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# Individual Attitudes on Food Quality and Safety: Empirical Evidence on EU Countries\*

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## Abstract

What are the determinants of individual attitudes on food? Focusing on EU citizens, we provide a first systematic answer to this question by using the 2010 Eurobarometer Special Survey on risk perception. Since respondents are asked about various features of food consumption, we check to what extent a specific demographic or socio-economic variable is differentially correlated with those features. We find that women show a higher risk aversion than men, given their attention on freshness, calories and safety. The same holds for more educated, higher income individuals and respondents living with children. Occupational status does not play a relevant role in food preferences, except for prices. We deal with potential response bias by using as dependent variable the difference between each response on a given food attribute and the average response on the other ones. We also perform a principal component analysis to identify the underlying patterns which drive individual responses.

*Keywords:* individual attitudes; food safety; food quality; Eurobarometer 73.5 Special Survey on Risk Perception

*JEL classification:* I18, Q18, K32

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# 1 Introduction

Food quality and food security are prominent concerns for citizens and public health authorities alike. Despite the relevance of the security aspect, food does involve a large set of dimensions, which citizens as rational or boundedly rational consumers take into account. On top of its basic subsistence function, food has a distinct social dimension, and it is assessed on the basis of its organoleptic qualities, price and calories intake. Within this multidimensional context it is natural to focus on the possibly time and individual-specific weights of those different aspects.<sup>1</sup>

From a policy perspective, public opinion –as an aggregate of individual attitudes– might pull or constrain public authorities in their decisions (ERIKSON ET AL., 1989; RODRIK, 1995). An increased concern of citizens about food security might induce public health authorities to step up or refocus their efforts, while a lack of concern –or a larger weight attached to other features of food– might exert an opposite effect. Hence, it is particularly important to investigate the determinants of individual-level attitudes on food characteristics.

The previous literature on food quality and security has focused on very specific aspects thereof, such as signaling and labeling strategies (SPORLEDER & GOLDSMITH, 2001 and VERBEKE, 2005b) and the willingness to pay for country of origin labeling (SCHUPP & GILLESPIE, 2001; DICKINSON & BAILEY, 2002; LOUREIRO & UMBERGER, 2003, 2005, 2007). To the best of our knowledge, there is no previous systematic work on the overall determinants of individual preferences about food and its main features.<sup>2</sup> This is the route we take here, which is consistent with the Lancasterian theory of consumption (LANCASTER, 1966). According to this approach, the traditional representation of consumers' utility as a function of *goods* is just the reduced form of a more primitive representation whereas consumers directly care about the intrinsic properties of goods themselves. This is a very abstract approach, which should encompass all features of consumption that enter into the primitive utility function of individuals.

We focus instead on a broad but specific area of consumption, i.e. food, by looking at its main dimensions, which are the basic subsistence function (hunger satisfaction), physical properties (freshness, calories intake and safety) and socio-economic attributes (conviviality and prices). We exploit the 2010 Eurobarometer 73.5 Special Survey on Risk Perception (EUROPEAN COMMISSION, 2010), realized across the 27 European countries by interviewing about 27,000 citizens. The aim of this paper is to explore how various

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<sup>1</sup>GRUNERT (2005) points out that food quality and safety are characterized by an objective and subjective dimension. The objective dimension is related to the physical features of the product, or –in the case of safety– to the scientific information on the risks of consuming some types of products. On the other hand, the subjective sphere is directly related to what consumers perceive in terms of quality and safety.

<sup>2</sup>See GRUNERT (2005) for a qualitative analysis of these issues. VERBEKE (2005a) investigates the determinants of attitudes of Belgian citizens about functional food.

demographic and socio-economic variables help predict the respondents' perception about the six dimensions of food consumption mentioned above. Our multivariate analysis indicate that preferences are generally influenced by gender, education, income, marital and occupational status.

We find that, in line with the literature (see GUSTAFSON, 1998 and FINUCANE ET AL., 2000), women show an higher risk aversion than men, given their attention on freshness, calories and safety. On the other hand, men are more concerned on the basic subsistence function of food and its social dimension. More educated and higher income individuals are especially interested in freshness and calorie content, while they care significantly less about the price dimension. As in VERBEKE ET AL. (2000) and VERBEKE (2005a), individuals living with children are more quality conscious and show a higher risk aversion. Regarding marital status, married individuals are more interested than singles about all food dimensions but the subsistence one. Finally, the occupation of an individual is typically not correlated with food preferences, with the only exception of the price dimension.

As underlined by BERTRAND & MULLAINATHAN (2001), biases due to the response process may affect regression analysis of survey data. Following GRASSI & PUGLISI (2008) we deal with this issue by generating new dependent variables, which are computed by subtracting from each of our six answers regarding food preferences the mean of the answers to the other five questions. In a nutshell, this would allow us to take into account the individual-specific tendency of respondents to agreeing with the questions being posed. With respect to our baseline results, we generally find no discernible changes when we look at the relationships of food attitudes with age, income and education. On the contrary, we find an upward bias for the children variable, the female dummy and the marital status dummies. On the other hand, there is a downward bias for the geographical dummies, and for several occupational dummies. Finally, we perform a principal component analysis on our six food dimensions, and focus on the two main underlying factors. Interestingly, the first factor displays positive loadings on all six survey questions, while the second factor has positive loadings on hunger satisfaction and the social dimension of food, and negative loadings on calories and safety.

The paper is organized as follows: Section 2 surveys the related literature. Section 3 presents the data, while Section 4 displays the results, with some robustness checks revolving around response bias issues. Section 5 concludes.

## 2 Literature Review

Provision, consumer demand and consumer perception are the three research areas on food quality and safety that are most investigated in the literature.

The first research area refers to the supply side and studies how the implementation of signaling and labeling strategies could be a good answer to market failures. As ERDEM &

SWAIT (1998), HOBBS (2003) SPORLEDER & GOLDSMITH (2001) and VERBEKE (2005b) underline, asymmetric and imperfect information between sellers (who know almost everything about their products) and consumers (whose knowledge is on the other hand limited) are crucial issues within this field. Furthermore, improvements in the quality and safety of products might exert an effect on the organization of agricultural production and on firms' competitiveness (see, for example, CASWELL ET AL.; 1998, SPORLEDER & GOLDSMITH; 2001 and MARTINO & PERUGINI; 2006).

Consumer demand for quality and safety is widely studied in the literature. This field of research is focused on consumers' willingness to pay for improvements in product quality and safety, as certified in terms of food traceability and origin labeling. A large body of studies investigates the importance for U.S. consumers of a mandatory country-of-origin labeling and of traceability of consumption products such as meat. For example, SCHUPP & GILLESPIE (2001), DICKINSON & BAILEY (2002) and LOUREIRO & UMBERGER (2003, 2005, 2007) find that American consumers consider indication of origin as a good signal of quality and safety.<sup>3</sup> A comparable attention for meat traceability and other characteristics is found in a multi-country setting by ROOSEN ET AL. (2003) and DICKINSON & BAILEY (2005).<sup>4</sup> More recently, AWADA & YIANNAKA (2012) provide a more general, theoretical framework regarding country-of-origin labeling.

Consumers also express awareness about genetically modified food, as found by BOCCALETTI & MORO (2000) and BURTON ET AL. (2001) for Italy and UK respectively. Furthermore, KANEKO & CHERN (2005) show a similar aversion in American consumers for genetically modified oil, cornflakes and salmon. On the contrary, according to KUCHLER ET AL. (2010) American demand of Southeast Asian shrimps was not influenced by the introduction of mandatory country-of-origin labeling in 2002.<sup>5</sup>

All these contributions generally make use of data gathered by mail surveys, face-to-face interviews, telephone interviews or laboratory auctions and choice experiments. In mail surveys or face-to-face and telephone interviews, households in different geographical areas are invited to express their preferences in terms of different properties of a specific food. For example, in the case of beef, the most investigated features are marbling, tenderness and the use of growth hormones and GM corn in the cattle diet (see, for example, DICKINSON & BAILEY, 2002 and 2005 and LUSK ET AL., 2001, 2003). Furthermore, these studies reveal how consumers' perceptions about food products are generally influenced by personal characteristics such as gender, age, marital and occupational status. In the case of laboratory auctions and choice experiments, a market research company

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<sup>3</sup>One might argue that the attention devoted to those issues in the U.S. is largely explained by its less strict legislation on mandatory labeling of food products –and especially meat– *vis à vis* the EU legislation (BUREAU & VALCESCHINI 2003).

<sup>4</sup>TONSOR ET AL. (2009) study the shape, in terms of convexity or concavity, of the willingness to pay for food certification by Canadian, Japanese and Mexican consumers.

<sup>5</sup>On this point, see also JONES ET AL. (2008). They find that shrimps demand is fairly stable, despite the conflicts in the seafood market between American producers and their foreign competitors.

recruits and studies a representative sample of the population which consumes a specific product (see, for example, LUSK ET AL.; 2001, DICKINSON & BAILEY; 2002 and 2005, LOUREIRO & UMBERGER; 2007).

Finally, a new strand of literature is focused on consumer perception of quality and safety. As underlined by GRUNERT (2005), this field of research is in between supply and demand, as it aims at explaining how consumers' perception of food quality and safety –controlling for prices– does influence their choices. The role of socio-demographic, cognitive and attitudinal factors in consumption is, for example, studied by VERBEKE (2005a). This empirical strategy would also allow to capture the impact on consumer preferences of dangerous events such as the Avian flu or the BSE contagion. BURTON & YOUNG (1996) study the short and long-run effects of news about BSE on consumption expenditure choices. In a similar vein, HERRMANN ET AL. (1997) and VERBEKE (2001) study the Alar crisis in the U.S. and the impact of the dioxin crisis in Belgium on consumers' perception of meat.

We contribute to this expanding literature by investigating the correlates of individual attitudes about various food characteristics for a large sample of respondents. On the negative side, we cannot analyze consumers' willingness to pay for specific food attributes. On the positive side the large set of questions being asked within the Eurobarometer Special Survey allows us to check whether individual and country level variables are differentially correlated with attitudes about various food characteristics, such as price, quality and security.

### 3 Data

We use Eurobarometer 73.5 edition data, the Special Survey on Risk Perception. This survey is periodically conducted by TNS Opinion & Social under request of the European Food Safety Authority (EFSA). A representative sample of 26,691 individuals of each Member State, aged 15 years and above, is considered. Data have been collected by face-to-face interviews in mother tongue at consumers' homes across the 27 European countries, during June 2010 (see EUROPEAN COMMISSION, 2010).

The dataset is multi-stage, random probability sample, with a stratification realized by individual unit and type of geographical area. All European countries are considered.<sup>6</sup> A national weighting procedure, is carried out for all countries surveyed, with the purpose of making a robust comparison between the sample and the Universe (EUROPEAN COMMISSION, 2010). The weighted sample would match the Universe along the following variables: gender, age, region and size of locality. Respondents are invited to express

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<sup>6</sup>The sampled countries are: Belgium, Bulgaria, Czech Republic (CZ), Denmark, Germany, Estonia, Greece, Spain, France, Ireland, Italy, Republic of Cyprus, Lithuania, Latvia, Luxembourg, Hungary, Malta, the Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Finland, Sweden and the United Kingdom.

their perceptions and concerns about food and food-related risks. Moreover, the survey investigates citizens' awareness about unsafe or unhealthy food, and the personal and public-level efforts to avoid food-related risks. Public confidence in information sources is also analyzed.

We consider the following question: 'To what extent do you associate food and eating with each of the following?'. The six associated situations are respectively: 'Satisfying your hunger', 'Enjoying a meal with friends or family', 'Selecting fresh and tasty foods', 'Looking for affordable prices', 'Checking calories and nutrients such as fat and sugar, etc.', and 'Being concerned about the safety of food'. The possible answers are: 'To a large extent', 'Somewhat', 'Not very much', and 'Not at all'.<sup>7</sup> We have recoded the respondents' answers in order to associate the minimum value of a 1-4 scale to 'Not at all' and the maximum value to 'To a large extent'. We take these answers as proxies of individual attitudes toward food characteristics, and use them as dependent variables in our empirical analysis. They are indicated in our regressions according to the following items:  $Hunger_i$ ,  $Conviviality_i$ ,  $Freshness_i$ ,  $Price_i$ ,  $Calories_i$  and  $Safety_i$  (see Table 1).

Following the existing literature (ROOSEN ET AL., 2003; LOUREIRO & UMBERGER, 2003, 2005 and TORSOR ET AL., 2009), we extract from the Eurobarometer 73.5 survey demographic and socio-economic variables which we then use as controls in our multivariate analysis. More specifically, we create a series of dummy variables to indicate: (i) the gender of the respondent ( $Female_i$ : 1 if she is a female, 0 otherwise); (ii) the place where the respondent lives ( $Rural_i$  for rural area,  $Small_i$  and  $Large_i$  for small or large city respectively); (iii) the respondent's marital status ( $Married_i$ ,  $Partner_i$  if he/she is single but living with a partner,  $Single_i$ ,  $Divorced_i$  and  $Widow_i$ ); and (iv) the employment status of the respondent ( $Selfemployed_i$ ,  $Manager_i$ ,  $Whitecollar_i$ ,  $Manual_i$  if he/she is a manual worker,  $Unemployed_i$ ,  $Houseperson_i$ ,  $Student_i$ ,  $Retired_i$ ).

We also include the age of the respondent ( $Age_i$ ) which is coded according to a 1-4 ordered scale.<sup>8</sup> The respondent's socio-economic position ( $Income_i$ ) is measured on an increasing [1, 10] scale. Given the lack of an objective income classification along a discrete scale of income thresholds (see, for example, ROOSEN ET AL., 2003 and LOUREIRO & UMBERGER, 2003, 2005), we use this variable as a proxy for household income. We consider the family composition of the respondent ( $Children_i$ ), a variable which takes values from 0 to 4,<sup>9</sup> and the respondent's years of schooling ( $Schooling_i$ ). We also control for the frequency of internet use at home ( $Internet_i$ ) as an additional proxy for the education level.<sup>10</sup>

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<sup>7</sup>We exclude from the analysis the answer 'Don't know'.

<sup>8</sup>The variable takes on a value of 1 for those who are between 15 and 24 years old, 2 for those between 25 and 39, 3 for those between 40 and 54, and 4 for respondents aged 55 and above.

<sup>9</sup>More specifically, we are considering the number of children less than 10 years living in the household. A value of '4' stands for four children or more.

<sup>10</sup>Regarding frequency of internet use, we recoded the original variable in the dataset, so that higher values correspond to a more frequent use. The variable thus ranges from 1 (never) to 7 (everyday). We



Summary statistics of all variables are reported in Table 1.

Table 1 near here

On average, the most important concern of respondents is the quality and freshness of food, while the social and the hunger satisfaction components rank second and third, respectively, albeit with a narrow gap. The price dimension is the fourth in rank, while the safety and the calorie components are the fifth and the sixth one. So, at least on average, EU citizens do not seem to attach a relatively large weight to food safety.

## 4 Empirical strategy and results

### 4.1 Baseline specification

We estimate the following linear regression by OLS:

$$Y_i = \beta_0 + \beta_1 Female_i + \beta_2 Age_i + \beta_3 Income_i + \beta_4 Children_i + \beta_5 Education_i + \beta_6 Community_i + \beta_7 Marital_i + \beta_9 Occupation_i + \mu_c + \epsilon_i, \quad (1)$$

where the subscript  $i$  is referred to the  $i$ -th respondent.  $Y_i$  is alternatively  $Hunger_i$ ,  $Conviviality_i$ ,  $Freshness_i$ ,  $Price_i$ ,  $Calories_i$  and  $Safety_i$ . In order to save space,  $Education_i$  refers to the two variables ( $Schooling_i$  and  $Internet_i$ ) we use as proxies of the education level of each respondent.  $Community_i$  indicates the set of dummies related to the place where respondents live ( $Rural_i$ ,  $Small_i$  and  $Large_i$ ); analogously,  $Marital_i$  and  $Occupation_i$  refer to the dummies related to marital status ( $Married_i$ ,  $Partner_i$ ,  $Single_i$ ,  $Divorced_i$  and  $Widow_i$ ) and to the occupation of each respondent ( $Selfemployed_i$ ,  $Manager_i$ ,  $Whitecollar_i$ ,  $Manual_i$ ,  $Unemployed_i$ ,  $Houseperson_i$ ,  $Student_i$  and  $Retired_i$ ).<sup>11</sup>  $\mu_c$  is a country (or region)-specific effect and  $\epsilon_i$  is the error term. In order not to inflate the precision of our estimates, following BERTRAND ET AL. (2004) we conservatively cluster the standard errors at the country (or region) level.

Table 2 near here

Our baseline results are shown in Table 2. We find that women ( $Female_i$ ) are more interested than men in enjoying a meal with their friends or their families, and in selecting fresh and tasty food. Moreover, they carefully look for food with affordable prices and they pay more attention to food calories and nutrients. Finally, they are less focused than men on the basic function of food for subsistence, while they are very concerned about

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proceed in a similar way for years of schooling: this variable takes on the value of zero if the respondent studied till an age of 15, up to a value of three if he/she finished to study at an age of 26 or more.

<sup>11</sup>For additional details about the characteristics of these variables, see the previous section.



food safety.<sup>12</sup> If we order coefficients by size, worries about calories and safety respectively rank as first and second, i.e. those are the issues on which women put comparatively more attention than men.

In the literature, there is a large consensus about female consumers being more attentive about food purchasing, as in LOUREIRO & UMBERGER (2003, 2005) and VERBEKE (2005a). Furthermore, women attention toward food safety is probably connected with their stronger degree of risk aversion, as compared to men (see among the others GUSTAFSON, 1998 and FINUCANE ET AL., 2000). It is also in line with what found by CHATTOPADHYAY AND DUFLO (2004), who show that in Indian rural villages women as policy makers systematically devote more attention to the provision of safe public goods such as drinking water.

Hunger satisfaction and the social dimension of food appear to be very relevant issues for the youngsters, while food freshness, calories and safety are a matter of concern to old people. The aging process thus reasonably changes how consumers relate to food.<sup>13</sup>

At the same time, an increase in the income level is positively related to the evaluation of the social dimension of food and to the choice of fresh and low calories food. This is consistent with higher levels of income allowing consumers to more easily enjoy (and afford) food-related interactions and food characteristics, over and above its basic function for subsistence. Not surprisingly, hunger satisfaction and prices are instead the main worries of low income respondents. Our results are furthermore in line with LOUREIRO & NAYGA (2005), who find that higher levels of per capita income, calorie intake and female labor force participation are significantly associated with overweight problems in OECD countries.

Individuals living with children aged 10 and below are systematically more concerned about the price of food, its subsistence role and its safety. Those findings are in line with the previous literature: as underlined by DOSMAN ET AL. (2001), VERBEKE ET AL. (2000) and VERBEKE (2005a), parents are more quality conscious and show a higher degree of risk aversion.

We find that more educated people are especially interested in calories, in fresh and safe foods, while they are less concerned about prices. Also, more frequent internet use is significantly correlated with the social dimension of food.

The community dummies indicate that respondents living in rural areas are mildly less concerned about prices and calories than the excluded category of those living in large cities, while those living in small towns are mildly less worried about food safety.

Looking at marital status and taking singles as benchmark, we find that prices are a matter of additional concern to married individuals, those living with a partner and

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<sup>12</sup>In fact, hunger satisfaction is the only feature of food for which women show *less* consideration than men.

<sup>13</sup>Interestingly, looking for the socio-economic determinants of obesity, JOHANSON ET AL. (1999) and DOSMAN ET AL. (2001) find that age and being a woman are positively associated with healthy dietary habits.

those who are divorced. We also find that people who are married or living with their partner are significantly more interested in enjoying the social dimension of a meal and in selecting fresh and tasty food. Moreover, married people are systematically more focused on safe and low calories food.

Coming to occupational status and taking white collars as the excluded category, managers and retirees are less concerned about hunger satisfaction. Second, managers and manual workers are more interested in the social dimension of food, while the opposite holds for retirees. Third, people with different jobs do not appear to differ much among each other in the valuation of food freshness.<sup>14</sup> On the other hand, individual attitudes on the price dimension are strongly correlated with occupational status: more precisely, manual workers, unemployed individuals and housepersons are significantly more concerned with prices, while the opposite is true for self-employed individuals, managers and students.<sup>15</sup> The calories content of food is significantly less relevant to self-employed and unemployed individuals, and manual workers. Finally, self-employed individuals and students are less interested in food safety.

In our baseline specification we include country fixed effects, taking Italy as a benchmark. The estimated coefficients on those fixed effects are reported in Table 3 and show some interesting patterns.

Table 3 near here

First, individuals living in *all* countries other than Italy display a significantly lower attention toward the hunger satisfaction dimension. More precisely, citizens living in Portugal, Latvia, Slovenia and Estonia display the lowest average attention, while those living in Hungary, Bulgaria and Cyprus are the closest to Italian citizens.

Second, there are eleven countries whose citizens attach a larger weight to the social dimension of food than the benchmark category of Italian citizens. Citizens living in Denmark, Sweden, Cyprus, Ireland and Spain are those with the highest estimated coefficient. On the other side of the distribution, i.e. countries with negative coefficients, we have East European countries such as Romania, Lithuania and Poland.

Third, there are fifteen countries whose citizens are significantly more interested in the freshness dimension of food than the excluded category of Italian citizens, and only six with a lower estimated coefficient, but not a large one (in absolute value). Individuals living in Cyprus, Malta, Denmark, Sweden display the largest coefficient on the country dummies, while residents of Luxembourg, France and Romania display the lowest coefficients.

The pattern is somewhat reversed in the case of prices: there are only six countries whose citizens care more about this dimension than Italians. Those countries are Cyprus,

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<sup>14</sup>The only exception is a positive coefficient on self-employed individuals.

<sup>15</sup>Since our income variable is coarse, the manager and self-employed dummies are likely to capture individuals with higher income. On the other hand, one could argue that students are partly or wholly subsidized by their parents and thus less concerned about (food) prices.

Hungary, Spain, Romania, Ireland and Estonia. On the other side of the spectrum, citizens living in Denmark, Portugal, Netherlands and Sweden display the lowest attention to prices.

Coming to the calories dimension, there are thirteen (ten) countries whose citizens are more (less) interested than Italians. The countries with the average highest attention to calories are Cyprus, Spain, Austria and Greece, while those with the lowest attention are Lithuania, Latvia, Slovenia, Netherlands and Poland.

On food safety fifteen (eleven) countries display a higher (lower) attention than Italy: Cyprus, Spain, France and Finland show the highest coefficients, while Portugal, UK and Germany show the lowest.

Finally, Table 10 shows that our results are largely robust to introducing regional instead of country dummies.

## 4.2 Dealing with response bias

The dependent variables in the previous analysis are the original responses to the survey questions about food features. However, a large literature emphasizes that survey data are likely to be affected by biases due to the response process itself. BERTRAND & MULLAINATHAN (2001) underline two sets of shortcomings related to survey data. First, cognitive problems imply that question ordering can influence respondents' answers by inducing them to attach a larger weight to the aspect that is covered first. Second, other kinds of problems may be induced from response biases related to social desirability and from people's reluctance to admit the lack of attitude, which might induce respondents to try and make up an opinion when they do not have one.<sup>16</sup>

For example, respondents that are asked about different features of a given object might display some systematic heterogeneity in the extent to which they tend to agree with *all* questions being posed. More specifically, suppose that women tend to be more emphatic in their responses about the relevance of food features. If we do not take this into account, the women dummy would capture both the *feature-specific* effect of being a woman and the general tendency of women to be emphatic in their responses.

Broadly following GRASSI & PUGLISI (2008), a simple way to deal with this bias is to define a new dependent variable as follows:

$$\Delta Y_i = Y_i - \bar{Y}_{-i},$$

where  $\bar{Y}_{-i}$  is the mean value of the other dependent variables and  $\Delta Y_i$  stands for the deviation of each dependent variable from this mean. The idea here is to use information from the answers to the other questions to infer the overall tendency of respondents to agreeing to the questions being posed. For example, to calculate  $\Delta Hunger_i$  we subtract

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<sup>16</sup>See also MCFADDEN ET AL. (2005).

from  $Hunger_i$  the mean of all the other five dependent variables. Then, we simply re-estimate Equation (1) with this deviation variable as the dependent variable.

Table 4 near here

To discuss these findings we sequentially focus on each explanatory variable, i.e. we proceed row by row showing first those variables which do not change their behaviour and then those ones which present an upward or a downward bias respectively.

The signs of coefficients on age and income are entirely unaffected by the introduction of the new dependent variable. The coefficients on the variables related to education (years of schooling and internet use) are analogously largely unchanged but for the regression on hunger satisfaction, whereas they are now negative and statistically significant.

On the other hand, we find a general upward bias in the coefficient of the female dummy: when looking at deviations it is no longer the case that women are significantly more interested in price and calories. Moreover, there is a sign switch for the social dimension, since now women are systematically *less* concerned about it than men. There is also an upwards bias for the children variable as well. In fact, the coefficient of this variable is no longer positive and statistically significant in the hunger satisfaction case and it is now negative and statistically significant in the case of calories. Moreover, we find an upward bias for the  $Married_i$ ,  $Partner_i$  and  $Divorced_i$  dummies. More precisely, married individuals are now significantly less interested in the subsistence and price dimensions of food than the benchmark category of singles, while they are no significantly more interested than singles in freshness and calories. Respondents living with a partner appear now to be significantly less concerned about calories, while they are no longer significantly more interested in freshness and price. Divorced individuals are now less concerned in the subsistence dimension of food, while they are not interested in safety.

We find instead a downward (understatement) bias in the case of the geographical variables ( $Rural_i$  and  $Small_i$ ) and of several occupational dummies. More precisely, individuals living in rural areas and small towns appear now to be significantly more interested in freshness than those living in big cities, while –only in the case of respondents living in rural areas– it is no longer the case that they are significantly less concerned about price and calories. Finally, coming to occupational dummies, self-employed individuals are now significantly more interested in the social dimension of food than the benchmark category of white collars, while their coefficient in the safety regression is no longer statistically significant. On the other hand, the coefficient on the manager dummy is again positive but now statistically significant for freshness, while it is no longer significant in the case of hunger satisfaction. Manual workers and unemployed individuals are now significantly *less* interested in safety, while only unemployed individuals are significantly less interested in its social dimension. Retired individuals are now significantly more concerned about price and they are systematically less interested in the subsistence dimension. A down-

ward bias characterizes students as well,<sup>17</sup> while housepersons are the only occupational category for which we do not see any relevant change in the coefficients. Similar results are found if we introduce region fixed effects (see Table 11).

One could also focus on the different features of food, i.e. column by column: hunger satisfaction and freshness display the largest number of changes in the significance of coefficients when moving from Table 2 to Table 4 (with eight and six changes respectively).<sup>18</sup> Similar results hold in the case of region fixed effects (see Table 11).

Coming to country fixed effects (see Table 5), we find again that citizens living in all countries other than Italy display a significantly lower attention for the hunger satisfaction dimension. On the other hand, British, German, Slovenian and Latvian citizens now show a significantly larger interest in the social dimension of food, while Greek and Cypriot citizens a significantly lower concern.

Table 5 near here

Interestingly, when looking at deviations there are twenty countries –instead of fifteen– whose residents are more interested than Italian ones in the freshness dimension of food.

We do not see any big change in the price dimension, albeit there are some switches in the sign of the estimated coefficients, with the signs on the dummies for Czech Republic, Latvia, Lithuania and Slovenia becoming positive and those on Spain and Cyprus becoming negative.

Regarding the calories dimension, there are here seventeen countries –instead of thirteen– with a significantly larger coefficient, and five –instead of ten– with a significantly lower coefficient. Finally, there are no large differences in the relative position of countries regarding the food safety dimension, except for Belgium and Slovenia, that now display positive coefficients.

One could also compare the two specifications ‘horizontally’ rather than ‘vertically’, i.e. by focusing on specific countries across different dimensions of food. In particular, individuals living in countries where understatement is a common social behavior might give more positive answers in the alternative specification based on deviations from the mean than in the baseline specification. In our sample this holds for German citizens on the social and freshness dimensions, for British citizens on those same dimensions plus the calories’ one, and for Slovenian citizens on all dimensions but hunger satisfaction and prices.

The opposite would be true for citizens living in ‘emphatic’ countries. This is the case for Cypriot citizens regarding the social and price dimensions.<sup>19</sup>

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<sup>17</sup>Students are now significantly more concerned about hunger satisfaction and they no longer appear to be worried about safety.

<sup>18</sup>Coming to the other food dimensions, there are five changes in significance for price and safety, four for calories and three for the social dimension.

<sup>19</sup>One should also note that Cyprus is the country with the fewest number of interviewed individuals within the Eurobarometer survey.

### 4.3 Explaining latent components of food preferences

In this section we want to check whether the complex patterns of individual responses about food characteristics are driven by simpler, underlying unobserved factors. To do so we perform Principal Component Analysis (PCA).

Table 6 near here

Table 7 near here

Table 6 shows the explained and cumulative variance for each component. The optimal number of factors is chosen according to Kaiser’s Criterion, which suggests to pick up only those factors whose eigenvalues are greater than one (see Table 6). We thus focus on the first two components. This choice finds support in the ‘explained variance criterion’ as well. This rule of thumb suggests that the optimal number of factors is the one whose cumulative explained variance is larger than fifty percent.<sup>20</sup>

Note that the first component ( $PC_1$ ) displays positive weights on *all* survey questions. So, it appears to capture the willingness to give importance to the features of food one is asked about. This factor might thus signal an overall sense of maturity, responsibility, attention, care, but it might simply be a proxy for the tendency to be emphatic. Interestingly, the second factor ( $PC_2$ ) is characterized by *positive* loadings on hunger satisfaction and the social dimension of food, and by *negative* loadings on calories and security. One could argue that this component reveals a dichotomy between a primary dimension of food (staying alive and eating with others) versus a secondary, ‘post-modern’ dimension, which is related to healthy and safe diets. In other words, according to this second factor, the more an individual is concerned with the basic social and subsistence dimensions of food, the less he/she is worried about the post-modern dimensions of calories and safety, which of course are typical of developed countries.<sup>21</sup>

Once equipped with those two underlying components, we are again interested in explaining them on the basis of individual-level variables. To this aim, by multiplying each loading by the row data of each respondent, we generate two new variables (namely  $PC_{1,i}$  and  $PC_{2,i}$ ), and we regress them against the controls we have used in the previous analysis. Table 8 displays the results.

Table 8 near here

Estimation results are consistent with the sign and magnitude of factor loadings, and with the sign and significance of specific coefficients in our baseline specification. In

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<sup>20</sup>Factor analysis would be another way to identify latent components. We perform it and –reassuringly– we find that the first factor in the factor analysis and the first component in the PCA behave in a very similar fashion, and the same is true for the second factor and the second component. Results are available upon request.

<sup>21</sup>If one looks at magnitudes of (absolute) factor loadings, the first component is mainly related to freshness and safety, while the second one is related to calories and hunger satisfaction.



fact, the first component is positively correlated with the female dummy, age, children, education and the partner (formal or informal) dummies. On the other hand,  $PC_{2,i}$  is negatively correlated with age, education, income, the female and the married dummies. At the same time it shows a positive and significant relationship with the self-employed, manual, unemployed and student dummies. Similar results are found when we re-estimate the regression with region fixed effects (see Table 12).

Table 9 near here

It is not easy to detect meaningful patterns in the country dummies, as displayed in Table 9. If we believe that the first factor does capture the degree of emphasis in ‘agreeing’ with survey questions, then the most emphatic countries are indeed Mediterranean, i.e. Cyprus, Spain, Greece and Malta, while the least emphatic ones happen to be Portugal, Slovenia, UK and Lithuania.

Coming to the second, ‘pre-modern vs. post-modern’ factor, the countries whose citizens are most concerned with the social and basic dimensions of food (and least so about calories and safety) are UK, Lithuania, Poland, Italy and Bulgaria, while the most ‘post-modern’ countries are Spain, Luxembourg, Austria and Cyprus.<sup>22</sup>

## 5 Conclusions

This paper is a first attempt to shed light on the determinants of individual attitudes about different food dimensions. We analyze data from the 2010 Eurobarometer 73.5 Special Survey on Risk Perception, where respondents across the 27 European countries are asked about various features of food consumption and food-related risks. We have performed a multivariate analysis with country fixed effects to investigate the relationship between demographic, socio-economic and country level variables and those characteristics of food. Our estimation results show that calories and safety are the food dimensions on which women put comparatively more attention than men. Age, education and income are the other factors that are mainly related to calorie content and freshness. Married individuals and respondents living with children show a higher risk aversion, as reflected in opinions about freshness and safety. On the contrary, the occupational status leads to significantly different attitudes toward prices.

We deal with potential response bias by using as dependent variable the difference between each response on a given food attribute and the average response on the other ones. When doing so, our findings on age, income and education do not significantly change with respect to the baseline specification. On the contrary, a general upward bias appears for the children variable, and for the female and marital status dummies.

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<sup>22</sup>Regarding British consumers, this finding could also be related to supply-side factors, i.e. the difficulty in finding healthy food in poor, urban areas (see WRIGLEY 2002).



A downward (understatement) bias characterizes instead both geographical and several occupational dummies. We also perform a principal component analysis, which shows the presence of a first factor that is positively correlated with all the six questions about food features, and a second one which might reflect a dichotomy between a primary dimension of food vs. a secondary, 'post-modern' dimension related to healthy and safe diets.

There is much room for further research in this area. First, one could investigate the correlation between food attitudes and information, especially the one conveyed by public authorities, the media and experts. Second, one could check whether average opinion on food at the regional level is significantly correlated with revealed preferences, i.e. actual consumption choices at the same geographical level of aggregation.

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**Table 1:** Summary statistics

	Mean	Median	Std. Dev.	Min	Max	Obs
<b>Dependent variables</b>						
<i>Hunger<sub>i</sub></i>	3.31	3	0.73	1	4	26,569
<i>Conviviality<sub>i</sub></i>	3.42	4	0.69	1	4	26,562
<i>Freshness<sub>i</sub></i>	3.55	4	0.62	1	4	26,597
<i>Price<sub>i</sub></i>	3.29	3	0.75	1	4	26,577
<i>Calories<sub>i</sub></i>	2.64	3	0.99	1	4	26,568
<i>Safety<sub>i</sub></i>	3.12	3	0.84	1	4	26,565
<b>Personal characteristics</b>						
<i>Female<sub>i</sub></i>	0.54	1	0.49	0	1	26,691
<i>Age<sub>i</sub></i>	2.89	3	1.05	1	4	26,691
<i>Income<sub>i</sub></i>	5.64	5	1.83	1	11	26,691
<i>Children<sub>i</sub></i>	0.28	0	0.65	0	4	26,691
<i>Schooling<sub>i</sub></i>	2.03	2	0.75	0	3	26,200
<i>Internet<sub>i</sub></i>	4.51	6	2.52	1	7	26,691
<b>Community dummies</b>						
<i>Rural<sub>i</sub></i>	0.36	0	0.48	0	1	26,693
<i>Small<sub>i</sub></i>	0.36	0	0.48	0	1	26,693
<i>Large<sub>i</sub></i>	0.28	0	0.45	0	1	26,693
<b>Marital status dummies</b>						
<i>Married<sub>i</sub></i>	0.52	1	0.49	0	1	26,693
<i>Partner<sub>i</sub></i>	0.09	0	0.29	0	1	26,693
<i>Single<sub>i</sub></i>	0.19	0	0.39	0	1	26,693
<i>Divorced<sub>i</sub></i>	0.07	0	0.26	0	1	26,693
<i>Widow<sub>i</sub></i>	0.09	0	0.29	0	1	26,693
<b>Occupational dummies</b>						
<i>Selfemployed<sub>i</sub></i>	0.07	0	0.26	0	1	26,693
<i>Manager<sub>i</sub></i>	0.10	0	0.30	0	1	26,693
<i>Whitecollar<sub>i</sub></i>	0.11	0	0.31	0	1	26,693
<i>Manual<sub>i</sub></i>	0.19	0	0.39	0	1	26,693
<i>Houseperson<sub>i</sub></i>	0.07	0	0.25	0	1	26,693
<i>Unemployed<sub>i</sub></i>	0.08	0	0.28	0	1	26,693
<i>Retired<sub>i</sub></i>	0.28	0	0.45	0	1	26,693
<i>Student<sub>i</sub></i>	0.08	0	0.27	0	1	26,693

**Table 2:** Consumers attitudes toward the six food dimensions

	<i>Hunger<sub>i</sub></i>	<i>Conviviality<sub>i</sub></i>	<i>Freshness<sub>i</sub></i>	<i>Price<sub>i</sub></i>	<i>Calories<sub>i</sub></i>	<i>Safety<sub>i</sub></i>
<i>Female<sub>i</sub></i>	-0.03** (0.01)	0.08*** (0.01)	0.11*** (0.01)	0.11*** (0.01)	0.28*** (0.02)	0.18*** (0.01)
<i>Age<sub>i</sub></i>	-0.04*** (0.01)	-0.02** (0.01)	0.03*** (0.01)	0.01 (0.01)	0.07*** (0.02)	0.05*** (0.01)
<i>Income<sub>i</sub></i>	-0.01** (0.00)	0.02*** (0.00)	0.01*** (0.00)	-0.04*** (0.00)	0.02*** (0.00)	0.00 (0.00)
<i>Children<sub>i</sub></i>	0.02** (0.01)	-0.00 (0.01)	0.01 (0.01)	0.03*** (0.01)	-0.02 (0.01)	0.02*** (0.01)
<i>Schooling<sub>i</sub></i>	-0.01 (0.01)	0.01 (0.01)	0.04*** (0.01)	-0.03*** (0.01)	0.07*** (0.01)	0.04*** (0.01)
<i>Internet<sub>i</sub></i>	-0.00 (0.00)	0.02*** (0.00)	0.02*** (0.00)	-0.01*** (0.00)	0.03*** (0.00)	0.02*** (0.00)
<i>Rural<sub>i</sub></i>	-0.01 (0.02)	-0.00 (0.02)	0.00 (0.02)	-0.04* (0.02)	-0.04* (0.02)	-0.01 (0.03)
<i>Small<sub>i</sub></i>	-0.02 (0.02)	-0.01 (0.02)	0.00 (0.02)	-0.00 (0.02)	-0.03 (0.02)	-0.04* (0.02)
<i>Married<sub>i</sub></i>	-0.01 (0.02)	0.14*** (0.02)	0.08*** (0.02)	0.05*** (0.01)	0.09*** (0.02)	0.11*** (0.02)
<i>Partner<sub>i</sub></i>	0.01 (0.02)	0.09*** (0.02)	0.06*** (0.02)	0.04* (0.02)	0.01 (0.02)	0.04 (0.03)
<i>Divorced<sub>i</sub></i>	-0.01 (0.02)	0.02 (0.02)	0.02 (0.02)	0.09*** (0.02)	0.02 (0.03)	0.05* (0.02)
<i>Widow<sub>i</sub></i>	-0.02 (0.02)	-0.01 (0.02)	0.01 (0.02)	0.02 (0.02)	-0.04 (0.03)	-0.00 (0.02)
<i>Selfemployed<sub>i</sub></i>	-0.012 (0.02)	0.03 (0.02)	0.04* (0.02)	-0.08*** (0.03)	-0.07** (0.02)	-0.06** (0.02)
<i>Manager<sub>i</sub></i>	-0.04** (0.01)	0.04* (0.02)	0.01 (0.01)	-0.07*** (0.02)	0.02 (0.03)	-0.03 (0.03)
<i>Manual<sub>i</sub></i>	0.01 (0.02)	0.03* (0.01)	0.02 (0.02)	0.07*** (0.02)	-0.07*** (0.02)	-0.03 (0.03)
<i>Houseperson<sub>i</sub></i>	0.01 (0.02)	0.00 (0.02)	0.01 (0.02)	0.07** (0.02)	-0.02 (0.03)	0.01 (0.03)
<i>Unemployed<sub>i</sub></i>	0.01 (0.02)	-0.03 (0.02)	-0.01 (0.02)	0.12*** (0.02)	-0.07*** (0.02)	-0.04 (0.02)
<i>Retired<sub>i</sub></i>	-0.04** (0.02)	-0.04** (0.02)	-0.00 (0.02)	0.02 (0.02)	-0.02 (0.03)	-0.02 (0.03)
<i>Student<sub>i</sub></i>	0.02 (0.03)	-0.01 (0.02)	-0.00 (0.02)	-0.09*** (0.03)	-0.05 (0.03)	-0.07** (0.03)
<i>Constant</i>	3.86*** (0.05)	3.12*** (0.05)	3.03*** (0.03)	3.57*** (0.04)	1.84*** (0.07)	2.65*** (0.06)
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
$R^2$	0.07	0.07	0.05	0.09	0.09	0.10
Obs	26,087	26,087	26,121	26,095	26,091	26,088

Notes: Standard errors are reported in parentheses and are clustered at the country level; A \*(\*\*)[\*\*\*] indicates significance at 10(5)[1] per cent level.



**Table 3:** Consumers attitudes toward the six food dimensions - Country fixed effects

	<i>Hunger<sub>i</sub></i>	<i>Conviviality<sub>i</sub></i>	<i>Freshness<sub>i</sub></i>	<i>Price<sub>i</sub></i>	<i>Calories<sub>i</sub></i>	<i>Safety<sub>i</sub></i>
Belgium	-0.37*** (0.01)	0.01** (0.00)	-0.00 (0.00)	-0.14*** (0.01)	-0.02** (0.01)	-0.09*** (0.01)
Denmark	-0.32*** (0.01)	0.29*** (0.01)	0.20*** (0.01)	-0.48*** (0.01)	0.05*** (0.01)	-0.06*** (0.01)
Germany	-0.36*** (0.014)	-0.01 (0.02)	-0.00 (0.01)	-0.15*** (0.01)	0.16*** (0.02)	-0.39*** (0.04)
Greece	-0.24*** (0.01)	0.01 (0.01)	0.07*** (0.01)	-0.05*** (0.00)	0.34*** (0.01)	0.23*** (0.01)
Spain	-0.37*** (0.01)	0.20*** (0.00)	0.14*** (0.01)	0.05*** (0.01)	0.43*** (0.01)	0.35*** (0.01)
France	-0.22*** (0.01)	-0.08*** (0.01)	-0.08*** (0.01)	-0.24*** (0.01)	0.24*** (0.01)	0.25*** (0.01)
Ireland	-0.29*** (0.01)	0.21*** (0.01)	0.10*** (0.01)	0.04*** (0.01)	-0.09*** (0.01)	0.03*** (0.01)
Luxembourg	-0.42*** (0.01)	-0.10*** (0.01)	-0.09*** (0.01)	-0.25*** (0.01)	0.25*** (0.01)	0.15*** (0.01)
Netherlands	-0.32*** (0.01)	0.05*** (0.01)	-0.02*** (0.01)	-0.32*** (0.01)	-0.13*** (0.01)	0.02** (0.01)
Portugal	-0.76*** (0.01)	0.04*** (0.01)	0.06*** (0.01)	-0.35*** (0.01)	-0.01 (0.01)	-0.46*** (0.01)
UK	-0.25*** (0.00)	-0.00 (0.01)	-0.01** (0.00)	-0.27*** (0.01)	-0.04*** (0.01)	-0.44*** (0.00)
Austria	-0.32*** (0.01)	0.01* (0.01)	0.01 (0.01)	-0.15*** (0.01)	0.39*** (0.02)	0.19*** (0.01)
Sweden	-0.16*** (0.01)	0.23*** (0.01)	0.19*** (0.01)	-0.30*** (0.01)	0.01 (0.01)	0.19*** (0.01)
Finland	-0.20*** (0.02)	0.12** (0.04)	0.06*** (0.01)	-0.07** (0.03)	0.05*** (0.01)	0.24*** (0.07)
Cyprus	-0.02** (0.01)	0.23*** (0.01)	0.37*** (0.01)	0.07*** (0.01)	0.57*** (0.01)	0.63*** (0.01)
CZ	-0.27*** (0.01)	-0.14*** (0.01)	0.00 (0.01)	-0.00 (0.01)	-0.01* (0.01)	0.02** (0.01)
Estonia	-0.49*** (0.01)	-0.14*** (0.01)	0.09*** (0.01)	0.03*** (0.01)	0.01 (0.01)	-0.22*** (0.01)
Hungary	-0.087*** (0.01)	-0.02*** (0.01)	0.18*** (0.01)	0.07*** (0.01)	0.26*** (0.01)	-0.04*** (0.01)
Latvia	-0.76*** (0.01)	-0.10*** (0.01)	0.07*** (0.01)	-0.01 (0.01)	-0.33*** (0.01)	0.06*** (0.01)
Lithuania	-0.35*** (0.01)	-0.21*** (0.01)	-0.01* (0.01)	-0.08*** (0.01)	-0.58*** (0.01)	0.16*** (0.01)
Malta	-0.24*** (0.00)	0.15*** (0.01)	0.29*** (0.01)	-0.05*** (0.01)	0.20*** (0.01)	-0.11*** (0.01)
Poland	-0.15*** (0.01)	-0.15*** (0.01)	0.03*** (0.01)	-0.10*** (0.01)	-0.12*** (0.01)	-0.15*** (0.01)
Slovakia	-0.12*** (0.01)	-0.00 (0.01)	0.09*** (0.01)	-0.02*** (0.01)	0.10*** (0.01)	-0.12*** (0.01)
Slovenia	-0.544*** (0.00)	-0.12*** (0.00)	0.00 (0.00)	-0.19*** (0.01)	-0.30*** (0.01)	-0.07*** (0.01)
Bulgaria	-0.04*** (0.0130)	0.01 (0.01)	0.08*** (0.01)	-0.01 (0.01)	-0.12*** (0.01)	0.16*** (0.02)
Romania	-0.29*** (0.01)	-0.21*** (0.01)	-0.05*** (0.01)	0.05*** (0.01)	0.19*** (0.01)	0.17*** (0.01)

Notes: Standard errors are reported in parentheses and are clustered at the country level; A \*(\*\*)[\*\*\*] indicates significance at 10(5)[1] per cent level.

**Table 4:** Deviation of each dimension with respect to the average on the other dimensions

	$\Delta Hunger_i$	$\Delta Conviviality_i$	$\Delta Freshness_i$	$\Delta Price_i$	$\Delta Calories_i$	$\Delta Safety_i$
<i>Female<sub>i</sub></i>	-0.18*** (0.02)	-0.05*** (0.01)	-0.01 (0.01)	-0.02 (0.01)	0.19*** (0.02)	0.07*** (0.01)
<i>Age<sub>i</sub></i>	-0.07*** (0.01)	-0.05*** (0.01)	0.01** (0.01)	-0.01 (0.01)	0.07*** (0.02)	0.04*** (0.01)
<i>Income<sub>i</sub></i>	-0.02*** (0.00)	0.02*** (0.00)	0.02*** (0.00)	-0.05*** (0.00)	0.02*** (0.00)	0.00 (0.00)
<i>Children<sub>i</sub></i>	0.02 (0.01)	-0.01 (0.01)	-0.01 (0.01)	0.02** (0.01)	-0.03** (0.01)	0.01* (0.01)
<i>Schooling<sub>i</sub></i>	-0.04*** (0.01)	-0.01 (0.01)	0.02** (0.01)	-0.06*** (0.01)	0.06*** (0.02)	0.02** (0.01)
<i>Internet<sub>i</sub></i>	-0.02*** (0.00)	0.01*** (0.00)	0.01*** (0.00)	-0.03*** (0.00)	0.02*** (0.00)	0.01* (0.00)
<i>Rural<sub>i</sub></i>	0.00 (0.02)	0.02 (0.02)	0.03** (0.01)	-0.03 (0.02)	-0.03 (0.02)	0.01 (0.02)
<i>Small<sub>i</sub></i>	-0.00 (0.02)	0.01 (0.02)	0.03** (0.01)	0.02 (0.02)	-0.02 (0.02)	-0.03* (0.01)
<i>Married<sub>i</sub></i>	-0.11*** (0.01)	0.08*** (0.02)	-0.00 (0.01)	-0.03* (0.02)	0.02 (0.02)	0.04** (0.02)
<i>Partner<sub>i</sub></i>	-0.04 (0.03)	0.06*** (0.02)	0.02 (0.02)	-0.00 (0.02)	-0.04* (0.02)	-0.01 (0.02)
<i>Divorced<sub>i</sub></i>	-0.05** (0.02)	-0.01 (0.02)	-0.01 (0.02)	0.08*** (0.02)	-0.01 (0.03)	0.02 (0.03)
<i>Widow<sub>i</sub></i>	-0.02 (0.02)	0.00 (0.02)	0.02 (0.02)	0.03 (0.02)	-0.04 (0.03)	0.01 (0.02)
<i>Selfemployed<sub>i</sub></i>	0.01 (0.02)	0.07*** (0.02)	0.08*** (0.02)	-0.07*** (0.02)	-0.05* (0.03)	-0.04 (0.02)
<i>Manager<sub>i</sub></i>	-0.03 (0.02)	0.05** (0.02)	0.03*** (0.01)	-0.07*** (0.02)	0.03 (0.03)	-0.02 (0.02)
<i>Manual<sub>i</sub></i>	0.01 (0.02)	0.03* (0.02)	0.02 (0.02)	0.08*** (0.02)	-0.09*** (0.02)	-0.04** (0.02)
<i>Houseperson<sub>i</sub></i>	-0.00 (0.02)	-0.01 (0.03)	0.00 (0.01)	0.06*** (0.02)	-0.04 (0.03)	-0.01 (0.02)
<i>Unemployed<sub>i</sub></i>	0.01 (0.02)	-0.04** (0.02)	-0.02 (0.02)	0.20*** (0.02)	-0.10*** (0.02)	-0.05** (0.02)
<i>Retired<sub>i</sub></i>	-0.03 (0.03)	-0.03* (0.02)	0.01 (0.02)	0.05*** (0.02)	-0.01 (0.03)	-0.00 (0.03)
<i>Student<sub>i</sub></i>	0.06*** (0.02)	0.03 (0.03)	0.04 (0.02)	-0.07** (0.03)	-0.02 (0.03)	-0.04 (0.03)
<i>Constant</i>	1.02*** (0.06)	0.14** (0.05)	0.02 (0.04)	0.67*** (0.05)	-1.41*** (0.07)	-0.44*** (0.06)
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
$R^2$	0.08	0.07	0.05	0.12	0.07	0.08
Obs	26,085	26,087	26,120	26,095	26,091	26,087

Notes: Standard errors are reported in parentheses and are clustered at the country level; A \*(\*\*)[\*\*\*] indicates significance at 10(5)[1] per cent level.

**Table 5:** Deviation of each dimension with respect to the average on the other dimensions - Country fixed effects

	$\Delta Hunger_i$	$\Delta Conviviality_i$	$\Delta Freshness_i$	$\Delta Price_i$	$\Delta Calories_i$	$\Delta Safety_i$
Belgium	-0.33*** (0.01)	0.14*** (0.01)	0.12*** (0.00)	-0.05*** (0.01)	0.10*** (0.01)	0.01** (0.01)
Denmark	-0.32*** (0.01)	0.41*** (0.01)	0.30*** (0.01)	-0.52*** (0.01)	0.13*** (0.01)	-0.01 (0.01)
Germany	-0.28*** (0.01)	0.14*** (0.01)	0.15*** (0.03)	-0.03 (0.03)	0.34*** (0.01)	-0.32*** (0.04)
Greece	-0.36*** (0.01)	-0.06*** (0.01)	0.02*** (0.01)	-0.14*** (0.01)	0.34*** (0.01)	0.20*** (0.01)
Spain	-0.61*** (0.01)	0.08*** (0.01)	0.01 (0.01)	-0.10*** (0.01)	0.36*** (0.01)	0.25*** (0.01)
France	-0.24*** (0.01)	-0.07*** (0.01)	-0.07*** (0.01)	-0.26*** (0.01)	0.32*** (0.01)	0.32*** (0.01)
Ireland	-0.36*** (0.01)	0.26*** (0.01)	0.12*** (0.01)	0.05*** (0.01)	-0.11*** (0.01)	0.04*** (0.01)
Luxembourg	-0.41*** (0.01)	-0.02*** (0.01)	-0.02*** (0.01)	-0.21*** (0.01)	0.39*** (0.01)	0.27*** (0.01)
Netherlands	-0.25*** (0.01)	0.20*** (0.01)	0.12*** (0.00)	-0.24*** (0.01)	-0.01 (0.01)	0.17*** (0.01)
Portugal	-0.62*** (0.01)	0.35*** (0.01)	0.37*** (0.01)	-0.13*** (0.01)	0.28*** (0.01)	-0.26*** (0.01)
UK	-0.11*** (0.01)	0.20*** (0.01)	0.19*** (0.00)	-0.13*** (0.01)	0.16*** (0.01)	-0.33*** (0.00)
Austria	-0.42*** (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.21*** (0.01)	0.44*** (0.01)	0.20*** (0.01)
Sweden	-0.23*** (0.01)	0.25*** (0.01)	0.20*** (0.01)	-0.39*** (0.01)	-0.02 (0.01)	0.19*** (0.01)
Finland	-0.29*** (0.01)	0.10*** (0.02)	0.03 (0.02)	-0.12*** (0.01)	0.02 (0.03)	0.25*** (0.05)
Cyprus	-0.40*** (0.01)	-0.09*** (0.01)	0.07*** (0.01)	-0.28*** (0.01)	0.31*** (0.01)	0.38*** (0.01)
CZ	-0.24*** (0.01)	-0.09*** (0.01)	0.08*** (0.00)	0.08*** (0.01)	0.06*** (0.01)	0.10*** (0.01)
Estonia	-0.45*** (0.01)	-0.02*** (0.01)	0.25*** (0.00)	0.18*** (0.01)	0.15*** (0.01)	-0.12*** (0.01)
Hungary	-0.18*** (0.01)	-0.10*** (0.01)	0.14*** (0.01)	0.01 (0.01)	0.24*** (0.01)	-0.12*** (0.01)
Latvia	-0.70*** (0.01)	0.09*** (0.01)	0.30*** (0.01)	0.20*** (0.01)	-0.18*** (0.01)	0.28*** (0.01)
Lithuania	-0.21*** (0.01)	-0.04*** (0.01)	0.20*** (0.01)	0.11*** (0.01)	-0.48*** (0.01)	0.41*** (0.01)
Malta	-0.34*** (0.01)	0.14*** (0.01)	0.30*** (0.01)	-0.11*** (0.01)	0.19*** (0.01)	-0.18*** (0.01)
Poland	-0.06*** (0.01)	-0.05*** (0.01)	0.17*** (0.01)	0.00 (0.01)	-0.01 (0.01)	-0.05*** (0.01)
Slovakia	-0.14*** (0.01)	0.01* (0.01)	0.12*** (0.00)	-0.01** (0.01)	0.14*** (0.01)	-0.12*** (0.01)
Slovenia	-0.41*** (0.01)	0.10*** (0.01)	0.25*** (0.00)	0.02** (0.01)	-0.11*** (0.01)	0.16*** (0.01)
Bulgaria	-0.07*** (0.01)	-0.00 (0.01)	0.08*** (0.01)	-0.03** (0.01)	-0.16*** (0.01)	0.17*** (0.01)
Romania	-0.32*** (0.01)	-0.23*** (0.01)	-0.03*** (0.01)	0.09*** (0.01)	0.25*** (0.01)	0.23*** (0.01)

Notes: Standard errors are reported in parentheses and are clustered at the country level; A \*(\*\*)[\*\*\*] indicates significance at 10(5)[1] per cent level.

**Table 6:** Principal component analysis: eigenvalues, explained and cumulative variance

$k$	<i>Eigenvalues</i>	<i>Proportion</i>	<i>Cumulative</i>
1	2.08	0.35	0.35
2	1.04	0.17	0.52
3	0.91	0.15	0.67
4	0.75	0.13	0.79
5	0.64	0.11	0.90
6	0.58	0.09	1.00

**Table 7:** Principal component analysis: factor loadings

	$PC_1$	$PC_2$
<i>Hunger<sub>i</sub></i>	0.33	0.57
<i>Conviviality<sub>i</sub></i>	0.42	0.29
<i>Freshness<sub>i</sub></i>	0.49	0.12
<i>Price<sub>i</sub></i>	0.36	0.14
<i>Calories<sub>i</sub></i>	0.37	-0.60
<i>Safety<sub>i</sub></i>	0.45	-0.43

**Table 8:** Principal component analysis

	$PC_{1,i}$	$PC_{2,i}$
<i>Female<sub>i</sub></i>	0.31*** (0.02)	-0.21*** (0.02)
<i>Age<sub>i</sub></i>	0.05*** (0.01)	-0.09*** (0.02)
<i>Income<sub>i</sub></i>	0.01 (0.01)	-0.02*** (0.01)
<i>Children<sub>i</sub></i>	0.02* (0.01)	0.02 (0.01)
<i>Schooling<sub>i</sub></i>	0.06*** (0.01)	-0.06*** (0.01)
<i>Internet<sub>i</sub></i>	0.03*** (0.00)	-0.02*** (0.00)
<i>Rural<sub>i</sub></i>	-0.04 (0.04)	0.01 (0.03)
<i>Small<sub>i</sub></i>	-0.03 (0.03)	0.02 (0.02)
<i>Married<sub>i</sub></i>	0.20*** (0.02)	-0.06*** (0.02)
<i>Partner<sub>i</sub></i>	0.11*** (0.03)	0.03 (0.02)
<i>Divorced<sub>i</sub></i>	0.08** (0.03)	-0.02 (0.03)
<i>Widow<sub>i</sub></i>	-0.02 (0.03)	0.01 (0.02)
<i>Selfemployed<sub>i</sub></i>	-0.05 (0.03)	0.06** (0.03)
<i>Manager<sub>i</sub></i>	-0.02 (0.03)	-0.02 (0.02)
<i>Manual<sub>i</sub></i>	0.00 (0.03)	0.09*** (0.02)
<i>Houseperson<sub>i</sub></i>	0.04 (0.04)	0.02 (0.03)
<i>Unemployed<sub>i</sub></i>	0.00 (0.03)	0.08*** (0.02)
<i>Retired<sub>i</sub></i>	-0.04 (0.03)	-0.01 (0.03)
<i>Student<sub>i</sub></i>	-0.09** (0.04)	0.05* (0.03)
<i>Constant</i>	7.26*** (0.07)	1.72*** (0.06)
Country Fixed Effects	Yes	Yes
$R^2$	0.09	0.08
Obs	25,835	25,835

*Notes:* Standard errors are reported in parentheses and are clustered at the country level; A \*(\*\*)[\*\*\*] indicates significance at 10(5)[1] per cent level.

**Table 9:** Principal component analysis - Country fixed effects

	$PC_{1,i}$	$PC_{2,i}$
Belgium	-0.23*** (0.01)	-0.17*** (0.01)
Denmark	-0.07*** (0.01)	-0.14*** (0.01)
Germany	-0.30*** (0.03)	-0.15*** (0.02)
Greece	0.17*** (0.01)	-0.43*** (0.01)
Spain	0.36*** (0.01)	-0.53*** (0.01)
France	-0.03*** (0.01)	-0.44*** (0.01)
Ireland	0.03** (0.01)	-0.04*** (0.01)
Luxembourg	-0.15*** (0.01)	-0.52*** (0.01)
Netherlands	-0.24*** (0.01)	-0.15*** (0.01)
Portugal	-0.55*** (0.01)	-0.25*** (0.01)
UK	-0.41*** (0.01)	0.03*** (0.01)
Austria	0.07*** (0.02)	-0.51*** (0.01)
Sweden	0.12*** (0.01)	-0.12*** (0.01)
Finland	0.11 (0.07)	-0.21*** (0.01)
Cyprus	0.78*** (0.01)	-0.50*** (0.01)
CZ	-0.15*** (0.01)	-0.19*** (0.01)
Estonia	-0.26*** (0.01)	-0.21*** (0.01)
Hungary	0.14*** (0.02)	-0.16*** (0.01)
Latvia	-0.37*** (0.01)	-0.27*** (0.01)
Lithuania	-0.39*** (0.01)	0.02 (0.01)
Malta	0.13*** (0.02)	-0.13*** (0.01)
Poland	-0.26*** (0.01)	0.01 (0.01)
Slovakia	-0.03** (0.01)	-0.07*** (0.01)
Slovenia	-0.44*** (0.01)	-0.16*** (0.01)
Bulgaria	0.05** (0.02)	-0.00 (0.02)
Romania	-0.05*** (0.01)	-0.41*** (0.01)

Notes: Standard errors are reported in parentheses and are clustered at the country level; A \*(\*\*)[\*\*\*] indicates significance at 10(5)[1] per cent level.

**Table 10:** Consumers attitudes toward the six food dimensions - Region fixed effects

	<i>Hunger<sub>i</sub></i>	<i>Conviviality<sub>i</sub></i>	<i>Freshness<sub>i</sub></i>	<i>Price<sub>i</sub></i>	<i>Calories<sub>i</sub></i>	<i>Safety<sub>i</sub></i>
<i>Female<sub>i</sub></i>	-0.03*** (0.01)	0.08*** (0.01)	0.11*** (0.01)	0.11*** (0.01)	0.29*** (0.02)	0.17*** (0.01)
<i>Age<sub>i</sub></i>	-0.03*** (0.01)	-0.02** (0.01)	0.03*** (0.01)	0.01* (0.01)	0.07*** (0.01)	0.05*** (0.01)
<i>Income<sub>i</sub></i>	-0.02*** (0.00)	0.02*** (0.00)	0.01*** (0.00)	-0.04*** (0.00)	0.02*** (0.00)	0.00 (0.00)
<i>Children<sub>i</sub></i>	0.02*** (0.01)	0.00 (0.01)	0.01 (0.01)	0.03*** (0.01)	-0.02* (0.01)	0.02** (0.01)
<i>Schooling<sub>i</sub></i>	-0.01 (0.01)	0.01* (0.01)	0.03*** (0.01)	-0.03*** (0.01)	0.07*** (0.01)	0.04*** (0.01)
<i>Internet<sub>i</sub></i>	-0.00 (0.00)	0.02*** (0.00)	0.02*** (0.00)	-0.01*** (0.00)	0.03*** (0.00)	0.02*** (0.00)
<i>Rural<sub>i</sub></i>	-0.05** (0.02)	-0.02 (0.02)	-0.01 (0.02)	-0.06*** (0.02)	-0.04 (0.03)	-0.02 (0.02)
<i>Small<sub>i</sub></i>	-0.05** (0.02)	-0.02 (0.02)	-0.01 (0.02)	-0.02 (0.02)	-0.03 (0.03)	-0.04 (0.02)
<i>Married<sub>i</sub></i>	-0.01 (0.02)	0.14*** (0.02)	0.08*** (0.01)	0.05*** (0.01)	0.10*** (0.02)	0.11*** (0.02)
<i>Partner<sub>i</sub></i>	0.01 (0.02)	0.10*** (0.02)	0.06*** (0.01)	0.04** (0.02)	0.01 (0.02)	0.03 (0.02)
<i>Divorced<sub>i</sub></i>	-0.01 (0.02)	0.02 (0.02)	0.02 (0.02)	0.08*** (0.02)	0.02 (0.03)	0.04 (0.02)
<i>Widow<sub>i</sub></i>	-0.02 (0.02)	-0.01 (0.02)	0.00 (0.02)	0.01 (0.02)	-0.04 (0.03)	-0.00 (0.03)
<i>Selfemployed<sub>i</sub></i>	-0.02 (0.02)	0.03 (0.02)	0.03 (0.02)	-0.09*** (0.02)	-0.07** (0.03)	-0.05* (0.03)
<i>Manager<sub>i</sub></i>	-0.04* (0.02)	0.03* (0.02)	0.01 (0.02)	-0.07*** (0.02)	0.02 (0.03)	-0.02 (0.02)
<i>Manual<sub>i</sub></i>	0.01 (0.02)	0.02 (0.02)	0.01 (0.02)	0.06*** (0.02)	-0.07*** (0.02)	-0.02 (0.02)
<i>Houseperson<sub>i</sub></i>	0.01 (0.02)	0.00 (0.02)	0.01 (0.02)	0.05** (0.03)	-0.03 (0.03)	0.00 (0.03)
<i>Unemployed<sub>i</sub></i>	0.01 (0.02)	-0.03 (0.02)	-0.02 (0.02)	0.16*** (0.02)	-0.08*** (0.02)	-0.04 (0.02)
<i>Retired<sub>i</sub></i>	-0.03 (0.02)	-0.04* (0.02)	-0.00 (0.02)	0.02 (0.02)	-0.01 (0.03)	-0.01 (0.02)
<i>Student<sub>i</sub></i>	0.03 (0.02)	-0.01 (0.03)	-0.01 (0.02)	-0.10*** (0.03)	-0.06* (0.03)	-0.07** (0.03)
<i>Constant</i>	3.65*** (0.04)	3.29*** (0.05)	3.17*** (0.033)	3.55*** (0.04)	1.68*** (0.06)	2.15*** (0.06)
Region Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
<i>R</i> <sup>2</sup>	0.11	0.11	0.09	0.13	0.12	0.13
Obs	25,591	25,590	25,624	25,600	25,595	25,597

Notes: Standard errors are reported in parentheses and are clustered at the country level; A \*(\*\*)[\*\*\*] indicates significance at 10(5)[1] per cent level.



**Table 11:** Deviation of each dimension with respect to the average on the other dimensions - Region fixed effects

	$\Delta Hunger_i$	$\Delta Conviviality_i$	$\Delta Freshness_i$	$\Delta Price_i$	$\Delta Calories_i$	$\Delta Safety_i$
<i>Female<sub>i</sub></i>	-0.18*** (0.01)	-0.05*** (0.01)	-0.01 (0.01)	-0.02* (0.01)	0.20*** (0.02)	0.06*** (0.01)
<i>Age<sub>i</sub></i>	-0.06*** (0.01)	-0.05*** (0.01)	0.01** (0.01)	-0.01 (0.01)	0.06*** (0.01)	0.04*** (0.01)
<i>Income<sub>i</sub></i>	-0.02*** (0.00)	0.02*** (0.00)	0.02*** (0.00)	-0.05*** (0.00)	0.03*** (0.00)	0.00 (0.00)
<i>Children<sub>i</sub></i>	0.01* (0.01)	-0.01 (0.01)	-0.00 (0.01)	0.02*** (0.01)	-0.03*** (0.01)	0.01 (0.01)
<i>Schooling<sub>i</sub></i>	-0.03*** (0.01)	-0.01 (0.01)	0.02** (0.01)	-0.06*** (0.01)	0.06*** (0.01)	0.03*** (0.01)
<i>Internet<sub>i</sub></i>	-0.02*** (0.00)	0.01*** (0.00)	0.01*** (0.00)	-0.03*** (0.00)	0.02*** (0.00)	0.01*** (0.00)
<i>Rural<sub>i</sub></i>	-0.02 (0.02)	0.02 (0.02)	0.03** (0.01)	-0.03* (0.02)	-0.01 (0.03)	0.02 (0.02)
<i>Small<sub>i</sub></i>	-0.02 (0.02)	0.01 (0.02)	0.02* (0.01)	0.00 (0.02)	-0.01 (0.02)	-0.01 (0.02)
<i>Married<sub>i</sub></i>	-0.11*** (0.02)	0.08*** (0.02)	-0.00 (0.01)	-0.03** (0.01)	0.02 (0.02)	0.04** (0.02)
<i>Partner<sub>i</sub></i>	-0.03 (0.02)	0.06*** (0.02)	0.02 (0.01)	0.00 (0.02)	-0.04* (0.02)	-0.01 (0.02)
<i>Divorced<sub>i</sub></i>	-0.05** (0.02)	-0.01 (0.02)	-0.01 (0.02)	0.07*** (0.02)	-0.01 (0.03)	0.01 (0.02)
<i>Widow<sub>i</sub></i>	-0.01 (0.02)	-0.00 (0.02)	0.01 (0.02)	0.03 (0.02)	-0.03 (0.03)	0.01 (0.02)
<i>Selfemployed<sub>i</sub></i>	0.01 (0.02)	0.06*** (0.02)	0.07*** (0.02)	-0.07*** (0.02)	-0.05 (0.03)	-0.03 (0.02)
<i>Manager<sub>i</sub></i>	-0.03 (0.02)	0.05** (0.02)	0.03* (0.02)	-0.07*** (0.02)	0.04 (0.03)	-0.01 (0.02)
<i>Manual<sub>i</sub></i>	0.01 (0.02)	0.03 (0.02)	0.01 (0.01)	0.07*** (0.02)	-0.09*** (0.02)	-0.03* (0.02)
<i>Houseperson<sub>i</sub></i>	0.01 (0.02)	-0.00 (0.02)	-0.00 (0.02)	0.05** (0.02)	-0.05 (0.03)	-0.01 (0.02)
<i>Unemployed<sub>i</sub></i>	0.01 (0.02)	-0.04* (0.02)	-0.03 (0.02)	0.20*** (0.02)	-0.10*** (0.03)	-0.04** (0.02)
<i>Retired<sub>i</sub></i>	-0.02 (0.02)	-0.03 (0.02)	0.01 (0.02)	0.04** (0.02)	-0.00 (0.03)	0.00 (0.02)
<i>Student<sub>i</sub></i>	0.08*** (0.03)	0.03 (0.03)	0.03* (0.02)	-0.08*** (0.03)	-0.03 (0.04)	-0.04 (0.03)
<i>Constant</i>	0.88*** (0.05)	0.46*** (0.04)	0.29*** (0.03)	0.77*** (0.04)	-1.48*** (0.06)	-0.92*** (0.04)
Region Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
$R^2$	0.08	0.07	0.05	0.12	0.07	0.08
Obs	26,085	26,087	26,120	26,095	26,091	26,087

Notes: Standard errors are reported in parentheses and are clustered at the country level; A \*(\*\*)[\*\*\*] indicates significance at 10(5)[1] per cent level.

**Table 12:** Principal component analysis - Region fixed effects

	$PC_{1,i}$	$PC_{2,i}$
<i>Female<sub>i</sub></i>	0.30*** (0.02)	-0.21*** (0.01)
<i>Age<sub>i</sub></i>	0.05*** (0.01)	-0.08*** (0.01)
<i>Income<sub>i</sub></i>	0.00 (0.01)	-0.02*** (0.00)
<i>Children<sub>i</sub></i>	0.02* (0.01)	0.02* (0.01)
<i>Schooling<sub>i</sub></i>	0.05*** (0.01)	-0.06*** (0.01)
<i>Internet<sub>i</sub></i>	0.03*** (0.00)	-0.02*** (0.00)
<i>Rural<sub>i</sub></i>	-0.07** (0.03)	-0.01 (0.02)
<i>Small<sub>i</sub></i>	-0.06* (0.03)	-0.00 (0.02)
<i>Married<sub>i</sub></i>	0.20*** (0.02)	-0.06*** (0.02)
<i>Partner<sub>i</sub></i>	0.11*** (0.03)	0.03 (0.02)
<i>Divorced<sub>i</sub></i>	0.07** (0.03)	-0.02 (0.03)
<i>Widow<sub>i</sub></i>	-0.03 (0.03)	0.01 (0.03)
<i>Selfemployed<sub>i</sub></i>	-0.06 (0.03)	0.05* (0.03)
<i>Manager<sub>i</sub></i>	-0.02 (0.03)	-0.03 (0.02)
<i>Manual<sub>i</sub></i>	0.01 (0.03)	0.08*** (0.02)
<i>Houseperson<sub>i</sub></i>	0.03 (0.04)	0.03 (0.03)
<i>Unemployed<sub>i</sub></i>	-0.00 (0.03)	0.08*** (0.02)
<i>Retired<sub>i</sub></i>	-0.03 (0.03)	-0.01 (0.02)
<i>Student<sub>i</sub></i>	-0.09** (0.04)	0.06* (0.03)
<i>Constant</i>	7.02*** (0.07)	1.99*** (0.05)
Region Fixed Effects	Yes	Yes
$R^2$	0.13	0.11
Obs	25,347	25,347

*Notes:* Standard errors are reported in parentheses and are clustered at the country level; A \*(\*\*)[\*\*\*] indicates significance at 10(5)[1] per cent level.