How scary! An analysis of visual communication concerning genetically modified organisms in Italy

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Abstract

The 2010 Eurobarometer on life science and biotechnology reveals an overall suspicion of GM foods amongst the public: the 61% of Europeans agree that GM food makes them feel uneasy and a higher proportion, 70%, think that GM food is fundamentally unnatural. In the economics literature many studies investigate the factors that drive public resistance: ethical concerns, low public trust in regulatory institution, risk misperception, absence of perceived benefits and media bias. In particular, public attitudes and risk perception about agricultural biotechnology are proved to be influenced by press media communication.

This paper aims at gaining insight into the visual communication to which Italian population is exposed about GMOs, in order to investigate if images could have contributed to shape their negative public perception.

A set of 500 images collected through Google search for "GMO" in Italy are classified considering fearful attributes (i.e. alteration of color, shape or size of plants or animals, mention to death or war, presence of DNA double helix or syringe) and an index that accounts for the scary impact of these images is built.

Then the relationship between the index and a set of variables that refer to the context in which images appear is estimated. Preliminary results reveal that the order of appearance of images negatively affect index, namely that the first (and most viewed) Google result pages contain the most frightful images. It suggests that Italian population is subject to overstated negative inputs about GMOs. In addition, it emerges that web contents that show positive or neutral GMO attitudes are barely accompanied with objective and balanced visual communication. Implications and future research are then discussed.

Keywords: GMO, risk perception, information, media

Introduction

The European population shows an evident attitude against GMOs. The 2010 Eurobarometer survey on life science and biotechnology revealed that there is an overall suspicion of GM foods amongst the public: most Europeans (61%) agree that GM food makes them feel uneasy and a higher proportion (70%) think that GM food is fundamentally unnatural. A recent meta-analysis of 70 studies (Frewer et al., 2013) confirms that European consumers have more negative perception, attitudes and intention to purchase GM food compared to North Americans. Consumer resistance is a strong barrier against the diffusion of genetically modified foods.

The influence of the modern mass media on social acceptance of new technologies is a topic of great interest for scientific literature (Bauer, 2005; Bonfardelli, 2005; Schäfer, 2011; Cacciatore et al., 2014). The vast majority of the studies that assess the role of the media in GMO-related issues focus on the analysis of written communication (Kalaitzandonakes et al., 2004; Marks et al., 2007; Lewison, 2007; Vilella-Vila and Costa Font, 2008; Marks et al., 2003; Crawley, 2007; Mcinerney et al., 2004). Differently, visual communication has been less investigated. The use of images as a communication tool is supported by the "picture superiority effect" theory that was initially proposed by Paivio & Csapo (1969) and Nelson et al. (1976). Leaving aside the complex explanation of the cognitive processes that forms the base of this theory, its main idea simply rests on the very empirical findings that pictures are better remembered than words. This type of approach is widely used in marketing (Childers and Houston, 1984; Houston et al., 1987; McQuarrie and Mick, 2003; Pieters and Wedel, 2004), whereas, to the best of our knowledge, it has never been used before in relation to risk communication and public acceptance of GMOs which makes the present work the first example of its possible applications in this context.

This paper aims at gaining insight into the visual communication to which the Italian population is normally exposed in relation to the perception of the risk of GMOs through the media and assess the possible contribution of these images to the shaping of a negative public perception.

Methods

The first phase of the study has been dedicated to the selection of a suitable media where to gather visual information on the topic. The Google search engine was chosen due to different reasons: first of all, web searches have recently become one of the main accessed tools to seek for information. In a recent survey (FullPlan, 2013), it was reported that 68% of Italians use a web search engine at least once a day; one of the main reasons for that is to increase knowledge about something that was seen/read/heard through other communication media (i.e. TV, radio, and social networks). Moreover, in this report it was also shown that more than half of the Italian users (56%) tend to avail of the searching option for images that is made available together with other services (i.e. maps, news, and shopping ads) by the search engines within the searched result pages. This data suggests that web images are frequently used as ancillary tools to enhance comprehension of a particular topic. Additionally, the Google search engine provides an advanced search section that filters results according to different criteria: images are rapidly displayed and easily collected, making the recovery of data quick and effective.

The Google advanced search service was used in order to filter images for the country of origin (Italy). The search has been performed using the Italian acronym for genetically modified organisms (OGM) as the keyword. A total of 517 images were collected together with the URL link of the website in which they appeared.

For the construction of the Scary Impact Index, a coding scheme that describes the most relevant features of the image was defined. The coding system includes different attributes that could convey messages of "scariness", or more generally that could provoke feelings of fear in the consumer. The complete list of attributes is presented in Table 1.

Table1. Coding scheme for the construction of the SI Index. Source: own elaboration

		YES	NO
IMAGINARY VEGETABLE	Modification of vegetables	1	0
IMAGINARY ANIMAL	Modification of animals	1	0
MODIFICATION OF SIZE	Bigger vegetable/animal	1	0
MODIFICATION OF COLOUR	I.e. blue oranges	1	0
MODIFICATION OF SHAPE	I.e. square cherry	1	0
SYRINGE	Presence of syringe	1	0
DNA	Presence of DNA double helix	1	0
DRUG	Presence of medicines, pills	1	0
ACTIVISM	Images of activists, demonstrations	1	0
MONSTER	Presence of monstrous creature	1	0
WAR	Reference to war i.e. weapons	1	0
HAZARD/DEATH	Reference to risk i.e. skulls	1	0

The presence of a scary attribute in an image is marked as 1. The same image could be characterized by more than one attribute and the SI Index is then calculated as the sum of the scores for each attribute.

Among the scopes of the present work there is also the identification of the possible factors that could affect the SI Index, which takes into consideration all the different aspects of the context in which the image is presented: 1) order of appearance; 2) type of image; 3) global viewpoint of the webpage.

Order of Appearance: each image was classified through a serial *ID number* according to its position in the Google result pages. This variable is important to determine whether the level of scariness of the images follows or not a consistent pattern of distribution throughout the dataset, bearing in mind that the first results are generally the most viewed by the Google users. The reasons why an image occupies the first positions of the searching results are beyond the scope of this paper; nevertheless, the variable gives some information about the level of public exposure to scary images that refers to GMOs.

Type of image: A set of dummy variables that further describe the images was created: *Satire* is for an image that is a satirical cartoon; *GM-free campaign* is used if a logo that promotes the ban of genetically modified organisms is present: *Cultivated land* is for images that represent agricultural landscapes; *Lab* is for images with the representation of a laboratory; *Benefit* is for images that show any positive effect of GM plants (i.e. Papaya damaged by Ringspot

virus versus virus resistant Papaya); finally, two dummy variables also identified *Graphs* (i.e. tables on diffusion of biotech/GM crops) and *Conference/Event*'s flyers.

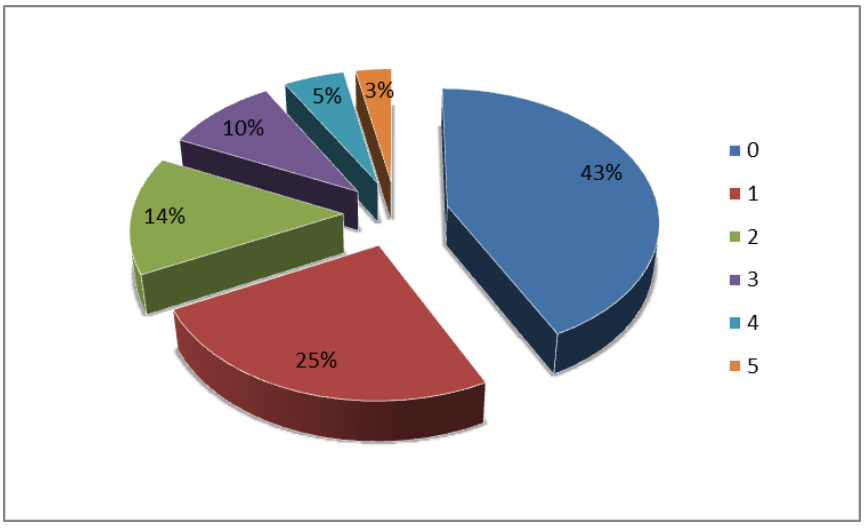
Global viewpoint: three variables that describe the overall message of the web page in which the image was included and consisted of the following categories: *pro-GM; neutral* or *against GM*.

As the SI Index is an ordinal variable, an ordered logistic regression (OLR). was performed through Stata® software package. A second version of the index, called SI Index2, was built with the aim of giving more emphasis to the two most fearful attributes in the images, i.e. any reference to *War* or to *Hazard/Death*, by doubling their initial weight in the SI Index.

Results and discussion

The 517 images collected from Google had a level of scariness that ranged from 0 (no scary attributes) to a maximum degree of 5 (Figure 1). Notably, 42% of the resulting images had index 0, i.e. they did not convey any negative attributes towards GMO. These images are often neutral pictures that could be classified as having a didactic or descriptive function as they could complete the written text, in many cases suggesting which content the web page itself is dealing with, i.e. agricultural.

Figure 1. Distribution of the SI index. Source: own calculation



Nevertheless, more than half of the GMO images (almost 58%) were described by an index ≥1, which suggests that there is a tendency of negative attributes to slightly outmatch positive or more neutral information. However, the frequency of the images with higher index is smaller compared to those with lower index; the ratio of the most frightful images (i.e. with score equal to 5) towards those with score equal to 1 is 16 vs. 130.

Table2. Results of the ORL. Source: own elaboration

	Scary Index			Scary Index2		
Observations	517			517		
Pseudo R^2	.1194			.1080		
	Coef.		*Std. Err.*	*Coef.*		*Std.Err.*
Order of Appearance	-.0033	***	(.0006)	-.0029	***	(.0006)
Satire	.6586	*	(.3403)	.8329	**	(.3364)
GM-free Campaign	-.1785		(.2755)	-.00754		(.2774)
Lab	-1.4680	***	(.3856)	-1.2796	***	(.3858)
Cultivated Land	-1.9079	***	(.3107)	-1.7633	***	(.3304)
Graph	-3.1880	***	(.5316)	-3.0727	***	(.5475)
Conference/Event	.7112		(.3689)	.5572		(.3706)
No-GM text	1.3211	***	(.4072)	1.3228	***	(.3991)
Neutral text	.5136		(.4019)	.3675		(.3923)

Significance at *p<0.05, **p<0.01, ***p<0.001

One of the main findings of this study is that the position of the image significantly affected the SI Index (Table 2): the sign of the relationship suggests that as ID grows the SI Index tends to decrease. In other words, the images that are ranked on the top of the Google results contain also the scariest attributes. Even though the explanation of the mechanisms which define the order of appearance of the results in the web search engine goes beyond the purpose of the present work, it is possible to define the relationship ID/SI Index in terms of exposure of the audience to GMO-related images. The highest visibility is reserved to the first pages of results during a web consultation, which means that results that are ranked less are almost non-accessed, or only marginally. It follows that the majority of web users have access to a set of images that preferably convey negative messages concerning GMOs over more positive or neutral information. Therefore, it could be also suggested that the greater exposure of the Italian web users to images with more negative attributes could be a contributing factor in shaping the negative perception of genetically modified organisms in the country.

Considering the variables that describe the attributes of images, it was also evident from the present work that the contribution of GM-free campaign was not significant. Three variables that referred to agricultural landscapes, laboratory, and infographics negatively affected the SI Index, as they conveyed almost neutral information about GMOs. Among them, the variable that had the strongest negative relationship with the Index was the one called *Graph*, thus confirming the prominent role of scientific websites in supplying objective and unbiased information on the topic.

The regression finding for *Satire* shows that the relationship with SI Index was significantly positive: this was explained as possibly due to the fact that this type of visual communication frequently uses fearful attributes referring to scenarios of death or war as a mean to reinforce the grotesque caricature of the topic.

Finally, the regression output also illustrates that the influence of the variables concerning global viewpoint was not uniform. The overall attitude of the web page in which the image was sourced positively affected the SI Index only in the case of *No-GM* contents (1.32), thus showing agreement between image and written text. On the contrary, web

pages that offered a more neutral viewpoint on the topic were not as coherent as the former and in some cases they use images with SI Index>0. It means that a web page that aims at conveying an objective message about GMOs is combined with a visual communication endowed with attributes of fear. This element suggests a potential underestimation of the power of images as vehicle of scientific information.

Conclusions

The present work attempts an investigation of the web communication in terms of use of images related to genetically modified organisms in Italy, and its potential role in influencing the public opinion. Public exposure to GMO-related scary images is confirmed by the results of the OLR. The factors that contribute to reduce the scary impact of images are the presence of laboratory, cultivated fields or scientific graphs. Results also highlight differences in the pattern of communication between No-GM and neutral GMO-related web pages, the former being characterized by a better coherence between images and written text.

As a future perspective, the work could be extended to the analysis of sources in order to evaluate if the type of web page (i.e. newspapers, blogs, institutional pages) influences the level of scariness of GMO-related images.

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