Seeds, food and trade wars: Public opinion and policy responses in the USA and Europe

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Date received (in revised form): 8th December, 2003

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Keywords: *World Trade Organization (WTO), public opinion, biotechnology, transatlantic*

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Abstract

The political debate over genetically modified foods entered a new phase when the USA (under the Bush Administration) threatened legal actions within the World Trade Organization (WTO) against a moratorium of these products in the European Union. This paper focuses on developing a societal context in which these political disputes arose though an investigation of public opinion polls conducted in both the USA and Europe. While some differences do exist with regards to opinions toward biotechnology, any contention that the WTO case is a direct outcome of public opinion is tenuous. The special interest groups that have vested interests in supporting or opposing biotechnology are likely to be the ones fanning the transatlantic flames, and arguing that public opinion is in their favour.

INTRODUCTION

Trade barriers have been an inevitable part of the relations between the USA and European countries, which may have begun even before the high-profile Boston Tea Party of 1773. While trade disputes are not normally of major concern for the wider public, barriers on food often lead to highly publicised conflicts. Recently, the USA imposed restrictions on the imports of European wines and cheeses in response to a European embargo on beef treated with growth-promoting hormones made with recombinant DNA. This led to protests in France, which included the partial dismantling of a McDonald's restaurant, and served as a rallying point for the anti-globalisation movement. In the minds of at least some countries, food is in a different category from other traded products. It is part of national and regional identity; the imposition of novel foods that challenge deeply held cultural values is likely to be resisted.

These factors have led to an increased polarisation within debates over US–EU trade in foods derived from biotechnology. The US Government recently referred the European Union to the World Trade Organization (WTO), arguing that the *de facto* moratorium on genetically modified (GM) crops and food products is a trade barrier counter to the regulations concerning the trading of commercial goods . However, it is not only the governments that are divided over the safety, feasibility and need for food and agricultural biotechnology. Public opinion polls in the USA and EU highlight a gap between public perceptions in the two continents that have contributed to the WTO showdown. This paper aims to show where the differences in public perceptions are most evident, and to explore how these bear on government policies in the WTO case.

US AND EU SUPPORT FOR THREE APPLICATIONS OF BIOTECHNOLOGY

Results from the Eurobarometer survey conducted in Europe in late 2002 and one conducted in the USA in early 2003 provide an indication of the extent of the

transatlantic gap in public perceptions of biotechnology, especially in terms of food and crop applications. The surveys were administered to a systematic sample of the publics of the two continents and included questions on both agricultural and medical biotechnologies.

In Europe there are nearly similar percentages of supporters and opponents of GM crops; however, the majority (62 per cent) are not prepared to support GM food

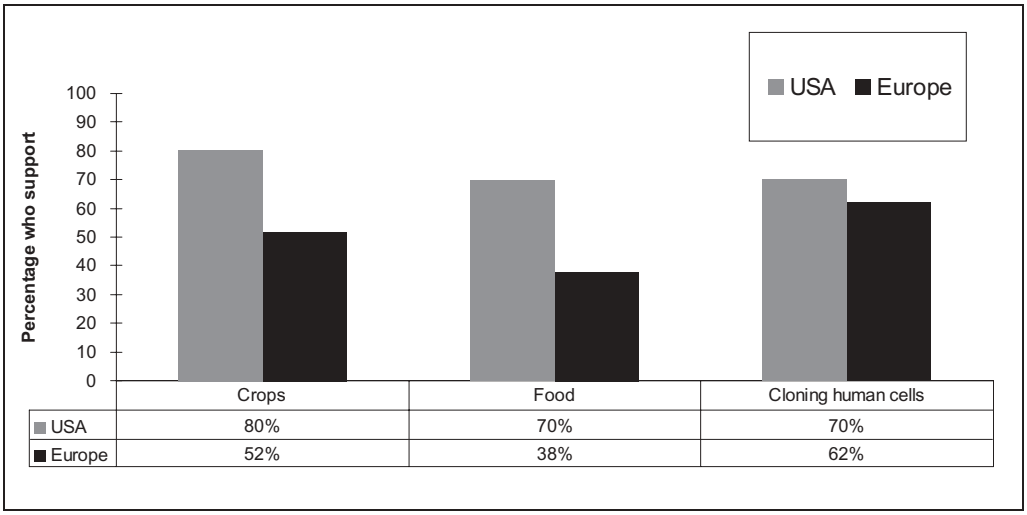
Respondents were questioned about three biotechnologies described as follows: *GM Crops*, taking genes from plant species and transferring them into crop plants to increase resistance to insect pests; *GM Food*, using modern biotechnology in the production of foods, for example to make them higher in protein, keep longer or change the taste; and *Cloning human cells,* cloning human cells or tissues to replace a patient's diseased cells that are not functioning properly.

Not everyone in the USA is a supporter of agricultural biotechnology

Figure 1 shows the percentages of North Americans and Europeans who said they support these applications. The figure highlights some interesting contrasts. First, for all three applications a larger percentage of North Americans offer support than do Europeans. Secondly, the transatlantic gap on agri-food biotechnologies is much greater than for medical biotechnologies. For 'Cloning human cells and tissues' the difference is 8 per cent – about the same as two other medical applications included in the survey – genetic testing (12 per cent) and xenotransplantation (12 per cent). By contrast the differences for the agri-food biotechnologies are far larger – 28 per cent for GM crops and 32 per cent for GM food. Thirdly, while in Europe there are nearly similar percentages of supporters and opponents of GM crops, the majority – 62 per cent – are not prepared to support GM food. The greater opposition to GM food over GM crops suggests that consumer traits are more worrying than agronomic traits. In other words, Europeans are somewhat more concerned about food safety than environmental impacts. Finally, it is worth recognising that not everyone in the USA is a supporter of agricultural biotechnology: 20 per cent do not support GM crops and 30 per cent do not support GM food.

The transatlantic gap on agri-food biotechnologies is much greater than medical biotechnologies

Other questions in the survey illustrate possible reasons for the differential support for GM food. While 77 per cent in the USA think 'GM food will be useful in the fight against third world hunger', in Europe only 44 per cent think so. This difference in attitudes may play a part in why the refusal of GM food from the



	Crops	Food	Cloning human cells
USA	80%	70%	70%
Europe	52%	38%	62%

Figure 1: Support for selected biotechnologies in Europe and the USA. In the Eurobarometer data, respondents were treated as supporters when they agreed that a particular biotechnology is morally acceptable and should be encouraged. In the US data, respondents were asked an amalgam question regarding whether the application is *both* morally acceptable and should be encouraged

USA by the Zambian Government catalysed the WTO case. And asked whether 'it is safe for me to eat GM food' 64 per cent agree in the USA while only 22 per cent agree in Europe. Responses to these questions suggest that in Europe the perceived benefits are lower than in the USA and equally that the perceived risks are greater. Yet, the picture is not always so clear; when asked 'GM foods pose no risk to future generations', 46 per cent disagree in the USA, with 54 per cent disagreeing in Europe.

Overall, it is evident that there are substantial differences in public perceptions of agri-food biotechnologies between the publics of the USA and Europe. It is also worth noting that the European opposition has a rather long history. A Eurobarometer survey in 1979 found that a substantial minority of Europeans saw genetic research and 'synthetic food' as unacceptable risks, leading Cantley[1] to write that 'public and political opinion was learning to see gene technology, genetic engineering, biotechnology and so on as a single, vague and disquieting phenomenon'.

Explanations of a 'transatlantic divide' over biotechnology are grounded in a number of assumptions

Explanations of a 'transatlantic divide' over biotechnology are grounded in a number of assumptions ranging from differences in journalistic practices (the European media are more critical and less balanced in their coverage of biotechnology), to Europeans being technophobic, to the lack of a strong, historical food culture in the USA and to the collapse of trust in science and regulations following the BSE/CJD crisis in Europe.[2] While these frequently cited explanations have been dealt with elsewhere,[3] in this paper we would like to take a closer look at two of them. First, the view that Europeans are technophobic; secondly the vexed issue of trust.

ARE EUROPEANS TECHNOPHOBIC?

Here the question is whether European attitudes to biotechnology reflect a wider anti-technology culture. Strumpel,[4] a theorist of the industrial society, argued that mass prosperity and welfare state provisions of the past 30 years undermined the dominant values of economies directed towards production and growth. Inglehart[5] shows the emergence of post-materialist values as societies outgrow their incessant need for material possessions and look to quality of life, environmental protection and civil liberties to provide a more meaningful existence. Could such disengagement from the materialist worldview and the resulting decline in optimism about the results of technological advancement account for the sceptical reception of biotechnology in Europe?

In the surveys, respondents were asked the following question about a number of technologies: 'Do you think it will improve our way of life in the next 20 years, it will have no effect, or it will make things worse?' Here we look at the responses to four of the technologies – cell phones, solar energy, the internet and biotechnology.

Table 1 shows the percentages of

Table 1: Attitudes toward technologies

The following technology will make life better in the next 20 years, make it worse, have no effect or don't know	US (%)	EU (%)
Cell phones		
Better	59	60
Worse	14	9
No effect	25	22
Don't know	2	9
Solar energy		
Better	89	74
Worse	2t	3
No effect	7	16
Don't know	2	7
The internet		
Better	73	65
Worse	9	7
No effect	15	16
Don't know	3	12
Biotechnology		
Better	69	44
Worse	11	17
No effect	8	14
Don't know	12	25

respondents (excluding 'don't knows') saying that the technology will improve our way of life, ie they are optimistic. For cell phones, Europeans are as likely to be optimistic about this technology as people in the USA. In fact, a CNET study[6] found that in some European countries approximately 70 per cent of the population had cell phones, compared with approximately 60 per cent in the USA.[7] With regards to solar energy, people in the USA seem to be more optimistic, though the percentage of respondents who think it will make things worse are very similar. The same is true for the internet. One major difference here is the percentage of respondents saying 'don't know' for these technologies, which could be a reflection of survey methods (respondents in the USA were contacted by phone while in Europe the survey was conducted in person), or a tendency among Europeans to hold ambivalent attitudes toward technologies. This interpretation is most clearly evident in responses toward nanotechnology (not shown in Table 1), in which 52 per cent of the US respondents felt it would improve our way of life in the next 20 years while 34 per cent answered 'don't know'. In the EU survey, 53 per cent said they did not know how nanotechnology would affect life in the future, while nearly 30 per cent thought it would improve their way of life. This is partial support for arguing that people in the US approach technologies differently from those in Europe, although this is a tenuous position and one that is not necessarily one dimensional. The responses in the USA and EU toward biotechnology are different enough, though, to warrant a closer look at what may be driving these opinions.

Every EU country studied saw a rise in optimism towards biotechnology after 1999

No singular European opinion when the various countries are compared with one another

First, it should be noted that nearly every EU country studied saw a rise in optimism towards biotechnology after 1999.[8] Secondly, there is no singular European opinion when the various countries are compared with one another. At one extreme an Austrian region declared itself a GM-free zone, a move that was vetoed by the European Commission, and at the other, Spain has some 10,000 hectares planted with GM maize. In fact, some countries, such as the Netherlands and Finland, have shown stronger support for biotechnology than the USA.[9]

ARE EUROPEANS LESS TRUSTING THAN THE NORTH AMERICANS?

It could be the case that people in the USA have more confidence in those involved in the production, retailing and regulation of biotechnology. Table 2 shows how the European and US publics think about various organisations involved in biotechnology; specifically as to whether, in the context of modern biotechnology and genetic engineering, they are doing a good or bad job for society. While both US and European publics seem to differ little on their

Table 2: Confidence in biotechnology actors

	Doing a good job (%)		Not doing a good job (%)	
	USA	EU	USA	EU
Newspapers and magazines	67	59	23	16
Industry developing new products with biotechnology	66	41	20	27
University scientists doing research in biotechnology	85	70	8	11
Medical doctors keeping an eye on the health implications of biotechnology	73	76	17	8
Farmers deciding which crops to grow	71	55	17	21
Consumer organisations checking products of biotechnology	68	70	19	11
Our government in making regulations on biotechnology	54	46	32	26
Shops making sure our food is safe	59	56	33	24

In the USA, nearly two-thirds of respondents thought the industry is doing a good job of developing new products while only about 40 per cent of Europeans feel the same

opinions towards newspapers and magazines – information sources that are key to information diffusion with regards to food technologies[10] – there is a large difference in confidence regarding industry. In the USA, nearly two-thirds of respondents thought industry is doing a good job of developing new products, while only about 40 per cent of Europeans feel the same. There are also some major differences with regards to university scientists, farmers and the government, with those in the USA showing more confidence in these organisations. Europeans, on the other hand, show slightly more confidence in medical doctors and consumer groups. While the percentage of people saying these latter two groups are doing a good job are very similar, more people in the USA say these groups are not doing a good job for society.

Trust or confidence is a significant determinant of attitudes towards GM food, and differential levels of trust may help explain transatlantic differences. Moreover, trust may have another, and quite subtle, function. Trust reduces complexity.[11] If one has confidence in the regulators of a technology, the issue of uncertainty and risk does not arise: one places one's fate in the hands of trusted others. But with lack of trust, people may be open to claims of uncertainty, hazard and potential harm.

Broader 'worldviews' are entering into the GM food debate in Europe more prominently than in the USA

Hence we can treat trust as a 'counterbalance ' or an 'innoculation' against uncertainty; it provides the basis of confidence in those who regulate the risk. Where there is less trust other factors may be considered, weighed more heavily and affect judgments.

To test these ideas, we analysed the survey data using a two-step procedure. The first, using a logistic regression model for the USA and Europe separately, predicts whether respondents agreed or disagreed (1–0) with the following statement: 'I think it is safe for me to eat GM food'. This statement is designed to tap into people's perception of risk.

The predictors are: age, education and sex of the respondent; an index of trust in the food chain (0–3), combining trust in industry, government and shops; an index of technological optimism (–7 to +7); an index of three questions capturing values about 'nature' (0–3), eg 'nature is fragile and easily damaged by human actions'; and an index of three questions about economic/materialist values (0–3), eg 'economic growth brings better quality of life'. The final predictor is negative images of food biotechnology. The survey included three questions tapping into popular imaginations of GM food, eg 'Ordinary tomatoes do not contain genes while genetically modified tomatoes do' and 'By eating a genetically modified fruit, a person's genes could become modified'. Such negative images, echoes of 'Frankenfoods' and other media depictions and cartoons, are assented to by around 20 per cent of the US public and nearly 30 per cent in Europe.

For the USA, the logistic regression shows – controlling for age, sex and education – that trust, technological optimism, negative images and values regarding nature are statistically significant predictors of perceived risk; while values regarding economics are not. In the case of Europe, all the predictors are important factors. Interestingly, the associations of values concerning nature and materialism with perceived risks appear to be much greater in Europe than in the USA. This suggests that broader 'worldviews' are entering into the GM food debate in Europe more prominently than in the USA, an indication of different perspectives on technology. Given the fact that Europeans are as likely, if not more so, than Americans to use some new technologies, such as cell phones, it may not be true that this broader perspective is constantly in use. Instead, it may be the case that this approach is used when a technology is not seen as immediately beneficial.

Having established that these attitudes and values are related to the perceived risk of GM food, we move to the second step in the analysis, extending the logistic

regression model to include key interactions. If trust is a counterbalance value then there will be statistically significant interactions between trust and, separately, values and negative images. This is because as trust decreases so will the impacts of values and negative images increase.

Table 3 provides a summary of key elements of the logistic regression model. It shows that in the USA there is a statistically significant interaction between trust and negative images, but for no other combination. (These interaction models also include main effects of sex, education and age, but the details are not provided for ease of presentation.) With low levels of trust, the effect of negative images is relatively high; but as trust increases so is this effect attenuated.

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Turning to Europe, Table 4 shows that the relationship between negative images and the perceived risk of GM food again differs according to levels of trust, and again in the same direction as in the USA. However, for Europe there is also an interaction with values regarding nature. As trust increases so do questions about the fragility of nature play a smaller role in risk perception.

Overall, these logistic regressions show that on both sides of the Atlantic, the more people have trust in the food chain (government, shops and industry) the less is the impact of negative images on the perceived risk of GM food. Where the publics differ, it is that in Europe trust in the food chain also lessens the impact of concerns about the fragility of nature.

These analyses show the importance of trust in perceptions of the risks of GM food. But they also show that when trust is absent, other issues colour people's judgments. In Europe, where a multiplicity of issues have come to be associated with the GM food debate,

Table 3: USA: Key aspects of a logistic regression model predicting agreement to: 'I think it is safe for me to eat GM food'

Variables	*B*	*P* value	Odds ratio
Values regarding the fragility of nature	−0.36	0.06	0.70
Values regarding the benefits of economic growth	0.28	0.14	1.32
Technological optimism	0.15	0.03	1.17
Holding negative images of GM food	0.45	0.19	1.44
Trust in the food chain	0.01	0.98	1.01
Trust * negative images interaction	−0.12	0.01	0.89
Trust * technological optimism interaction	0.04	0.32	1.04
Trust * economic values interaction	−0.12	0.26	0.89
Trust * nature values interaction	−0.09	0.36	0.91

Table 4: Europe: Key aspects of a logistic regression model predicting agreement to: 'I think it is safe for me to eat GM food'

Variables	*B*	*P* value	Odds ratio
Values regarding the fragility of nature	−0.32	<0.005	0.72
Values regarding the benefits of economic growth	0.13	0.03	1.14
Technological optimism	0.07	<0.005	1.07
Holding negative images of GM food	0.26	<0.005	1.27
Trust in the food chain	0.19	0.02	1.21
Trust * negative images interaction	−0.05	0.03	0.94
Trust * technological optimism interaction	0.02	0.13	1.02
Trust * economic values interaction	0.04	0.20	1.04
Trust * nature values interaction	0.07	0.02	1.07

concerns about environmental impacts appear to play a key role – particularly for those who express less trust in the actors in the food chain. This must be set against the general picture of greater levels of trust in the USA than in Europe (see Table 2).

GM FOOD: HYPOTHETICAL PURCHASING DECISIONS IN EUROPE

From the preceding analyses we know that the European public is less supportive of agri-biotechnologies, somewhat less technologically optimistic, less trusting of the food chain and more influenced by wider value considerations in their assessment of GM food than is the US public. Most North Americans, even if they are unaware of it, are consuming foods with GM ingredients on a regular basis. In Europe, with the notable exception of some cheeses, particularly vegetarian cheese made by chymosin which has been produced in genetically modified bacteria, there are no GM foods in the shops. What do the Europeans think about GM food when confronted by questions regarding hypothetical purchasing decisions?

Most North Americans, even if they are unaware of it, are consuming foods with GM ingredients on a regular basis

Respondents in the Eurobarometer survey were asked whether they thought they would buy GM food described as offering one of a number of particular benefits, for example lower prices or fewer pesticide residues. Also included was a question as to whether they would mind eating foods with GM ingredients in a restaurant.

As can be seen in Figure 2, Europeans are likely to reject GM food regardless of any potential benefit. However, fewer pesticide residues and more environmental friendliness are attractive to about 40 per cent and better taste for about 30 per cent. A substantial majority say they would mind if they found that they were eating a meal with GM ingredients in a restaurant. A substantial majority also find that less fat and lower prices are not persuasive reasons to purchase these products. Somewhat surprisingly, of the range of benefits offered in this question set, a lower price is apparently the weakest incentive for buying GM food. However, what people say and what they do are sometimes rather different. Is this an example of people responding as 'citizens' rather than as 'consumers'? For example, when a canned tomato purée explicitly labelled 'made with genetically modified tomatoes' was marketed in Britain at effectively a lower price it sold well.

A second way of looking at these intentions is based on a count of the number of persuasive reasons accepted by each respondent. Figure 3 shows the distribution from the total rejecters on the left hand side, to the enthusiasts on the right hand side.

While some 46 per cent of Europeans said they would not 'buy' GM food for any of the six reasons offered, there is still 54 per cent who are persuaded by at least one of the reasons. Furthermore, if we set aside the rejecters the mean number of persuasive reasons is 3.7. This suggests that while the rejecters operate a total veto, once a threshold of minimal acceptability is reached, people are inclined to find quite a number of the reasons for buying GM food persuasive.

What can be concluded from this? On the one hand, given that the largest single

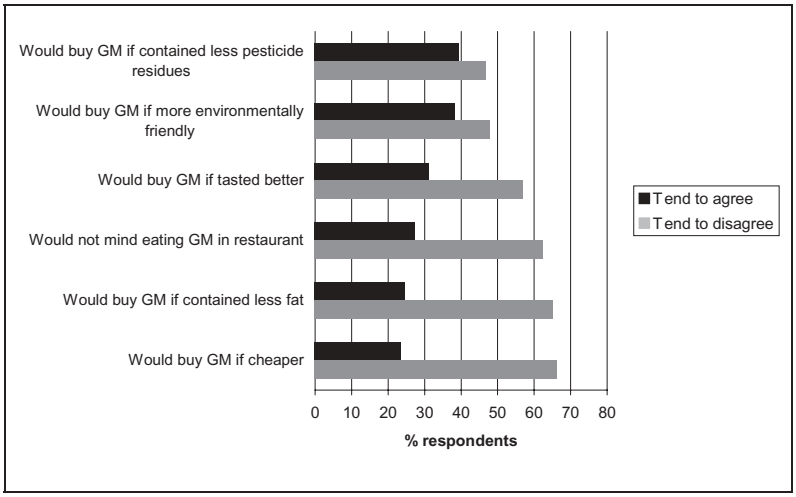

Figure 2: Intentions of Europeans regarding buying and eating GM food

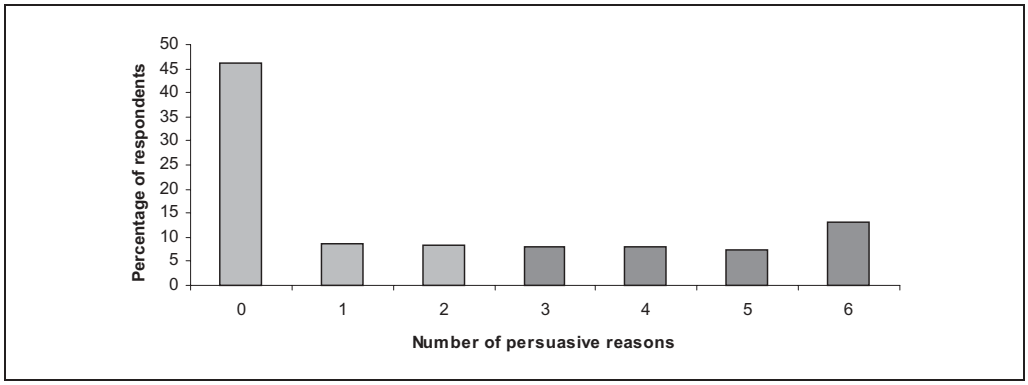

Figure 3: Number of persuasive reasons for buying GM food

If GM foods actually offered some benefits and if they were labelled appropriately, then such products might capture a sizeable market share

category is the rejecters, this could be discussed in terms of the impossibility of introducing such new products. On the other hand, it could be argued that if GM food actually offered some of these benefits, and if they were labelled appropriately to give the rejecters the opportunity to express their preference, then such products might capture a sizeable market share.

What this analysis of purchasing intentions shows is that European citizens are divided on the issue of GM food, a division that is also reflected at a political level. In terms of governance and regulatory policy on GM products, Europe continues to struggle with the problems of multi-level policy making and the resulting tensions between the European Commission and some of the European member states. This was seen most recently in the outcome of the EU's regulatory committee meeting of 10th November, 2003. Confronted with an application to approve the import of Syngenta's Bt-11 sweet corn, the committee postponed the decision until December. This was seen as a test case for the *de facto* moratorium on GMO products and by the European Commission as an opportunity to demonstrate to the USA and WTO that there is an effective European system for regulating GM products. But, while some member states, for example the UK, Spain and the Netherlands, voted in favour, Austria and Italy were strongly opposed.

THE WTO CASE

These findings from the surveys conducted in Europe and the USA serve as a backdrop for understanding the current trade disputes regarding biotechnology. In some measure the policy responses in the USA and in Europe mesh with the public mood. Public opinion in the USA is more supportive of biotechnology than is public opinion in the EU. So, while President Bush has argued that he does not pay heed to public opinion polls, his supportive stance for biotechnology does have some resonance among the US public.

Confrontation between the governments of the USA and EU on agricultural biotechnology began in the late 1990s

The confrontation between the governments of the USA and EU on agricultural biotechnology actually started in the late 1990s. In 1998 a number of EU countries imposed a *de facto* moratorium on the commercial exploitation of GM crops. In 1999 US Executive Order 13116 was signed calling for a more aggressive stance on international trade, including a push on agri-biotechnological exports into the EU (and elsewhere), and led to repeated calls for a WTO hearing against the EU.[12,13] The invasion of Iraq in March 2003 tempered the polemics of the Bush Administration as it was seeking support from European allies for the war effort, and advisers became concerned about the way in which a conflict over biotechnology would affect coalition building. By May 2003, though, the Bush Administration began raising the stakes:

end the moratorium, Europe was told, or face a hearing within the WTO. Lying behind this more assertive stance is the suspicion that Europe's adoption of the precautionary principle will bring other criteria outside 'sound science' into international trade and lead to a host of new non-tariff barriers, going beyond food to include chemicals and other products.

One of the catalysts for the WTO hearing was Zambia's refusal to allow GM corn from the USA to be imported into their country for aid relief. President Bush argued that this was due to a spillover effect from European fears, '[hindering] the great cause of ending hunger in Africa.'[3] While that may well have been a factor and many Americans believe that foods derived from biotechnology could help in feeding the hungry of the world, given the amount of research which shows that world hunger has more to do with the politics of distribution than of production,[15] it might be argued that the Bush Administration was clutching at straws. Instead, Zambia's refusal of US aid and European's staunch rejection of US biotechnology were seen as opposing the USA at a time when the world was expected to be sympathetic toward its goals (ie fighting terrorism after 11th September, 2001).

If the biotechnology industry thinks that consumers are behind them, labels might increase market share

In addition to Executive Order 13116, the Economic Research Service (USDA) published a statement that was another harbinger of an international confrontation. According to the statement, 'the acceptance of GMOs in the world market is critical for the future prosperity of US producers' and, that European consumers had lost confidence in scientists after the mad cow disaster.[15] This lack of confidence has led (EU) regulators to developing an approval process which 'has proven to be a barrier to the timely flow of traded goods'.[15] One of the European regulations in question (2001/18/EC) contains a number of new provisions regarding risk and impact assessment for the commercialisation of GM crops and includes a requirement for labelling of food products with more than 0.9 per cent GM ingredients. While such labelling of GM food has been consistently rejected by US authorities, it is one that, according to a number of polls, would be applauded by the greater majority of US and EU citizens alike. This is one case where there does seem to be similarities on both sides of the Atlantic, casting an interesting light on the differential impacts of public opinion in policy formation. Given recent changes in labelling requirements in the USA regarding *trans* unsaturated fats, it is not unfeasible that GM food might be labelled as such in the USA. In fact, if the biotechnology industry thinks that consumers are behind them, such a label might even increase market share.

Move on GMOs is largely based on economic advantages for the US agri-biotechnology industry

Risk is not a universal currency based on the gold standard of sound science; it has a cultural dimension that politicians and regulators ignore at their cost

CONCLUSIONS

When US Trade Representative Robert B. Zoellick and Agriculture Secretary Ann M. Veneman made the announcement that the USA would seek redress within the WTO regarding the European embargo on GM foods,[16] little attention appears to have been given to public opinion toward biotechnology in either the USA or Europe. While there are a number of wider issues at stake, for example concerns in the USA over the adoption of the precautionary principle in Europe, it would appear that the move on GMOs is largely based on economic advantages for the US agri-biotechnology industry.

A WTO dispute is likely to bring to the fore not arguments about free trade versus protectionism, but rather how US sectoral interests are in conflict with European values and perceptions of both the benefits and risks of GM crops and foods, both differing from the other side of the Atlantic. Risk is not a universal currency based on the gold standard of sound science; it has a cultural dimension that politicians and regulators ignore at their cost.

A WTO ruling in favour of the USA is unlikely to persuade Europeans that they

should be eating GM food. The reverse is a plausible scenario. Such a ruling could lead to the polarisation of European citizens against GMOs, supermarkets boycotting GM food, continued pressure on the governments of European member states to retain the moratorium – and more troubles for the European Commission in its attempts to establish a regulatory system for GMOs. These waters will surely be tested.

Acknowledgments
Funding for the US portion of this study was provided by a grant from the National Science Foundation (Ethics and Values Studies award no. SES 0115380).

References

1. Cantley, M. (1992), 'Public perception, public policy, the public interest and public information: The evolution of policy for biotechnology in the European Community', in J. Durant, Ed, 'Biotechnology in Public', Science Museum, London, pp. 1982–1992.
2. Gaskell, G., Einsiedel, E., Priest, S. H. *et al.* (2001), 'Troubled waters: The Atlantic divide on biotechnology policy', in Gaskell, G. and Bauer, M. W., Eds, 'Biotechnology 1996–2000', Science Museum, London, pp. 96–115.
3. Gaskell, G., Bauer, M., Durant, J. and Allum, N. (1999), 'Worlds apart: The receptions of GM foods in Europe and the United States', *Science*, Vol. 264, pp. 384–387.
4. Strumpel, B. (1990), 'Macroeconomic processes and societal psychology', in Himmelweit, H. and Gaskell, G., 'Societal Psychology', Sage, Newbury Park, CA.
5. Inglehart, R. (1997), 'Modernization and Postmodernization: Cultural, Economic and Political Change in 43 Societies', Princeton University Press, Princeton, NJ.
6. Charny, B. (2003), 'Study: Cell phone use to double', 6th August (URL: http://news.com.com/2100–1039–5060745.html).
7. McFarland, D. (2002), 'Cell Phone Ownership Grows 29 Percent from 1999–2001', 18th March, Scarborough Research (URL: http://www.scarborough.com/scarb2002/press/pr_cellphone.htm).
8. Gaskell, G., Allum, N. and Stares, S. (2003), 'Europeans and Biotechnology in 2002' (URL: http://europa.eu.int/comm/public_opinion/archives/eb/ebs_177_en.pdf).
9. Gaskell, G. and Bauer, M. W., Eds (2001), 'Biotechnology 1996–2000', Science Museum, London.
10. Ten Eyck, T. A. and Williment, M. (2003), 'The national media and things genetic: Coverage in *The New York Times* (1971–2000) and *Washington Post* (1977–2000)', *Science Communication*, Vol. 25, pp. 129–152.
11. Luhmann, N. (1979), 'Trust and Power', Wiley, Chichester.
12. 'Identification of Trade Expansion Priorities Pursuant to Executive Order 13116, April 30, 2001' (URL: http://www.ustr.gov/enforcement/super301.pdf).
13. URL: http://www.usda.gov/news/releases/2003/08/ustr03–54.htm
14. Boucher, D. M., Ed (1999), 'The Paradox of Plenty', Food First Books, Oakland, CA.
15. Kelch, D. R., Simone, M. and Madell, M. L. (1998), 'Biotechnology in agriculture confronts agreement in the WTO', 'Agriculture in the WTO/WRS', December (URL: http://www.ers.usda.gov/epubs/pdf/wrs984/wrs984e.pdf).
16. Harrison, A. (2003), 'United States requests dispute panel in WTO challenge to EU biotech moratorium', USDA Press Release, 19th September.