-Expert Sources, 1990-1999.

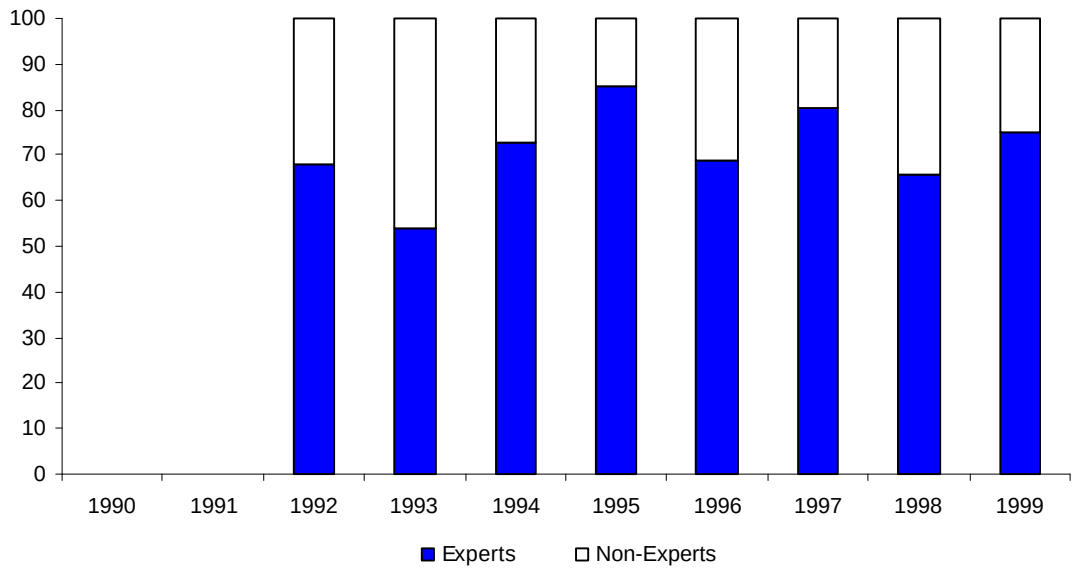

Figure 6. USA Today Use of Expert vs. Non-Expert Sources, 1990-1999.

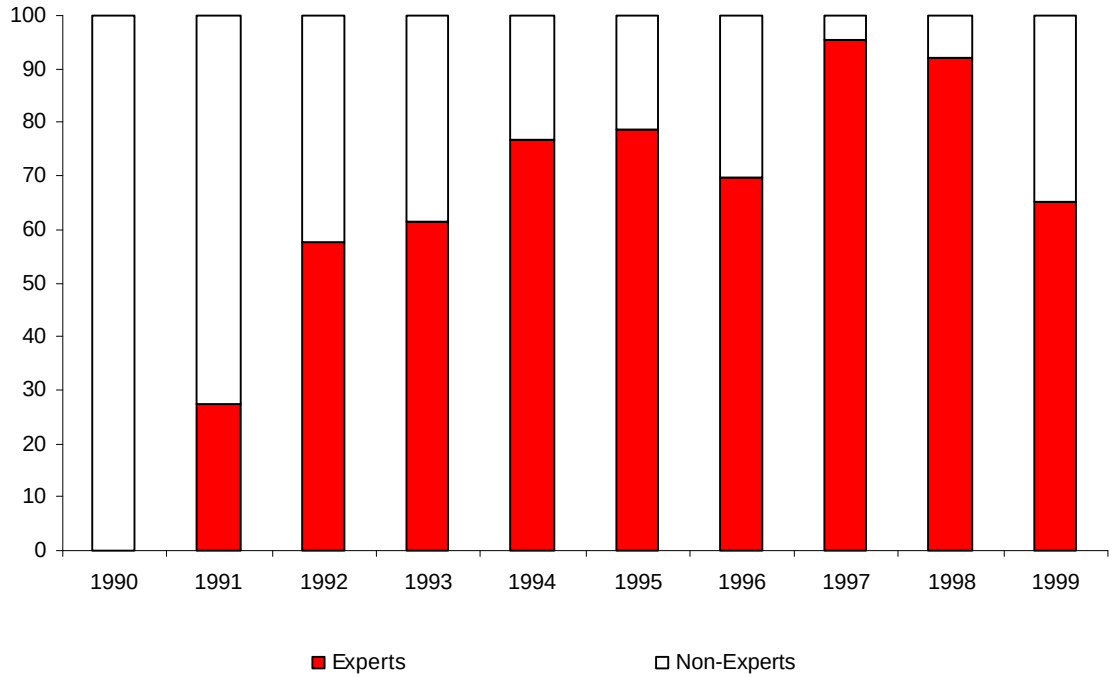

Figure 7. London Times Message Heterogeneity, 1990-1999.

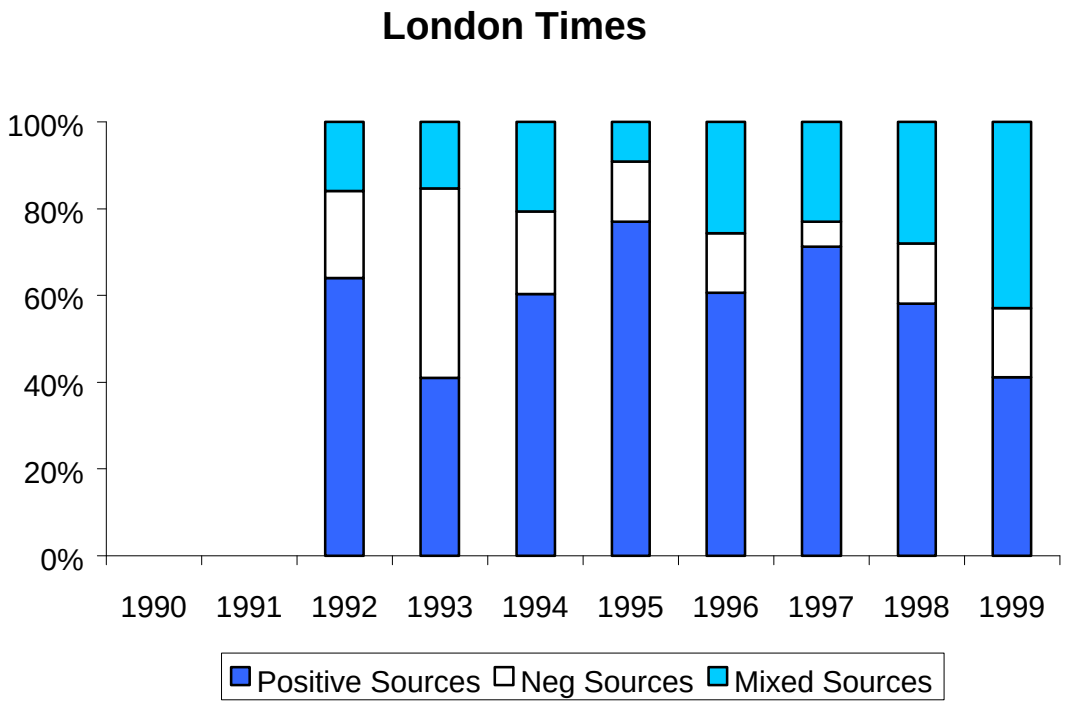

Figure 8. Washington Post Message Heterogeneity, 1990-1999.

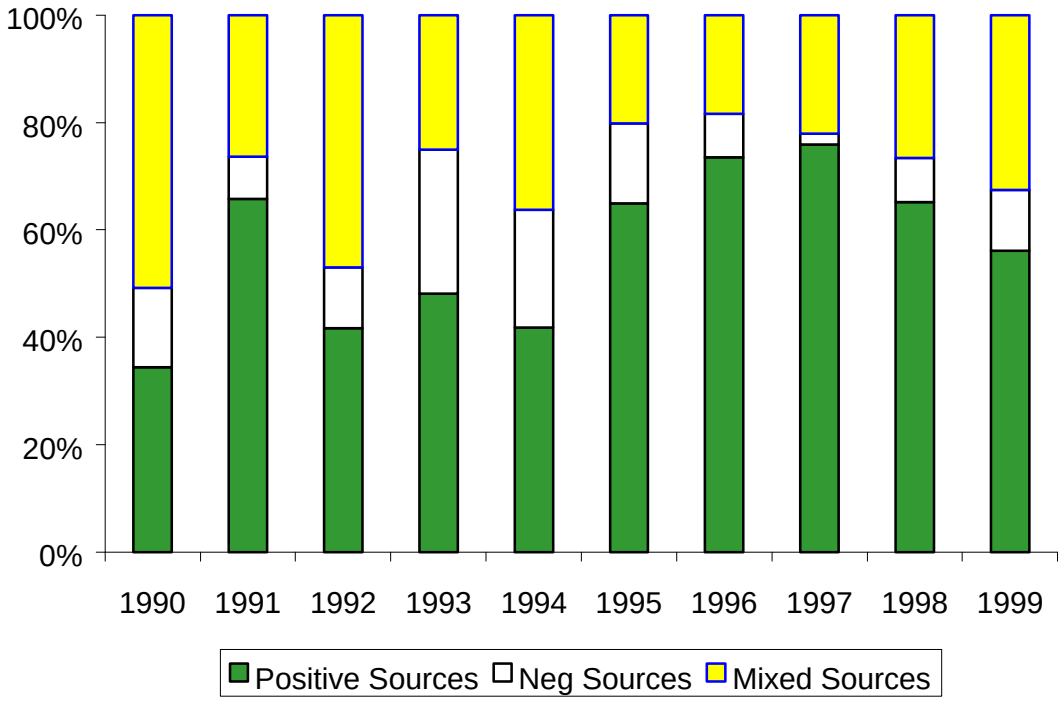

Figure 9. USA Today Message Heterogeneity, 1990-1999.