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Short Communication

The consumption of genetically modified foods in Italian high school students

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ABSTRACT

Genetically modified organisms (GMOs) can be defined as organisms in which the DNA has been altered in a way that does not occur naturally. Such methods are used to create GM plants – which are then used to grow (GM) food crops. GM foods have the potential to solve many of the world's hunger and malnutrition problems, and to help protect and preserve the environment by increasing yield and reducing reliance upon chemical pesticides and herbicides. Nevertheless, the consumption of GM foods provokes doubts and hesitations among consumers, especially in Italy. This paper has two aims, the first is to investigate genetically modified (GM) foods consumption in Italian high school students through a large sample size survey on 2122 students randomly selected in 39 schools of a metropolitan area (Naples, South-Italy). The second, by examining the behavioural process that drives individual's perceptions of GM food taking advantage of an empirical choice methodology that corrects for endogeneity in decision making relationships, namely structural equation model (SEM). The results show that a very large percentage of students never or rarely eat GM food and a lot of them do not suggest the consumption of GM food. The proposed SEM is a full formative measurement model and shows that GM foods consumption in Italian students depends on the knowledge of GMO and on the impact of the GMO on the men's health and on the environment. Therefore, in order to orient population it could be realized a standardized evaluation systems relative to human health and environment consequences produced by GM organisms and GM foods.

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1. Introduction

Food safety has been the object of increasing attention in recent years as a major consumer concern. Pesticide contamination, pollution, food scares and health concerns are having a major impact on consumer purchasing behaviours. Of particularly increasing interest is the purchasing behaviours towards genetically modified (GM) foods. In fact, the consumption of GM foods appears to be the cause of particular doubts and hesitations among consumers, especially in Italy and other parts of Europe (Costa-Font & Gil, 2009; European Commission, 2010).

Italy is a country free of transgenic production, where traditional values, such as the Mediterranean diet, might reduce the diffusion of GM foods (Costa-Font & Gil, 2009). Attitude toward GM foods has become clearer in Italy after the publication of the Eurobarometer series and other research studies. The series started in 1991 with Eurobarometer 35.1 (INRA, 1991) in the twelve Member States of the European Community. The survey performed in 2010 covered the 27 Member States of the European Union plus Croatia, Iceland, Norway, Switzerland and Turkey (European Commission, 2010). This Eurobarometer shows that 61% of EU citizens, an increase over the previous year, are opposed to genetically modified organisms (GMOs) and that GM foods are still Achilles' heel of biotechnology. Few papers, at least in the public domain, report information of consumer acceptance among Italian people based on primary data collection. Most of these studies were conducted by Boccaletti et al., who analysed people's attitudes and behaviours towards GM foods. In a first study, Boccaletti and Moro (2000) showed that Italian consumers had a low level of knowledge of the issue, but an overall positive attitude towards GM foods. In another study, Soregaroli, Boccaletti, and Moro (2003) demonstrated that the likelihood to purchase GM foods was lower for individuals who were more adverse to risk, older, with higher education and less confident in institutional guarantees. In addition, Boccaletti, together with Harrison and House, underlined that Italian consumers were more sensitive to the potential risks that GM foods may pose to human health and the environment, compared to US consumers (Harrison, Boccaletti, & House, 2004). In a recent study, Costa-Font and Gil (2009) reported that more than half of the Italian respondents do not consider GM food technology as useful or ethically acceptable, and agree that they do not need to be

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encouraged. However, despite the enormous importance of the subject, reliable information about the consumption of GM foods in Italian people is on the whole scarce.

For this reason, we conducted a survey to analyze the consumption of GM foods among Italian public high school students. This survey had two main aims. The first is to investigate GM foods consumption among Italian high school students. The second is to propose a structural equation model (SEM) to formalize the origins of behaviours regarding GM foods consumption and detect the drivers of their purchase.

2. Research methodology

From October 2009 to January 2010, public high school students, randomly selected in 39 school of a metropolitan area (Naples, South-Italy), were administered a questionnaire constructed and validated by a questionnaire expert group. In collaboration with each school, a meeting was organized with selected groups of students to explain them the objectives of the study. In addition, each participant was given verbal instructions on how to fill in the questionnaire and any other relevant information. Protocols, questionnaires, quality assurance and control procedures had been specifically designed. Informed consent was obtained from students and the project was approved by the Ethics Committee of Medical School of the University ''Federico II''. The questionnaire was composed by questions focusing on GMOs and GM foods. A first section was assessed on a three-point Likert scale (agree, uncertain and disagree) while the second section on a five-point Likert scale (never, rarely, sometimes, often and routinely). The questionnaire had been pretested and modifications made to improve the validity of responses.

In order to identify the main aspects (latent variables) that affected the consumption of GM foods in high school students, the data were analysed by means of Factorial Analysis (the principal component analysis to search the factors was used), performed using the method of minimum residual (MINRES) (Harman, 1960). This analysis was conducted on the polychoric correlation coefficient matrix because data collection were expressed by ordinal variables (Likert scale with 3 and 5 ordinal categories). The MINRES procedure, equivalent to an unweighted least squares method, was used because it does not require distributional assumptions and it is very robust. The data were analysed using PRELIS (Version 2.54 – <www.ssicentral.com/lisrel/techdocs/IPUG.pdf>). The criterion used to determine the number of factors was based upon the derivation of factors associated with an eigenvalue greater than one.

For examining the behavioural process, that drives consumer's GM foods consumption, a scheme via SEM was elaborated. In SEM we distinguish between covariance-based techniques, as represented by linear structural relations (LISREL) (Joreskog, 1970), and variance-based techniques, of which the partial least squares (PLS) path modeling (Wold, 1975) is the most prominent representative. In the paper we have chosen the PLS, performed by SmartPLS (Version 2), because it has less stringent assumptions for the distribution of variables and error terms, it is able to work with both reflective and formative measurement models. PLS path models are formally defined by two sets of linear equations called inner and outer model, respectively. The inner (or structural) model specifies the relationships between unobserved or latent variables (LVs), whereas the outer (or measurement) model specifies the relationships between a LV and its observed or manifest variables (MVs). PLS path modelling includes two different kinds of outer models: reflective and formative measurement models. In SEM framework, the focus of the research is mainly on the structural model rather than on the measurement model. In reality, the relationships between the LVs and the MVs should also be thought of as hypotheses that need to be evaluated in addition to the structural paths. Such measurement model misspecification can create measurement error, which in turn affects the structural model (Jarvis, MacKenzie, & Podsakoff, 2003). Therefore, in our research particular attention has been given to the construction and validation of the measurement models. Depending on the causal priority between the MV and the LV (Bollen, 1989), the first choice to take for measurement model specification is: formative or reflective. Four primary theoretical decision rules proposed by Jarvis et al. (2003) have been used to discover the model specification.

In the first rule the researcher should consider the theoretical direction of causality between each LV and corresponding MVs. In the second the researcher should analyse the interchangeability of the MVs, in another words the removal of an item does/does not change the essential nature of the underlying construct. The third and the fourth decision rules regard the presence of covariation among the MVs and the nomological net of the construct indicators. Next, to the aim to corroborate the suitability of the chosen model some empirical tests have been performed. In our research we chose for all measurement model the formative specification, therefore our SEM is a full formative model. PLS path modelling does not provide any global goodness-of-fit criterion. So, the evaluation model takes place in a two-step process: the assessment of the outer and inner models. At the beginning, the model assessment focuses on the measurement models. In formative measurement model framework traditional validity assessments and classical test theory do not apply to the MVs (Bollen, 1989). A first examination of the construct validity of formative indicators should use theoretic rationale and expert opinion (Rossiter, 2002). Next from empirical point of view, in order to evaluate the construct validity a researcher needs of assessing convergent and discriminant validity of the involved measures. The former is when the measures for a construct are more correlated with one another more than measures of another construct, whereas the latter is when the measures can be isolated into distinct constructs (Petter, Straub, & Rai, 2007). But, with formative constructs no restriction exists on the magnitude of correlations among indicators, so that there are no definitive rules on between vs within construct correlations (Bollen & Lennox, 1991). For that latter reason the classic methods of achieving construct validity may not be applied to formative factors. Therefore we have chosen the MINRES method applied on the polychoric correlation matrix of the MVs, particularly we considered the correlation between items/factors for the evaluation of convergent validity and the correlation matrix among factors for the evaluation of discriminant validity. To complete our analysis of the convergent validity we considered for each estimated convergent validity and the correlation matrix among MVs for the evaluation of discriminant validity. To complete the analysis of the convergent validity we considered for each weighs magnitude estimation, linking the question/item to the relative corresponding LV, the bootstrapping results for assessing the statistical significance.

The reliability evaluation for formative measurement model needs to examine the error term for each LV, since the measurement error is assessed at construct level and not at indicator level as it happens for reflective measures instead. This type of error is not random error, as a matter of fact it tells information about the items already existing in the model and it may be quite informative only regarding items not incorporated in the model. So, the only way to overcome measurement error is to design it out of the study before collecting the data. Particularly, it is possible to eliminate the error term or capturing all possible causes on the construct or specifying the focal construct in such a way as to capture the full set of indicators (Diamantopoulos, 2006). Both approaches legitimately exclude the error term ($\zeta = 0$). Although elimination of the error term may sometimes be possible, in most instances, error would have to be incorporated in the formative model specification and no simple way exists to empirically assess it. A first analysis can be done considering the magnitude of the error term and the statistical significance of indicator coefficients. Particularly if it is small and all indicator coefficients are significant, then it could be concluded that the formative measure is accepted. If the error term is large, some aspects of the construct are not adequately captured (in case of statistical significance of indicator coefficients) or the construct should be redefine (in case of many indicators are not significant) (Diamantopoulos, 2006).

Another approach for the assessment of measurement error in formative models is based on the tetrad test (Coltman, Devinney, Midgley, & Veniak, 2008). A "tetrad" refers to the difference between the products of two pairs of error covariances. The test is based on nested vanishing tetrads that are implied by comparing two theoretical measurement models (Spearman & Holzinger, 1924). In the case of a reflective model, the null hypothesis is that the set of non-overlapping tetrads vanishes. In simpler terms, when the intercorrelations between pairs of errors are compared, they should tend to zero. The tetrad test confirms whether or not this is true. The tetrad test is a confirmatory procedure that should not be used as a stand-alone criterion for distinguishing formative from reflective models. Another measurement issue that researchers need to check in formative measurement models is collinearity. The presence of highly correlated indicators will make estimation of their weights in the formative model difficult and result in imprecise values for these weights. In order to check the degree of multicollinearity among the formative indicators the variance inflation factor (VIF) has been computed (Sen & Srivastava, 1990). Reliable and valid outer model estimations allow an evaluation of the inner path model estimates. The essential criterions for this assessment are the statistical significance of the path coefficients and the coefficient of determination (R^2) of the endogenous LV.

3. Results and discussion

A total of 2122 public high school students were administered a questionnaire. Students gender distribution was not markedly different (51.6% male), nor was their age distribution, as 49.01% and 35.87% of students were respectively 18 and 17 years old; only 259 students (12.4%) were 19 years old.

Questions and answers about GMO and GM foods are presented in Table 1. More than 78% of students know the definition of GMO and that a GMO is any organism whose genetic patrimony has been modified by man (83.9%). More than 47% of them stated that GMO production reduce the number of vegetables species with a consequent damage to the world's nourishment potential. The students' behaviours showed that a relevant percentage never (41.9%) or rarely (30.9%) eat GM foods (*Q*13) and that 66% of them certainly do not advise the consumption of GM food (*Q*17). At comparable costs, more than 59.2% of student prefer to buy organic food than GM food (*Q*15), and 47% prefer organic foods even if they are more expensive (*Q*16). However no more than 4% of students buy GM food routinely (*Q*14). Compared to the survey carried out in 2002 in Northern Italy, the results of this survey shown a higher level of knowledge on GM foods (Soregaroli et al., 2003). In the present study almost 83% of responders know the meaning of the GMO acronym and that it refers to artificial DNA transfer, while in Boccaletti's survey the percentage was 65%. Presumably, this could be explained by the students's cultural level and by the different geographical area of study. Anyway, Boccaletti et al. found a higher degree of knowledge on GM foods in the 2002 survey compared to his previous survey, carried out in 1999 in the same area (Boccaletti and Moro (2000)).

The data collection have been analysed by a Factorial Analysis using the MINRES method. In order to identify the main aspects that influence GM food consumption among Italian high school students, a five-factor solution is derived (Table 2). The five factors account for 54% of the total variance and the communalities are generally respectable. This means that much of the variance of the original data has been explained for by these extracted components. The five factors are largely independent of one another, as demonstrated by low correlation among factors (Table 3).

The first factor (*F*1), associated with six variables (*Q*12, *Q*13, *Q*14, *Q*15, *Q*16, *Q*17), includes all the consumption aspects: the diffusion (*Q*12), the action to eat/buy (*Q*13, *Q*14), the comparison with organic foods (*Q*15, *Q*16) and the promotion to other people (*Q*17).

Table 1
Questions and answers on GM foods.

No	Variables	Agree (%)	Uncertain (%)		Disagree (%)	
Q1	Is "Organism" a living organism with genetic code?	78.7	15.2		6.1	
Q2	Have fruits and vegetables a genetic code?	57.6	25.4		17.2	
Q3	Can the organisms modify their genetic patrimony in the course of generations?	50.1	27.3		23.6	
Q4	Is GMO every organism whose genetic patrimony have been modified naturally?	10.9	15.8		73.3	
Q5	Is GMO every organism whose genetic patrimony have been modified from the man?	83.9	12.4		3.7	
Q6	About the GMO commercialization, is the European normative more severe than extra-European normative?	25.3	62.8		11.9	
Q7	Does the European normative specify that it must label only food products with more 0.9% GMO contained?	26.8	54.6		18.6	
Q8	Can the GM food consumption determine health injury in future?	50.6	38.6		10.8	
Q9	Can the GM food consumption cause change of the consumers DNA?	8.8	34.3		56.7	
Q10	Can the GMO production increase the formation of resistant microrganisms?	33.4	48.8		17.8	
Q11	Can the GMO production reduce the number of the vegetable species with a consequent nourishment world damage?	47.9	37.2		14.9	
Q12	Do you agree to the GMO diffusion?	13.4	32.7		53.9	
		Routinely (%)	Often (%)	Sometimes (%)	Rarely (%)	Never (%)
Q13	Do you eat food derived from genetically modified organisms?	5.6	5.5	16.1	30.9	41.9
Q14	Do you buy foods containing products derived from genetically modified organisms?	4.2	6.2	19.3	31.1	39.2
Q15	At the same cost, do you always choose a natural organic food compared to a food derived from genetically modified organisms?	59.2	11.4	11.3	9.2	8.9
Q16	At a higher cost, do you always choose a natural organic food compared to a food derived from genetically modified organisms?	47.8	15.7	14.9	11.9	9.7
Q17	Do you suggest to other people using products containing foods derived from genetically modified organisms?	4.6	3.3	8.6	17.6	65.9

Table 2
MINRES Factor analysis for five Factors. Association between Factors and Questions, all significant values are shown in bold type.

No. questions	Factor1	Factor2	Factor3	Factor4	Factor5
1	0.17	−0.28	−0.03	**0.57**	0.23
2	0.21	−0.40	−0.08	**0.52**	0.13
3	0.09	−0.24	−0.04	**0.40**	−0.30
4	−0.48	**0.50**	−0.21	0.21	0.06
5	0.46	−**0.47**	0.19	−0.07	−0.09
6	0.03	0.15	−0.24	0.09	−**0.55**
7	0.05	0.07	0.18	−0.05	−**0.68**
8	0.05	0.49	**0.52**	0.16	0.08
9	−0.26	0.22	**0.27**	0.37	0.01
10	0.10	0.29	**0.38**	0.37	−0.18
11	0.24	0.35	**0.39**	0.04	0.09
12	−**0.45**	−0.22	−0.21	0.13	−0.19
13	−**0.56**	0.02	−0.05	−0.03	0.16
14	−**0.58**	−0.03	−0.06	0.05	0.07
15	**0.57**	0.34	−0.47	0.09	0.07
16	**0.54**	0.45	−0.47	0.06	0.04
17	−**0.53**	−0.01	−0.27	0.10	−0.11

So that, the corresponding latent variables (*F*1) can be conceptualized as a formative construct called "GM food consumption". The third factor (*F*3) is associated with four variables (*Q*8, *Q*9, *Q*10 and *Q*11) and is defined as "Health Consequences". The Health Consequences does not exist as an independent entity. Rather, it is a composite measure of direct consequences on the man's health, indirect consequences on the man's health and environmental consequences for GM food consumption. It includes: the students agreed that the GM food consumption can determine health injury in future (direct effect on the man), the GMO production increase the formation of resistant microorganisms (indirect effect on the man) and GMO production reduce the number of the species vegetables with a consequent nourishment world damage (direct effect on the vegetable). The second factor (*F*2) is associated with two variables regarding the knowledge of GMO (*Q*4 and *Q*5), particularly if GMO are every organism whose genetic patrimony have been modified from the man or naturally. This relationship can be conceptualized as a formative construct named "GMO Knowledge". The fourth (*F*4) and the fifth (*F*5) factors are associated with *Q*1, *Q*2, and *Q*3 and *Q*6 and *Q*7 respectively and are defined as "Biological Knowledge" and "Law Knowledge".

For these last three cases (*F*2, *F*4 and *F*5) the relationship between the factor and the variables can be seen as a formative relationship, because the LVs regard "declarative knowledge" (Yi & Davis, 2003). As a matter of fact, the considered MVs are characteristics of the construct rather than manifestations and the construct can be viewed as an index. In our case we have chosen a formative model specification for all the constructs because it seemed more plausible to assume each measurement model as an index rather than as a scale. Moreover for each measurement model we observed that each variable was not interchangeable, in fact if we eliminate an indicator from the measurement model we became

Table 3
MINRES Correlation matrix among factors.

	Biological Knowledge	GM Foods Consumption	GMO Knowledge	Health Consequences	Law Knowledge
Biological Knowledge	1				
GM Foods Consumption	−0.102608	1			
GMO Knowledge	−0.152285	0.216724	1		
Health Consequences	−0.013557	−0.26351	−0.15812	1	
Law Knowledge	−0.007527	−0.043011	0.053466	0.024524	1

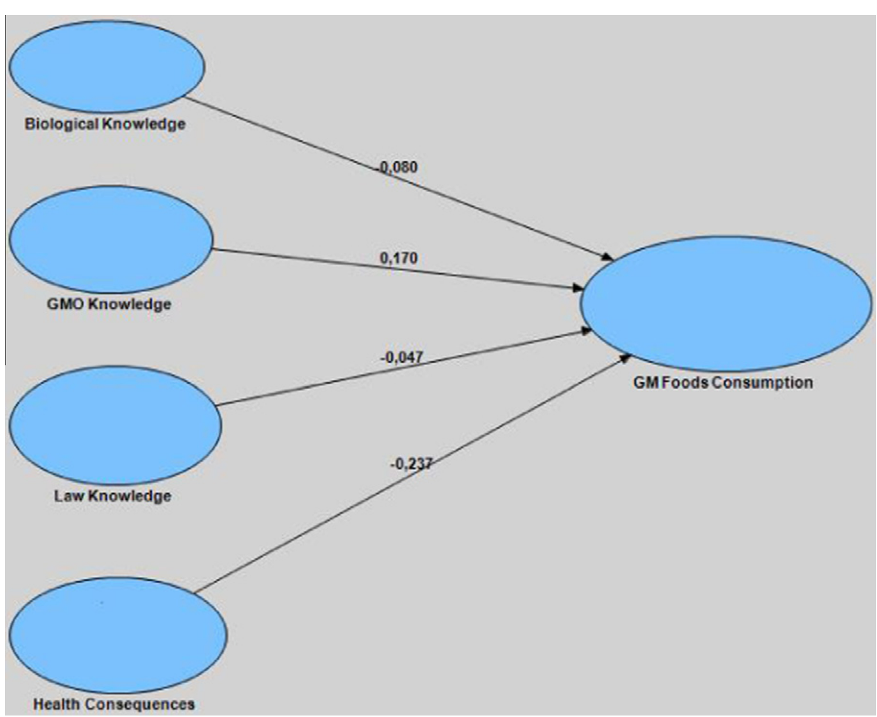

Fig. 1. Path diagram results for the consumption of genetically modified (GM) foods in Italian high school students.

Table 4
Test of criterion validity for measurement model measured formatively.

	Original sample (O)	Sample mean (M)	Standard error (STERR)	T Statistics (|O/STERR|)
Biological Knowledge				
Q1	0.6496	0.5563	0.2824	2300
Q2	0.4548	0.4848	0.1892	2404
Q3	0.4156	0.4561	0.1838	2261
GMO Knowledge				
Q4	0.7704	0.7323	0.39	1975
Q5	−0.3399	−0.4839	0.1949	1744
Law Knowledge				
Q6	0.9941	0.6286	0.3178	3128
Q7	0.0736	0.6519	0.3059	0241
Health Consequences				
Q8	0.3817	0.4588	0.2198	1737
Q9	−0.7496	−0.5428	0.2608	2874
Q10	0.1459	0.2113	0.0763	1912
Q11	0.5069	0.4258	0.2546	1991
GM Foods Consumption				
Q12	0.3762	0.3523	0.1861	2021
Q13	0.2382	0.3107	0.1254	1899
Q14	−0.0175	−0.3467	0.255	0069
Q15	−0.731	−0.4979	0.3171	2305
Q16	0.1523	0.2573	0.0886	1719
Q17	0.3273	0.3859	0.1925	1700

Table 5
Test of criterion validity for gm foods consumption measured formatively (Structural Model).

GM Foods Consumption	Original sample (O)	Sample mean (M)	Standard error (STERR)	T Statistics (|O/STERR|)
Biological Knowledge	−0.0803	−0.2286	0.0443	1.927
GMO Knowledge	0.1696	0.2276	0.0880	1.9263
Health Consequences	−0.2366	−0.2945	0.0869	2.7223
Law Knowledge	−0.0469	−0.1635	0.0693	0.6769

Table 6
Tetrad test results for Formative Indicators.

	Number of indicators	Chi 2 (Df)	Df	Significance	Implication
Biological Knowledge[a]	3	8.2	2	<0.01	Formative
Health Consequences	4	9.8	2	<0.01	Formative
GM Foods Consumption	6	22.4	9	<0.01	Formative

[a] As this construct had three indicators. a fourth – unrelated-indicator was added to the test. This follows the advice of Bollen anf Ting (2000).

different the conceptual domain of the construct. In a nutshell, each measure captures differing aspects of the LV.

For each formative LV, the construct validity has been analysed by means the MINRES method applied on the polychoric correlation matrix of the MVs. Both the evaluation of convergent validity (Table 2), both the evaluation of discriminant validity (Table 3) are resulted acceptable.

Starting from these results we hypothesized that GMO Knowledge, Health Consequences, Biological Knowledge and Law Knowledge were exogenous LVs, while GM food consumption was an endogenous LV. The relationship and the results of the SEM are summarized in Fig. 1. As can be seen, the results show that GM food consumption depends, above all on the perception of the Health Consequences (−0.237). Especially students who consider the consumption of GM foods dangerous do not purchase them. The second latent factor that influences the consumption of GM foods is GMO Knowledge (0.170), the student who knows GMOs eats GM foods. The results show that the influence of Law Knowledge and Biological Knowledge on the GM foods consumption is negligible (−0.047 and −0.080, respectively).

In Table 4 are reported the estimated indicator weighs magnitude linking the MV to the corresponding LV and all the bootstrapping results for assessing the significance of these weighs (empirically convergent validity). These results added further support to the formative model, as the LVs predict GM Food Consumption well and the majority of outer item coefficients (Table 4) and inner path coefficients have the right signs and adequate t-statistics (Table 5). The exception is Law Knowledge, which, although the formative model seemed alright appropriate, from the individual indicator perspective, does not predict GM Food Consumption. In any case we chose to keep non significant items to preserve content validity (Bollen & Lennox, 1991).

Regarding the measurement error and collinearity, we also apply the vanishing tetrad test to each construct. This test rejects the reflective model for all the three constructs, lending added support to the formative view taken here (Table 6). The magnitude of error term evaluation for measurement model has been done according to the following guidelines: $f2$ values of 0.02 ($R2$ = 0.0196), 0.15 ($R2$ = 0.13), and 0.35 ($R2$ = 0.26) refer to a small, moderate, and large effect size, respectively (Diamantopoulos, 2006). In our case all the error term are small magnitude. In order to evaluate the collinearity, the VIF was computed for each variable (Table 7). Multicollinearity did not seem to pose a problem, the maximum VIF came to 2.309, which is far below the common

Table 7
Variance inflation factor (VIF) for each variable.

Item	Factor1
Q1	1.305
Q2	0.904
Q3	1.504
Q4	2.309
Q5	1.974
Q6	1.506
Q7	0.969
Q8	2.301
Q9	0.867
Q10	0.754
Q11	1.257
Q12	0.909
Q13	0.917
Q14	1.286
Q15	1.054
Q16	1.417
Q17	0.857

cut-off threshold of 10 However, both theoretical and empirical analysis shows that the formative assumption is satisfactory. The evaluation of the goodness of the fit is substantial (R^2 = 0,69).

The results show that those who knows GMO eats GM foods, while the students who consider the consumption of GM foods dangerous to men's health, do not purchase them. In the latter case if we analyse jointly the variables defined as Health Consequences and as GMO Knowledge we can observe that there are many students in this status: limited knowledge of GMO and worried about future health injury caused by GM foods consumption. Therefore, we could suppose that little GM food consumption among students worried about the Health Consequences of its use depends on their limited GMO Knowledge. Considering the formative measurement model of GM Food Consumption we can observe that this index includes all the consumption aspects: the diffusion, the action to eat/buy, the comparison with organic foods and the promotion to other people. All these aspects are statistically significant as shown by the bootstrapping results (Table 4), particularly the aspects more influents are the diffusion and the comparison with organic foods. In other words people wants to know the advantages of GM food respect to the organic foods.

If we analyze together the results of the SEM and the students' responses to the questionnaire (Table 1), we can note that, after the law-related aspects, the variables that represent more "uncertainty" are Q8, Q9, Q10 and Q11 (latent variable Health Consequences). This remark allows us to hypothesize that students, uncertain about the Health Consequences of GM food consumption, prefer to abstain from the use of GM foods. Moreover, more than half of students do not know the European legislation on GMOs, which implies that the link between the latent variables Law Knowledge and GM Foods Consumption is not statistically significant. To verify a possible relationship between the two constructs, more targeted education on the legislative aspects is needed.

Finally, it is fair to say that the main limitations of this study, and other similar studies, are the sample classification and the very limited geographical coverage. However, our findings unravel key information on the consumption of GM foods among Italian high school students.

4. Conclusions

This study reports that a relevant percentage of Italian high school students never (39.9%) or rarely (30.8%) eat GM foods and a lot of them do not recommend the consumption of GM food (66%). The proposed SEM represents a rapid, practical and solid instrument to interpret the drivers of GM foods consumption. This full formative model, supported by the large sample size of the research and the results of statistical methods, is able to conceptualize GM foods consumption as an endogenous latent variable. It, mainly, depends on the degree of GMO Knowledge and on the impact of the GMO on the men's health and on the environment. However, a high percentage of Italian students are not informed of the Health Consequences of GM food consumption and consequently prefer not to buy them because technological modification of food and food production evoke a negative response among consumers, especially in the absence of good communication on risk assessment efforts and cost/benefit evaluations. Particularly, the main Health Consequences underlined by the students are indirectly observed on the men's health (genetic mutations) and directly observed on the environment through the reduction of the vegetables species. Therefore, in order to inform people, it could be a good idea to realize a specific international system for the rigorous evaluation of human health and environmental consequences for GM foods consumption. This evaluation system, conveniently launched, could be a very useful instrument to instruct the population about GM foods effects, so they have an aware role in relation to the choice of GM foods consumption.

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