Sociodemographic and subjective belief reasons for inter-EU differences of attitudes towards genetically modified food

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SOCIODEMOGRAPHIC AND SUBJECTIVE BELIEF REASONS FOR INTER-EU DIFFERENCES OF ATTITUDES TOWARDS GENETICALLY MODIFIED FOOD

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Modern biotechnology is a central issue in the public debate as there are still concerns about possible adverse effects deriving from the use of genetically modified organisms. The public, by influencing decisions on new biotechnology, politically through democratic channels or interest groups, but also as consumers via the market, will constitute the ultimate judge of agricultural biotechnology.

The present research paper deals with attitudes towards genetically modified food (GM foods) in the European Union and their change over a given time period, using survey data of the Eurobarometer of 1999 (EB 52.1) and 2002 (EB 58.0). The analysis mainly focuses on the 2002 data trying to explain national differences of attitudes towards GM foods. In a first step, an overview of all European member countries concerning their attitude towards genetically modified (GM) food products in general will be provided. A more detailed approach is applied on selected countries, namely Greece, Germany, the Netherlands and Spain. In addition, an effort to explain differences in attitudes towards GM foods through cross-cultural differences will be made using data from the European Social Survey (ESS, 2002).

1 Introduction

The uses of biotechnology have increased rapidly over the last 20 years. In 2004, the global area of biotech crops continued to grow for the ninth consecutive year at a sustained double-digit growth rate of 20 percent, compared with 15 percent in 2003. The estimated global area of approved biotech crops for 2004 was 81.0 million hectares up

from 67.7 million hectares in 2003. Wind-blown pollen, commingled seeds and black-market plantings have further extended estimated production.

Considering that a variety of products (wine, bread, beer, cheese) are being produced with the use of microorganisms, it is clear that biotechnological methods have been used over the centuries in order to create new products and increase agricultural productivity. In this paper, the term "modern biotechnology" refers to those techniques that enable the modification of genes within an organism or the transfer of genes between organisms or species in a way that would be impossible to happen in nature. Modern biotechnology does not include traditional breeding techniques, in-vitro fertilisation or hybrids.

Over the years the public has become in general more ambivalent towards new technologies. While expecting technological innovation to improve living conditions, concerns about possible adverse effects deriving from the use of these technologies still exist. Modern biotechnology is a central issue in the public debate and scientific claims about its benefits for society are not accepted without criticism.

The debate over the use of modern biotechnology in food production includes health concerns as demonstrated in Pusztai rat experiments (Ewen & Pusztai, 1999), or addresses antibiotic resistance; environmental concerns that include effects on non-target species (Losey et al., 1999), biodiversity loss and genetic pollution; socio-economic concerns focusing on corporate bio-patenting (Greenpeace, 2000; Anderson, 1999) and ethical concerns "playing God" (Barbagello & Trench, 1999: 25) or trying to "displace the first Creator" (Krimskey, 1982: 266).

Today, it is more realistic to consider the development of a new technology as a result of a complex social system of interactions and decisions. The public influences decisions on modern biotechnology, not only politically through democratic channels or interest groups, but also as consumers via the market. It is important for decision makers to understand the public's range of views on biotechnology in order to be able to anticipate potential problems of acceptance, or, one step further, to take consumer or public desires and concerns into account in the development of applications.

Stenholm and Waggoner (1992) observe that consumers are the ultimate judges of emerging new technologies in agricultural biotechnologies.

A review of literature shows that consumer attitudes towards genetically modified food are mainly focused on the influence level of knowledge and socio-demographic status.

Gloede, Bechmann & Hennen (see Renn & Zwick, 1997: 45) expected to find that the overall attitude towards genetics is determined by socio-demographic factors such as age

and education. They proofed wrong the hypothesis that attitudes towards genetics are only related to a general attitude towards technology. However, they did not find any differences between the socio-demographic groups. Hamstra (1995) investigated acceptance of Dutch consumers with regard to genetically modification of foods in three studies in 1991, 1993 and 1995. When she examined product and consumer characteristics as determinants of consumer acceptance, she found that demographic factors had only little explanatory power, whereas the subjective perceptions of product characteristics were more important.

Research has shown that public attitudes towards genetic engineering are influenced by the general perception on the potential risks and benefits involved (Sparks & Shepherd, 1994; Fischoff et al., 1978; 1984). Different factors influence perception of risk again associated with various related issues (Renn et al., 1992). Risks to society deriving from biotechnology are perceived as significantly greater than those to one's self (Frewer et al., 1994).

Arguments both for and against this new technology can be found in literature (Beck, 1992; Straughan, 1991). Some studies show that the general effect of knowledge and information about biotechnology and applications of biotechnology on the acceptance seems to be relatively low (Urban, 1998; Urban & Pfenning, 1999). This finding is supported by Hampel and Renn (1999) who stated that attitudes towards genetics are not rooted in knowledge. They found only a small correlation between knowledge and GM foods acceptance. However, recent evidence suggests that even though public's knowledge has increased in the field of biotechnology, people are less optimistic regarding the capacity of biotechnology to improve their living conditions (Eurobarometer 1999 and 2002, own calculations). The fact that the percentage of "Don't know" responses regarding biotechnology in the two Eurobarometer surveys remains similar, suggests either that the issue is still relatively marginal to people's everyday life or that weighing up the advantages and disadvantages of biotechnology remains now, as then, no easy matter. In particular, the application of genetic engineering to the food sector is considered to be less useful than other biotechnological applications (Eurobarometer 1999 and 2002, own calculations).

It is also likely that attitudes towards modern biotechnology are strongly influenced by the perception that its consequences are unknown. Moreover, perceptions of uncertainty about outcomes rather than beliefs about particular outcomes might provide the dominant influence on attitudes (Sparks et al., 1995). This leads to the notion of the "precautionary principle", which is based on the premise that when an activity arises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not yet fully established scientifically (Barrett & Flora, 2000).

In the case of genetic engineering applied to food production, it is likely that the unknown consequences of development and application play an important role in defining the risk perceptions of the public (Sparks & Shepherd, 1994; Renn et al., 1992).

2 Attitudes towards GM foods in Europe – an overview

This paper attempts to explore the attitudes of the European consumers towards the genetic modification of food. The starting point of exploring attitudes towards GM foods is based on Eurobarometer data, which shows that in Europe, significant and marked national differences in acceptance/rejection rates towards GM foods can be found. But how can these considerable differences in attitudes towards GM foods be explained? Besides reporting on the status quo of GM foods attitudes in the EU, we wish to outline two different explanations for these attitudinal differences. In the course of the analyses we will contrast an explanation based on socio-demographic variables compared to an explanation based on cultural belief variables.

The country ranking shown in table 1 is based on a sum index of three separate attitudinal ratings of GM foods measured by the following item: "Use of modern biotechnology in the production of foods, for example to make them higher in protein, keep longer or improve the taste." Respondents were asked to refer to the following categories: the issue of usefulness, the issue of risk, the issue of moral acceptability or whether GM foods should be encouraged or not. A 4-point agreement scale measures the responses on these items. A factor analysis has shown that three out of the four possible responses are highly intercorrelated, resulting to one single factor even in separate country analyses. The risk response was not included in the analysis due to its inconsistent correlation with the other three attitudinal responses, which constituted the basis for the formation of an index of GM foods acceptance. Concerning the sum index the maximum value is 12 and the minimum is 3, as the original items were each rated on a 4-point scale. Thus, a low score indicates low acceptance while a high score indicates a very positive attitude towards GM foods.

The figures in Table 1 show the mean attitude score for each country, ordered according to its mean score from high acceptance towards GM foods (on top of the table) to low acceptance (at the bottom of the table). Additionally, the European mean attitude score is shown. In this case Greece and Spain hold the two extreme positions in this ranking. Spain with the most positive attitude while in Greece people tend to be very sceptical towards GM foods. In between, European countries can be grouped according to their acceptance/rejection rates into groups of countries that hold strongly negative, relatively negative or positive and strongly positive attitudes towards GM foods.

Table 1 Ranking of countries with positive attitudes towards GM foods, sum index

Country	Mean	STD	N
Spain	8.42	2.89	325
Finland	7.91	2.78	406
Portugal	7.89	2.80	309
Ireland	7.83	3.14	256
Northern Ireland	7.78	2.77	114
East Germany	7.61	2.74	388
Great Britain	7.50	2.76	397
Netherlands	7.47	2.82	272
Belgium	7.13	2.91	394
West Germany	7.09	2.69	392
Norway	7.06	2.93	450
Sweden	7.05	2.85	395
Denmark	6.74	3.15	431
Italy	6.53	3.07	330
Austria	6.52	2.86	428
France	6.13	2.73	322
Luxembourg	5.96	2.93	236
Greece	5.61	2.94	336
EU	7.11	2.96	6181

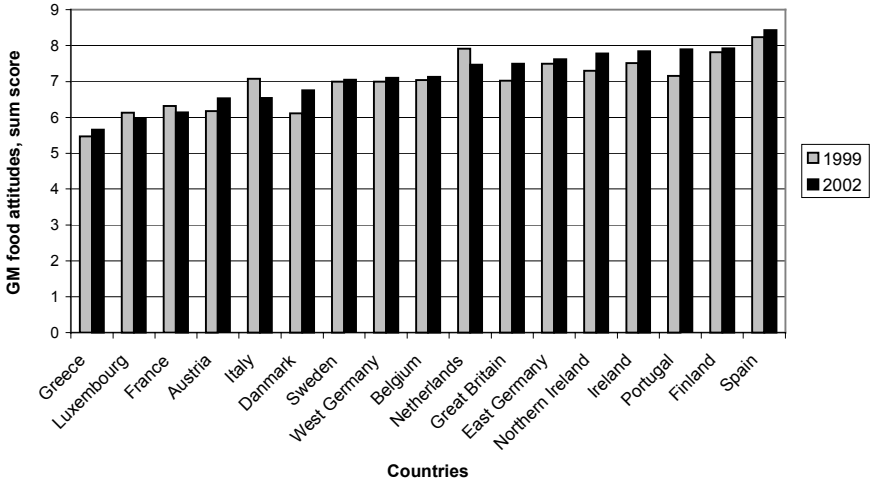
Source: own calculations, EB 58.0 (2002)

So one could say that Greece, Luxembourg and France are the countries with lowest acceptance, then one might group together Austria, Italy and Denmark, the next group would be Sweden, Norway, West Germany and Belgium as countries representing the European mean concerning attitudes towards GM foods. Another group representing countries with slightly more positive attitudes would be the Netherlands, Great Britain, East Germany, Northern Ireland, Ireland, Portugal, and Finland. And finally Spain with the most positive attitude among all European member countries portrayed here.[1] Addi-

1 Researchers normally assume that the response to items in a questionnaire reflect a respondents true position regarding the content of the given question. But this is not always the case

tionally, a comparison over time was conducted, indicating that there are only small changes in attitudes over the observed period of time. As shown on diagram 1, no major divergence in consumer attitudes towards GM foods can be identified between 1999 and 2002.

Diagram 1 Attitudes towards Gm food in European countries 1999 and 2002



Source: Own calculations, EB 52.1 (1999), EB 58.0 (2002)

In order to explain these differences in attitudes towards GM foods between the EU member countries, a review of the existing literature provides useful hints.

(Schwarz, 2003). Response styles like e.g. (dis)acquiescence may affect answers. Response styles can be understood as communication habits which work like lenses and which can distort the view on participants' real attitudes. In cross-cultural studies with variables such as values or attitudes, it is often assumed that differences in scores can be compared at face value. But response styles may bias the assessment of true scores or rather the relation between true scores. Thus, it should be noted that response styles may also affect the results presented here (see Baumgartner & Steenkamp, 2001 who stated that Greek and Portuguese respondents displayed more acquiescence than respondents from other EU countries).

A series of empirical studies on attitudes towards GM foods are based on a universally valid attitudinal model focusing on socio-demographic characteristics and knowledge on GM related issues as the main determinants of acceptance of GM foods (Sparks et al., 1994; Frewer et al., 1997; Durant et al., 1998). Following this line, the observable national differences are explained as reflections of the socio-demographic and/or knowledge differences among countries.

Furthermore, a number of studies try to establish causal relationships between attitudes towards GM foods and subjective beliefs on various aspects of the use of modern biotechnology in food production (Hamstra, 1991; Bredahl, 2001). The inference that subjective beliefs on GM foods consequences shape the acceptance/rejection towards GM foods is reached by acknowledging national differences and focusing on selected countries. Finally, a third field of literature, cross-cultural psychology, provides leads for further explaining different attitudes. Especially the work of Triandis (1994, 1995, 1996), Hofstede (1991) and Schwartz (1992) developed concepts of cultural differentiation. As these socio-cultural concepts have not yet been applied to the analysis of attitudes towards GM foods, it seems worth attempting to explain existing intra EU differences.

3 Data and Methods

Data of the Eurobarometer 2002 was used in order to test the socio-demographic and subjective belief hypotheses on the national intra-EU GM foods differences in attitudes. In each of the 15 European countries, questions about topics related to biotechnology were put to a representative sample of the populations of the national populations over 15 of age. In each country, a number of sampling points are drawn with probability proportional to population size and population density. The Eurobarometer data covers different topics by employing a slit-ballot design. Fifty percent of the sample in each country received one of two versions of the questionnaire In the split A of the Eurobarometer survey, which is used for the analyses at hand, data are provided on GM attitude as well as on subjective beliefs on GM foods and some standard socio-demographic information. In addition, Eurobarometer 2002 provides several items for the analysis of subjective beliefs on GM foods.

The following diagram gives an overview of the items measuring subjective beliefs.

Overview 1 Variables measuring subjective beliefs

Please tell me whether you tend to agree or disagree with each of the following statements. (Scale: Tend to agree, tend to disagree, don't know)

Genetically modified food:

- will *be useful for me* and other consumers
- will be useful in *fight against 3rd world hunger*
- will *only be good for industry* and not for the consumer
- in the long run, *will be good for the economy*
- poses *no threat to future* generations
- eating will *be harmful to my health* and my family's health
- *threatens* the *natural order* of things
- *safe* for me *to eat*
- Whatever the dangers of genetically modified food, *future research will deal with* them successfully
- current *regulations are sufficient* to protect people from any harm
- Growing genetically modified crops will be *harmful to the environment*

For information on the socio-demographic composition of the sample, several variables were used. Apart from gender, age (measured in six categories), education (measured in years of completed education) and income (measured in five categories ranging from very low to very high and don't know) we also included the occupational position (manager, self-employed, other white collar worker, worker, house person, unemployed, retired, student), the type of community (rural area or village, small or middle sized town, large town, don't know) and marital status.

Furthermore data from the European Social Survey (ESS, 2002) were used where the Schwartz Value Survey was applied for the first time. The European Social Survey is the first large study of national representative samples to measure people's basic values directly. Basic values can provide predictive and explanatory power in the analysis of attitudes, opinions and actions. By applying this instrument, we expect to get a more detailed picture of potential reasons for the intra-European differences of attitude.

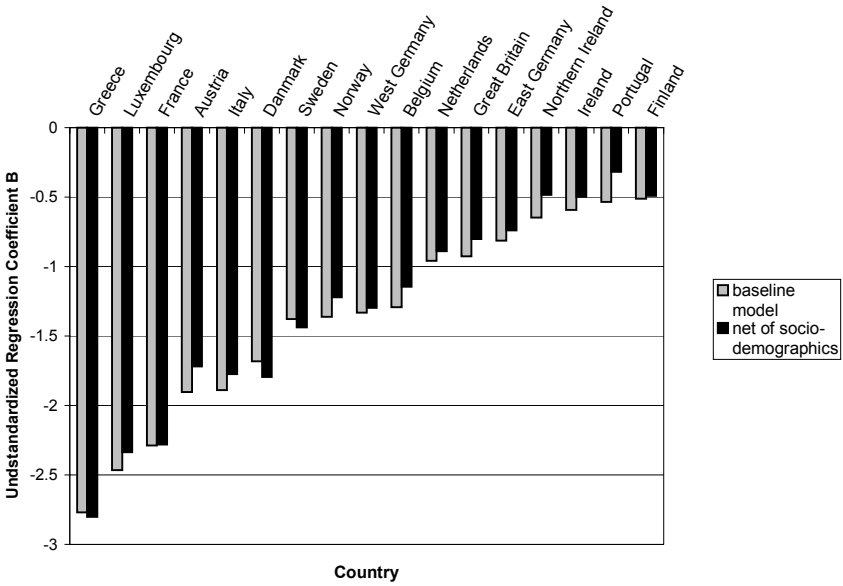
In the regression analyses applied, the cumulative index of attitudes towards GM foods constitutes the dependent variable, while, nationality, socio-demographic status indicators and subjective belief measures are used as independent variables. Spain was selected as the reference country because it shows the highest score of acceptance.

4 Results

4.1 Attitudes towards GM foods

In a first step, the observed differences between countries concerning the attitude towards GM foods are estimated as a regression equation. Nationality is included into the equation as a list of dummy variables; each of them corresponds to one country. *By estimating this regression equation a country attitudinal ranking by means of the regression coefficient is maintained*. For the following analyses this model is called the baseline model. Adding the effect of socio-demographic variables, the results are portrayed on Diagram 2.

Diagram 2 Impact of socio-demographic variables towards GM food

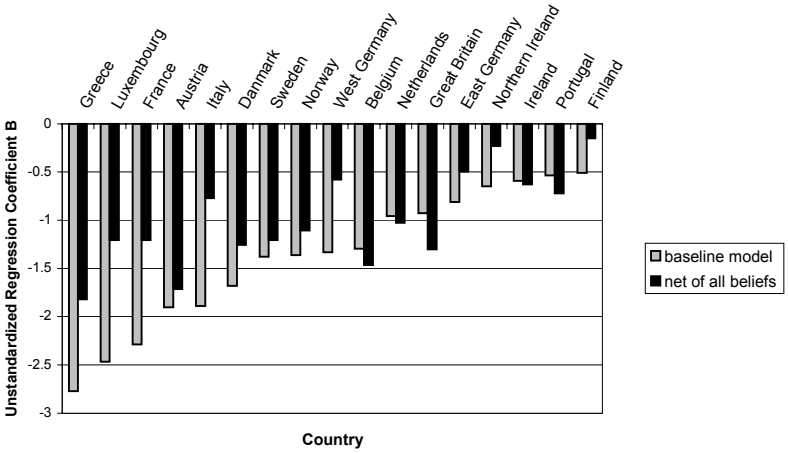


Source: own calculations, EB 58.0 (2002)

As shown in Diagram 2, after controlling for the socio-demographic composition, national differences and their ranking do not change substantially. Thus, national differences in attitudes towards GM foods do not tend to be reflections of differences in national socio-demographic profiles.

In a second step, the subjective belief variables are included in the analysis. The effect of controlling for subjective beliefs compared to the existing national differences in attitudes is presented on Diagram 3.

Diagram 3 Impact of beliefs on attitude towards GM food



Source: own calculations, EB 58.0 (2002)

It can clearly be seen that there are marked changes concerning the country differences after including the subjective belief variables. The attitudinal gaps of several EU member countries diminish to a remarkable extent, namely for Greece, Luxembourg, France, Italy, West and East Germany. The small difference of North Ireland and Finland as opposed to Spain drops nearly to zero. For Austria, Denmark, Sweden and Norway the difference to Spain also diminishes but only to a smaller extent. For Belgium and the Netherlands, Ireland and Portugal the attitudinal difference to Spain is not affected by controlling the subjective belief profiles.

In the case of Great Britain, a marked increase of the initial difference to Spain indicates that the high positive attitude towards GM foods is partly due to the fact that in Great Britain are more positive beliefs towards GM foods than in Spain. After controlling for this factor, the level of GM foods acceptance in Great Britain drops and the difference to Spain increases.

By adding each belief indicator consecutively in the study of subjective beliefs, the analysis becomes more precise as the relative importance of specific beliefs is revealed. For all countries the most important belief aspect – most important in the meaning of being reflected in attitudinal differences – is associated to GM foods' safety to eat, followed by beliefs concerning GM foods and their relationship to the environment and human health (confer overview 1). For Italy, and Luxembourg, the prevalence of the belief that GM foods is only good for the industry is additionally responsible for their relative low acceptance of GM foods.

4.2 Cultural Profiles as an explanation of country differences

For a more detailed view concerning attitudes towards GM foods and the relative importance of beliefs for attitude formation, the analysis focuses on four countries, namely Germany, Greece, Spain, and the Netherlands.

Looking at the belief effects separately for each country, specific weights of belief effects on GM foods constitute a first step towards the analysis of cultural differentiation by using a general quasi-universal attitude model.

The challenge is to link still unexplained intra-EU attitude differences to nationally specific roles.

Table 2 Importance of beliefs for the formation of attitudes towards GM foods

Country	Net of beliefs
	R2 in %
Spain	28.4
Greece	35.1
West Germany	49.1
Netherlands	53.7

Source: own calculations, EB 58.0 (2002)

Table 2 shows the importance of beliefs in attitude formation towards GM foods in the selected countries. There seems to be a gap between the Northern and Southern countries of the EU, whereby in the Northern parts of the EU, namely West Germany and the Netherlands, beliefs may play a relatively more important role than in the Southern member countries.

Several researchers offer possible explanations concerning this divergence (Schwartz, 1992; Schwartz and Sagiv, 1995). Schwartz (1992), with the introduction of a universal value system, developed a theory about the internal structure of value domain that was empirically supported in more than 40 countries worldwide. 10 different value types were identified: Hedonism, Stimulation, Self-Direction, Universalism, Benevolence, Tradition, Conformity, Security, Power and Achievement which can be all considered as guiding principles in one's life that vary in importance.

Schwartz (1992) identifies three main conflicts within this value structure. The first conflict is between openness to change and conservation, which opposes value types referring to novelty and personal autonomy (Stimulation & Self-direction) to value types leading to stability, certainty and social order (Tradition, Conformity & Security). A second conflict may be identified between self-enhancement and self-transcendence, which opposes value types referring to the pursuit of selfish interests (Achievement & Power) to value types promoting the welfare of both close and distant others (Benevolence & Universalism). A third conflict refers to values associated to the satisfaction of one's desires (Hedonism) and values implying self-restraint and the acceptance of external limits (Tradition & Conformity). In this section value types were grouped according to the main conflicts within the value structure as identified by Schwartz (1992).

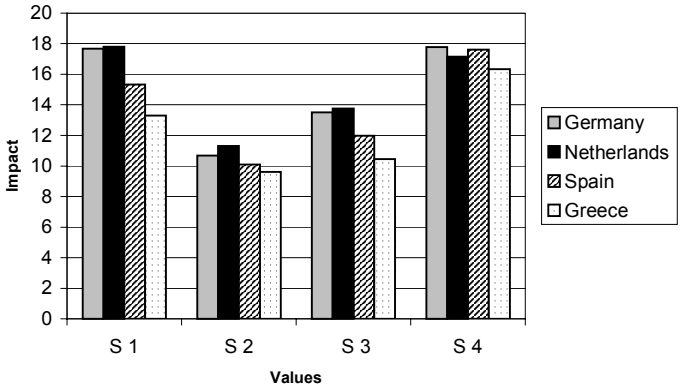
The degree of importance for each group was calculated through the construction of sum-indices aggregating the relative importance of each value. A score of 1 to absolute agreement and a score of 6 to total disagreement were attached according to the relevant statement, hence the higher the scores the less important the value is. It should be noted however that the following graphical design (see diagram 4) should be interpreted with caution.

Concerning the interpretation of the results, the first striking observation is the pattern of orientation. Reflections of the cultural cleavage between the Northern and Southern countries of Europe, which are employed to explain existing differences in rejection rates towards GM foods products (Bredahl, 2001; Hamstra, 1991; Hoban & Kendall, 1992), can also be found in the ESS results. Although the analysis is restricted to 4 countries, it is still apparent, especially in syndromes 1 and 3, that Greece and Spain follow similar patterns, while Netherlands and Germany are not distant from each other either. At this point, it should be noted that a quantitative approach addressing these correlations might further add to the discussion.

The first column (S1) shows, that people in Greece and in Spain tend to consider values associated to stability, certainty and social order more important than in Germany and the Netherlands. As in these Southern countries relationships are especially regulated by social norms, one would expect that attitude formation develops in familial interactions by

adapting to the expectations of the family environment and through information exchange with high status family members. In these cultures, it is expected that individuals form their attitudes towards important issues like GM foods, mainly relying on beliefs and perceptions, which are founded on family norms and traditions.

Diagram 4 Main groupings within the value structure



Source: own calculations, ESS 2002

On the contrary, in Germany and the Netherlands, with a generally lower level of significance concerning these values, the intensity of influence from significant others should be weaker in attitude formation. Instead, other non-social factors, like scientific knowledge on GM processes, should get more prominent in differentiating the approval or disapproval of attitudes towards GM foods.

Value types associated with the promotion of welfare of close and distant others (S2) do not present significant differences for the selected countries. In cases where a construct of these value types is negatively associated with genetic engineering, it is fair to expect that this value type would be more significant in attitude formation in countries where strong importance is attached to it.

Value types presented in S2 (promoting the welfare of close and distant others) oppose to value types leading to pursuit of selfish interests (S3). When a given culture needs to emphasis on relationships and goals, the relative importance attached to these value types may play a crucial role. Giving priority to relationships considering the needs of the others, even when there is no benefit for the individual, may lead to differing attitudes to-

wards modern biotechnology. The direction of these attitudes will depend on a number of factors. Thus, while rationality presupposes the careful trade-off of the advantages and the disadvantages associated with a given relationship before any action is taken, prioritising personal goals over in-group goals may lead to actions that neglect the needs of future generations and /or the environment. It is only a small step to link this notion to attitudes directly associated to GM foods. Companies investing in food biotechnology belong to a vast percentage to the private sector. The way that the alleged benefits are shared by those who need them is left partly indecisive. Thus a cost-benefit analysis evaluating the introduction of a new GM products would be a pre-requisite for its introduction but a positive result on the benefits side would not constitute a panacea. Individuals strongly orientated towards universalism would oppose the introduction of new technologies even when clear-cut benefits are estimated. As long as the analysis is static, it does not allow for the calculation of externalities and it does not guarantee decent benefit sharing.

S4 presents value types referring to novelty, personal autonomy and hedonism. Self-direction and stimulation as opposed to tradition, security and conformity, lead to a trade-off of associated costs and benefits before any attitude is formed. When a given culture is in general values prioritising personal autonomy, idiocentric individuals do not base their opinions on others and as already stated, they may well depend, on a great extent, upon scientific knowledge in order to form their attitudes.

5 Conclusions

As a first step, it is empirically confirmed that differences between EU member countries in attitudes towards GM foods cannot simply be explained as reflections of socio-demographic differences. This can be partially justified by similarities in the socio-demographic and socio-economic profiles of the EU member countries. It is validated by the relatively low influence of socio-demographic variables on attitude formation towards GM foods.

The analysis of subjective beliefs reveals that the existing national differences in attitudes diminish to a great extent, after controlling for these variables. Thus, a small set of core subjective belief factors may be used in order to explain national differences in GM foods acceptance in the EU. However, analysing specific country profiles, empirical evidence shows that it may not be sufficient to group the countries according to some one-dimensional criteria. In specific countries, unique value priorities and cultural syndromes may play a crucial role in attitude formation towards GM foods. In order to fully understand and explain existing differences in EU countries, these country specific attributes should be also taken into consideration.

References

Anderson, L. (1999). *Genetic Engineering, Food and Our Environment.* Green Books: Totnes.

Barbagello, F. & Trench, B. (1999). *Genes on the agenda, Report from the School of Communications.* Dublin: Dublin City University.

Barrett, K. & Flora, G. (2000). *Genetic Engineering and the Precautionary Principle: Information for Extension.* ND Windsor: The Science and Environmental Health Network. Minneapolis: The Institute for Agricultural and Trade Policy.

Baumgartner, H. & Steenkamp, J. (2001). Response styles in Marketing research: a Cross-national Investigation. *Journal of Marketing Research, 38*, 143-156.

Beck, U. (1992). From industrial society to risk society: Questions of survival, social structure and ecological enlightenment. In M. Featherstone (ed.), *Cultural Theory and Cultural Change* (97-123), London: Sage.

Bredahl, L. (2001). Determinants of Consumer Attitudes and Purchase Intentions With Regard to Genetically Modified Foods – Results of a Cross-National Survey. *Journal of Consumer Policy, 24*, 23–61.

Durant, J., Bauer, M.W. & Gaskell, G. (1998). *Biotechnology in the Public Sphere. A European Sourcebook.* London: Science Museum.

Ewen, S.W. & Pusztai, A. (1999). Effect of diets containing genetically modified potatoes expressing Galanthus nivalis lectin on rat small intestine. *Lancet 354 (9187),* 1353-1354.

Fischoff, B., Watson, S.R. & Hope, C. (1984). Defining risk. *Policy Sciences 17,* 123-139.

Fischoff, B., Slovic, P., Lichtenstein, S. & Combs, B. (1978). How safe is safe enough? A psychometric study of attitudes towards technological risks and benefits. *Policy Studies 9,* 127-152.

Frewer, L.J., Shepherd, R. & Sparks, P. (1994). Biotechnology and food production: knowledge and perceived risk. *British Food Journal 96 (9),* 26-32.

Frewer, L.J., Howard, C. & Shepherd, R. (1997). Public concerns in the United Kingdom about general and specific applications of genetic engineering: Risk, benefit, and ethics. *Science, Technology and Human Values 22(1),* 98-124.

Gloede, F., Bechmann, G. & Hennen, L. (1997). Die Dimensionen von "Risiko- und Technikakzeptanz. In Renn, O. & Zwick, M. M. (Hrsg.), *Risiko- und Technikakzeptanz*. Berlin: Springer.

Greenpeace (2000). Website: http://www.greenpeace.org/~geneng

Hampel, J. & Renn, O. (1999). *Gentechnik in der Öffentlichkeit. Wahrnehmung und Bewertung einer umstrittenen Technologie.* Frankfurt/Main: Campus.

Hamstra, A. M. (1991). *Biotechnology in foodstuffs – towards a model of consumer Acceptance.* The Hague: The SWOKA Institute.

Hamstra, A.M. (1995). *Consumer acceptance model for food biotechnology – final report.* The Hague: The SWOKA Institute.

Hoban J.K. & Kendall P.A. (1992). *Consumer attitudes about the use of biotechnology in agriculture and food production*. Raleigh: North Carolina State University.

Hofstede, G. (1991). *Cultures and organizations.* London: McGraw-Hill.

Krimskey, S. (1982). *Genetic Alchemy.* Cambridge: MIT Press.

Losey, J.E., Rayor, L.S. & Carter, M.E. (1999). Transgenic pollen harms monarch larvae. *Nature 399 (6733),* 214.

Renn, O., Burns, W.J., Kasperson, J.X., Kasperson, R.E. & Slovic, P. (1992). The social amplification of risk: theoretical foundations and empirical applications. *Journal of Social Issues, 48* (4): 137-60.

Schwartz, S. H. (1992). Universals in the content and structure of values: Theoretical advances and empirical tests in 20 countries. In: M. Zanna (ed.), *Advances in Experimental Social Psychology (vol. 25)*. New York: Academic Press.

Schwartz, S. H. & Sagiv, L. (1995). Identifying culture-specifics in content and structure of values. *Journal of Cross-Cultural Psychology 26,* 92-116.

Schwarz, N. (2003). Culture-sensitive context effects: A challenge for cross-cultural surveys. In: J. Harkness, F. van de Vijver & P. Ph. Mohler (eds.), *Cross-cultural survey methods (93-100)*. New York: Wiley

Sparks, P. & Shepherd, R. (1994). Public perceptions of hazards associated with food production and food consumption: an empirical study. *Risk Analysis 14,* 79-86.

Sparks, P., Shepherd, R. & Frewer, L.J. (1994). Gene technology, food production, and public opinion: A UK study. *Agriculture and Human Values 11(1),* 19-28.

Sparks, P., Shepherd, R. & Frewer, L.J. (1995). Assessing and structuring public attitudes towards the use of gene technology in food production: The role of perceived ethical obligation. *Basic and Applied Social Psychology 16*, 267-85.

Stenholm, C.W. & Waggoner, D.B. (1992). Public policy, in animal biotechnology in the 1990s: challenges and opportunities. In: J.F. MacDonald (ed.), *Animal biotechnology: Opportunities and Challenges* (25-35). Report No. 4. New York: National Agricultural Biotechnology Council.

Straughan, R. (1991). Genetic manipulation for food production: social and ethical issues for consumers. *British Food Journal, Vol. 92 No. 7:* 13-26.

Triandis, H.C. (1994). *Culture and social behaviour*. New York: McGraw-Hill.

Triandis, H.C. (1995). *Individualism and collectivism*. Boulder, CO: Westview Press.

Triandis, H.C. (1996). The psychological measurement cultural syndromes. *American Psychologist, 51,* 407-415.

Urban, D. (1998). *Technikeinstellungen: gibt es die überhaupt? Eine Längsschnittanalyse von Bewertungen der Gentechnik.* Stuttgart: IfS.

Urban, D. & Pfenning, U. (1999). *Technikfurcht und Technikhoffnung. Die Struktur und Dynamik von Einstellungen zur Gentechnik.* Stuttgart: Grauer.

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