

The dramatisation of biotechnology in elite mass media

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In this chapter we will characterise the cultivation of biotechnology in the European, Canadian and US public spheres during the 1990s as a drama. Drama involves a background of scenery and sound, and a foreground of plot, actors, reasoning and, on occasion, tragic outcomes. Classical drama theory argues that dramatic representation is rule based (rather than a simple stroke of intuition and genius), it focuses on actions rather than personality and makes a positive contribution to the conduct of life outside the theatre.¹ The Aristotelian idea of ‘katharsis’ or ‘purification’ suggests that dramatic representation of events raises laughter, fear and pity among the audience and thereby regulates such emotions towards a ‘level of passion’ that is adequate to the issues in reality. The adequacy of passions is difficult to judge *a priori*. However, classical drama theory suggests that in a world where passions are absent, they need to be raised, and where they are too high or overwhelming, they need to be contained. In this manner, drama cultivates human virtues and prepares for effective collective action. This is achieved by the ‘homeopathic living-through’ of these passions in the vicarious reality of reading, watching scenes and images, and listening to arguments about issues.

This classical point of view offers some advantages. First, it steers a middle way between assuming that mass mediation is either objective information or only misleading and despicable entertainment. Education and information are often demanded from the mass media, but few media workers would subscribe to these as their mission. Entertainment is what fits the professional ethos of most media workers. It is only when challenged that the media industry, which is based on political ambitions and advertising revenue, falls back to the defence of its role as information provider to the public. Secondly, it avoids the alternative error of relegating mass media coverage to irrelevance and thereby ignoring its power on one hand, or endowing it with overwhelming powers on the other. The latter gives rise to moral panic and ‘media bashing’ over alleged misinformation or propaganda. Viewed from the

perspective of classical drama, media discourse over biotechnology contributes to the regulation of collective passions over an issue, which influences the manner in which we think about it and how we come to solutions for future actions.

In our research, we systematically compare the press coverage of biotechnology in 15 countries over two periods, 1992–96 and 1997–99, using a randomised sample of newsprint in each country, and a common coding frame. The coding frame identifies the scenes that are set, the actions, the actors, their reasoning and the outcomes, as these are associated with biotechnology in the 1990s. We define these two periods as the years before and after the ‘watershed years’ of 1996/97, which mark a clear turning point in this drama, where heroes turn into villains, and villains into heroes. The two episodes of Monsanto’s export of Roundup Ready Soya (from late autumn 1996) and of Dolly the sheep (February 1997) changed the symbolic landscape of biotechnology in Europe and worldwide.

Mass media and, in particular, the daily press, provide one of several arenas in the modern public sphere, which itself has a protracted history.² They offer a public space where various actors present a drama of public significance to a wider audience in order to entertain, to alert and focus attention, to raise passions, to inform, to distract and mislead, and to argue in order to educate.

Many theories on the media’s role in society have been formulated, some of which have reflected a ‘realistic approach’ of telling how the world is. This is based on the assumption of an existing set of events, which can be reported ‘objectively’ and balanced by competent, fair and unbiased journalists. According to this realistic approach, journalism’s role in society is seen to mirror reality. The ideal-typical ethos of this kind of journalism is ‘objectivity and dispassion’. By contrast, others have stated that the media offer meaning and orientation by presenting a ‘constructed world’ using understatement, exaggeration, elaboration and foremost, selection and framing. This is a ‘constructive’ activity, akin

to dramatisation according to the rules of drama, rather than simply mirroring a 'reality out there'. In the mediated reality, processes of news selection play a role, in particular in the theoretical notions of news value and framing. The framing of news can be understood as the process through which complex issues are given shape along journalistically manageable dimensions, resulting in a particular focus on an issue. This reasoning implies that journalistic framing may also lead to journalistic selection, for example by relying heavily on the information from particular sources. Differences in perceptions between those sources due to selectivity or conflicting values, in particular regarding the risks and benefits of modern biotechnology, may motivate journalists and editors to further emphasise their role of watchdogs or as extra-parliamentary opposition, highlighting neglected issues and framing the news as danger and controversy. These processes may encourage media outlets to highlight some aspects of biotechnological innovations at particular times, but also encourage the media to ignore other biotechnology issues. The construction of meaning necessarily involves selection and framing. The ideal-typical ethos of this kind of journalism is guided by advocacy, investigation and fulfilling the role of the fourth estate in society.

To the analytical eye it appears paradoxical that what is called the 'realistic approach' is very much a normative stance, highlighting how journalists ought to report the world by appealing to the ethos of 'objectivity' as a self-regulatory professional standard. The function of such an analysis is the critical assessment of journalistic practice measured against an external standard of reality that is 'misrepresented'. On the other hand, the constructive approach is more realistic from the empirical point of view; in daily practice objectivity may not be achieved, and may not be a guiding principle. Constructive analysis includes 'realistic' analysis as a special case. It attempts to understand how news is produced as a matter of actual practice according to operative rules, such as news values and framing. Normative expectations may or may not be part of the analysis. The media representations are assessed comparatively with reference to their functions in a context. For this purpose, the defense or diagnosis of the violation of professional standards, such as 'objectivity and dispassion', is secondary, albeit with juridical implications at particular times and in particular cases.

Public opinion *qua* elite press: salience and framing

We focus on the opinion-leading press. The press informs the wider public about important issues that are relevant for a country. It equally informs policy-makers and also serves as an indicator of what the wider public may think about the issues at hand. The selection of events to be reported and the way events are portrayed may have an impact on public perception of these events. However, they are more likely to influence policy processes, by indirectly pointing to what public opinion may be about.

Among the many types of mass media, the press serves a key function. Across Europe, certain newspapers and news magazines are considered to be opinion-leading sources of information for other media, as well as for the public and decision-makers such as politicians, civil servants, experts or industrialists. Therefore, newspapers are very suitable for studying journalistic selection and framing by proxy. By analysing the opinion-leading press, we can get a reasonably robust impression of how society processes meaning about modern biotechnology, as well as an insight into the development of these information flows over time. The choice of the opinion-leading press in the participating countries leads to a diverse set of print media: in some countries large-circulation dailies, in others small-circulation newspapers, and in others news-weeklies.

We consider elite media as addressing an elite audience and their concerns in the public sphere. These representations are characterised in aggregate by inference from a sample of observations. Beneath this observable and aggregate order is the fractal nature of media coverage. In the reality of events, each news item (in research terms, each item of coding), has a 'natural history' that, in principle, is traceable to various sources; for example the occasion of attention of a particular journalist whose motives and inspiration are translated into text, or the editorial negotiations that turn it into a published piece that must then compete with other news items in a confluence of luck and local competence. Here we observe the aggregate patterns that emerge from a myriad of local battles in the newsrooms between source, writers, editors and the contexts of the hour or the day. We assume that these emergent patterns, once abstracted from random elements, are indicative of a climate of opinion outside the newsrooms. Newsrooms have particular

sensitivities to the world by reference to virtual readers, or in our case elite publics, who are most likely configured as advertising profiles. In the context of increasing competition in the information market, journalists – like everybody else in that market – need to get ever closer to the pulse of society in order to hold their audience and consumers to attention.

The main focus of our analysis is journalistic salience and framing which, considering the sensitivity of journalists to the pulse of society, can be considered as indicators of wider societal concerns and as representing public opinion. Our method is classical content analysis,³ which is particularly useful for longitudinal and comparative analyses.⁴ The purpose is to construct aggregate indicators of discourse that are sensitive to variation across time and contexts. This is a particularly effective approach for characterising the long-term trends, the ‘longue duree’ of the development, rather than the short-term perturbations in the media coverage. The index of the topicality of biotechnology in the public sphere is, however, predicated on the observers’ analytic framework. What the questionnaire provides for the pollster, the content analytic frame provides for the media analyst: it gives an explicit framework of data construction, comparison, and interpretation. For the observer, mass media contents are traces; their context of production and reception is a matter of inference. Thus, inferences about public opinion are based on differentials in salience and framing.

For the present purpose we focus on the period from 1996 to 1999. The period from 1973 to 1996 has already received a detailed analysis.⁵ The press material was sampled according to an annual random regime and retrieved online from databases of national opinion-leading newspapers or news magazines. Articles were coded on a coding frame that was developed for this purpose and which has already been documented in detail.⁶ The present study follows those established procedures with minor changes. All quoted figures refer to elite newspapers only and to articles with clear focus on biotechnology.

Our argument unfolds in several steps. First, we focus on the synchronisation of public spheres by analysing the background ‘scenery and sound’ of the biotechnology drama through various indicators of selection: salience, format, focus and size of reportage in the various countries. Next, we explore the plotting of biotechnology through various indicators of journalistic framing. We analyse the themes of biotechnology including notable absences,

the degree of controversy in the coverage, the frames that are mobilised and the actors appearing in the coverage, as well as the consequences of biotechnology in terms of risks and benefits. Most features are compared by country and over time. The analysis culminates in a typology of different dramas of biotechnology across Europe and North America. Results are then presented in the form of relative frequencies and correspondence analyses.

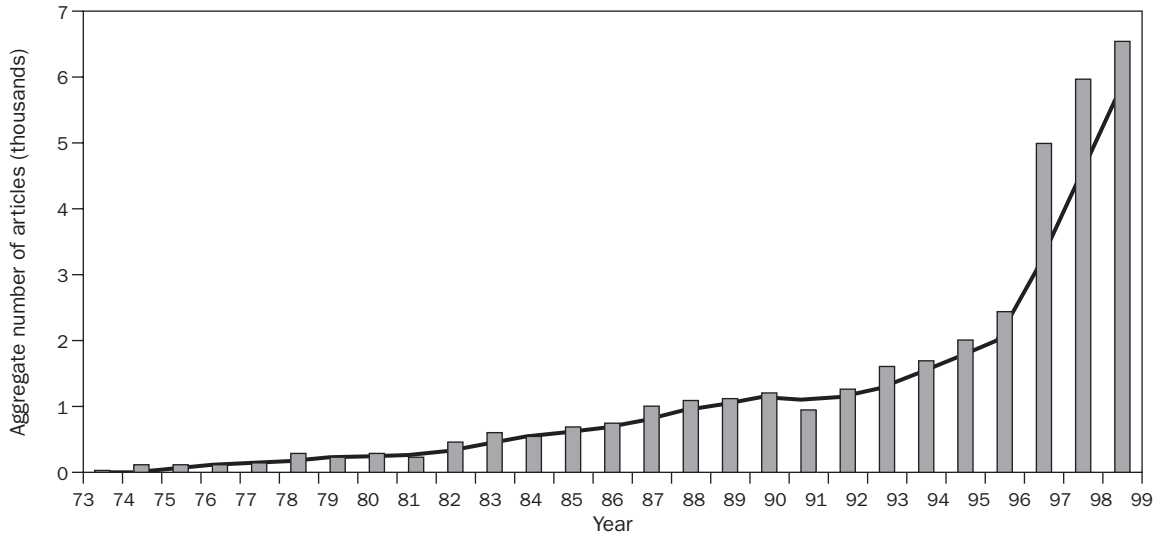
Salience: setting the scene and the rhythm

Every drama has a background of scenery, sound and rhythm, which make up its quantitative elements. We characterise these elements of the biotechnology drama in terms of four indicators: salience of the topic, the average size of the articles, the journalistic formats that are mobilised and finally, the degree of focus in the reference to biotechnology. Salience and size describe the background scenery, shifts in salience its rhythm and thus, to complete the analogy, journalistic formats and their focus suggest the type of ‘sound’.

Synchronising the debate

Figure 1 shows the aggregate yearly coverage of biotechnology in the elite press across 12 European countries from 1973 to 1999. In the online retrieval we used the following four keywords (appropriately translated to local languages): *biotech**, *genetic**, *genome*, *DNA*. The figure indicates that in terms of media events, biotechnology went through a number of phases: from a slow start after Asilomar of 1975, to its recognition as a ‘strategic technology for the twenty-first century’ in the early 1980s, to the European regulations of crop biotechnology in 1991, and finally to the events after 1996/97 around Monsanto Roundup Ready Soya, GM crops and foods, and Dolly the sheep in February 1997. The years 1996/97 are a clear watershed, indicated by the step rise in coverage. While our previous reports have shown much diversity in the phasing of biotechnology,⁷ the watershed 1996/97 marks a break across all of Europe and in Canada. The years 1997–99 saw a veritable explosion of coverage of biotechnology. Overall, 1999 sees three times the coverage of 1996, whilst 1996 had only doubled over 1992. There does not seem any reason to believe that in recent years the intensity of coverage has abated, considering the various national debates over stem-cell research in 2000 and 2001. Until 1996, the debates over biotechnology followed separate timings and different

Figure 1. The coverage of biotechnology in the elite press across 12 European countries from January 1973 to December 1999. Annual counts of newspaper articles are aggregates based on a single opinion leading newspaper outlet in each country. The bars show the total annual counts, the line shows the moving three-year average



agendas in the various countries; after 1997, the debates went into a joint rhythm. Thus, here we are documenting two of Luhmann’s hypothetical contributions of mass media to society, namely to irritate society and to synchronise attention.⁸ It is clear that the levels of salience have reached the threshold of irritation at various points across Europe. The watershed events of 1996/97 induced a step function bringing biotechnology into public attention like never before.

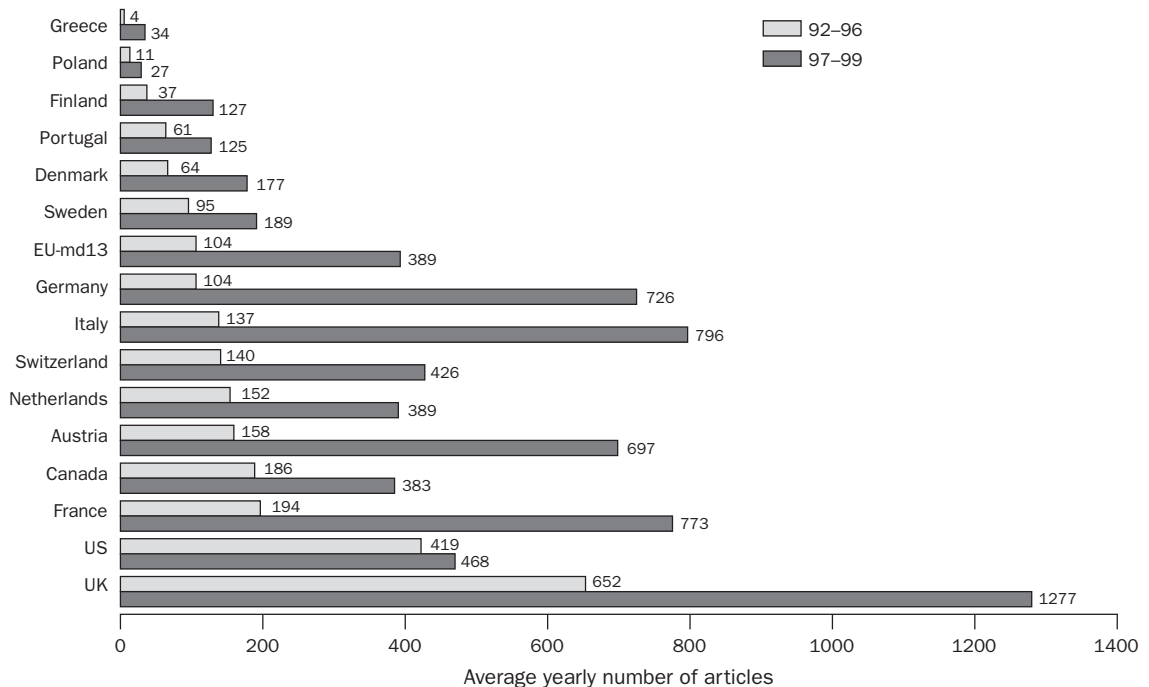
However, one should not overstate the unity of this aggregate picture, since the pace of events has been different across the regions and countries of Europe. Despite synchronisation, the countries vary both in terms of overall salience and in the rate of change. Figure 2 shows a comparison of the yearly coverage for the two waves (wave 1 and wave 2) before and after the watershed years, 1992–96 and 1997–99. The countries are ordered by the salience in the first wave. The UK remains the one country with extraordinary attention to biotechnology with a single daily paper carrying more than 1000 articles per year, or three to four articles per day. This remains a puzzle. Possible explanations could include the relative significance of the biotechnology sector for the economy and the City of London; or the particular cultural significance of all things ‘genetic’, anchored in the status of Charles Darwin as a national hero; or simply the cutthroat competition for readership attention between four quality newspapers in roughly the same market segment.

In the last-mentioned case, no newspaper would want to lose out on a gene or biotechnology story for fear that the others will make a story out of it.

Austria, Italy, France and Germany are all countries that have experienced a ‘wake-up call’ with respect to biotechnology after the watershed years. These countries approached the threshold of 1000 articles in 1999. Their coverage increased three to four times from the pre-watershed years, and they have now clearly moved into serious coverage. Here, Monsanto’s soya and Dolly the sheep were major catalysts for the whole area. Biotechnology as a whole is now covered by more than 600 articles per year, the equivalent of two to three daily articles per newspaper. For other countries, such as the Netherlands, Finland, Sweden, Switzerland, Denmark and Greece, coverage has at least doubled, although overall levels remain modest. What this indicates is a synchronisation over biotechnology after 1996/97. The clocks on the issue finally tick in time with each other, albeit with different intensity.

Figure 2 also includes data from Canada and the USA. The coverage in Canada can be seen to increase to the same degree as Switzerland, the Netherlands and the European average. On the other hand, while the level of media attention in the USA remains high, the increases have been small. This indicates that the salience of biotechnology in the USA remains as high as it already was during the early 1990s. While the

Figure 2. Change in salience of biotechnology in 15 different countries and the European average before and after 1996/97. The figures show the average yearly numbers of articles for each wave and are ordered by the salience for 1992–96



debates over GM food and cloning did not impact south of the big lakes, further north, Canada tuned in with Europe. Thus, public attention over biotechnology has been synchronised across Europe and Canada, but not with the USA.

Scenery and sound: size, format and focus

The length of text that is dedicated to a topic is an indicator of editorial importance. However, it is also a matter of journalistic practice, which may change as newspapers get thicker or thinner over time. The faster the pace of life, the smaller the average media 'bite'. The average reader is no longer expected to have the leisure to digest long arguments. Under these changing circumstances, low expectations of the reader and sound-bite styles of reporting, increased length of writing indicates a more serious elaboration of a topic. Since the period we are considering here is only eight years, changes in the length of articles during this time are taken as indicators of journalistic importance, rather than of a change in practice. Each article is coded according to a national criterion of 'small', 'medium' and 'large'. By this criterion, the scenery of biotech-

nology after 1996/97 is getting more elaborate in Finland, Poland, Sweden and Austria, and less elaborate in Denmark, Greece and France. In contrast, in Canada, the UK, Germany, Italy, the Netherlands and Switzerland there is no detectable change in the length of reporting.

Biotechnology can be reported in a series of different journalistic formats. We distinguish eight different journalistic genres or writing formats in our coding: latest news; investigative reporting; interview; column; editorial; outside commentary; reviews of books, films, etc.; and others. Each of these can be considered as a particular means of dramatising biotechnology for the reader, in analogy to a musical commentary: it can enhance or tone down the significance of a piece of news in the delivery. The distribution of journalistic formats across the different countries shows an increased range of 'music'. Over the watershed years, elite newspapers show a diversification of journalistic scenery. We see a move from the initially dominant 'latest news' into column writing, editorials, and outside commentary. However, Canada is the exception where no such change is observed and the 'latest news' item continues to dominate.

Another feature of the dramatic scenery is the degree of specific focus on biotechnology. For each article we code whether biotechnology is the focus of the argument, whether it is only mentioned in passing while the article follows other issues, or whether it is only used as a metaphor or by allusion in passing. In dramaturgical terms, the last-mentioned indicates the number of 'episodic', irrelevant and purely ornamental elements in the plot. From the point of view of biotechnology, these references are 'irrelevant' writings; however, from the point of view of popular culture, these are highly significant cross-references. We have noted earlier, for example in the UK, that genes and genetics have become topics to which other issues become attached.⁹ For example making reference, either in pictorial form or in text, to genes in the context of an evolutionary analogy for technical designs, such as cars, has become a common feature of advertisement in the UK since 1996/97. It appears that with increasing societal salience, the topic has developed news value in itself. As the references to biotechnology increase, they are elaborated to various degree of foci. We observe across the contexts an increase in articles with passing or metaphorical cross-references to biotechnology. This indicates that genes, genetic engineering, biotechnology and the like have increasingly become a resource for the popular imagination. However all the analysis reported here excludes the most marginal references. We fade out some of the music to come to a clearer picture of the plot.

In summary we can say that after 1996/97, articles on biotechnology in all the considered contexts get longer, use a wider range of journalistic formats, and have a greater number of passing cross-references to genes and biotechnology. The watershed years of 1996/97 shift the coverage in all countries, including Canada but with the exception of the USA, into a clearly upward trend. The drama of biotechnology expands the journalistic 'scenery' over the 1990s, thereby diversifying its 'sound' while synchronising its rhythm, and keeping to a different pulse in different countries. What this shows for Europe is that we see the emergence of a 'European theatre of biotechnology': the drama expands, synchronises, and gains a richer scenery. While Canada assimilates its scenery to that of Europe, the US media continue to set a different tune. The watershed years mark the reversal of fortunes in an ongoing drama of biotechnology where the conclusion is not yet defined, but where many authors are working on the unfolding plot.

Plotting biotechnology: actors, activities, reasoning and outcomes

The qualitative elements of drama are those of activities, actors and reasoning. For our analysis we analyse activities in terms of the fields of applications of biotechnology that come into the media focus. Reasoning is analysed as frames of argumentation and controversy, while actors are coded in terms of those public actors and agencies that cut through the threshold and reach the media stage.

Activities and reasoning – themes and frames

Besides salience, a second major dimension of the drama of biotechnology is its framing. What kind of activity is biotechnology? The metaphor of 'frame' plays on the image of a picture that is demarcated on the edges, thereby putting a drawing or a photograph into a defined co-text. The same picture can be presented in different frames, giving it a different perspective. In other words, the meaning of the picture depends on the co-text that is opened up by the frame. By analogy, a press article on a particular theme of biotechnology is elaborated within a particular frame of discourse which presents biotechnology in a particular light and perspective. A frame in this sense has several characteristics. First, it offers a discursive space within which disagreement and controversy over the topic is elaborated. Second, it is often illustrated by a root metaphor that condenses the main point into a succinct image. Finally, a frame is often associated with an actor who favours a particular frame because it offers an argumentative advantage in the public debate. Frame analysis shows that public controversies are as much about how to argue a topic as about disagreements within a particular frame. With different framing the topic appears in a different light, hence sponsors compete in elaborating frames which show their take on a topic most clearly. Our analysis distinguishes nine frames of biotechnology as shown in Table 1.

These nine different frames were carefully developed to capture the main argumentative frames in the discourse of biotechnology over the whole period of investigation. Table 1 gives a short characterisation of these frames. For some of the following analyses we classified the frames into two main arguments. Firstly, the *argument of prospect* which combines descriptions of biotechnology as scientific, technical or cultural progress and as a prospect for economic advance of a nation.

Table 1. *Biotechnology framing in the press*

| <i>Frame</i> | <i>Dimension</i> | <i>Key images</i> |
|-----------------------|---|--|
| Prospects | | |
| Progress | Progress / old wine in new bottles | Scientific breakthrough |
| Economic prospect | profitable / loss making investment | Technology of the twenty-first century |
| Concerns | | |
| Ethical | morally sound / immoral | Slippery slope |
| Pandora's Box | open the box / warning: keep locked in | 'Frankenfood', thalidomide |
| Nature/nurture | genetically determined / environment | Gene for X, Y and Z, e.g. intelligence, female empathy, aggression, etc. |
| Public accountability | public involvement / public exclusion | For example, consensus conference |
| Globalisation | international competition / isolation | The country is falling behind |
| Runaway | too late to do something / never too late | The train has already left the station |

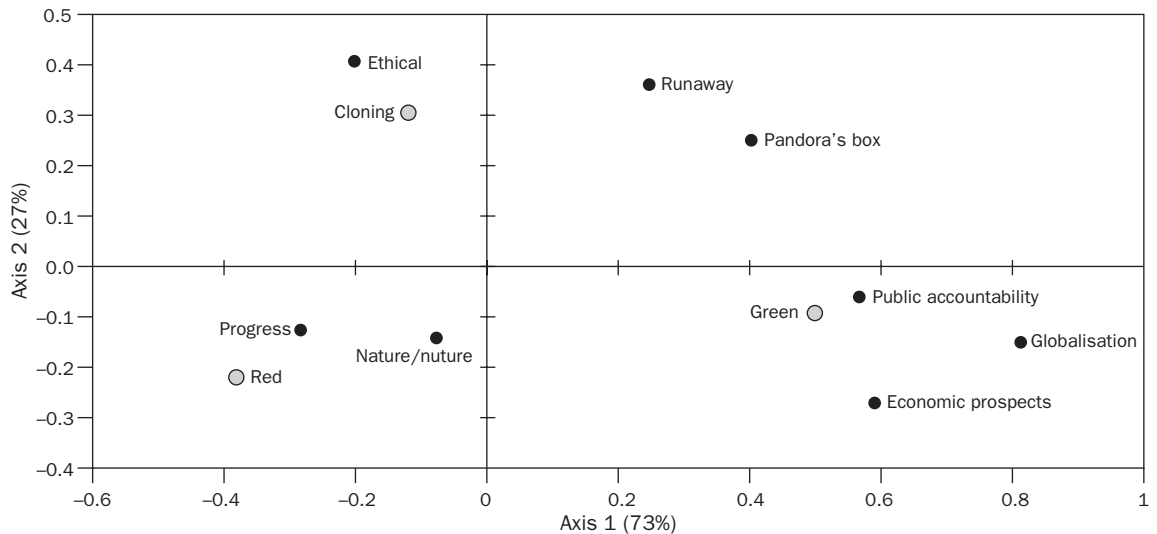
Table 2. *Basic frequencies (based on multiple coding for themes and actors) of frames, themes, actors, and risk and benefits for two waves of coverage*

| | <i>Wave 1: 1992-96</i> | <i>Wave 2: 1997-99</i> |
|---------------------------|----------------------------|----------------------------|
| Frame | | |
| Progress (%) | 50 | 42 |
| Economic prospects (%) | 17 | 14 |
| Ethical (%) | 12 | 10 |
| Pandora's box (%) | 4 | 6 |
| Runaway (%) | 2 | 3 |
| Nature/nurture (%) | 4 | 8 |
| Public accountability (%) | 10 | 16 |
| Globalisation (%) | 2 | 2 |
| Risks and benefits | | |
| Both | 23 | 25 |
| Risk only | 9 | 15 |
| Benefit only | 44 | 39 |
| Neither | 25 | 21 |
| Main theme | | |
| Biomedical ('red') | 28 | 23 |
| Agrifood ('green') | 15 | 20 |
| Generic research | 12 | 9 |
| Economics | 12 | 8 |
| Moral issues | 2 | 2 |
| Public opinion/policy | 4 | 7 |
| Regulation | 6 | 6 |
| Genetic identity | 15 | 12 |
| Cloning | 0 | 9 |
| Other | 6 | 4 |
| Main actor | | |
| Independent science | 45 | 39 |
| Interest groups, NGOs | 4 | 5 |
| Politics | 16 | 15 |
| Moral authorities | 2 | 2 |
| Media/public opinion | 6 | 7 |
| Business | 21 | 20 |
| International | 1 | 2 |
| EU | 2 | 4 |
| Other | 4 | 6 |

Secondly, the *argument of concerns* combines most other frames, for example ethical arguments, which remind the reader that biotechnology is 'too important to be left to the scientists and the engineers'; Pandora's box arguments, which warn that caution is required; arguments of nature/nurture with regard to human characteristics such as homosexuality, female empathy and so on, which proliferate in news about genetic breakthroughs; arguments about the lack of or the functioning of public accountability with regard to these new developments; arguments of globalisation concerned with the position of the nation in global markets for research and development; and finally runaway arguments pointing to a fait accompli, behind which the public debate is helplessly lagging, leaving little freedom of choice. Table 2 shows the basic frequencies of these frames from the first to the second wave, and the overall shift in public discourse from arguments of prospects to those of concern, in particular in the areas of public accountability and nature/nurture.

Table 2 also shows the frequencies of basic classes of application of biotechnology as themes of reportage. The most important are biomedicine, agrifood, general genetic research, and issues of assessing genetic identity through either genetic fingerprinting or genetic testing. Through the 1990s, agrifood becomes more important, biomedicine less so, while cloning gains in salience. These reflect the impact of the debate over GM food and cloning after 1997. The distribution of themes by country shows some characteristic patterns. Whereas some countries pay more attention to cloning, for example Greece, Sweden, Portugal, Austria, Poland and Italy, other countries pay more attention to 'red' biotechnology (biomedicine), in particular Poland and Portugal, but also Germany, Canada and

Figure 3. Correspondence between frames and themes over the period 1992–99 in a two-dimensional space with very good fit. Thematic clusters by frames (100%)



Finland. Still in others, it is ‘green’ applications (agrifood) that are most in focus, for example Denmark, Britain, France, Netherlands, Austria and Switzerland.

Figure 3 shows the correspondence between the framing of three biotechnology applications in agrifood (*green*), biomedical (*red*), and *cloning*. Closer proximity of the points in the figure indicates characteristic, but not exclusive covariation between themes and frames across the different countries. Hence, we can say that biomedical applications are associated with a discourse of progress and nature/nurture. Many developments in medicine are celebrated as progress, or they elaborate the uncertainties over how to attribute dispositions, either the environment or the genetic endowment. Cloning is closely associated with the ethical argument, making the point in public that the development is too important to leave to the specialists. Green applications are mainly framed in terms of economic prospects, globalisation or public accountability. Agrifood biotechnology provides business opportunities and responds to a global imperative. These issues are clearly presented as matters for publicly accountable regulation. The two frames of ‘Pandora’s box’ and ‘runaway’ do not have a clear association with any of the key applications, although they are between *cloning* and *green*, indicating that for both themes admonition of caution and recognition of *fait accompli* have salience. ‘Tampering with the forbidden’ raises ethical

questions and urges circumspection; however, it seems little choice is left with too many facts are already on the ground.

An analysis across the two waves shows little shift in these associations between themes and frames over time, with the exception that ‘runaway’ and ‘Pandora’s box’ become more closely associated with *green* applications. The framing of agrifood biotechnology has shifted, whilst medical biotechnology has remained in the light of the progress frame. Not surprisingly, this reflects the focus of controversy over GM food and crops after 1997, offering a sense of *fait accompli* as well as admonition to the readers.

These patterns of associations between themes and frames show some variation across countries. After the watershed years we find a diversification in the frames. Before 1996/97, most countries mainly celebrated biotechnology in terms of progress and economic prospects. This changed after 1997 when arguments over biotechnology diversified in all countries and characteristic patterns of discourse emerged. For example, Britain and Finland are more concerned with nature/nurture than other countries; issues of public accountability are particularly prevalent in Denmark and Switzerland; progress remains the dominant discourse for Germany; the economic prospect is an important argument in France, Germany and Canada; and ethical framing is most prevalent in France and Denmark.

Actors: dramatis personae

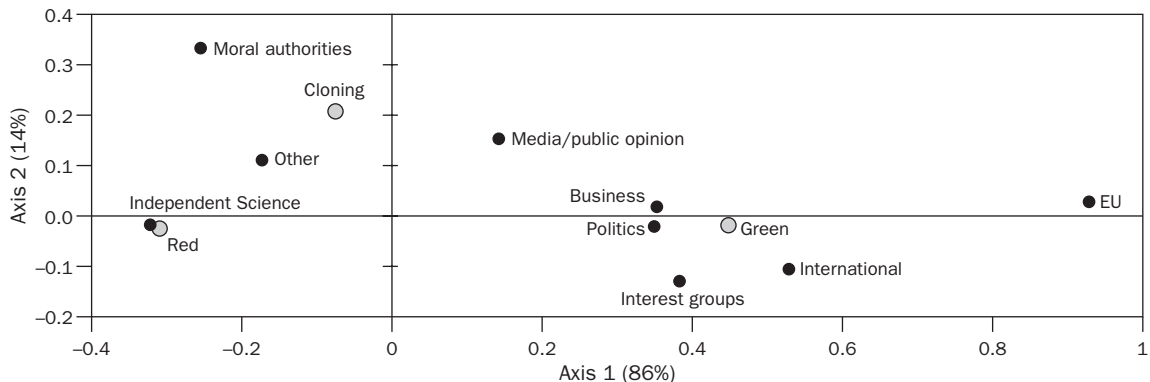
Every drama has a number of persons who perform the actions on stage, whose ‘characters’ explain their contribution to the plot, and who reason about their predicament. The mass media are the stage upon which different actors perform. The question arises when, in what company and on what pretext do the various actors of biotechnology enter the media stage? From the point of view of particular actors, visibility through media attention is often a strategic objective and therefore a criterion to evaluate the success of their own public-relations activities. A public profile in terms of media coverage is an actor’s achievement, which indicates, at least potentially, that a particular voice is heard in public debate. The various actors may ask: what are the topics on which we are likely to find an opening to enter the stage of public debate? In our analysis we coded for around 40 different actors. These 40 actors are reduced to independent science and research, moral authorities such as ethics committees, the media and the general public, business enterprises, political parties, interest groups, international actors, and the EU. These are the actors and agencies implicated in the drama over biotechnology in the different countries.

Table 2 lists the actors, of which science and scientists, business and industry, and politics and politicians are the most important, figuring in about 80 per cent of the articles. There is little overall shift during the 1990s in this pattern. The common notion, according to which interest groups have been given disproportionate visibility in the GM food debate or over cloning is not supported by our observations, for they stay at around 5 per cent. Also, little attention is dedicated to international

actors such as the EU or World Health Organisation, etc., and there is little national variation in this pattern of staging the actors over biotechnology. There is, however, the important distinction between working behind the scenes and acting on stage. Our analysis can reveal little in that respect. Many of the actors who have little visibility in our analysis, could be very active behind the scenes. An actor can get ‘editorial’, which means one brings a journalist to write about oneself, or ‘position’ an article, meaning one writes an article and have it published under one’s name. Our analysis picks up both these cases of publicity seeking. However, finally, there is also the case where an actor ‘plants’ an argument with a journalist, where their names are not mentioned, but the issue is framed in their terms. It is likely that NGOs, such as Greenpeace, were successfully planting arguments by way of press releases in many countries, while their visibility remained low. Another significant absence among the stage actors are the military. Over the whole period of monitoring actors, the military are mentioned in relation to genetic engineering in less than 0.2 per cent of all articles. Considering the international efforts at biological warfare and the opportunities arising from genetic engineering for this activity, this is a rather surprising finding.

Figure 4 shows the discursive association between the actors on the media stage and the main themes of biotechnology. The applications of biotechnology are relatively clearly associated with actors, and there is little variation in these associations over time and across countries: *red* is a matter for science, *cloning* a matter of ethics and public opinion, and *green* a matter for private business, interest groups and the regulators. If anything, this seems to show the emergence of an international plot in the theatre

Figure 4. Correspondence between actors and themes with a very good fit in two dimensions. Themes are reduced to green, red and cloning. Raw profiles and column profiles on axes 1 and 2 (100%)



of biotechnology, with clear assignments of who is playing what role.

The correspondence between frames and actors is much less clear. In general, the progress and nature/nurture frames tend to be associated with independent science and research. Not surprisingly, economic prospects are close to business and industry, whilst arguments over globalisation and public accountability tend towards international actors, NGOs, the EU, the mass media and the general public. Political parties and residual actors are associated with the Pandora's box, runaway and ethics arguments. However, in the drama over biotechnology overall, the various actors show considerable flexibility in their use of arguments, which is why a statistical analysis has difficulty in identifying consistencies and correspondences.

Controversy and conflict

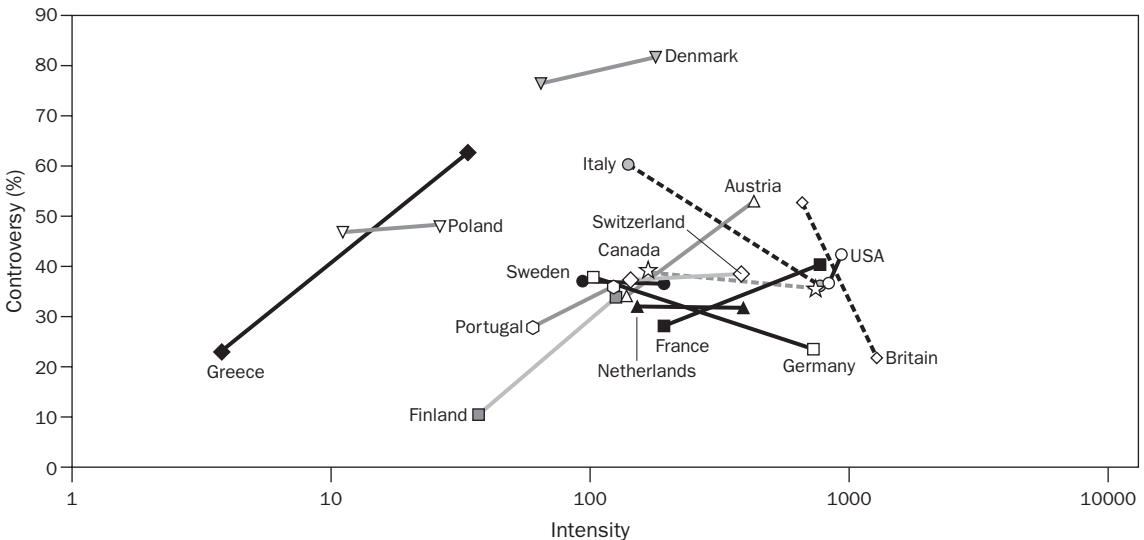
Part of the comparison of the dramas is to assess the degree of conflict and controversy, and here we consider two indicators: salience and the proportion of controversial reportage. Salience, the level of coverage, seems a necessary but insufficient measure of public controversy. Public controversy generally results in media reportage, but media reportage does not always indicate controversy. High levels of media coverage, such as over the death of Diana, Princess of Wales, may indicate other news values such as human feeling, rather

than public conflict (although an implicit controversy over the British Royal family undoubtedly contributed to the public mourning over Princess Diana). Media generally operate under limited capacity selecting news items from a number of candidate topics. It is likely that it is only those scientific and technical topics that signify deviation from the normal course of expectations, and therefore are likely to concern the public, that are selected. Considering the functions of the media as catalyst, purifier or mirror of public passions, salience may be an indicator of controversy, although not in all circumstances.

Given this uncertainty, intensity of coverage needs to be validated by another indicator to qualify as a controversy index. Our second indicator considers whether the articles make explicit reference to public controversy, for example by mobilising contradictory sources and arguments, or by explicitly advocating sides in the writing. For each article we coded whether the writing is controversial or not, and if it is controversial, in which ways: by advocating one side of the controversy, or by reporting in a balanced manner? This leaves us with two indicators of controversy: the ratio of controversial writing and the overall intensity of coverage.

Figure 5 shows these two indicators before and after the watershed years. This gives us a picture of how salience and controversy over biotechnology combine and shift. The emerging picture is complex.

Figure 5. Salience of and controversy over biotechnology in wave 1 (1992–96) compared to wave 2 (1997–99) in 15 countries. Salience is on a log scale; intensity is measured as average number of articles per year in wave 1 and wave 2. Controversy is measured by the proportion of articles that are coded as controversial reportage



Looking at the individual countries, we can say, as shown below, that salience generally increases over the two periods. This is shown by the majority of lines pointing in the direction from left to right in Figure 5. At the same time, the level of controversy moves in different directions. This is indicated by the line pointing either from bottom to top, indicating an increase, from high to low indicating a decrease, or on the horizontal, indicating an increase in salience with stable controversy. Controversy over biotechnology decreases in Britain, Germany and Austria; stays the same in Italy, Sweden, Canada, Poland and the Netherlands; and increases in Greece, France, Switzerland, Portugal, Denmark, Finland and, to a lesser extent, the USA.

To explore the complex relationship between salience and controversy we look at the reportage across different applications of biotechnology. Controversy is measured by the proportion of articles that refer to a controversy over biotechnology, for example by citing different experts or by alluding to contradictory arguments over an issue. We compare the level of controversy for the two types of biotechnology applications.

Figure 6 shows the levels of controversy for *red* biotechnology by country comparing the period before and after 1996/97. The countries are ordered from left to right according to the level of controversial reporting in wave 1. Before 1996/97, Denmark, Italy, Switzerland, Poland and the Netherlands had higher levels of controversy;

Canada, Sweden, Greece, Britain, Portugal and Finland had lower levels of controversy; and the USA, France, Austria, and Germany may be said to occupy the middle ground (since the average level over the two phases is 35 per cent). The picture changes slightly after the watershed years. Most countries see a reduced level of *red* controversy, while USA and Canada, and to some extent France move in the opposite direction. *Red* biotechnology has become more of a controversial drama in North America in the 1990s than it has in Europe.

Figure 7 shows the controversial reportage over *green* biotechnology. Given that the average controversy across the two phases was 59 per cent, the ranking shows again that those countries with high levels of conflict before 1996/97, were Denmark, Poland, Sweden, the UK, Canada, Austria and the Netherlands, and those with lower levels of conflict were Germany, France, Finland and Greece. After the watershed years, seven countries show stable or increasing controversy over *green* biotechnology (the USA, France, Switzerland, Portugal and, more dramatically, Finland and Greece); and only two countries, the Netherlands and Poland, show a significant decrease in controversial reportage; all others remain level.

In summary, although salience is not a direct indicator of controversy over biotechnology, it does give an indication of the level of attention in the public sphere. There is only a tenuous correlation

Figure 6. Percentage biomedical (*red*) biotechnology that is reported controversially in the two waves 1992–96 and 1997–99 for 15 countries. The countries are ranked by declining levels of controversy in wave 1 (1992–96)

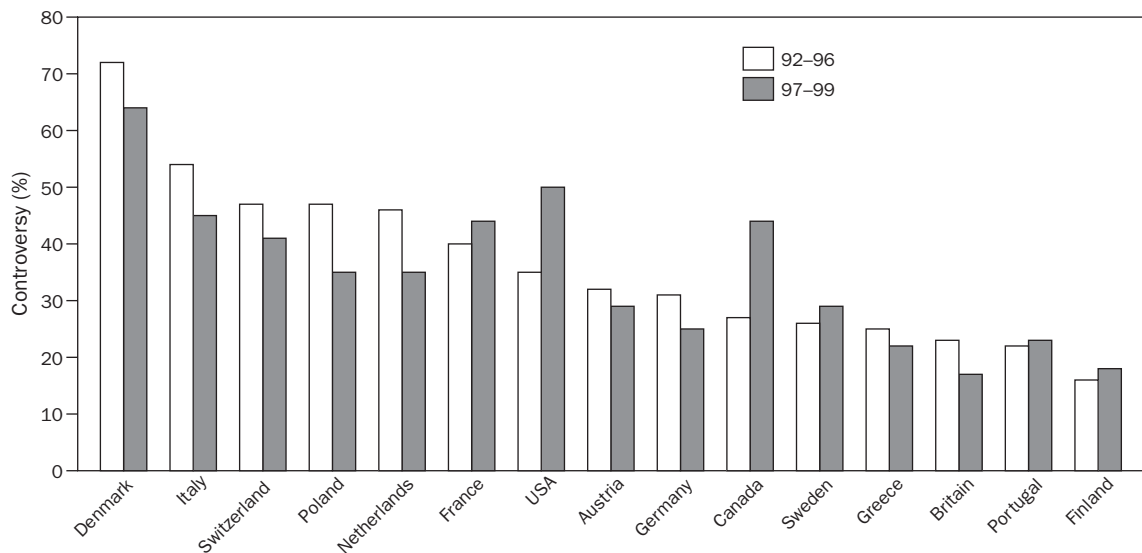
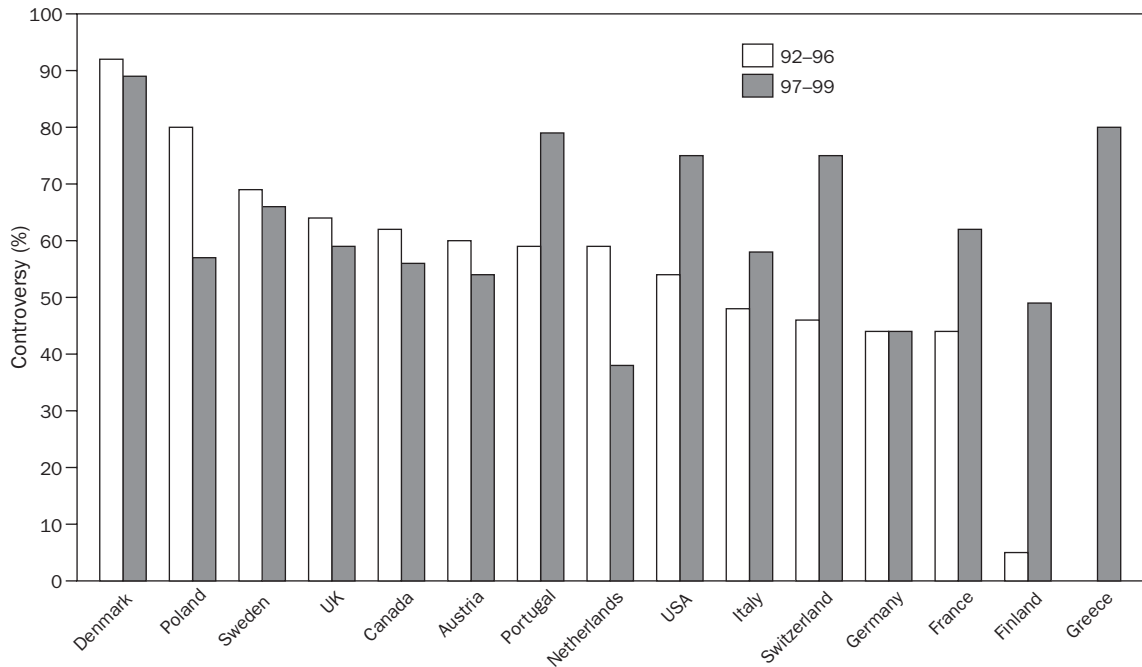


Figure 7. Percentage agrifood (green) biotechnology that is reported controversially in the two waves 1992–96 and 1997–99 for 15 countries. The countries are ranked by declining levels of controversy in wave 1, 1992–96.



between salience and controversial reporting. In dramatic terms, this means that a larger scenery does not necessarily mean more fighting on stage. More reportage does not come with more controversy. For some countries, such as the USA and France, a general increase in salience is accompanied by an increase in controversy. In others, the controversy shifts from *red* to *green*, as in Switzerland and Italy. However, for Austria, Germany and Sweden there is little shift.. The watershed years 1996–97 have affected the drama over biotechnology: levels of controversy over *red* are decreasing, while those over *green* are increasing. During the 1990s, the drama of biotechnology splits into two distinct plots, one over agrifood and one over biomedical applications. The question arises, how is this crystallisation of two different plots in the mass media reflected in public perceptions? This is not a question which we will address here, but clearly invites further investigation.

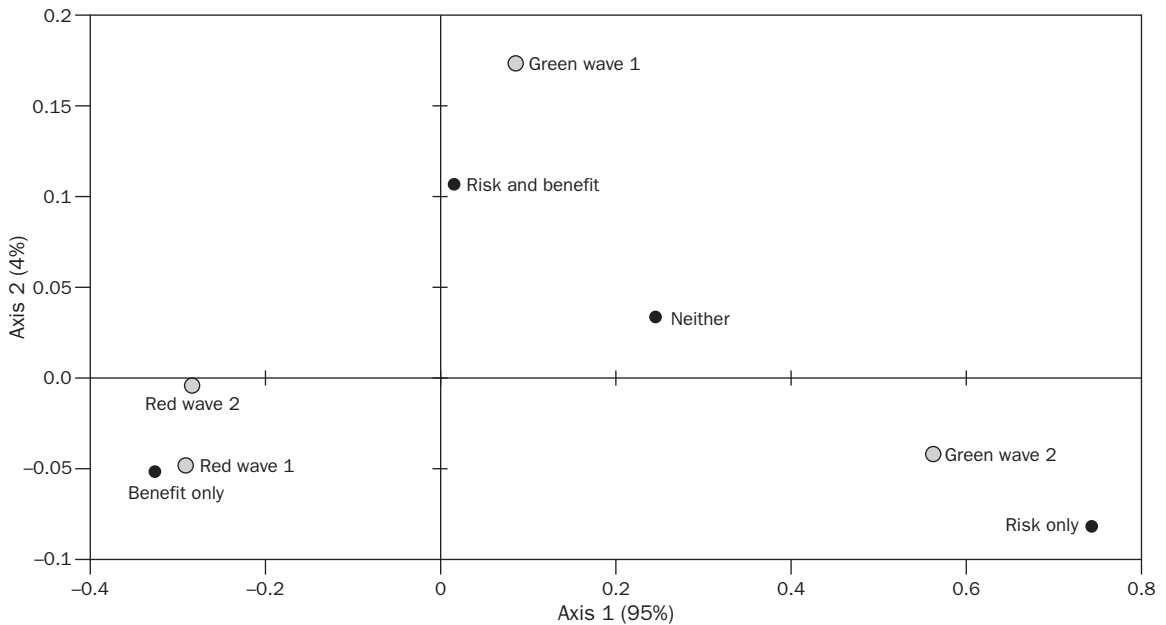
Sensitivities and outcomes

Another element of the biotechnology drama is the extent of reporting of good or bad outcomes of biotechnology, and the kind of sensitivities that are at stake. Does the drama point towards a happy or

an unhappy ending? Are the consequences of biotechnology presented in terms of benefits and risks or costs? What kinds of consequences are considered in terms of risk and benefits? We coded each article on whether potential consequences of biotechnology are mentioned, whether these are elaborated in terms of risk and benefits, and what type of consequence are sensitive in each country. We interpret consequences as either dreaded or desired outcomes of action. From this we defined an indicator of four possible discourses of consequences: biotechnology is only risky, biotechnology is only beneficial, biotechnology is risky and beneficial, and biotechnology is neither of these – it is ‘beyond good and evil’ as other possible consequences apply. An emphasis on risk discourse might reflect more concerned public opinion towards biotechnology while a discourse of benefit might reflect one that is embracing this new technology.

Figure 8 maps the associations for the two waves between biomedical and agricultural or food applications on the one hand, and discourses of risks and benefit on the other. It clearly indicates a substantial shift in press coverage from the wave of 1992–96 to the wave of 1997–99. In wave 1, *red* applications were both associated with risk-and-benefit discourses and with benefit-only discourses. But in the later wave, *red* applications are more

Figure 8. Correspondence of green and red biotechnology and risk or benefit discourses for the two waves of media coverage. The fit is 99 per cent for the two-dimensional solution.



clearly and uniquely associated with the discourse of benefit only. In other words, the European press perceives such applications as more promising now than in the past. The changes are even more substantial for the *green* applications of biotechnology to food and agriculture. In the earlier wave, such applications were perceived either ambiguously in terms of risks and benefits or outside the context of hopes for benefits and fears over risks, while in wave 2 they become closely associated with risks only and far removed from potential benefits. In other words, the European as well as the North American press increasingly differentiates between biotechnology applications, and presents medical applications as promising and agrifood applications as posing risks and threats. The European press clearly locates different applications in different discourses: *red* is beneficial and good, *green* is risky and problematic. Again the question arises, how is this long-term split in the media drama over biotechnology reflected in public perceptions?

There are two further issues to consider. Firstly, the balance between risk and benefit might indicate a culturally dependent mode of reasoning and/or manner of reporting on such issues. Overall, as shown in Table 2 above, risk-only discourse increases from 8 per cent in wave 1 to 15 per cent in wave 2, risk-and-benefit discourse remains at 25 per cent, benefit-only decreases slightly from 44 to

39 per cent, and 'beyond good and evil' discourse declines slightly from 25 to 20 per cent. There are, however, clear differences in the way the countries endorse these arguments in 1997–99. Canada and Greece largely balance risks and benefits in their reportage. For these countries the drama of biotechnology seems open-ended. For the USA, Poland, Portugal, Austria, Finland, Italy and Germany the drama is mainly one of 'happy endings' with 40 per cent of benefit-only arguments, these represent an optimistic outlook. Denmark, Switzerland and France are the skeptical countries with 20 per cent and more risk-only arguments on biotechnology. In the Netherlands, the UK and Sweden, risks and benefits are not the main concern over biotechnology.

Discourses of risk and benefit are always content specific. Concerns and promises have a double reference to 'for whom' and 'in what respect'. Therefore, we distinguish different types of consequences that are mentioned: economic growth, 'third world' development, health, legal, social equality, moral and ethical, ecological, war and peace, research, and consumer. These indicate the specific hopes and fears which are associated with biotechnology. Health, economic growth and research are the most frequent types of benefits, and moral/ethical, health and ecological fears represent the main types of risk.

Figure 9. Correspondence of countries with the types of risks and benefits for the second wave 1997–99 only. The fit is 61 per cent suggesting that more than two dimensions are necessary to depict the full complexity of the distribution. Types of risks and benefits, wave 2, 1997–99 (61%)

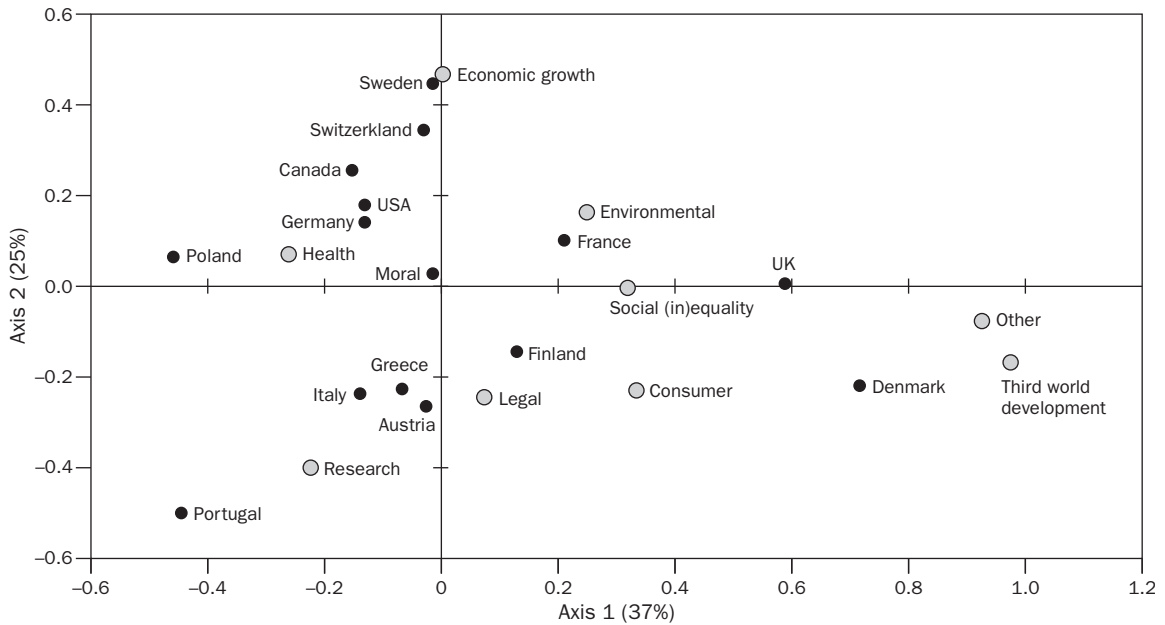


Figure 9 shows the associations between countries and the types of consequence of biotechnology, both risky or beneficial, for the second wave of media coverage in 1997–99. After the watershed years, the moral and ethical issues, the ‘natural boundaries’ or ‘playing God’ type arguments, show no variation across the countries: their position is at the centre of the figure. The salience of these concerns are similar in all countries. Sweden, Switzerland, Canada, the USA and Germany tend towards the upper end associated with high salience of economic benefits; similarly, Poland, Germany, the USA and Canada are also associated with high salience of health type consequences. Portugal, Italy, Greece and Austria see prospects in the area of research, while Denmark is characteristically sensitive to consequences for the developing world. The French drama of biotechnology is characteristically argued on ecological grounds, and that of the UK on issues of social equality.

In summary, we observe that the representation of consequences of biotechnology clearly polarises into two discourses after the watershed years: *red* biotechnology is beneficial, and *green* biotechnology is problematic. Overall the risk-only discourse gains in ground, while benefit-only discourse loses ground. There are particular sensitivities in the various countries in terms of which risks and

benefits are in focus; however, the picture is far from clear cut.

Different dramas over biotechnology

We have considered the similarities and differences across the various countries in terms of salience and journalistic features – the scenery and the sound of the drama; and in terms of actors, themes, frames, sensitivities and outcomes – the plot of the drama. We will now attempt to construct a typology of dramas over biotechnology across the 15 countries. The question is: can we identify a small number of distinct ways in which the drama over biotechnology unfolds in the various national contexts?

For this purpose we focus on wave 2 from 1997 to 1999, when there was a considerable increase in media attention, which we referred to earlier as the synchronisation of the dramas. We focus on biomedical applications on the one hand, and the agricultural and food applications on the other, a split we have already observed in the discourses on several of our variables. The coverage of *red* and *green* amounts to about 38 per cent of the whole media coverage of biotechnology during the period, compared to 44 per cent in the period before from 1992–96. These two clusters of applications cover about two-fifths of all references to biotechnology.

Table 3. Country typology of biotechnology coverage (relative percentages)

| | <i>Red</i> | | | | | | <i>Green</i> | | | | | |
|---|------------|----------|----------|----------|----------|----------|--------------|----------|----------|----------|----------|----------|
| | <i>A</i> | <i>B</i> | <i>C</i> | <i>D</i> | <i>E</i> | <i>F</i> | <i>A</i> | <i>B</i> | <i>C</i> | <i>D</i> | <i>E</i> | <i>F</i> |
| Type I. All prospects, few concerns | | | | | | | | | | | | |
| Poland | 43 | -19 | 58 | 20 | 82 | 18 | 14 | 10 | 64 | 31 | 71 | 29 |
| Italy | 18 | -19 | 47 | 23 | 62 | 38 | 17 | -12 | 35 | 36 | 67 | 33 |
| Germany | 18 | -6 | 50 | 24 | 64 | 36 | 14 | -2 | 41 | 26 | 62 | 38 |
| Canada | 25 | -2 | 88 | 48 | 73 | 27 | 20 | 4 | 64 | 70 | 51 | 49 |
| USA | 25 | 5 | 50 | 27 | 75 | 25 | 11 | -2 | 35 | 37 | 49 | 51 |
| Type II. Prospects and concern | | | | | | | | | | | | |
| | 19 | -10 | 38 | 19 | 44 | 56 | 37 | 24 | 23 | 28 | 45 | 55 |
| | 15 | -1 | 38 | 22 | 65 | 35 | 14 | -9 | 24 | 20 | 41 | 60 |
| Finland | 31 | 4 | 68 | 19 | 62 | 38 | 26 | 6 | 53 | 48 | 39 | 61 |
| Type III. Forget green, run red with caution | | | | | | | | | | | | |
| UK | 10 | -3 | 54 | 25 | 58 | 42 | 25 | 13 | 36 | 50 | 21 | 79 |
| Sweden | 9 | -35 | 54 | 31 | 67 | 33 | 29 | 19 | 23 | 27 | 23 | 77 |
| Greece | 20 | -3 | 89 | 22 | 72 | 28 | 28 | 25 | 40 | 72 | 28 | 72 |
| Switzerland | 12 | -5 | 43 | 34 | 46 | 55 | 18 | 5 | 22 | 52 | 28 | 72 |
| Austria | 10 | -6 | 81 | 21 | 75 | 25 | 15 | 7 | 38 | 39 | 32 | 68 |
| Type IV. Red: yes please, green: no thanks | | | | | | | | | | | | |
| Portugal | 59 | -13 | 82 | 16 | 84 | 16 | 11 | 4 | 54 | 69 | 12 | 88 |
| Type V. Risky business | | | | | | | | | | | | |
| Denmark | 4 | -56 | 55 | 73 | 64 | 36 | 47 | 36 | 18 | 89 | 12 | 88 |

A = Intensity 97-99, B = Shift, C = Benefit, D = Risk, E = Prospect, F = Concern

To define the typology we include the following variables as shown in Table 3 from left to right: first, the intensity of the coverage 1997-99, which measures the salience of the topic; secondly, the shift in salience, measured by the relative increase or decrease of the topic from wave 1 to wave 2; thirdly, we consider the frames of the stories. For this purpose we distinguished between prospect frames and concern frames, as defined in Table 1 above. Across all countries three quarters of all *red* articles frame this topic as prospect, with no change between the two periods. In comparison, articles dealing with *green* applications are framed less frequently as prospect, around 50 per cent, decreasing in the period from 1997-99 from the period before. Finally, we consider evaluation in terms of the discourse of consequences. 'Risk' corresponds to either risk and benefit or risk only, 'benefit' corresponds to risk and benefit or benefit only, as shown in the previous section.

The analysis reveals five distinctive patterns of framing and evaluation of these applications. In all countries *red* biotechnology is framed mainly as prospect and is more likely to be evaluated as benefit than as risk. Across all countries benefit arguments and prospect framings are much more salient than risk discourses and concern framings. *Red* receives a consensual plot with some variation,

but no reversal of the drama. By contrast, the framing and evaluation of *green* shows various features, varying considerably on the plot. There are some countries where the mass media coverage draws more heavily on concerns and paints a more risky image, and there are others where the media coverage is framed in terms of prospects and the benefit arguments exceed those of risk. It should be noted however, that above-average frequencies in both risk and benefits indicate high salience of the risk-and-benefit type discourse.

The first drama is enacted in Germany, Italy, Poland, Canada and the USA. In these countries the reasoning on the prospects of *green* applications far exceeds that of concerns, while the benefit discourse is equal or more salient than the risk discourse. These countries tend to have decreasing or lower salience of *green* coverage overall. This drama is called 'biotechnology: all prospects, few concerns'.

The second drama runs in France, the Netherlands and Finland. Here, *green* biotechnology is relatively salient overall, in Finland *red* is very salient. Here the reasoning is ambiguous. For *green* neither prospects, nor concerns, nor risk nor benefits are clearly dominant. On *red* they show a relatively high level of concern. The drama in these countries is 'biotechnology: prospects and concerns'.

The third drama includes the UK, Sweden, Greece, Switzerland and Austria. In these countries, *green* biotechnology is highly salient and increasingly so, and comes with a predominantly sceptical reportage. Concerns far exceed prospects, and risk discourse exceeds benefits discourse. The salience of *red* biotechnology is declining after the watershed years, and this is particularly dramatic in Sweden where it declines by 35 per cent. Considering that many of these countries have a strong medical and pharmaceutical research basis, the low salience of biomedicine and the focus of controversy on agrifood biotechnology is a curious phenomenon. Overall, most of the public concerns focus on *green* biotechnology, while *red* biotechnology receives below-average concern (with the exception of the UK and Switzerland). This drama may be called: ‘biotechnology: forget *green*, run *red* with caution’.

Finally, our exercise in typology creates two interesting exceptions. Firstly, there is Portugal where there is very high salience of biomedical biotechnology, that is seen in terms of benefits and prospects, but very low salience of agrifood biotechnology, which nevertheless is regarded with great concern through a discourse of risk. Considering that Portugal is a newcomer to the debate over biotechnology and has only recently woken up to it, the drama may be called ‘biotechnology: *red* yes please, *green* no thanks!’. This is in contrast to Denmark, where the coverage comes with low salience of biomedical applications and very high salience of agrifood applications. *green* applications are seen as very concerning and are discussed through a discourse of risk. Danish *red* applications also have high-risk coverage with considerable levels of concern. Thus, Denmark seems to make little difference between *red* and *green* biotechnology, but to consider them as one unified development. The Danish drama is therefore: ‘biotechnology, a risky business’.

When considered together, our typology reveals a crucial feature of the public drama of biotechnology in the new millennium. While the biomedical applications have hitherto had a generally good press, agrifood applications have encountered a mixed press, particularly after the watershed years. The media coverage of the opinion leading press increasingly makes a clear distinction between *red* and *green* applications both in their framing and in their evaluation. The age of biotechnology is entering into a new phase, in which several dramas are unfolding. While the overall dramatic scenery has many similarities, the dramaturgy diversifies into a small number of different plots serving different contexts.

Conclusions

In this chapter we characterise the cultivation of biotechnology in the European, Canadian and US public spheres during the 1990s through the looking-glass of the mass media. The main focus of our analysis is the representation of biotechnology in the press during the 1990s in two dimensions: salience and framing. This representation contributes to a characterisation of trends in public opinion over biotechnology in each country. We consider these representations in terms of a classical drama and explore the analogy between the elements of classical drama including scenery, sound and a plot that comprises actors, actions, reasoning and outcomes. We also consider some features of mass media reportage of biotechnology such as salience, journalistic features, actors, themes, frames and risk-and-benefit discourse. Speculatively, we adopt the Aristotelian idea of ‘katharsis’ or ‘purification’. This suggests that dramatic representations regulate the passions of the audience, who are actors in real life and, in so doing, facilitate the finding of adequate solutions to societal problems. Virtues are thus cultivated by drama. In this sense, drama prepares for collective action by the ‘homeopathic living-through’ of particular passions in reading, watching and listening to ideas and arguments about biotechnology. Here, we content ourselves with analysing the drama over biotechnology. Its cathartic effects remains speculative. However, the drama analogy moves us to consider the media as part of the solution rather than as part of the problem in the controversy over biotechnology.

The salience of biotechnology considerably expands during the 1990s and after the watershed years of 1996/97. Articles on biotechnology get longer, use a wider range of journalistic formats, and the rate of passing references to ‘genes’ or ‘biotechnology’ increases. The watershed years synchronise the coverage across many countries – with the exception of the USA – into an upward trend. Biotechnology becomes a daily news item. In dramatic terms one could say that biotechnology expands its scenery, diversifies its ‘sounds’, synchronises the rhythm, but keeps different time.

The watershed years clearly mark a reversal in the coverage of biotechnology. Different biotechnology activities are associated with different forms of reasoning. The frame of progress, which equates new technology with social progress, is in long-term decline and losing ground. Overall, *red* biotechnology remains a matter of progress and mobilises concerns related to the issue of nature/

nurture. Cloning raises ethical concerns that may be too important to be left to the engineers and scientists alone. And finally, *green* biotechnology becomes a matter of public accountability and economic prospects where the problem of globalisation comes to bear.

Different episodes bring different actors on stage. Cloning gives visibility to moral authorities such as the Vatican or national or international ethics committees. *Red* biotechnology gives independent science a voice, and *green* biotech brings business, politics, NGOs and international organisations into the picture. The watershed years 1996/97 affect the drama over biotechnology: levels of controversy over *red* are decreasing, while those over *green* are increasing. The drama of biotechnology splits into two distinct plots during the 1990s, one over agrifood and one over biomedical applications. Increased salience does not always mean higher levels of controversy. A larger stage may or may not bring more conflict or drama. In the USA and France general controversy is increasing with increased salience, whilst in Switzerland and Italy the controversy is shifting from *red* to *green*. Meanwhile in Austria, Germany and Sweden, there is more attention to biotechnology but little shift in the conflict before and after the watershed years.

During the 1990s, the reasoning over consequences of biotechnology polarises into two discourses: *red* biotechnology is beneficial, and *green* biotechnology is problematic. Overall the risk-only discourse gains ground, while the benefit-only discourse loses ground. Different countries have their particular sensitivities in terms of types of consequences. Scientific research is a sensitive area for Portugal, Italy, Greece and Austria, whereas economic growth is sensitive in Switzerland, Sweden, Canada, Germany and the USA. At the same time, developing countries concern the Danish press, whilst social inequality concerns the British. In addition, we have identified a typology of five different dramas that are played over biotechnology in different contexts. This is testimony to the diversity in treatment that *red* and *green* biotechnologies are given in the elite press of the various countries. Biotechnology comprises an ongoing dramaturgy where the end is not yet defined, but where many authors are working on the plot for different audiences.

After all this, we ask ourselves, can we predict future trends in the media representations of biotechnology? Considering the process of globalisation and its discontents, and the protracted processes of

the EU, it seems reasonable to expect that agrifood applications will remain controversial for some time to come. However, the big question is for how long the public enthusiasm over *red* biotechnology will carry on? Will the controversy that was unleashed over Monsanto's Roundup Ready Soya carry over into biomedical applications? The short but sharp controversy over Dolly the sheep may have given a taste of things to come. The signs are indeed already visible. The enthusiasms for genomics, post-genomics and proteomics with which the new millennium started, are con-fronted by regulatory uncertainties and contro-versies over patenting rights, the access to genetic information, and most recently, the use of stem-cell cloning in medical research. Are these cells more like fetuses or corpses?: a question that German courts and law professors have been asking themselves recently. This is likely to draw the developments of biomedical biotechnology into the established confrontations over abortion. This alignment of old and new issues is likely to mobilise larger sectors of the public than food issues were able to in the past. And this is also likely to confuse the established arguments, which had seemed previously to settle the issues.

Considering the trends in media coverage, we can expect a revival of the debate over genetic determinism in terms of nature/nurture. The increase in this frame of arguing is visible in many countries, but particularly in the UK. This may be a more middle-class debate than that over abortions, but it is capable of mobilising strong passions through historical analogies with the eugenics movements of the early twentieth century. This again seems an old issue. The lawyers are uncertain on how to classify and contain it, and old debates over abortion and eugenics are drawn into the controversy. One looks ahead to interesting times for biotechnology.

However, one thing seems clear: the salience of biotechnology is likely to increase even further in the public spheres across Europe and the world. Hence, the dramaturgy over biotechnology will continue to unfold. As the drama is not closed, but continues to be written, there are two issues to consider. First, whether biotechnology is a tragedy or an epic, a comedy or a farce. Only the future will tell. Second, we need to investigate how the drama played out in the mass media has influenced the trajectory of biotechnology as we witness it. This answer can only be given with hindsight: what would have happened to biotechnology if the drama had been different?

Acknowledgement

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