Trust in authorities monitoring the distribution of genetically modified foods: dimensionality, measurement issues, and determinants

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Abstract

Based on a combined internet and mail survey in Germany the independence of indicators of trust in public authorities from indicators of attitudes toward genetically modified food is tested. Despite evidence of a link between trust indicators on the one hand and evaluation of benefits and perceived likelihoods of risks, correlation with other factors is found to be moderate on average. But the trust indicators exhibit only a moderate relation with the respondents' preference for either sole public control or a cooperation of public and private bodies in the monitoring of GM food distribution. Instead, age and location in either the New or the Old Lander are found to be significantly related with such preferences.

Key words: Consumer trust, genetically modified foods, monitoring, food safety

JEL classification: D18, Z13

Background and objectives

In response to a number of crises, in particular BSE, the EU and her Member States have restructured their authorities for risk assessment, risk management and monitoring with regard to food-safety. In all cases these attempts to increase efficiency and effectiveness of the various activities have been accompanied by information campaigns directed at regaining consumer trust. The effort appears to be worth while, as empirical evidence shows that consumers who trust an organization find its risk assessment more credible and its risk management more acceptable.

For three reasons, trust as a determinant of consumer response to potential hazards is particularly important for regulating and monitoring genetically modified (GM) foods. First, it is a complex technology which is difficult to understand for lay people. Second, it is a novel technology whose impacts are uncertain and difficult to judge. And third, the highly controversial public debate about risks and benefits leaves lay people in an ambiguous state of mind for their own judgment. These three conditions contribute to an exaggerated and diffuse risk perception, which, in turn, calls for a trusted entity as a means to decrease the uncertainty and complexity of an increasingly dynamic world.

Hence, public authorities and politicians in the EU should have an interest in measuring trust in the public monitoring system for GM foods. However, one has to be aware that the notion of trust is complex, multidimensional, context-dependent, and not necessarily unambiguous and comprehensive. Therefore, the measurement of trust dimensions is of central importance to that venture. Furthermore, due to the relative novelty of the technology, trust might be interrelated with or moderated through other determinants of behavioral intentions, e.g. attitudes. In this poster paper we address these important measurement issues and formulate the following more concrete objectives. First, drawn from a literature review, we will present the various trust dimensions that ought to be considered in the measurement of (impersonal) trust in public and private organizations.

Second, based on a survey in late 2004 and early 2005 in Germany, we apply factor analysis to test for the independence of the trust dimensions from other determinants of behavioural intentions, and analyse whether a measure of trust in public bodies has an impact on

the preference for public authorities and/or private bodies to be involved in the monitoring process.

The rest of the paper is organized accordingly. In the following section the findings of the literature review of the various trust dimensions are presented. In chapter three we discuss potential determinants of trust in public and private bodies from a theoretical and empirical perspective. The fourth chapter presents the empirical part of the paper with descriptive and statistical analyses of the survey data. The paper concludes with a discussion of the results.

Measuring trust: an interdisciplinary review

Conditions of trust

Taking account of trust research in the relevant social sciences disciplines, five conditions must be present for trust to play a role in human interaction (see among others: Mayer et al. 1995; Poortinga & Pidgeon 2003; Wicks et al. 1999):

- vulnerability,
- elements of rational prediction,
- independence from the ability to monitor,
- affect between trusting and trusted entities, and
- the affective element enabling trust having a clear moral element.

It is quite clear that parties must have something at risk, before trust can play a role in their decision making. Without uncertainty there would be no vulnerability. The second precondition for trust to arise is that elements of (rational) predictions are present, that is, the trusting person must have some indicator for the predictability of the other party's performance. This condition separates trust from (blind) faith, which is irrespective of any indicators and always assumes positive outcomes. Although this cognitive element is clearly important in the analysis of trust, it would be unwise to make it the focal point of empirical research, as authors of solely rationally predictive accounts of trust do. Wicks et al. (1999: 100) clearly repel such a simplistic approach that would eliminate core elements of trust by reducing it to prediction.

The third condition for trust will illustrate that point and lead to the two remaining (pre)conditions of trust. As will be seen, these conditions are hard to reconcile with universally purely rational. Implicit in the above definitions is the assumption that a trusting party does not (have to) consider to safeguard her investment in the specific transaction or interaction. This third condition of trust is expressed in the final part of the definition by Mayer et al. (1995: 712):

> Trust is the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party.

It is exactly at this point where we leave the realm of economics, because an actor would be considered irrational, if he did not strive to safeguard his investment against misconduct of the other party in a transaction. But when we go beyond that point, it becomes clear that trust

makes sense from an economic point of view, that it is economically valuable. This has been claimed by Baier (1994: 196, also cited in Wicks et al. 1999: 100):

> If one actually reviewed all the possible outcomes of some avoidable dealing with another before embarking on it, the calculated risk which one then would take, if one went ahead, would scarcely warrant the label "trust." Trusting is taking not-so-calculated risks, which are not the same as ill-judged ones. Part of what it is to trust is not to have too many thoughts about possible betrayals. They turn trust into mistrust.

The third condition is closely linked with the final two, i.e. the affective and moral elements. Intuitively, these should primarily play a role in interpersonal trust. But they might also be relevant for trust in groups and organizations, when, e.g., the relationship between trustee and trustor is characterized by deep interdependence or when the organization is represented by a single or few persons.

From these conditions of trust three dimensions have been derived for measuring trust, which will be dealt with in the following sub-section.

Dimensions of trust for measurement

Measurement of trust covers the four last conditions presented in the preceding subsection. Vulnerability as the most fundamental condition can also be measured to indicate the perceived relevance or importance of the issue or transaction that is being investigated. But it does not "translate" into a trust dimension and is therefore not considered in the measurement of trust. Furthermore, the final two dimensions are to a large extent interdependent: sympathy or an emotional bond develop more quickly, when salient values are similar; and once an emotional bond exists, shared values become more likely. Consequently, Wicks et al. (1999) merge the two elements in one termed "affect-based belief in moral character," which leaves three conditions of trust that ought to be taken into account in the measurement process. There is some consensus in the research on trust in the various disciplines that three dimensions capture these conditions of trust (Johnson 1999):

- perceived **competence** of the trusted entity represents the element of rational prediction on the side of the trusting person,
- perceived **care** (or benevolence) of the trusted entity may substitute for the ability to monitor,
- shared or **consensual values** represent the "affect-based belief in moral character," as the combination of the final two conditions "affect between trusting and trusted entities," and "the affective element enabling trust having a clear moral element."

The third dimension points to the conjecture that trust is embedded in culture, and thus cannot readily transferred across cultural borders. For measurement, more concrete indicators than these rather general dimensions are necessary. An overview of such indicators is given in Figure 1 below.

Figure 1: Indicators of trust dimensions

Competence	Care	Consensual Values
Formal / life-derived credentials Command of information Experience Procedural efficiency Past performance ('good track record')	Fiduciary responsibility Fair process Honesty and lack of contradiction Integrity Respect and politeness	Shared values Cultural proximity Sympathy Shared outcome preferences

Source: Johnson (1999: 330ff.)

The dimensions competence and care are not strictly independent from one another, i.e., there may be some overlap between them. E.g., in the above figure, the cue of promises being kept would appear in both dimensions, because it can be seen as an indicator for both competence (the person/entity judges the situation realistically and thus makes no promises that cannot be kept) and care (the person/entity does not lure the audience into wishful thinking by making unrealistic promises). Also, Poortinga and Pidgeon (2003) see 'consistency' as an indicator of competence. As a consequence of such overlap, a meaningful differentiation between competence and care appears to be only achievable on a case-by-case approach. This becomes even more evident, when we see how Johnson (1999) discusses, next to alleged weaknesses of each dimension, further aspects of measuring trust on the two dimensions:

- more specific to very special cues used to signal competence or care;
- the cognitive demand necessary to process or understand a specific cue,
- the audience/target group that would likely respond to a specific cue, and
- limiting assumptions for each type or sub-type.

The third dimension, consensual values, was first proposed by Earle and Cvetkovich (1995). They do not argue in favor of complementing competence and care, as Johnson (1999) does. Instead, they want to see consensual values replace the other two dimensions, mainly for two reasons. First, they are cognitively complex and too demanding. Second, they are culturally bound and thus cannot be applied universally. With the notion of trust based on shared values, as derived from broader cultural narratives, immediate evidence is not needed for a leap of faith. The belief that trusted ones share one's own values suffices. Johnson (1999: 333ff.), however, argues in detail against the abolition of competence or care as trust dimensions. In summary, his counterpoints are:

- Only some of the competence and care indicators are cognitively fairly demanding, while values need not be as easily observes and checked as Earle and Cvetkovich (1995) claim.
- Some of the competence and care indicators actually are closely related with or represent values. If lack of universality applies to the first two, then it should also apply to the third dimension.
- Analysis of trust would preclude interesting constellations, in which parties with divergent value systems can agree on expertise, e.g., when a referee or moderator is chosen for his reputation of being knowledgeable, objective and impartial.
- Which of the many approaches for identifying values whose estimated consensus is pertinent to trust measurement is an empirical question, as such values may differ across people, times, regions or hazards.

Determinants of trust in public and private bodies monitoring the distribution of GMOs

A person's trust in a monitoring authority or body may depend both on personal characteristics, as captured by socio-demographic or psycho-graphic variables, and on perceived characteristics of the judged authority or body. Most of trust research has focused on the latter, delivering the dimensions of trust measurement as discussed above. The reason for this might be that such research provides valuable insights in how to signal trustworthiness to a target audience. Opposite to that, knowledge of the determinants of trusting behavior may not be readily transformed in guidelines for signaling (increased) trustworthiness. The determinants at the individual level, such as knowledge and experience, can hardly be influenced. Furthermore, they are costly and sometimes impossible to observe, thus providing no basis for signaling and communication recommendations. Consequently, the demand for information on the dimensions of trustworthiness is much higher than that for information on the determinants at the individual level.

Due to the paucity of information we make the assumption that the determinants at the individual level of trust in entities monitoring GMO distribution are related with the acceptance of GM food and the corresponding attitudes and risk and benefit perceptions. Based on this assumption we choose to discuss the "usual suspects" among the socio-demographic and psycho-graphic variables as potential determinants of trust and the corresponding preference for public and/or private bodies to be in charge of monitoring.

Socio-demographic variables

Survey research traditionally focuses on socio-demographic characteristics as determinants of attitudes and preferences. However, social modernization processes have decreased the weight of traditional milieus in individuals ' attitudes and decision making. E.g., Hampel and Pfenning (1999: 44) find that the German Biotech Survey from 1997 data reveal only weak relations between the judgment of genetic engineering on the one hand and socio-demographic variables on the other. In fact, only two factors are found to predict differences in attitudes in a sufficiently stable and reliable way. First, Germans in the New Lander are more optimistic about the technology. Although the authors do not provide an explanation, this might be caused by greater technological optimism in general or by fewer ethical or religious concerns. For historic reasons, religion plays only a minor role in East Germans' everyday life. Another reason might be the high unemployment in the New Lander where any factor that might contribute to economic growth is more welcome than in the Old Lander.

Second, women judge the applications of genetic engineering to food production more critically than men do. This finding is in line with empirical research on risk perception: with few exceptions, women tend to rate hazards more dangerous and likely across all hazard groups. Similar findings are reported in the Eurobarometer surveys, as e.g. by Gaskell et al. (2003: 4).

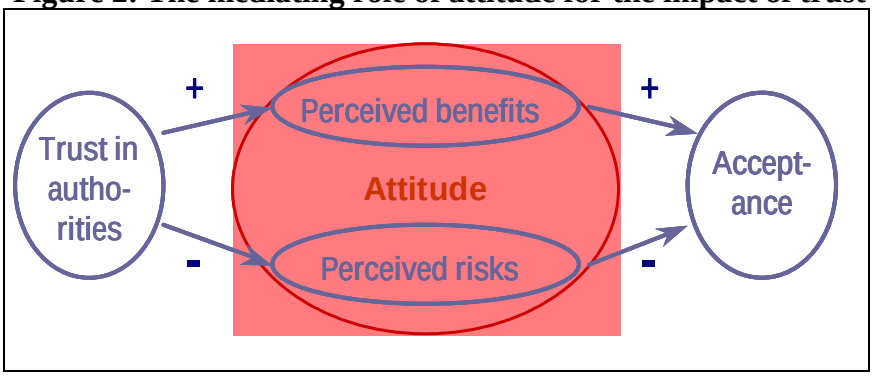
The German Biotech Survey data do not reveal an impact of other standard socio-demographic variables, such as age, education, income, or occupational status on the valuation of GM foods and related applications (Hampel & Pfenning 1999). But due to the fact that these were found to be influential in the Eurobarometer data, they should be included in the analysis. Another important factor to be considered is knowledge, because proponents argue

that lack of knowledge about genetic engineering amplifies the perception of possible risks so that adequate information to fill this knowledge gap may also increase the acceptance of GM food. Indeed, the Biotech Survey clearly shows that only very few Germans, i.e. 1.5%, rate their own knowledge about genetic engineering as "very good," while 27% rate it as "rather good," 62% as "rather poor," and 10% as "very poor."

Psycho-demographic variables: risk and benefit perception

Recent empirical findings show that trust in authorities and attitudes toward genetic engineering, as expressed in perceived risks and benefits, are interrelated (see e.g. Frewer et al. 1996, 2003; Moon & Balasubramanian 2004; Poortinga & Pidgeon 2003; Siegrist & Cvetkovich 2000). That is, they do not influence GMO acceptance independently. Instead, there are two competing hypotheses on that interrelationship. The first is that the impact of trust is mediated through risk and benefit perception, as illustrated in Figure 2 and supported by the empirical findings of Siegrist (2000) and Moon & Balasubramanian (2004). As trust in authorities increases, perceived benefits increase, while perceived risks decrease. Both effects lead to an increase in GMO acceptance. Reducing trust would lead – again indirectly – to the opposite. Since this model is not dynamic, it does not imply that first trust has to change before attitudes, i.e. perceived benefits and risks change.

Figure 2: The mediating role of attitude for the impact of trust on GMO acceptance



Source: Siegrist (2000: 197).

Alternatively, a number of studies indicate that the role of trust is more complex and cannot be adequately pictured in a simple one-directional causal relationship. E.g., in an attitude change experiment among 1405 consumers from Denmark, Germany, Italy and the UK Frewer et al. (2003) found that trust in information sources appears to be driven by the attitude toward GM food. Based on the analysis of three separate data sets Poortinga and Pidgeon (2005) also find support for the counter hypothesis that trust in risk regulation is an indicator, rather than a determinant of GM food acceptance. They argue that specific risk judgments with regard to GM products are driven by more general judgments and evaluations. But in any case, the implications of the competing hypotheses are that trust and attitudes stabilize each other and tend to change jointly in the same direction. Hence, a close investigation of the relationship between risk and benefit perception variables on the one hand and trust variables on the other in the survey data is necessary.

Empirical part: data basis and results

Sample generation and socio-demographic characteristics

The total sample of 350 respondents consists of two sub-samples. The first data set was generated in an internet survey in July 2004. Respondents were addressed through an e-mail address list. In total, 118 usable questionnaires were gathered. The second subset was generated in a mail survey in Northern Germany in January 2005, producing 232 usable questionnaires. Since no heavily publicized GM-related event or incident was reported in the media in the period July 2004 to January 2005, we assume away an effect of different recording times. The combined sub-samples clearly deviate from a representative distribution of socio-demographic variables, as can be seen in Figure 3. In particular, the two most relevant characteristics with regard to GMO acceptance, gender and location in either the Old or the New Lander, do not match well at all with the figures of the German population. In order to correct for this deviation of a representative sample, the SPSS weighting procedure with integer figures for these four groups was applied. In the adjusted sample there is a bias toward women and the New Lander. But the deviations from the representative distribution of the socio-demographic variables are now acceptable.

Figure 3: Key socio-demographic characteristics of sample

	New Lander (incl. Berlin)		**Old Lander**	
	Female	**Male**	**Female**	**Male**
Figures for Germany	11%	10%	41%	39%
Original sample	17%	25%	19%	39%
Weighting factor	2	1	5	2
Adjusted sample	14%	11%	41%	34%

The remaining socio-demographic variables are now being reported for the adjusted sample. As can be seen in Figure 4, the adjusted sample appears to be fairly representative with regard to age and income.

Figure 4: Distribution of GM-specific knowledge, age, and income in adjusted sample

Number of GM applications known in agriculture and food production (out of 5)

One or none	**Two**	**Three**	**Four**	**Five**
5.6%	19.9%	28.6%	21.6%	24.4%

Age groups (*figures for German population in parentheses***)**

18 to 24	**25 to 39**	**40 to 59**	**60 to 64**	**65 and older**
11.3% (*9.9%*)	22.8% (*26.7%*)	36.1% (*33.5%*)	10.9% (*8.4%*)	18.8% (*21.5%*)

Net household income in € (*figures for German population in parentheses***)**

Less than 1000	**1000 to 1999**	**2000 to 2999**	**3000 to 3999**	**4000 and more**
15.1% (*19.4%*)	33.1% (*39.1%*)	25.7% (*20.4%*)	15.6% (*10.4%*)	10.6% (*10.7%*)

Knowledge of various applications of genetic engineering in agriculture and food production differs fairly much between respondents. But we do not have any information to compare this distribution with that of the above mentioned self-rated knowledge of genetic engineering in general reported by Hampel and Pfenning (1999).

Descriptive statistics of preference, trust, and risk and benefit perception data

For measurement of trust we did not apply the dimension of consensual values. Opposite to competence and care, we cannot even know whether this dimension plays a role at all for every research that investigates citizens' trust in a societal entity. In fact, conceptual research by Sheppard and Sherman (1998) that relates distinct forms of relations between persons with qualities of trustworthiness and mechanisms of trust indicates just the opposite. Consensual values should only play a role in relationships characterized by deep dependence. And this does not apply when citizens judge more or less distant societal entities, where the relational form is in most cases that of a shallow dependence. Furthermore, due to time limitations in Internet surveys we devised only five items for trust measurement, These were measured on seven-point scales ranging from 1 (extremely poor performance in the corresponding dimension) to 7 (extremely good performance):

- public authorities' past success to keep non-authorized GM foods from the EU market as a measure of competence (PAUT_JOB),
- public authorities' keeping consumer concerns about GM foods seriously as a signal of care (PAUT_CONC),
- public authorities' honesty in their information releases about GM food as a further signal of care (PAUT_HON),
- public authorities' independence from industry as a signal of integrity, i.e. care (PAUT_IND),
- producers' and retailers' honesty in their information releases about GM food as a signal of care (PROD_HON).

The emphasis on the care dimension is justified by the relative lack of information on the competence of authorities due to the complexity of the matter. In addition 12 items were applied to measure risk- and benefit-perception as indicators of attitude toward genetic engineering in food and agriculture. In line with the Theory of Planned Behavior (TpB) (Ajzen 1991) we differentiate between behavioral beliefs and the evaluation of relevant outcomes of one's own behavior. Behavioral beliefs are the subjective probability that the behavior will produce a given outcome, while the evaluation will rate the outcome as more or less desirable, positive, acceptable, or vice versa, more or less undesirable, negative, or unacceptable. According to the expectancy-value model, attitude toward a behavior is determined by the behavioral beliefs linking the behavior to various outcomes. In the composition of these two elements,, the strength of each belief (b) is weighted by the evaluation (e) of the outcome, and the products are aggregated across outcomes, such as (Ajzen 1991):

$$A \propto \Sigma b_i e_i$$

Based on a literature review (e.g. Kerry xyz), we chose three negative outcomes, i.e. risks, and three positive ones, i.e. benefits, to measure attitudes. These were rated by the re-

spondents on a seven-point scale ranging from –3 (totally undesirable) with 0 midpoint to +3 (extremely desirable). Further, the belief strength, i.e. the subjective probability, was also measured on a seven-point scale ranging from 1 (extremely unlikely) to 7 (extremely likely). Specifically, the risks and benefits chosen are:

Benefits:

- reduced use of pesticides and chemicals in agriculture and food production (ATT_PEST for evaluation and LIK_PEST for subjective likelihood),
- development of food with specific positive health effects (ATT_FOOD and LIK_FOOD),
- improved nutritional situation of people in developing countries (ATT_LDCS and LIK_LDCS),

Risks:

- reduced biodiversity in eco-systems (ATT_BIO and LIK_BIO),
- health risks to my family and me (ATT_HEAL and LIK_HEAL),
- negative health effects for future generations (ATT_FUT and LIK_FUT).

Finally, the respondents were asked to state their preference for public and/or private bodies to be in charge of monitoring the distribution and marketing of genetically modified foods. Four answers were possible, with the number and share of each given for the adjusted sample :

- public authorities (PUBLIC) 358 (44.8%),
- private organizations (PRIVATE) 27 (3.4%),
- both public and private bodies (BOTH) 397 (49.7%),
- don't know as the residual category (UNDECIDED) 17 (2.1%).

Not surprisingly, only a very small minority does not want the state to be involved in the monitoring process at all. And nearly half of the respondents apparently do not trust private organizations to do a proper monitoring job. Due to the small share of respondents having chosen the second option, this will not be considered further in the analysis. The descriptive statistics for the attitudinal variables are presented in Figure 5.

Figure 5: Descriptive statistics of attitudinal variables

	Evaluation of outcome*			**Subjective probability****		
	Median	**Mean**	**Std. dev.**	**Median**	**Mean**	**Std. dev.**
PEST	1.00	0.60	2.24	5.00	4.41	2.00
FOOD	0.00	-0.02	2.31	4.00	3.97	1.98
LDCS	1.00	0.52	2.28	4.00	3.79	2.14
BIO	-3.00	-2.51	1.00	6.00	4.93	1.98
HEAL	-3.00	-2.73	0.83	5.00	4.49	2.08
FUT	-3.00	-2.74	0.88	5.00	4.63	2.02

** Measured on a seven-point scale from –3 (totally undesirable) to +3 (extremely desirable).*
*** Measured on a seven-point scale from 1 (extremely unlikely) to 7 (extremely likely).*

The median and mean scores of the outcome evaluation show a slightly positive for the benefits overall and a clear negative attitude toward the risks. As can be seen from the small

standard deviation figures, the respondents agree very much on the evaluation of the risks associated with the technology. But they do disagree a lot on the evaluation of the benefits. Further, and in line with previous survey results for Germany, risks are perceived to be more likely than benefits. Variation of subjective probabilities between respondents, however, does not differ between risks and benefits. Finally, we turn to the trust measures. The descriptive statistics are shown in Figure 6.

Figure 6: Descriptive statistics of trust variables

	Median	Mean	Std. dev.		Median	Mean	Std. dev.
PAUT_JOB	4.00	3.73	1.779	PROD_HON	3.00	2.98	1.484
PAUT_CONC	4.00	3.95	1.902	PAUT_IND	2.00	2.56	1.565
PAUT_HON	4.00	3.56	1.471				

According to the mean and median scores public authorities were on average rated mediocre in their own competence and care performance. However, with regard to their independence from industry influence the rating was negative and with fairly little variation between subjects. Likewise, producers' and retailers' honesty was rated below the midpoint and thus clearly smaller than the public bodies' honesty. Taking this into consideration, it is somewhat surprising that the majority of respondents in the adjusted sample want private organizations to be involved in the monitoring process.

Statistical analysis of relationships between trust and attitudinal variables

As hypothesized above, the novelty and complexity of the technology might make it difficult for respondents to clearly separate their judgments on trust(worthiness) and other concepts that might also have an impact on behavioral intentions. To test for this, we conduct a factor analysis with the five trust variables and twelve attitudinal variables. As extraction method we chose general least squares, because the distribution of most variables is nonnormal. Since rotation of factors may have a decisive impact on factor composition, we chose to apply both the orthogonal Varimax rotation and the oblique Oblimin rotation and compare the results afterwards. In general, the data are fully adequate for factor analysis, as documented by the KMO measure of 0.878 and a highly significant Bartlett statistic.

As pointed out above, for this analysis we do not aim to identify a set of latent variables for further analyses. Hence, we can disregard the task of choosing the "right" number of factors to be extracted. Instead we will run repeated factor analyses for reasonable predetermined factor numbers. That is here between two and five factors, after the scree test and the "Eigenvalue Greater than unity" decision rule had suggested a three factor solution (Cudeck 2000: 278). Comparing the results for different factor numbers provides information on the stability of the results. In the test for the relative independence of the trust variables from the attitude variables, the factor solutions must satisfy the following conditions:

a) For each factor number, the trust variables must generally load highest on one and the same factor. Other variables should not load highly on that factor. Neither should any trust variable load highly on any other but the "trust" factor.
b) For the Oblimin rotation the "trust" factor should only be moderately correlated with the other factors. In case of the orthogonal Varimax rotation factors are ruled out to be correlated.

The total variances explained by the factors are 43%, 50%, 53%, and 57% for the two, three, four, and five factor solutions respectively. In general, the solutions for the different rotation methods are very similar with regard to the first condition. For all four solutions, the trust variables loaded clearly highest on a single factor, and none of the other variables loaded highest on this factor. Thus, the first condition is satisfied.

With regard to condition b), the correlation with the other factors for the Oblimin rotations ranges from 0.07 to 0.56 with a geometric mean of 0.27. For comparison, the geometric mean of the of the remaining factor correlations that do not involve the trust factor is 0.31 and thus slightly higher. However, when in five cases the correlation between the trust factor and other factors are considerably above the geometric mean. And in all these cases the variables establishing the evaluation of benefits on the one hand and those establishing the likelihood of risks are involved. This points to a closer link between these variables and the trust variables. Nonetheless, we rate the correlations of the trust factor with the other factors as moderate, in particular when considering that the Oblimin factor solutions do not deviate considerably from those with the Varimax rotation.

Statistical analysis of possible determinants of preference for monitoring entities

We now proceed to investigating the determinants of the respondents' preference for which type of bodies and organizations ought to be in charge of monitoring the distribution and marketing of GM food. The data differentiate between two groups in this regard. The first is in favor of sole "public control" of the monitoring process, while the second would prefer to see "public and private cooperation" in this matter. Since we have not explored theoretical explanations for such preferences, we cannot provide hypotheses that express causal relationships between potentially explanatory variables and the preference variable. Therefore, we must restrict ourselves to an exploratory analysis of statistical relationships between the preference variable and the potential explanatory variables discussed in the previous sections, i.e. trust and socio-demographic variables. For this purpose we first perform a number of non-parametric Mann-Whitney-U-tests to test for statistical differences between the two groups with regard to the trust variables scores. The results are presented in Figure 7.

Figure 7: Test for statistical differences[+] in trust variables between two groups

	Sole public control			Public-private cooperation				
Variable	**N**	**Mean**	**Std. dev.**	**N**	**Mean**	**Std. dev.**	**Z**	**Significance**
PAUT_JOB	358	3,61	1,94	397	3,85	1,63	-2.00	0.046**
PAUT_CONC	358	3,99	2,01	397	3,93	1,81	-0.58	0.565
PAUT_HON	358	3,46	1,50	397	3,66	1,45	-1.92	0.055*
PROD_HON	358	2,95	1,54	397	2,98	1,44	-0.68	0.495
PAUT_IND	358	2,67	1,65	397	2,44	1,49	-1.74	0.082*

[+] *Applying the Mann-Whitney U test for two independent samples.*
**(**) significant at the 10% (5%) error level.*

Overall, when looking at the differences between the group means, there are no major or overwhelming differences between the trust judgments of the two groups. Three of the

five variables exhibit moderate levels of statistical significance. Those who would prefer that public authorities are in sole control exhibit a slightly higher trust that these authorities have done a good job in barring unauthorized GM food from the market and that they are independent from industry influences. However, those who would rather see public and private bodies cooperate in monitoring the distribution of GM food have a slightly higher trust that public authorities are honest in their information releases. Somewhat surprisingly, this group has the same – low – score on judging producers' and retailers' honesty. Apparently, independence of the private monitoring bodies from industry's influences is assumed. In summary, the selection of trust variables used here does not seem to stand in a close relationship with the preference for different monitoring systems.

Therefore, in a next step we will test for significant differences in socio-demographic variables between the two groups. The results of the non parametric tests are shown in Figure 8.

Figure 8: Test for statistical differences[+] in trust variables between two groups

	Sole public control		Public-private cooperation			
Variable	**N**	**Median/Share**	**N**	**Median/Share**	**Z**	**Significance**
Gender	358	55% female	397	57% female	-0.45	0.654
Income[+++]	335	2.0	389	3.0	-0.94	0.346
Age	356	51.0	397	46.0	-3.47	0.001***
Knowledge[++]	353	3.0	391	4.0	-0.94	0.346
New/Old Lander	358	72% Old Lander	397	80% Old Lander	-2.59	0.010***

[+] *Applying the Mann-Whitney U test for two independent samples.*
[++] *Number of known GM applications in food and agriculture (individual scores between 0 and 5).*
[+++] *Income groups as in Figure 4.*
*** *significant at the 1% error level.*

The differences in the income and knowledge score medians there are not significant. Although the applied knowledge measure does not reveal any in-depth or detailed knowledge in the issue, the figures provide further support for rejecting the hypothesis that preferences with regard to GM food and the corresponding monitoring systems are related with knowledge. Based on the 2002 Eurobarometer data, Gaskell, Allum and Stares (2003: 26) reach the similar conclusion that "(t)he 'knowledge deficit model' of the public in relation to science and technology gives some indication of the bases of positive and negative attitudes, but certainly does not tell the whole story. It is too simplistic to attribute opposition to science to a lack of knowledge and to suggest that a dose of scientific information will cure people's skepticism." Instead, they point out that engagement with the issue, as measured by numerous factors in combination, may provide a better key for understanding the formation of attitudes. Also gender, although the only robust discriminating variable with regard to acceptance of genetic modification, does not seem to be related with the preference for a monitoring system.

Instead, age and the location of the respondents in either the New or the Old Lander exhibit such a relation in our data. Those who want the private sector to be actively involved in the monitoring process are younger and more likely to be living in the Old Lander. Apparently, preferences for state control and intervention are stronger in the New Lander.

Concluding remarks

The above analysis has shown that trust in public authorities is rather independent from attitudinal variables with regard to genetic modification in agriculture and food production. But the indicators of trust do exhibit only a moderate and partly ambiguous relation with the respondents' preference for either sole public control or a cooperation of public and private bodies in the monitoring of GM food distribution and marketing. Instead, statistical analysis of socio-demographic variables has shown that age and location in either the New or the Old Lander are significantly related with such preferences. These findings raise the question of whether communication measures can influence the preferences despite their ability to influence trust.

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