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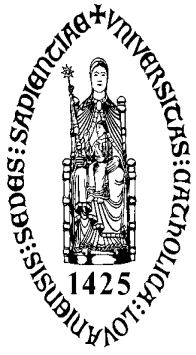

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The Impact of Information on the Willingness-to-Pay for Labeled Organic Food Products

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Abstract

Organic labels potentially play an important role in shaping consumer preferences for organic food products. Information implied by the presence of labels can be used by consumers to facilitate their consumption decisions. Therefore, we investigate the influence of the provision of objective information on the willingness-to-pay of consumers for labeled organic apples in Flanders (Belgium). Initially, we find that Flemish consumers are willing to pay a positive price premium of approximately 33 eurocent per kilogram for labeled organic apples. After the provision of information on the actual environmental and health effects of organic apple production, this price premium becomes even more pronounced and amounts to approximately 56 eurocent per kilogram.

Key words: Organic food production; willingness-to-pay; choice experiment, role of information
JEL classification: Q01, Q51, D12

I. Introduction

Consumers' demand for organic and sustainably grown food products is affected by various factors. Consumers' values such as security (health), hedonism (taste) and universalism (environment and animal wealth), as well as their attitudes such as beliefs about health, taste, and environmental consequences of organic food, and the importance of social and personal norms, are important drivers for organic food consumption. The organic label plays a significant role in shaping consumers' choice for (non)-organic food since it provides consumers with additional information on product characteristics. Thus, labeling instruments are a crucial tool within the agro-food chain to ensure that producers' effort to rely on organic production methods is rewarded by allowing retailers to ask a premium for organic products or by allowing retailers to increase their market share. However, not much research has been done on how consumers' willingness-to-pay for organic labels is actually affected by the information available to consumers about the true impact of organic food production on health, animal welfare, the environment, the development of rural societies and the local economy. This paper investigates to what extent consumers' willingness-to-pay for organic labels depends on the objective information and subjective perception they have about a specific label. It is well established in the stated-preference literature that the provision of information influences the responses given by survey respondents (Teisl et al. 2002). In essence, the appropriate amount of information should be provided such that respondents have a clear definition of the public good that are valuing. However, labeling instruments make information disclosure a policy variable. Labeling decreases search costs for information and may signal the importance of environmental information. Thus labeling might affect the implicit weights that consumers assign to each attribute that they consider during purchasing decisions.

We rely on surveyed data specifically designed to answer this research question and collected through a combination of quota and convenience sampling. A choice experiment is set up in which Flemish[1] consumers are asked to make a choice between two apple varieties with different attributes and one 'opt out' option. One attribute is the price of a kilogram apples of that variety, while other attributes relate to the presence of a label, the taste, form and origin (locally produced or not) of the product. Next, the respondents' knowledge about the impact of organic production methods for consumers' health and the environment is updated. After receiving the updated information, the respondents are confronted with the same choice cards and asked whether they would like to change their previously made choices. This allows us to analyze how the information about the labels which was provided by the interviewer affects consumers' preferences. Initially, we find that Flemish consumers are willing to pay a positive price premium for labeled organic apples (approximately 25% of the price of conventional apples). After the provision of information on the actual environmental and health effects of organic apple production, this price premium becomes even more pronounced and amounts to approximately 42%. Moreover, we are able to illustrate how the willingness-to-pay for labels as well as the impact of objective information and subjective perception about labels differs among consumer groups (e.g. according to membership of nature protection organizations).

In the next section we look at consumer preferences concerning food purchases with a specific focus on organic food products. In section 3 we describe the supply and demand side of the organic fruit and vegetable market in more detail. The formal model used to estimate consumer willingness-to-pay for organic apples is presented in section 4. Next in section 5, we look at the design and description of the choice experiment and the respondents, while the results are presented and discussed in section 6. In section 7 we conclude.

[1] Flanders is one of the three regions in Belgium.

II. Consumer preferences

In this section we discuss the use of labeling as an environmental policy instrument and look closer into consumer behavior with respect to organic food products. We also describe the attitude of Belgian consumers when it comes to buying organic food.

2.1 Labeling and consumer choice

Labeling is one of the instruments used by governments, regulatory bodies and independent organizations to spread information about the environmental characteristics of companies and products. From a policy perspective, one aim of labeling is to educate consumers about the environmental or other impacts of the product's production, use and disposal. Thus, labeling policies may promote environmental objectives by subjecting production sites to (voluntary) command and control methods (Teisl et al. 2002).

Labeling is an example of "the ultimate use of the market mechanism" (Clark and Russell 2004) as no one is obliged to act in any particular way and the products themselves may, but need not, be changed. Consumers may choose to change their purchasing behavior. There are at least three possible explanations why some consumers prefer greener products: 1) consumers overestimate the environmental impact of their individual consumption decisions, 2) some consumers receive a 'warm glow', i.e. a positive feeling of doing the right thing, or 3) consumers associate private health effects with certain green products.

Whatever the reason, there is indeed evidence that labeling has actually changed consumers' purchasing decisions. For example, Bjorner et al. (2004) found that the Nordic Swan label has had a positive significant effect on the consumers' brand choices for toilet paper and it also appeared that consumers' choice of detergents were affected by information on environmental performance. Teisl et al. (2002) provide market-based evidence that the dolphin-safe label increased the market share of canned tuna. Nimon and Beghin (1999)

found a significant and robust price premium for organic cotton up to 33% of the apparel price. Using hedonic value estimates, Estes and Smith (1996) found a price premium of approximately 118% for organic apples (holding other factors constant) paid by a group of consumers in supermarkets in Arizona.

Moreover, evidence collected in surveys shows that consumers would pay a premium for labeled goods based on their stated preferences. For example, Blend and van Ravenswaay (1999) found that over one-third of surveyed households would be willing to buy eco-labeled apples at a price premium of 0,40$ per pound. Gil et al. (2000) have analyzed consumers' willingness to pay for organic food in Spain using contingent valuation estimates. They found that consumers concerned with healthy diet and environmental degradation are the most likely to buy organic food and are willing to pay a premium ranging from 15 to 25% over the price of conventional products. Also, using contingent valuation, Louriero et al. (2001, 2002) find that female respondents with children and strong environmental and food safety concerns are more likely to pay a premium for eco-labeled apples. However, their estimated premium is limited to 5 cents per pound over an initial price of 99 cents.

2.2 Consumer choice and organic food

Consumers typically consider a variety of factors when purchasing fresh fruits or vegetables. Estes and Smith (1996) mention price, personal disposable income, absolute and relative quality, overall availability of the item, availability of a substitute item, satisfaction obtained from consumption, perceived freshness, personal tastes, appearance of product (firmness, specked, size etc.), health, safety and dietary considerations.

Focusing on organic food products, the concept of 'credence' goods or characteristics becomes important (Dabbert 2006). Consumers cannot directly check whether a product has been produced organically or not. So it has to be made credible for the consumer that the product is actually organic and organic products have to be easily distinguishable from non-

organic products. Moreover, when it comes to the environmental impact of organic farming methods, the consumer also has to believe that environmental benefits have been realized during production. However, when it comes to buying organic products, environmental concerns only come in second after health concerns. Consumers react more strongly to private benefits associated with organic food such as health effects, than to external benefits such as environmental effects. Dabbert (2006) concludes that attempts to sell organic products based only on their environmental characteristics are likely to fail, while as a secondary aspect communication about environmental benefits can have a positive effect on sales. Yet, it is not clear whether the belief held by consumers that 'organic is healthier as well as better for the environment' is warranted for all types of organic food products. Thus in our survey we try to disentangle health concerns from environmental ones by explicitly providing - scientifically based - information on the absence of health effects of organic apples compared to conventional apples (Renagold et al. 2001, Briviba et al. 2007, Dangour et al. 2009).

A recent overview of the literature related to the personal determinants and values held by consumers of organic food can be found in Aertsens et al. (2009). Regarding socio-demographic factors the following relations emerge from the literature: a higher proportion of women buy or consume organic food, families with children are more likely to buy organic products, the relation between age and consumption of organic food and between education and consumption of organic food is ambiguous and not always significant.

III. Organic food market

In this section we have a closer look at the organic food market and investigate the characteristics of supply and demand. We also discuss environmental and health impacts of apple production and apple consumption.

3.1 Organic food production and supply

Land devoted to organic farming in EU countries has been steadily increasing. The area of land used for organic farming in 2009 is estimated by Eurostat at some 8.4 million hectares or a share of 4.7% of the total area of land used for agricultural in the EU. This constitutes a growth of 8% compared to the previous year. Next we take a closer look at organic farming in Flanders and Belgium (Table 1). While the total area of organic crop production is slowly increasing in Flanders, it is far below the European average. Organic crop production involves some 0.6% of the total area of land used for agriculture. Looking at fruit production, the picture is slightly better as some 2 to 3% of land used for fruit production is dedicated to organic fruit production.

Canals et al. (2006) studied the environmental impacts of apple production in New Zealand using life cycle analysis. They distinguished the following impacts: non-renewable energy consumption, photochemical oxidant formation and terrestrial eco-toxicity, climate change, acidification, human toxicity, and nutrification. The analysis was performed for three different orchards and shows that individual growers' techniques have a significant impact on the results, showing 30% to 50% variances in energy consumption and other environmental impacts for the same field operations.

Reganold et al. (2001) report on the sustainability of different apple production systems in Washington State from 1994 to 1999. They investigate organic, conventional and integrated production systems. Organic management systems exclude the use of synthetic pesticides and fertilizers and put an emphasis on building up the soil, rotating crops and naturally controlling pests. Integrated farming systems focus on a reduced use of chemicals by integrating organic and conventional production methods. The results found by Reganold et al. (2001) show that, while all three systems gave similar apple yields, the environmental and economic sustainability of the systems differ considerably. The organic and integrated

systems had higher soil quality and potentially lower negative environmental impact than the conventional system. Moreover, the organic system produced sweeter and less tart apples, higher profitability and greater energy efficiency than the other two systems.

3.2 Organic food consumption and demand

Looking at the consumption of organic food products in Belgium, we see a marked increase over time. According to Samborski and Van Bellegem (2011), expenses for organic products by Belgian households increased by 20% in 2010 compared to 2009 and amount to 421 million euro. The group of consumers that purchased at least one organic product in 2010 is equal to 89.6% of the Belgian population, while 18% buy organic products at least once every ten days. In Flanders the number of consumers buying organic products is with 90.3% slightly higher than the national average in 2010. The Belgian buyers of organic food purchase in the first place vegetables (58% of buyers), secondly fruit (36%) and thirdly dairy (33%) in 2010. In absolute terms the largest group of organic consumers consists of wealthy families with children and wealthy pensioners. Jointly they are responsible for over 50% of organic expenses. Looking at per capita expenses for organic food by the Belgian population in 2010, we see that annually some 6.6 euro per capita is spend on organic vegetables, 4.7 euro on dairy, 4.4 euro on fruit and 3.6 euro on bread. Further, it is noteworthy that the price difference between organic and conventional is decreasing, but organic food products still remain some 33% more expensive than conventional products. For apples sold in Belgium, we find that organically produced apples were 50% more expensive than conventional apples in 2008, while the price difference was still 67% in 2006 and 55% in 2007.

IV. Method

Since organic labels represent goods and services such as environmental quality that are not traded in markets, non-market valuation techniques must be used to estimate the value of

these labels. A choice experiment[2] is a stated preference technique especially suited to deal with multidimensional choices such as the purchasing decision of organic food. A choice experiment is a survey-based method for modeling preferences for goods, where goods are described in terms of their attributes and the levels that these take (Hanley et al. 2001). People are presented with alternative varieties of a particular good, differentiated by their attributes and levels, and asked to select their most preferred variety. A baseline alternative, corresponding to the status quo or 'do nothing' situation is included in each choice set in order to be able to interpret the results in standard welfare economic terms. By including price or cost as one of the attributes of the good, the willingness-to-pay for each attribute can be indirectly recovered from peoples' choices.

The analysis of respondents' choices is based on random utility theory, which states that a respondent's utility function is comprised of a deterministic, observable component and a random, unobservable component (Christie et al. 2004):

$$U_i = V_i + \varepsilon_i$$

where U_i represents the utility of choosing alternative i, V_i represents the deterministic component and ε_i represents the random error term. The choice set C comprises three alternatives: variety A, variety B and the status quo. Choosing one alternative over the others implies that the utility of the chosen alternative exceeds the utility associated with the other alternatives. Thus the probability of an individual choosing alternative i can be expressed as:

$$\begin{aligned} \Pr\left[i|C\right] &= \Pr\left[U_i > U_j\right], \forall j \neq i \in C \\ &= \Pr\left[V_i + \varepsilon_i > V_j + \varepsilon_j\right] \end{aligned}$$

In the setting of choice experiments with three alternatives in a choice set and using that error terms are independently and identically distributed with an extreme value distribution, the

[2] The choice experiment method was initially developed by Louviere and Hensher (1982) and Louviere and Woodworth (1983).

choice probabilities have a convenient closed-form solution known as the conditional logit model. Welfare estimates in the form of compensating surplus can be derived and when the choice set includes a single change in a policy option, the welfare estimate reduces to (Christie et al. 2004):

$$CS = -\frac{1}{\beta_M}(V_0 - V_1)$$

where β_M is the marginal utility of income (assumed to be equal to the negative of the coefficient of the monetary variable); V_0 and V_1 represent the indirect utility function functions before and after the change under consideration. A further reduction is possible if the marginal value of a chance with a single attribute is estimated. This implicit price *IP* can be estimated as a ratio of coefficients:

$$\text{IP} = -\frac{\beta_{attribute}}{\beta_M}$$

The implicit price then represents the marginal willingness-to-pay or willingness-to-accept for a change in the attribute in question.

V. Choice Experiment

First we describe the design of the choice experiment and then we describe the characteristics of the dataset.

4.1 Experimental design

In order to investigate consumers' willingness-to-pay for organic food products and the influence of information on this willingness-to-pay, we performed a survey of consumer decisions concerning the purchase of apples in Flanders (Belgium). Each survey contained socio-demographic questions (age, gender, education, income, constitution of household…), questions measuring social and environmental attitudes (member of environmental NGO,

volunteer work, importance of particular societal problems, frequency of sport activities, vegetarian life style…) and questions dealing with consumer behavior (responsibility for food purchases, main location for food shopping, important choice characteristics when buying food, …).

Besides these descriptive questions, we also performed a choice experiment. Each respondent faced six different choice sets (for an example, see table 2), each of which consists of two alternative apple varieties (A and B) and the option not to buy any apples. The apple varieties were described using six attributes: taste, size, shape & skin, organic label, origin and price. See table 3 for the different levels that were included for each attribute. Each respondent was asked of which apple variety they would prefer to buy a kilogram.

Since the full factorial design of the experiment would include 486 (= $3^5.2$) different apple varieties, we limit the number of varieties included in our questionnaires. Our design strategy starts from an orthogonal main effects plan (OMEP) since this allows the uncorrelated estimation of all main effects under the assumption that all interactions between attributes are negligible and uses the search algorithm developed by Street et al. 2005 to arrive at a optimal experimental design. In particular, we selected an OMEP including 18 different apple varieties and by taking a transformation of this OMEP we constructed 18 different choice sets. In order to limit the response time and increase the response rate, we made three different versions of the questionnaire each with six randomly selected choice sets.

So, in order to study the impact of information provision on consumer choices, we asked each respondent to make six choices between two pairs of apple varieties each (+ option not to buy one kg apples) and then we explicitly listed the environmental and health related impact of organically versus conventionally produced apples. Specifically, we provided the respondents with the following information (based on Reganold et al. 2001, Briviba et al. 2007, Dangour et al. 2009): *"Objective scientific studies find that organic apples provide: 12% better soil*

quality (less flooding with heavy rainfall), 84% less environmental pollution (due to reduced use of hazardous chemicals), need 7% less energy to produce the same amount of apples (better for climate) and that they are not healthier than non-organic apples". After this information was provided, we asked the respondents to go over the six choice sets again to see whether they would change the choices they made. If they did not change their preferences, we asked them why this was so. We explicitly distinguish four reasons: 1) the information provided was not new, 2) the respondent did not care about the positive environmental impact of organic labels, 3) the respondent did not trust the information implicit in organic labels, or 4) the respondent believed that the environmental effects are too small to take into account.

4.2 Data description

The online survey was executed between April and September 2010 and 226 respondents filled out the questionnaire of which 146 respondents filled out the six choice cards twice (thus before and after we provided information about the impact of organic production methods). The remaining 80 respondents made six choices between two pairs of apple varieties each, but did not go over the choice sets a second time because they indicated that they would not change their preferences as a consequence of the information provided.

Table 4 gives a description of the socio-economic characteristics of the respondents. The average respondent was 42 years old. 74% was married or cohabitating with a partner. In comparison with the overall population, a disproportionately high share of respondents obtained a higher educational degree (bachelor, master or PhD). Not surprisingly, the majority of respondents had a relatively high net household income of more than 3000 euro per month at its disposal. When asked what three social themes the respondents considered important, over 70% selected 'health'. This topic was followed by 'environmental quality', 'pension security' and 'safety on the streets', each selected by approximately 40% of

respondents. Moreover, 41% of the respondents considers organic food to be healthier and 51% considers it to be better for the environment than conventional food. Thus we find that two topics closely related to the beliefs people hold about organic labels, i.e. health and the environment, are indeed very important to respondents. Further, we also asked what aspects determine the respondents' choice when buying fruit and vegetables. Freshness is the single most important factor (87%), second comes taste (62%) and next come seasonality (38%) and price (32%). The relatively limited attention to price in our sample might be explained by the relatively high household income available to the majority of our respondents.

VI. Empirical Results

In this section we present the results of the logistic regression based on the choices made by the respondents. First we look at the simple model including only the main effects of the various attributes associated with the apple varieties. Next, we look at the impact of respondents' characteristics on their willingness-to-pay for labeled organic apples.

6.1 Baseline estimation results

To estimate the coefficients that maximize the probability of choice, we used a conditional logit model. We assume an indirect utility function where the deterministic component depends on the attribute values of the alternatives. An alternative specific constant (ASC_i) is included in the model to reflect the effect of choosing to buy any apple over not choosing to buy an apple and to correct for possible order effects (i.e. whether an apple variety was presented first or second in a particular choice set). The coefficients associated with the different attributes are shown in table 5.

Model (1) and (2) estimate the coefficients of the attributes respectively before and after the information regarding the impact of organic farming has been given and this for all 226 respondents (entire sample). Since 80 respondents went only once over the choice cards

because they indicated that the provided information did not alter their responses, we proceeded as if they did make the six choices in the second round and provided identical answers as in the first round. In addition in model (3) and (4) we also estimated the coefficients of the attributes respectively before and after the information about the impact of organic farming was provided but retained only these respondents in our sample that effectively went over the choice cards twice (reduced sample).

The results are as expected: consumers dislike sour specked apples of medium size and prefer domestically produced apples above those produced in Spain and Australia. Also, buying apples with an organic label gives an increase in consumer utility. The exact willingness-to-pay (WTP) for each attribute level can be found in Table 6. Note that these amounts estimate the WTP for a particular characteristic ceteris paribus. Thus the amounts cannot be summed as such since they are each calculated assuming that all other factors remain constant. The positive coefficients of the ASC show that consumers derive utility from buying an apple over not buying an apple and since the two coefficients are virtually identical no order effects are found The estimation results also illustrate that the provision of information about organic labels increases the utility derived from buying organic apples. Recall that we explicitly mention to our respondents that organic apples have considerable environmental benefits compared to conventional apples, but that there are no scientifically proven health effects. Thus any increase in the WTP for organic labeled apples reflects a valuation for external effects such as environmental quality improvements and not a valuation for private effects such as health improvements. We find that the coefficient of the organic label attribute significantly increases when additional information is provided and, in the limited sample, its significance level increases as well. When looking at the entire sample, the WTP for buying one kilogram of apples with an organic label increases from 0.33 € to 0.56 € per kilogram. In the reduced sample, the WTP for organic labels is always lower than in the entire sample, but

the increase in WTP for buying one kilogram of apples with an organic labels due the provision of information is even more pronounced (from 0.26 € to 0.60 € per kilogram). This indicates that the respondents that went over the choice cards only once, were respondents that were already aware of the positive effects of organic production systems and were already willing to pay a price premium for it.

Furthermore, respondents value certain apple characteristics that are used more as a proxy for private benefits less after the provision of subjective information about the true impact of organic production methods. In particularly, respondents wanted to pay significantly less for a non-specked apple with an irregular (not round) shape than for a non-specked apple with a regular (round) shape before the information provision, while this difference disappeared after the information provision and this to the benefit of the WTP for a characteristic (i.e. organic label) that generates a positive environmental effect (Table 6). The same holds for apples of medium size. Respondents wanted to pay significantly less for a medium sized apple before they were informed of the positive external effects of organic production methods, while they cared less about an apple being of medium size afterwards.

Finally, consumers are willing to pay a high premium for apples that are locally produced. This might indicate that respondents care about food miles, but it might as well mean that consumers care about stimulating the local economy. However, the farther away the country of origin (Australia versus Spain) the less respondents are willing to pay for the apple. This indicates that consumers do not only prefer to consume locally produced apples to stimulate local development, but that they do take the negative external effects of transport into account when making their consumption decision.

6.2 Identification results using interaction terms

So far we have considered a choice model in which only the attributes of the apple variety were taken into account. However, socio-economic factors are also likely to affect

consumers' choices and to affect their WTP for organic apples. In order to test these effects, we include several interaction terms of the organic label attribute variable with socio-economic variables (see Table 7). The results indicate that several variables do not affect the WTP for organic apples; more specifically this holds for age, gender, presence of children, marital status, frequency of sport activities, income and respondents' attitude towards social themes. However, we do observe an effect concerning respondents' membership of one or more nature conservation organizations, for vegetarian respondents and respondents with a higher education. A detailed overview of the estimation results of these significant interactions is provided in appendix. We now discuss these effects in more detail.

Firstly, we find that respondents that are members of a nature protection organisation have a higher willingness-to-pay for organic apples than non-members (see Table A1). Moreover, the willingness-to-pay of members is not affected by the information we provided. Presumably the information we provided was not new to this group of respondents and was already included in the first choice moment. However, the choices made by non-members were influence by the information we provided and they are willing to pay a significantly higher amount for organic labels after information on the production method has been provided (45 eurocent instead of 25 eurocent per kg). This result clearly illustrates the important role of information provision on individuals' consumption choices (see table A1).

Secondly, we find that vegetarian respondents are willing to pay a significantly higher price premium for organic apples than non-vegetarians (see Table A2). Again, we observe that the additional environmental and health information had no effect on the willingness-to-pay by vegetarian respondents, while it significantly increased the WTP by non-vegetarians (from 23 to 50 eurocent per kg).

Thirdly, the estimation results (see Table A3) indicate that people with a higher education (professional bachelor, academic master or PhD) are willing to pay a significantly higher

price for organically labelled apples than for non-labelled apples, while lower educated people are not willing to pay a higher price for organically produced apples. After information is provided concerning the impact of organic production methods, both higher and lower educated people are willing to pay a higher price for labelled apples. While information provision increases the WTP for organic labels of lower educated people, their overall WTP is still not significantly different from zero. The latter may be due to the limited amount of information that is provided or to the smaller sample size.

6.3 Impact of objective information on subjective beliefs

We now analyse the impact of objective information provision on the willingness-to-pay for organic labels for different groups of respondents depending on their ex ante (subjective) beliefs. We asked respondents about the characteristics they associate with organic labels and are thus able to distinguish four types of respondents depending on their positive or negative environmental and health beliefs (see Table 8). We then investigated the effect of objective information provision on each of these four groups (see Table 8). First, the results show that information has no effect on the group of respondents who did associate health effects with organic labels, irrespective of their ex ante environmental beliefs. Respondents that associated positive health and environmental effects to organically produced food had a significantly positive WTP both before and after the information provision (see Table A4). This illustrates their high valuation of the external (environmental) effects: the WTP for apples with an organic label remains positive even if they know that the their ex ante private (health) beliefs were unwarranted. On the other hand, respondents that associated positive health effects but no environmental effects with organically produced food did not want to pay a price premium for apples with an organic label, before nor after the information provision. This is not very surprising. It is generally known that individuals attach more importance to private benefits than to external benefits. Hence, an individual that does not

value positive private effects such as health effects will for sure not value positive external effects after the information provision. Finally information provision significantly increased the willingness-to-pay for organic labels by those respondents that did not have positive health beliefs, irrespective of their ex ante environmental beliefs. Respondents that did not associate a private health benefit with organic production methods were initially not willing to pay more for apples with an organic label. However, after the information provision their WTP becomes positive. This indicates that, while the objective information confirmed the absence of private health benefits, the provision of objective information on environmental effects resulted in a significant increase in their WTP for organically produced apples and hence in a positive valuation of these external environmental effects.

VII. Conclusion

To investigate how consumers' willingness-to-pay for organic labels depends on the objective information and subjective perception they have about a specific label, we have set up a choice experiment in which Flemish consumers were asked to make a choice between two apple varieties with different taste, shape, price, origin and label. We estimated the respondents' a priori willingness-to-pay for labeled organic apple varieties. For our sample, consumers were willing to pay a price premium of 33 eurocent per kilogram for labeled organic apples compared to non-labeled apples. Next, we updated the respondents' knowledge about the impact of organic production methods for consumers' health and the environment. After receiving the updated information, the respondents were confronted with the same choice cards and asked whether they would like to change their previous made choices. Thus we were able to estimate a significantly positive effect of information provision on consumers' preferences. For our sample, consumers were willing to pay up to 56 eurocent per kilogram for labeled organic apples after the additional information on positive

environmental and neutral health impacts was explicitly provided. Finally, socio-demographic information is collected in order to control for some fixed effects. While our results indicate that variables such as age and gender do not affect the WTP for organic apples, we do observe an effect related to education, a vegatarian life style and respondents' membership of one or more nature conservation organizations. Moreover, the effect of information provision depends on the ex ante beliefs held by consumers relating to the environmental and health effects of organic fruit consumption and production. Especially, the group of consumers that did not held positive health beliefs show a significant increase in their willingness-to-pay for organic apples after information on the positief environmental effects was provided.

Our analysis illustrates how the willingness-to-pay for labeled organic products increases by providing consumers with objective information about the impact of organic production systems. In that way, the paper provides useful insights for policy makers concerned with the environment and rural development as well as different actors in the agro-food chain (both producers and retailers) on how information provision can affect their product demand. Using labeling to promote sustainable products might provide a stimulus to develop the supply and demand for these products. However, our results show that this positive effect on the development of a green market can be significantly increased by providing simple, to-the-point and trustworthy information on the environmental implications of the presence of an organic label to consumers.

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Table 1: Crop production (in ha) in Flanders 2003-2010 (Samborski and Van Bellegem 2011; NIS 2010)

Crop production in Flanders (ha)	Total area	Organic crop production		Total fruit production	Organic fruit production	
2003	634 934	3 445	0.54%	17 286	201	1.16%
2005	629 684	3 153	0.50%	16 186	196	1.21%
2007	622 133	3 497	0.56%	15 006	246	1.64%
2008	623 699	3 492	0.56%	15 897	270	1.70%
2009	620 161	3 659	0.59%	14 874	389	2.62%
2010	616 866	3 822	0.62%	14 835	431	2.91%

Table 2: Example of a choice set

	Apple variety A	**Apple variety B**	**Neither A nor B**
Taste	Sweet	Mildly sweet	
Size	Large	Small	Neither Apple variety A, nor Apple variety B
Shape & skin	Round & specked	Irregular & not specked	
Organic label	No	Yes	
Origin	Australia	Belgium	
Price	1,5 euro/kg	2 euro/kg	
	☐	☐	☐

Table 3: Attributes and attribute levels

Attribute	*Attribute levels*
Taste	Sweet Mildly sweet Sour
Size	Small Medium Large
Shape and skin	Round & not specked Round & specked Irregular & not specked
Organic label	With label Without label
Origin	Belgium (local) Spain Australia
Price	1 euro/kg 1.5 euro/kg 2 euro/kg

Table 4: Descriptive statistics

Number of respondents	226
Average age (years)	42
Female (%)	62
Did or doing voluntary work (%)	47
Higher education – bachelor, master, PhD (%)	78
Member nature protection organisation (%)	19
What social themes do you consider important? (%)	
Health	74
Environmental quality	40
Pension security	40
Safety on street	39
Political correctness	28
Unemployment	27
Equal opportunities	21
Tax pressure	13
Animal wellbeing	10
What aspects are considered important when buying fruit and vegetables? (%)	
Freshness	87
Taste	62
Season	38
Price	32
Health	19
Country of origin	19
Consumption ease	12
Bio/organic	10
Variation	8
Nutritional value	4
What characteristics do you assign to organic food? (%)	
Healthier	41
Better for the environment	51
Which statements can you subscribe? (%)	
Labels are a marketing tool but do not guarantee sustainable production	36
Only labels certified by governmental/public organisation guarantee sustainable production	32
Private and public labels both guarantee sustainable production	16
None of the above statements is correct	16
Net income (euro/month) (%)	
0-1000	2
1001-2000	12
2001-3000	19
3001-4000	28
4001plus	23
Not specified	15

Table 5: Baseline estimation results

	Full		Reduced	
	(1) Before	(2) After	(3) Before	(4) After
Round specked	-0.430	-0.403	-0.403	-0.414
	(4.72)***	(4.39)***	(3.46)***	(3.50)***
Not round not specked	-0.188	-0.092	-0.186	-0.068
	(1.99)**	(0.98)	(1.53)	(0.56)
Mildly sweet	-0.117	-0.057	-0.185	-0.104
	(1.34)	(0.66)	(1.68)*	(0.94)
Sour	-0.951	-0.932	-1.143	-1.137
	(9.82)***	(9.61)***	(9.04)***	(8.94)***
Spain	-0.483	-0.547	-0.432	-0.529
	(5.48)***	(6.17)***	(3.87)***	(4.67)***
Australia	-0.901	-0.900	-0.925	-0.924
	(9.44)***	(9.40)***	(7.55)***	(7.48)***
Medium size	-0.259	-0.154	-0.245	-0.092
	(2.86)***	(1.69)*	(2.10)**	(0.79)
Large size	-0.250	-0.175	-0.208	-0.080
	(2.59)***	(1.78)*	(1.69)*	(0.63)
Organic label	0.203	0.355	0.179	0.421
	(3.10)***	(5.34)***	(2.16)**	(4.92)***
Price	-0.615	-0.635	-0.685	-0.704
	(6.55)***	(6.75)***	(5.69)***	(5.80)***
ASC1	3.175	3.000	3.318	3.047
	(14.22)***	(13.67)***	(11.47)***	(10.74)***
ASC2	3.151	2.971	3.315	3.030
	(13.85)***	(13.25)***	(11.24)***	(10.45)***
Observations	4083	4083	2628	2628
Test H_0: WTP organic label ex ante = WTP organic label ex post	Prob > chi2 = 0.0205 ** Reject H_0 at 5% sig level		Prob > chi2 = 0.0191 ** Reject H_0 at 5% sig level	

Table 6: Mark up in euro for a specific apple attribute*

	Full						Reduced					
	Ex ante			Ex post			Ex ante			Ex post		
	Mean WTP	95% CI Lower limit	95% CI Upper limit	Mean WTP	95% CI Lower limit	95% CI Upper limit	Mean WTP	95% CI Lower limit	95% CI Upper limit	Mean WTP	95% CI Lower limit	95% CI Upper limit
Shape an skin												
Round specked	-0.70	-1.05	-0.35	-0.64	-0.96	-0.31	-0.59	-0.98	-0.20	-0.59	-0.97	-0.21
Not round not specked	-0.31	-0.59	-0.02	-0.15	-0.42	0.13	-0.27	-0.62	0.08	-0.10	-0.43	0.24
Taste												
Mildly sweet	-0.19	-0.47	0.09	-0.09	-0.35	0.17	-0.27	-0.59	0.05	-0.15	-0.45	0.16
Sour	-1.55	-2.14	-0.96	-1.47	-2.01	-0.92	-1.67	-2.26	-1.07	-1.61	-2.18	-1.05
Origin												
Spain	-0.78	-1.19	-0.38	-0.86	-1.27	-0.45	-0.63	-0.98	-0.28	-0.75	-1.11	-0.39
Australia	-1.46	-1.95	-0.98	-1.42	-1.89	-0.95	-1.35	-1.84	-0.85	-1.31	-1.79	-0.84
Size												
Medium size	-0.42	-0.70	-0.14	-0.24	-0.50	0.01	-0.36	-0.70	-0.02	-0.13	-0.46	0.19
Large size	-0.41	-0.74	-0.07	-0.28	-0.61	0.06	-0.30	-0.65	0.04	-0.11	-0.47	0.24
Organic label	0.33	0.12	0.54	0.56	0.31	0.81	0.26	0.02	0.50	0.60	0.32	0.88

* Mark up compared to a sweet, small apple that has an irregular shape and a non-specked skin and that is produced in Belgium and according to organic production methods

Table 7: Summary of the choice modelling results using interaction terms

Interaction term of organic label with	*Impact on indirect utility*	*Impact of information provision on WTP for organic labels*
Age	No	
Being older than 60	No	
Having obtained higher education	Significantly positive	*Information significantly increases the WTP for organic labels of both higher and lower educated respondents
Having children	No	
Number of children younger than 12	No	
Household size	No	
Being a female	No	
Being a female and having children	No	
Being married or co-habituating	No	
Income	No	
Having a high income (more than 3000 euro net per month)	No	
Doing or did voluntary work	No	
Considering the social theme 'environmental quality' as important	No	
Considering the social theme 'animal wellbeing' as important	No	
Considering the social theme 'health' as important	No	
Considering the social theme 'safety' as important	No	
Sporting frequently	No	
Sporting regularly or frequently	No	
Being a vegetarian	Significantly positive	*Information does not significantly increase the WTP for organic label of vegetarians *Information significantly increases the WTP for organic label of non-vegetarians
Being member of a Nature Protection Organisation (NPO)	Significantly positive	*Information does not significantly increase the WTP for organic label of respondents that are member of a NPO *Information significantly increases the WTP for organic label of respondents that are not member of a NPO

Table 8: Impact of objective information provision on the WTP for organic labels according to the ex ante (subjective) beliefs about the positive environmental and heath effects of organic labels

Ex ante belief that organic labels have	*Test H0: WTP org. label ex ante = WTP org. label ex post*
positive environmental effects and positive health effects	Accept H0
no positive environmental effects and positive health effects	Accept H0
positive environmental effects and no positive health effects	Reject H0 at 5% sig level
no positive environmental effects and no health effects	Reject H0 at 10% sig level

Appendix

Table A1: Choice modelling results with an interaction term of the organic label attribute with being member of a nature protection organisation

	Full		Reduced	
	(1) Before	(2) After	(3) Before	(4) After
Round specked	-0.431	-0.403	-0.435	-0.393
	(5.00)***	(4.90)***	(4.09)***	(3.95)***
Not round not specked	-0.192	-0.098	-0.251	-0.099
	(2.12)**	(1.09)	(2.17)**	(0.88)
Mildly sweet	-0.120	-0.062	-0.209	-0.115
	(1.35)	(0.72)	(1.94)*	(1.11)
Sour	-0.957	-0.940	-1.226	-1.200
	(6.68)***	(6.72)***	(6.76)***	(6.92)***
Spain	-0.485	-0.550	-0.435	-0.535
	(4.44)***	(4.82)***	(3.38)***	(3.94)***
Australia	-0.906	-0.908	-0.947	-0.956
	(9.12)***	(8.96)***	(7.79)***	(7.72)***
Medium size	-0.261	-0.155	-0.272	-0.103
	(3.05)***	(1.80)*	(2.55)**	(0.97)
Large size	-0.255	-0.180	-0.260	-0.125
	(2.35)**	(1.63)	(2.00)**	(0.94)
Organic label	0.150	0.285	0.156	0.366
	(2.23)**	(3.86)***	(1.79)*	(3.70)***
Price	-0.612	-0.631	-0.714	-0.752
	(5.90)***	(6.29)***	(5.39)***	(5.92)***
Organic label * NPO	0.276	0.368	0.297	0.391
	(1.71)*	(2.21)**	(1.45)	(1.83)*
ASC1	3.179	3.006	3.388	3.133
	(11.14)***	(10.86)***	(9.52)***	(9.15)***
ASC2	3.156	2.979	3.361	3.089
	(11.21)***	(10.83)***	(9.53)***	(9.06)***
Observations	4083	4083	2880	2880
WTP Organic label				
Not member NPO	0.25	0.45	0.22	0.49
Member NPO	0.43	0.65	0.45	0.76
Test H_0: WTP organic label ex ante = WTP organic label ex post				
Not member NPO		Prob > chi2 = 0.0473 **		Prob > chi2 = 0.0440 **
		Reject H_0 at 5% sig level		Reject H_0 at 5% sig level
Member NPO		Prob > chi2 = 0.1182		Prob > chi2 = 0.1233
		Accept H_0		Accept H_0

Table A2: Choice modelling results with an interaction term of the organic label attribute with being a vegetarian

	Full		Reduced	
	Ex Ante	Ex Post	Ex Ante	Ex Post
Round specked	-0.430	-0.401	-0.432	-0.389
	(4.95)***	(4.87)***	(4.02)***	(3.92)***
Not round not specked	-0.180	-0.086	-0.250	-0.091
	(1.98)**	(0.96)	(2.15)**	(0.82)
Mildly sweet	-0.131	-0.067	-0.230	-0.122
	(1.47)	(0.77)	(2.11)**	(1.17)
Sour	-0.977	-0.946	-1.264	-1.208
	(6.76)***	(6.73)***	(6.80)***	(6.87)***
Spain	-0.473	-0.539	-0.420	-0.524
	(4.30)***	(4.72)***	(3.23)***	(3.86)***
Australia	-0.899	-0.897	-0.948	-0.947
	(9.18)***	(8.99)***	(7.95)***	(7.81)***
Medium size	-0.255	-0.150	-0.268	-0.098
	(2.98)***	(1.75)*	(2.50)**	(0.93)
Large size	-0.263	-0.183	-0.276	-0.129
	(2.41)**	(1.66)*	(2.10)**	(0.98)
Organic label	0.137	0.310	0.148	0.408
	(2.27)**	(4.42)***	(1.94)*	(4.40)***
Price	-0.600	-0.624	-0.694	-0.741
	(5.81)***	(6.25)***	(5.22)***	(5.83)***
Interaction org.label *	1.072	0.735	1.339	0.761
vegetarian	(3.63)***	(3.00)***	(2.85)***	(2.07)**
ASC1	3.164	2.988	3.376	3.111
	(11.18)***	(10.88)***	(9.57)***	(9.17)***
ASC2	3.138	2.958	3.351	3.066
	(11.26)***	(10.87)***	(9.60)***	(9.08)***
Observations	4083	4083	2880	2880
WTP Organic label				
Non vegetarian	0.23	0.50	0.21	0.55
Vegetarian	2.02	1.67	2.14	1.58
Test H_0: WTP organic label before = WTP organic label after				
Non vegetarian	Prob > chi2 = 0.0088 ***		Prob > chi2 = 0.0095 ***	
	Reject H_0 at 1%		Reject H_0 at 1%	
Vegetarian	Accept H_0		Accept H_0	

Table A3: Choice modelling results with an interaction term of the organic label attribute with education level

	Full		Reduced	
	(1) Before	(2) After	(3) Before	(4) After
Round specked	-0.431	-0.403	-0.436	-0.393
	(5.01)***	(4.92)***	(4.10)***	(3.97)***
Not round not specked	-0.188	-0.092	-0.243	-0.089
	(2.09)**	(1.04)	(2.13)**	(0.80)
Mildly sweet	-0.123	-0.063	-0.209	-0.112
	(1.38)	(0.73)	(1.94)*	(1.08)
Sour	-0.960	-0.940	-1.226	-1.195
	(6.72)***	(6.73)***	(6.79)***	(6.91)***
Spain	-0.482	-0.545	-0.429	-0.529
	(4.39)***	(4.78)***	(3.32)***	(3.88)***
Australia	-0.902	-0.900	-0.939	-0.945
	(9.13)***	(9.01)***	(7.77)***	(7.76)***
Medium size	-0.260	-0.153	-0.271	-0.100
	(3.05)***	(1.80)*	(2.54)**	(0.95)
Large size	-0.258	-0.181	-0.259	-0.121
	(2.37)**	(1.64)	(1.99)**	(0.92)
Organic label	-0.023	0.147	-0.055	0.205
	(0.15)	(0.93)	(0.28)	(0.94)
Price	-0.609	-0.629	-0.715	-0.753
	(5.89)***	(6.29)***	(5.42)***	(5.97)***
Interaction org.label *	0.284	0.262	0.344	0.307
higher education	(1.69)*	(1.48)	(1.53)	(1.28)
ASC1	3.175	2.998	3.384	3.123
	(11.19)***	(10.90)***	(9.59)***	(9.22)***
ASC2	3.151	2.969	3.353	3.075
	(11.26)***	(10.90)***	(9.60)***	(9.13)***
Observations	4083	4083	2880	2880
WTP Organic label				
No higher education:	-0.04	0.23	-0.08	0.27
Higher education:	0.43	0.65	0.40	0.68
Test H_0: WTP organic label before = WTP organic label after				
No higher education	Prob > chi2 = 0.0989 * Reject H_0 at 10% sig level		Prob > chi2 = 0.0958* * Reject H_0 at 10% sig level	
Higher education	Prob > chi2 = 0.0608 * Reject H_0 at 10% sig level		Prob > chi2 = 0.0550 * Reject H_0 at 10% sig level	

Table A4: Choice modeling results for different subsamples according to respondents' subjective ex ante beliefs

	positive environmental effects and positive health effects		no positive environmental effects and positive health effects		positive environmental effects and no positive health effects		no positive environmental effects and no health effects	
	Ex ante	Ex post	Ex ante	Ex post	Ex ante	Ex post	Ex ante	Ex post
Round specked	-0.499	-0.271	-0.388	-0.587	-0.481	-0.486	-0.456	-0.373
	(2.23)**	(1.40)	(1.88)*	(2.95)***	(3.07)***	(3.29)***	(2.61)***	(2.26)**
Not round not specked	0.106	0.029	-0.170	-0.298	-0.330	-0.285	-0.313	0.099
	(0.47)	(0.15)	(0.71)	(1.39)	(2.17)**	(1.70)*	(1.92)*	(0.57)
Mildly sweet	0.175	0.044	-0.104	0.024	-0.264	-0.145	-0.152	-0.111
	(0.95)	(0.24)	(0.46)	(0.11)	(1.66)*	(0.93)	(0.86)	(0.66)
Sour	-0.760	-0.908	-1.273	-1.184	-0.952	-0.752	-1.020	-1.101
	(2.46)**	(3.08)***	(3.49)***	(3.30)***	(3.63)***	(2.90)***	(3.94)***	(4.33)***
Spain	-0.946	-1.088	-0.390	-0.454	-0.296	-0.270	-0.381	-0.462
	(3.62)***	(4.07)***	(1.60)	(1.73)*	(1.53)	(1.34)	(1.84)*	(2.10)**
Australia	-1.288	-1.282	-0.696	-0.637	-0.860	-0.849	-0.843	-0.853
	(4.58)***	(5.49)***	(3.19)***	(2.99)***	(5.08)***	(4.98)***	(4.50)***	(4.04)***
Medium size	-0.155	-0.133	-0.267	-0.073	-0.286	-0.172	-0.336	-0.222
	(0.74)	(0.64)	(1.37)	(0.40)	(1.94)*	(1.14)	(2.02)**	(1.33)
Large size	-0.228	-0.151	-0.293	-0.177	-0.083	-0.012	-0.507	-0.425
	(0.89)	(0.59)	(1.14)	(0.71)	(0.39)	(0.06)	(2.78)***	(2.05)**
Organic label	0.820	0.816	0.274	0.350	0.056	0.279	-0.070	0.157
	(4.33)***	(4.31)***	(2.17)**	(2.32)**	(0.54)	(2.32)**	(0.73)	(1.37)
Price	-0.458	-0.538	-0.459	-0.343	-0.594	-0.652	-0.864	-0.902
	(2.40)**	(2.94)***	(1.72)*	(1.38)	(3.03)***	(3.60)***	(4.40)***	(4.55)***
ASC1	2.638	3.029	2.771	2.345	3.584	3.136	3.549	3.389
	(3.79)***	(4.91)***	(3.60)***	(3.39)***	(7.22)***	(6.24)***	(7.88)***	(7.22)***
ASC2	2.514	2.871	2.917	2.473	3.578	3.157	3.464	3.281
	(3.63)***	(4.58)***	(3.77)***	(3.54)***	(7.21)***	(6.29)***	(8.17)***	(7.29)***
Observations	846	846	810	810	1224	1224	1203	1203
WTP Organic label	1.790708	1.5166035	.59815113	1.0194568	.09434042	.42772734	-.08066513	.17399632
Test H_0: WTP organic label=0								
	**	***	Accept H_0	Accept H_0	Accept H_0	**	Accept H_0	*
	Reject H_0 at 5%	Reject H_0 at 1%				Reject H_0 at 5%		Reject H_0 at 10%
Test H_0: WTP organic label ex ante = WTP organic label ex post								
	Accept H_0		Accept H_0		**		*	
					Reject H_0 at 5%		Reject H_0 at 10%	