How do consumers in developed countries value the environment and workers' social rights in developing countries?*

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Abstract

This paper uses a lab experiment to investigate developed countries' consumer valuations of characteristics linked to the environment and workers' social rights in developing countries. It focuses on seafood products and distinguishes between regular, environmentally friendly and fair trade varieties. Consumer valuations are elicited with a multiple price list. Results show that environmental and social labels have similar effects on participant willingness-to-pay when they are first presented. Using welfare variation coming from the labels, we also show that the absence of negative information linked to the regular variety may lead to an underestimation of the value of information associated with the label.

Keywords: label, willingness-to-pay, multiple price list, value of information, seafood.

JEL Classification: C9, D8, J8, Q5.

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1. Introduction

Environmentally friendly and fair trade labeled products have emerged over the last two decades and their markets have expanded very rapidly. By enhancing production and export capacities, such products may contribute to the emergence of developing countries on the world market and to their economic growth. Some factors may however restrict their sales. At the macro-level, multilateral trade negotiations at the World Trade Organization (WTO), while acknowledging the important role played by such labels, do not make them mandatory. For instance, under WTO rules, countries cannot ban products based on the way they are produced (environment pollution, indecent working conditions, etc.). At the micro-level, consumers may not really trust such labels or are not willing to pay a premium for such products.

In this paper, we investigate developed countries' consumer valuations of characteristics linked to the environment and workers' social rights in developing countries. Developed countries are indeed the main market for labeled products coming from developing countries. We use a lab experiment conducted in France in 2009 to evaluate the impact of information about environmental and social characteristics of products on consumer choice. We distinguish between regular and labeled varieties. Production of regular varieties may imply pollutions and/or may not respect decent social rights, while labeled varieties goods are made according to certain environmental or/and social production standards. Successive positive or negative information is delivered to participants. Our experiment focuses on shrimps. Several environmental and social issues affect their production in developing countries.

World shrimp production has grown rapidly during the last two decades. However, this boom has come at some cost. First, there are health costs as shrimps often contain bacteria (e.g. salmonella) or pesticide, drug and antibiotic residues. There are also concerns related to the environment with the destruction of mangroves and the depletion of rivers and groundwater sources for maintaining oxygen levels in farms. Other concerns deal with the illegal use of areas

for shrimp aquaculture and corruption of local authorities, as well as bad working conditions (World Bank, 2001). These costs are likely to play an increasing role in swaying both consumers' choices and international trade. Environmentally friendly shrimps have recently emerged. However, they represent less than 1% of world production (Hervieu, 2009).

This paper makes an important contribution to the experimental literature on labels. This literature shows that a significant proportion of consumers are willing to pay substantial premiums for environmentally friendly products (Blend and Van Ravenswaay, 1999; Bougherara and Combris, 2009; Loureiro et al., 2001; Nimon and Beghin, 1999; Wessells et al., 1999) or fair trade products (Arnot et al., 2006; Loureiro and Lotade, 2005). However, there is still disagreement on whether or not labeling should combine different characteristics to increase WTP and to favor products from developing countries. Loureiro and Lotade (2005) compare WTP for coffee with fair trade, environmentally friendly or organic labels and Bernard and Bernard (2009) compare WTP for milk with conventional, organic, rBST-free or no-antibiotic characteristics. These papers offer a ranking of positive premiums for these new characteristics signaled by a label and suggest that consumers are very receptive to one characteristic. Our paper goes one step further since we show that the ordering of information is important. Participants are receptive to the first-detailed characteristic presented in the experiment. However, we also highlight a fast-diminishing interest in the added characteristic presented in second position.

The second contribution of our paper is to provide a complete estimation of the value of information associated with labels and defined by consumer surplus variations derived from the experimental results. While previous papers have determined the value of information through experimental auctions or surveys, we attempt to do so with a choice procedure based on a multiple price list. Furthermore, the estimation includes all negative and positive information for a characteristic (social or environmental) that delineates the regular and the new labeled varieties. In many existing studies (Huffman et al., 2003, 2007; Lusk et al., 2005; Lusk and

Marette, 2010; Rousu et al., 2004, 2007; Rousu and Lusk, 2009), [1] all information revealed in the experiment concerns only the newly introduced variety and not the regular/conventional variety. Our paper shows that the omission of the negative (or positive) information linked to the regular/conventional variety may bias the estimation of information value. More precisely, this omission leads to an underestimation of the value of information associated with the label since the knowledge about the regular variety is still imperfect.

The next section describes the experiment. Results are reported in section 3. Section 4 provides econometric estimations of the determinants of consumer willingness-to-pay. Section 5 studies the value of information and consumer welfare. Section 6 concludes.

2. Experiment

2.1 Sample

The sample consists of 160 people aged between 18 and 85 years. We conducted the experiment in Paris, France, in multiple one-hour sessions in December 2009. The sample of participants was randomly selected based on the quota method. Participants were contacted by phone and informed that they will have to reply to questions about food during one hour with a 15-euro participation fee. The sample is relatively representative of the age-groups and the socio-economic status of the population of the city although retired people are slightly over-represented.

In our experiment, the sample is divided into four groups (see the explanation and the figure 1 below) and participants are randomly assigned to one group. A Pearson chi-square test

[1] One exception is Gifford and Bernard (2004).

shows that the four groups are not significantly different from each other in terms of participants' socio-economic characteristics (gender, age, education, income, household composition).[2]

2.2 Product

The experiment focuses on a 100g plastic package of farmed, midsize, shelled, cooked and refrigerated shrimps. Cooked and refrigerated shrimps are the most consumed shrimps in France (two-thirds of all consumption of shrimps both in value and quantity in 2008 according to the FranceAgriMer, 2008).[3] As no major brand dominates the market, the private brand (linked to a French supermarket) is concealed to avoid any influence of this supermarket brand.

For fair trade and environmentally friendly shrimps, we add the corresponding label to the picture of the regular product (instead of using real labeled products). Indeed for really measuring the marginal value of the environmental and fair trade characteristics with sequential choices, regular, environmentally friendly and fair trade varieties would have to be similar in a maximum number of elements, namely, brand, sauce, weight, packaging, and price. Such a similarity between regular and environmentally friendly varieties did not exist and no fair trade shrimps were sold on the French market at the time of the study.[4] In this last case, the experiment allows us to measure consumers' WTP for the hypothetical fair trade variety and evaluate the possible benefits linked to the introduction of a fair trade label, which is likely to appear in a near future for shrimps. Participants are however not informed during the experiment that the fair trade variety is not currently available on the market.

[2] The socio-economic characteristics of participants within each group and the results of the Pearson chi-square test are available upon request.

[3] Statistics do not distinguish between shelled and non-shelled shrimps.

[4] Furthermore, the cold process linked to refrigeration makes the sale/distribution of real products to participants hazardous in terms of food safety.

Based on the previous literature, the risks of possible hypothetical biases can be downplayed regarding the welfare measures, since the marginal WTP (namely the difference between WTP expressed under different choices) is used for computing the value of information that is the surplus variation coming from revealed information (see also footnote 5). By comparing hypothetical and non-hypothetical responses, Lusk and Schroeder (2004) show that marginal WTP for a change in quality/characteristic is, in general, not statistically different across hypothetical and real payment settings. Moreover, Camerer and Hogarth (1999) show that performance-based financial incentives have little effect on mean responses.

2.3 Experimental design and revealed information

The experiment is divided into several stages as described in figure 1. Participants receive general instructions and sign a consent form. They fill in an entry questionnaire on consumption behavior and socio-demographic characteristics. Five successive rounds of WTP elicitation are then organized. For each round, we first provide some information to the participants. After the information revelation, they fill in a multi-price list (or payment card) presented on a paper sheet, which allows elicitation of the WTP. Finally, participants complete an exit questionnaire and receive the €15 compensation.

Insert figure 1 here

While the complete information revealed to participants is given in appendix, it is possible to sum up the content delivered at different points in the experiment as follows:

- In the first round, we provide basic information about the shrimp, including the range of existing prices observed in supermarkets (between €1.50 and €4).
- In the second round, we provide brief information on concerns about the environment and working conditions.

- In the third and fourth rounds, we reveal additional information about possible environmental and working conditions attributes linked to shrimps. We divide our sample into four groups and we vary the type (positive vs. negative) and the order of information (environmental vs. social) provided to each group. The two first groups (groups $Info^{Positive}_{Social\_Environment}$ and $Info^{Positive}_{Environment\_Social}$) receive positive information, while the two last groups (groups $Info^{Negative}_{Social\_Environment}$ and $Info^{Negative}_{Environment\_Social}$) receive negative information. Information on working conditions is delivered before information on environmental conditions to groups $Info^{Positive}_{Social\_Environment}$ and $Info^{Negative}_{Social\_Environment}$, while groups $Info^{Positive}_{Environment\_Social}$ and $Info^{Negative}_{Environment\_Social}$ receive information on environmental conditions before information on working conditions.
- Finally, in the fifth round, we reveal information about safety. Previous experiments show that safety information is a priority for participants eclipsing other characteristics (Marette et al., 2009), while in this experiment we want to ignore food safety considerations except at the end of the experiment.

A multiple price list is presented on a sheet of paper to elicit participants' WTP. During each choice phase, participants are asked to choose whether or not they will buy the product for prices varying from €0.25 to €4 with a 25-cent interval between possible choices. A color picture of the shrimp package is posted on the paper sheet. For fair trade and environmentally friendly shrimps, we also post a "fair trade" or "environmentally friendly" label. For each price, participants have to check off either "yes", "no" or "maybe" denoting their purchase preferences. The option "maybe" is useful for capturing hesitation that differs from a firm "yes". For each choice #*i* with *i*=1,...,5, the WTP is determined by taking the highest price linked to a "yes" choice. If no "yes" is checked off, we set the WTP to zero. If "yes" is always selected, we set the WTP to €4.

Andersen et al. (2006) underline two disadvantages of the multiple price list. The first disadvantage is the interval response eliciting interval from participants rather than point estimates for WTP. With our experiment, the 25-cent interval offers enough precision for the elicited WTP. The other disadvantage is the framing effect with a psychological bias towards the middle of the multiple price list for choices made by participants. Andersen et al. (2006) control for this effect by changing the boundaries of the multiple price list. In this paper we do not change the boundaries of the list and therefore do not control for this framing effect, since we focus on the impact of the revelation of information and messages. The psychological bias is plausible for the first round of our experiment, 18.1% of participants expressing a WTP of €2. However, this effect disappears after the revelation of information. Only 11.3% of participants make a bid of €2 in choice #2, and this percentage becomes less than 6% in choices #3, #4 and #5. Despite these limitations, the multiple price list methodology is useful for providing information regarding the consumers' WTP.

3. Experimental results

Figure 2 shows the average WTP in euro for 100g of shrimps. This average takes into account bids by all participants, including the ones with WTP equal to zero. The standard deviation is reported in parentheses. Recall that the two upper groups $Info^{Positive}_{Social\_Environment}$ and $Info^{Positive}_{Environment\_Social}$ (respectively the two lower groups $Info^{Negative}_{Social\_Environment}$ and $Info^{Negative}_{Environment\_Social}$) receive positive information with labels (respectively negative information). The *x*-axis of each graph details under each bar the round of choice *i* with *i*=1,...,5 and information preceding the choice leading to the WTP elicitation. The indicators Δ isolate the significant impact of a single round of additional information. We test for the significance of the WTP differences following a single round of information (namely, between WTP #*i* and WTP #*i+1*) by using the Wilcoxon test for paired samples and indicate the significant differences at the 1 %, 5%, and 10% level.

Insert figure 2 here

Seven main results could be highlighted:

(i) The initial WTP before the revelation of any information about social, environmental and health-related conditions is similar across groups. A Kruskal-Wallis test concludes that the valuation for the first round across the four groups is not statistically significant.

(ii) The short and vague message we provide does not influence consumers with pre-existing knowledge about the question studied in the experiment. A Kruskal-Wallis test concludes that the valuation for the second round is similar across groups. Furthermore, the revelation of short and general information about environment and social conditions before choice #2 does not lead to a significant change in WTP for three of the four groups. For the last group (group $Info^{Negative}_{Social\_Environment}$), the Wilcoxon test for paired samples shows that the difference in WTP between the first and the second bars is significant but only at the 10% level. This result differs from conclusions showing that short and simple information is efficient for changing WTP (Wansink et al., 2004). Clearly, there are no definitive conclusions that depend on both the products and the characteristics at stake.

(iii) A sufficient level of precision in the revealed information is efficient for changing WTP. Participants react to the second and more precise round of information (before choice #3). The differences in WTP between the second and third bars of each graph are significant, except for one group (group $Info^{Negative}_{Environment\_Social}$, significant at 10.1% only).

(iv) Positive information has a larger impact on consumers' WTP in absolute value than negative information. The average variation in absolute value between the second and third bars is equal to €0.73 and to €0.75 for the two groups receiving positive information and only to €0.34 and to €0.48 for the two groups receiving negative information.[5] This diverges from some

[5] For positive information the premium equal to €0.75 corresponds to an increase of 35% of the WTP. Some farms in Madagascar recently offer organic shrimps with a price premium of 25% compared to regular products sold in

results on food safety showing that negative information has a larger impact than positive information (Fox et al., 2002; Hayes et al., 1995). One explanation for our result could be that consumers tend to undervalue the distinctive advantage of the label and give higher ratings to products with a label and additional details covered by that label (Hoogland et al., 2007).

(v) Different labels have similar effect. The Mann-Whitney-U test across the two groups $Info^{Positive}_{Social\_Environment}$ and $Info^{Positive}_{Environment\_Social}$ reveals that valuations for the third rounds are not statistically different, even if labels are different. Interestingly, the same result occurs when one focuses on the two groups receiving negative information. The fact that no label dominates other labels may explain the appearance of new labels on the market, since some producers may benefit from higher consumers WTP with a new signal that is different from other labels. This result also suggests that farmers from developing countries could consider different quality improvements associated with different labels to capture consumer WTP.

(vi) Consumers' WTP does not seem to be influenced by different labels or negative information. The additional information about the second characteristic (before choice #4 leading to the 4th bar) does not impact WTP for the four groups of participants. This is true whatever the type of information (positive vs. negative) and in case of positive information whatever the type of labels (environmentally friendly or fair trade). Similarly, the last information about safety (before choice #5 leading to the 5th bar) clearly matters for the two groups, which previously received only positive information. The effect is much smaller and even not significant for the two groups previously receiving negative information.

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other farms (see Hervieu, 2009). This premium of 25% at the farm gate is a lower bound since middlemen and supermarkets tend to increase it when offering the organic product. This simple comparison suggests that our welfare measures do not suffer from a hypothetical bias

(*vii*) *Experiment results are driven by neither an information effect per se nor a tiredness effect.* First, the revelation of short and general information before choice #2 does not lead to a significant change in WTP for three of the four groups, suggesting the absence of an information perturbation whatever its content (information effect *per se*). As a consequence, the significant impact of information before choice #3 can really be interpreted as a shock coming from the content of positive information or negative information. Second, the significant impact of the last round of information before choice #5 indicates that participants' attention does not suffer from a tiredness effect.[6] The non-significant impact of information before choice #4 can therefore be interpreted as the absence of an additional premium for a second characteristic (under both positive and negative information).

4. Econometric estimations

We now provide more explanations regarding the results of figure 2 and investigate the determinants of changes in WTP. To do so, we regress difference in WTP expressed by participants between choices #*i*+1 and #*i* (with *i=1,…,4*) on information and participants' characteristics. Results are presented in table 1. Since participants provide several answers, our sample is a panel and we could use a panel estimator. However, each participant makes multiple choices, and therefore there could be some correlation across data points relating to WTP. To deal with this issue, we use the random effects panel estimator.[7]

We first examine whether the revelation of positive information (respectively negative) before choice #*i*+1 increases (respectively decreases) participants' WTP (column 1). We assume

[6] Due to tiredness, participants' attention could decrease during the experiment and they react less (or even do not react) to new information.

[7] We also tested for the influence of participants' socio-economic characteristics (sex, age, presence of children in the household, and level of education). Because none of the estimated coefficients on these variables was statistically significant, we decided to remove them from the estimations.

that three types of information are revealed during the experiment: (i) neutral information (i.e. general and brief messages #1 and 2 provided to all participants), (ii) positive information (messages #3 and 4 delivered to groups $Info^{Positive}_{Social\_Environment}$ and $Info^{Positive}_{Environment\_Social}$), and (iii) negative information (messages #3 and #4 delivered to groups $Info^{Negative}_{Social\_Environment}$ and $Info^{Negative}_{Environment\_Social}$, and message #5 to all groups). To test the impact of information on participants WTP, we therefore define two dummies: one for positive information and one for negative information. The first dummy (respectively the second one) is set to one if positive information (respectively negative information) is revealed and 0 otherwise. Results suggest that revealed positive information increases participants' WTP, while negative information decreases it. Estimated coefficients on both dummy variables are significant at the 1% level.

In column (2), we interact the dummies on positive and negative information with dummies on the type of revealed information before choice #*i*+1: environmental, social or health-related. Interestingly, only three interaction terms are significant at the 1% level and have the expected sign; positive social and positive environmental information increases WTP, while negative safety information reduces WTP. The two other interaction terms (namely, negative social and negative environmental information) are not significant. Furthermore, the F-test shows that the interaction terms (positive x social information and positive x environmental information) are not significantly different.

Column (3) examines if the order in which information is presented impacts the WTP, i.e. if information about social conditions (respectively environment) has a similar or different effect depending on whether it is presented before or after environmental concerns (respectively social conditions). To perform this analysis we define two dummies: "first information" equals to one for information provided before choice #3 (0 otherwise) and "second information" set to one for information revealed before choice #4 (0 otherwise). We then interact these two dummies with the previous dummies on positive/negative and social/environmental information. Results show

that only the positive message on social or environmental conditions delivered before choice #3 significantly affects the differences in WTP. The first negative message before choice #3 and the second (positive or negative) message before choice #4 have no significant influence. Besides, the F-tests suggest that the interaction terms (positive x social x first information and positive x environmental x first information) are not significantly different. These results are in line with figure 2 and confirm that consumers' valuations are more sensitive to positive information than to negative information.

Finally, in columns (4) and (5), we investigate whether information affects differently participants belonging to alternative demographic groups. We interact information variables with two socio-economic characteristics of participants: sex and presence vs. absence of children in the household. Previous results remain qualitatively unchanged. The estimated coefficients on these interaction terms show some differences between male and female and between participants living with/without children at home. However, the F-tests suggest that these differences are not statistically significant. This absence of influence of socio-economic characteristics is often found in experimental economics, especially when one controls for the individual effect (i.e. for the correlation across the multiple choices made by each participant) as we do. It suggests that reactions to information seem similar across the sample of participants and, by extrapolation, for the overall French population. In other words, reactions are relatively similar whatever the people attending the experiment.

Insert table 1 here

5. Value of information and consumer welfare

The WTP can be used to determine the consumer surplus and the value of information. Following Foster and Just (1989) and Teisl et al. (2001), information is welfare enhancing if consumers change their consumption behavior. The contribution of our experiment is twofold.

First, we investigate whether positive and negative information for the same characteristics has a similar impact on participants' behaviors. Second, we combine both positive and negative information to estimate consumer welfare. Our approach therefore differs from the previous studies focusing only on the effect or/and the value of information related to the labeled variety (Huffman et al., 2003, 2007; Lusk et al., 2005; Rousu et al., 2004, 2007; Rousu and Lusk, 2009).

Consumers' knowledge is affected by various parameters including levels of consumer attention, advertising, ambient opinion, media coverage, regulation, etc. There are many contexts of information perception that makes difficult the precise characterization of "correct" or "incorrect" information. Some consumers (or nations) pay more attention to positive information and some others are more concerned by negative information. Many limits in consumption are coming from difficulties to collect, understand and/or process the load of information (Ariely, 2000). Imperfect recall, lack of time before purchasing or/and confusion about complex information characterize many consumers in the supermarket and potentially bias their consumption decisions. Risks of consumers' confusion and difficulties to understand complex recommendations with positive and negative points of views diminish the information efficiency (Sasaki et al., 2011).

All these facts explained why we describe different contexts of information. Surplus analysis under different contexts could help streamline debates around food media coverage and improve regulatory efficiency regarding the revelation of information. Both positive and negative messages are complementary since they concern different varieties in competition. Positive information is clearly related to the variety with the label (organic or fair trade), while negative information is related to the regular variety without label. Revealing information about the environmentally friendly or fair trade variety does not mean that all information is revealed about the 'harmful' one and the extent of the environmental and social problems. The consumers' perception of the regular variety is also modified by the revelation of information about the

regular variety.[8] This revelation impacts the intensity of the perceived variety differentiation as precisely described in section 5.3"

We focus on information delivered just before choice #3. This information significantly impacts WTP for three of the four groups (see figure 2)[9], and therefore its welfare impact can be computed by comparing WTP_3 and WTP_1. The focus on this third message presents three main advantages:

(i) When positive information linked to a label is revealed, consumers are aware of a new purchasing option. In this case, we may simulate the introduction of a new variety of the product signaled by a label (fair trade or environmentally friendly label).

(ii) When negative information about the regular variety is revealed, consumers may take different action compared to the absence of precise information. In this case, we may determine a non-internalized damage.

(iii) Eventually, we combine both types of positive and negative information to have a complete view when different varieties of a given product coexist on the market. The combination of detailed and complete information about each variety provides a balanced estimation of the value of information. In our context, each group provides well-informed, thoughtful preferences about one variety without interferences with competing varieties since the consumers' focalization is guaranteed.

[8] Negative information on the regular product would not be revealed by the regular industry via advertising. It may be revealed by intense campaigns made by environmentalist groups that can be highly vocal like Greenpeace. Rousu et al. (2004) detail a method for valuing information as correct despite the eyes of the entity providing it. In this paper, we do not focus on a specific entity, but rather insist on different sources of information linked to different products.

[9] For group 'Neg_env/soc', information is significant at 10.1% only when we compare WTP_2 and WTP_3. However, the comparison of WTP_1 and WTP_3 for this group shows a statistically significant difference at 1%.

5.1 Positive information about the new (labeled) variety

With positive information linked to a labeled variety for groups $\text{Info}^{\text{Positive}}_{\text{Social\_Environment}}$ and $\text{Info}^{\text{Positive}}_{\text{Environment\_Social}}$, we can measure the impact of a label introduction on participants' surplus. This label leads to the introduction of a new variety complying with the label requirements. Before measuring the value of information, we determine the participants' purchase choices in periods 1 and 3. We assume that a participant purchases a good if his WTP for the good is higher than the price observed on average in the supermarkets in France. Before choice #1, only "regular" shrimps are offered, and the participant can choose between two outcomes: regular at price P_R and none. The participant *j* chooses the option generating the highest utility, namely:

$$CS_1^j = \max\{WTP_1^j - P_R, 0\}, \quad (1)$$

where the subscript 1 denotes the bid linked to choice #1 for a participant *j* (with *j=1,…,N*).

When a label is introduced at price P_L (before choice #3), the participant can choose between three outcomes: regular variety, labeled variety, and none. She/he chooses the alternative, which generates the highest utility, and thus:

$$CS_3^j = \max\{WTP_1^j - P_R, WTP_3^j - P_L, 0\} \ . \quad (2)$$

We now turn to the value of information by using two metrics to compute the average value for each group $\text{Info}^{\text{Positive}}_{\text{Social\_Environment}}$ or $\text{Info}^{\text{Positive}}_{\text{Environment\_Social}}$ receiving positive information. The participants' surplus change from a label introduction, if all participants are fully informed about the label, is:

$$\Delta CS^K_{Label} = \frac{\sum_{j=1}^{K}[CS_3{}^j - CS_1{}^j]}{K} = \frac{\sum_{j=1}^{K}[\max\{WTP_1^j - P_R, WTP_3^j - P_L, 0\} - \max\{WTP_1^j - P_R, 0\}]}{K}. \quad (3)$$

where *K* can take two values. First $K=S_P$, where S_P is the number of switchers receiving positive information who start to consume the labeled variety after its introduction. In this case, the information revelation only modifies the surplus of these switchers. Conversely, the surplus

variation is zero for participants who do not change their behavior, namely by continuing to choose the regular variety or nothing when the label is introduced and when P_R is constant (which is the case under constant-return to scale for producers). Second, $K=N_P$, where N_P is the overall number of participants within a group receiving positive information. The measure given by (3) is similar to the one provided in papers focusing on the introduction of genetically modified products (Huffman et al., 2003, 2007; Lusk et al., 2005).

5.2 Negative information about the regular variety

With negative information revealed to groups $\text{Info}^{\text{Negative}}_{\text{Social\_Environment}}$ and $\text{Info}^{\text{Negative}}_{\text{Environment\_Social}}$, we can measure the non-internalized damage[10] linked to the lack of precise information (as before choice #1). When the negative and precise information (before choice #3) is revealed to these two groups, some participants stop buying the product. For a participant *j*, the non-internalized damage linked to the absence of complete information about a characteristic before choice #1 is $D^j = I_j[WTP_1^j - WTP_3^j]$ where I_j is an indicator variable taking the value of 1 if participant *j* is predicted to have chosen the regular variety at price P_R with $WTP_1^j > P_R$ in choice #1 (and 0 otherwise). The non-internalized damage reduces the participant's surplus associated with choice #1. By taking into account $CS_1^j = \max\{WTP_1^j - P_R, 0\}$ (see equation 1), the overall surplus is:

$$CSC_1^j = CS_1^j - D^j = \max\{WTP_1^j - P_R, 0\} - I_j[WTP_1^j - WTP_3^j] \quad (4)$$

When negative information is revealed, outcomes remain unchanged (regular variety or none). However, participants may adjust their consumption, and the surplus becomes $\overline{CS}_3^j = \max\{WTP_3^j - P_R, 0\}$. For each group $\text{Info}^{\text{Negative}}_{\text{Social\_Environment}}$ or $\text{Info}^{\text{Negative}}_{\text{Environment\_Social}}$, the value of

[10] This non-internalized damage is slightly different from the cost of ignorance suggested by Foster and Just (1989). In Foster and Just's (1989) framework, consumers incur a cost of ignorance from consuming a contaminated product that could cause detrimental health effects without knowledge of the adverse information.

information or total surplus change for participants linked to the revealed information is given by:

$$\Delta CS_{Neg}^{K} = \frac{\sum_{j=1}^{K}[\overline{CS}_3{}^{j} - CSC_1{}^{j}]}{K} = \frac{\sum_{j=1}^{K}[\max\{WTP_3^{j} - P_R, 0\} - \left(\max\{WTP_1^{j} - P_R, 0\} - I_j[WTP_1^{j} - WTP_3{}^{j}]\right)]}{K} \quad (5)$$

where $K=S_N$ (the number of switchers) or $K=N_N$ (the overall number of participants within a group receiving negative information). In this context, S_N is the number of switchers that stop consuming the product when negative information is revealed before choice #3.

5.3 Combination of positive and negative information

Eventually, one can combine negative and positive information across the groups by integrating the average values of the non-internalized damages coming from groups receiving negative information in the surplus of the groups receiving positive information. This combination is likely to be more satisfying compared to previous situations presented in subsections 5.1 (revelation of positive information on the labeled variety only) and 5.2 (revelation of negative information on regular variety only) as it equally balances the weight of both groups for positive and negative information. The value of information is computed to measure the impact of the new variety linked to a fair trade or environmentally friendly label by including the average value of the non-internalized damage linked the purchase/consumption of the regular variety. The existence of a new label may also lead many consumers to question the existence of "bad" characteristics linked to the regular variety.

For the two groups receiving negative information, the average value of the non-internalized damage linked to the regular variety is:

$$E(D) = \frac{\sum_{j=1}^{N_N} I_j [WTP_1^j - WTP_3^j]}{\sum_{j=1}^{N_N} I_j} \quad (6)$$

where $\sum_{j=1}^{N_N} I_j$ is the number of participants who purchase the good based on WTP revealed by choice #1.

The average measure *E(D)* coming from group $\text{Info}^{\text{Negative}}_{\text{Social\_Environment}}$ is integrated in the participant's *j* surplus for group $\text{Info}^{\text{Positive}}_{\text{Social\_Environment}}$ receiving positive information (the equivalent can be made for groups $\text{Info}^{\text{Negative}}_{\text{Environment\_Social}}$ and $\text{Info}^{\text{Positive}}_{\text{Environment\_Social}}$). By taking into account $CS_1^j = \max\{WTP_1^j - P_R, 0\}$ given by (1) and linked to the choice #1, the overall surplus with only the regular variety on the market is:

$$CSD_1^j = CS_1^j - E(D) = \max\{WTP_1^j - P_R, 0\} - I_j E(D) \quad (7)$$

The introduction of the label leads to two situations, namely case 1 and case 2. Under case 1, participants faced with a label are only aware of positive information coming from the label for choosing between options (regular, label, and none), but their choices may be distorted because of a lack of information regarding the regular variety. Their surplus is $CSD_3^j = \max\{WTP_1^j - P_R, WTP_3^j - P_L, 0\} - II_j^R E(D)$, where II_j^R is an indicator variable taking the value of 1 if participant *j* is predicted to have chosen the regular variety at price P_R when the label exists on the market (and 0 otherwise). In this case, the value of information is:

$$\Delta CSD^K_{Label} = \frac{\sum_{j=1}^{K} [CSD_3^j - CSD_1^j]}{K} = \frac{\sum_{j=1}^{K} [\max\{WTP_1^j - P_R, WTP_3^j - P_L, 0\} - II_j^R E(D) - (\max\{WTP_1^j - P_R, 0\} - I_j E(D))]}{K} \quad (8)$$

where $K=S_P$ (the number of switchers) or $K=N_P$ (the overall number of participants within a group receiving positive information).

Under case 2, participants faced with a label are fully aware of both positive information coming from the label and negative aspects linked to the regular variety when they choose between regular, label or none. The emergence of a label may indeed lead to awareness of negative aspects linked to the regular variety. For instance, participants realize to what extent the production of the regular variety pollutes the environment or does not provide decent working conditions. Thus, their surplus is $CSE_3^j = \max\{WTP_1^j - E(D) - P_R, WTP_3^j - P_L, 0\}$. Their WTP for the regular variety at price P_R is $WTP_1^j - E(D)$ if they are aware of the negative aspect based on the average non-internalized damage *E(D)* that is internalized in their demand. In this case, the value of information is:

$$\Delta CSE_{Label}^K = \frac{\sum_{j=1}^{K}\left[CSE_3^j - CSD_1^j\right]}{K} = \frac{\sum_{j=1}^{K}\left[\max\{WTP_1^j - E(D) - P_R, WTP_3^j - P_L, 0\} - \left(\max\{WTP_1^j - P_R, 0\} - I_j E(D)\right)\right]}{K} \quad (9)$$

where $K=S_P$ (the number of switchers) or $K=N_P$ (the overall number of participants within a group).

All these measures indicating the value of information (or the welfare variation linked to more complete information) lead to the following results presented in table 2. Based on observations across several supermarkets, we use P_R = €2.2 and a price premium equal to 25% for the varieties with a label leading to P_L = €2.75 (Hervieu, 2009).[11]

[11] Hervieu (2009) emphasizes that environmentally friendly shrimp production requires 25% more work than regular shrimps, which leads us to assume a price increase equal to 25%. Since fair trade shrimps are not available in France, we assume that the price premium for such shrimps is similar to the one observed for environmentally friendly shrimps.

The first three lines of table 2 measure the value of information as in previous papers by focusing on positive information related to the labeled variety. Lines 4-6 measure the value of negative information linked to the regular variety. The welfare variation linked to the revelation of negative information is higher than the one observed when positive information is revealed. This result comes from the higher number of switchers stopping consumption of the regular variety when negative information is revealed. It shows the importance of taking into account the non-internalized damage coming from the regular variety when measuring the value of information.

Results based on the combination of positive and negative information are presented in the bottom part of table 2. Recall that negative information comes from the average damage *E(D)* for which participants are aware or not. Case 2 corresponds to the situation of perfect information. Both cases 1 and 2 show a relative large value of information, which is higher than that observed when only positive information related to the labeled variety is accounted for. Thus, by focusing only on information related to the new (labeled) variety, previous welfare measures underestimate the value of information. Robust evaluations need to combine both negative and positive information. Interestingly, our results also show that the two average values of information over all participants given in the last line of table 2 are relatively high compared to a price P_R = €2.2 considered for the estimations of the surplus variation coming from information. This suggests a high-social benefit linked to the complete revelation of information to consumers. This benefit should be compared to regulatory costs coming from quality monitoring and advertising efforts.

Insert table 2 here

Moreover, fully revealing negative and positive information generates higher WTP by developed countries' consumers that can be of benefit to producers from developing countries. The results of the experiment could therefore be used to measure the increase in producers' marginal income from a complete development of labels, where both labeled and regular

varieties would be offered everywhere in France. The simulation is as follows: In France, the consumption of farmed tropical shrimps is 56,548,800 kg per year.[12] To carry out the income estimation, we consider the participants who switch to labeled varieties after the information revelation. Among them, we distinguish the percentage x of participants who purchase the regular variety before the label introduction and the percentage y of participants who do not purchase shrimps before the label introduction. The income increase for producers comes from these consumers changing varieties at a better price P_L compared to P_R and from the new consumers purchasing goods at price P_L. Ignoring any cost consideration the increase in producers' marginal income is defined by $56{,}548{,}800*[x*(P_L - P_R) + y* P_L]$ and presented in table 3. Negative information is not taken into account since this information is not widely broadcasted compared to the labels. Although these estimations are imperfect, they show significant increase in producers' income that may cover additional label-sunk costs (not passed into the price P_L) and generate higher income compared to the existing situation.

Insert table 3 here

6. Conclusion

These results suggest that environmental and social labels have similar effects on participant willingness-to-pay when it is first presented. However, we also highlight a fast-diminishing interest in the second-presented characteristic. These results suggest (*i*) the importance of the first/major information sent by advertising campaigns to consumers to signal new varieties, (*ii*) the difficulties of developing added attributes for new varieties when one attribute dominates a market and (*iii*) the possibilities of cumulating several labels to attract consumers with different

[12] This volume is calculated by taking the total consumption of shrimps in France in 2008 and multiplying it by the percentage of shrimps that are tropical (80%) and by the percentage of farmed shrimps (60%). Statistics sources: FranceAgriMer (2008) and United Nations Food and Agriculture Organization (2009).

priorities regarding the conditions of production and not consumers with utilities favoring added attributes. It also means that farmers from developing countries should carefully consider the type of labels they should use to improve quality and capture consumer WTP.

Using welfare variation from the environmentally friendly or fair trade labels, we also show that the absence of negative information linked to the regular variety may lead to an underestimation of the value of information associated with the label. The consumers' choices are distorted since negative information linked to the regular variety is not internalized by consumers. The segment for products with labels could be expanded. This last result underlines that the benefit of complete information in terms of welfare and profit variations could be high not only for French consumers but also for shrimp producers developing high-quality products. Improving the quality of agricultural products is one way to increase income in developing countries, even if choosing the type of labels or the advertising strategy is challenging for these producers.

Our application is simple and based on various assumptions. In real situations, participants are limited in their ability to collect complete information about products, and they may be confused about different labels. Moreover, the cost of building the reputation of a new label indicating environmentally friendly and/or fair trade products needs to be taken into account. Some extensions also could be considered for completing the results of this paper. An experiment in some shrimp farms in Asian countries to find out producer willingness to invest in high-quality/labeled products may suitably complete the analysis. A second extension of this work could consist in investigating the psychological mechanisms that drive the WTP expressed by consumers. Do environmental and social concerns appeal to the same type of motivations? How do consumers perceive negative and positive information when it comes to ethical consumption? A third extension could consist in deeply studying what information should be delivered to consumers to consider them "well-informed" with thoughtful preferences. It is likely to include both positive and negative information sources. A new experiment could then be used

for computing the value of not receiving information, of receiving positive information before negative information, and of receiving negative information before positive information.

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Table 1. Influence of information and individual characteristics on WTP differences

Model	(1)	(2)	(3)	(4)	(5)
Dependent variable	Difference in WTP between choice #i+1 and #i ($WTP_{i+1}^{j} - WTP_{i}^{j}$)				
Specification	Panel random effects				
Characteristic				0: male 1: female	0: no children 1: children
Positive information (0/1)	0.53[a] (0.12)				
Negative information (0/1)	-0.29[a] (0.11)				
Positive x social info. (0/1)		0.45[a] (0.15)			
Positive x social x 1st info. (0/1)			0.97[a] (0.19)		
Positive x social x 1st info. (0/1) x characteristic = 0				1.00[a] (0.22)	0.90[a] (0.21)
Positive x social x 1st info. (0/1) x characteristic = 1				0.93[a] (0.29)	1.20[a] (0.34)
Positive x social x 2nd info. (0/1)			-0.11 (0.19)		
Positive x social x 2nd info. (0/1) x characteristic = 0				-0.31 (0.29)	-0.07 (0.22)
Positive x social x 2nd info. (0/1) x characteristic = 1				0.01 (0.24)	-0.20 (0.32)
Positive x environmental info. (0/1)		0.61[a] (0.15)			
Positive. x envir. x 1st info. (0/1)			0.99[a] (0.19)		
Positive x envir. x 1st info. (0/1) x characteristic = 0				1.14[a] (0.29)	1.10[a] (0.22)
Positive x envir. x 1st info. (0/1) x characteristic = 1				0.90[a] (0.24)	0.74[b] (0.32)
Positive x envir. x 2nd info. (0/1)			0.26 (0.19)		
Positive x envir. x 2nd info. (0/1) x characteristic = 0				0.29 (0.22)	0.26 (0.21)
Positive x envir. x 2nd info. (0/1) x characteristic = 1				0.21 (0.29)	0.26 (0.34)
Negative x social info. (0/1)		-0.10 (0.15)			
Negative x social x 1st info. (0/1)			-0.23		

			(0.19)		
Negative x social x 1st info. (0/1) x characteristic = 0				-0.15	-0.40[c]
				(0.26)	(0.24)
Negative x social x 1st info. (0/1) x characteristic = 1				-0.31	0.04
				(0.26)	(0.29)
Negative x social x 2nd info. (0/1)			0.03		
			(0.19)		
Negative x social x 2nd info. (0/1) x characteristic = 0				-0.07	-0.12
				(0.32)	(0.22)
Negative x social x 2nd info. (0/1) x characteristic = 1				0.07	0.39
				(0.22)	(0.32)
Negative x environmental info. (0/1)		0.10			
		(0.15)			
Negative. x envir. x 1st info. (0/1)			-0.10		
			(0.19)		
Negative x envir. x 1st info. (0/1) x characteristic = 0				-0.28	0.02
				(0.32)	(0.22)
Negative x envir. x 1st info. (0/1) x characteristic = 1				-0.02	-0.36
				(0.22)	(0.32)
Negative. x envir. x 2nd info. (0/1)			0.30		
			(0.19)		
Negative x envir. x 2nd info. (0/1) x characteristic = 0				0.36	0.29
				(0.26)	(0.24)
Negative x envir. x 2nd info. (0/1) x characteristic = 1				0.24	0.31
				(0.26)	(0.29)
Negative x safety info (0/1)		-0.58[a]	-0.58[a]		
		(0.12)	(0.12)		
Negative x safety info. (0/1) x characteristic = 0				-0.71[a]	-0.55[a]
				(0.15)	(0.13)
Negative x safety info. (0/1) x characteristic = 1				-0.48[a]	-0.65[a]
				(0.14)	(0.17)
Observations	640	640	640	640	640
Pseudo-R^2	0.084	0.118	0.162	0.168	0.171

[a], [b] and [c]: significant at 1%, 5% and 10% respectively. Standard errors in parentheses.

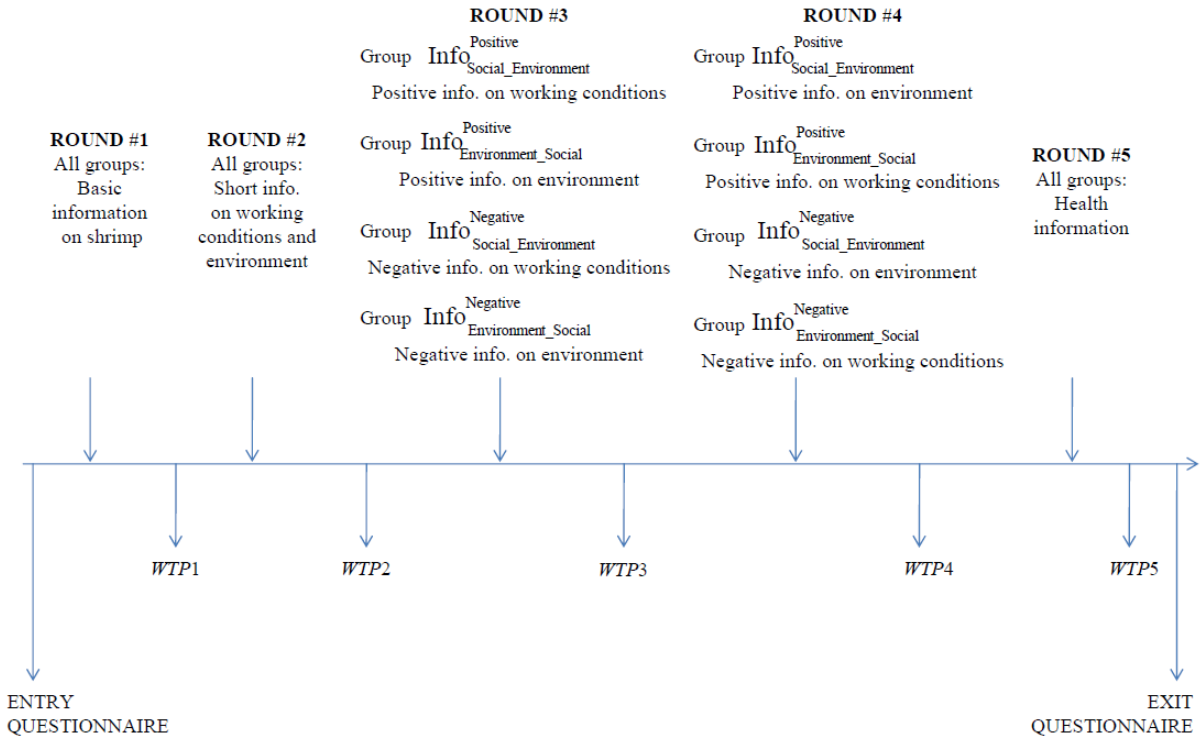
Table 2. Value of information and introduction of the labeled variety

Groups	'Pos_soc/env'	'Pos_env/soc'	'Neg_soc/env'	'Pos_env/soc'
Participants facing the new labeled variety				
Participants who switch to the labeled variety after positive information (%)	19%	20.5%		
Value of the labeled variety $\Delta CS_{Label}^{S_P}$ (switchers)	€0.76	€0.53		
Value of the labeled variety $\Delta CS_{Label}^{N_P}$ (all participants)	€0.14	€0.11		
Participants receiving negative information about the existing regular variety				
Participants who switch to avoid purchasing the regular variety after negative information (%)			33.3%	30%
Value of information about the regular variety $\Delta CS_{Neg}^{S_N}$ (switchers)			€1.05	€1.45
Value of information about the regular variety $\Delta CS_{Neg}^{N_N}$ (all participants)			€0.35	€0.43
Combination of groups				
Case 1: Consumers only aware of positive information coming from the label				
Average non-internalized damage *E(D)*			€-1.04	€-0.95
Participants who switch to labeled variety after positive information (%)	19%	20.5%		
Value of the labeled variety $\Delta CSD_{Label}^{S_P}$ (switchers)	€1.27	€1.12		
Value of the labeled variety $\Delta CSD_{Label}^{N_P}$ (all participants)	€0.24	€0.23		
Case 2: Consumers aware of positive and negative information				
Average non-internalized damage *E(D)*			€-1.04	€-0.95
Participants who switch to the labeled variety after positive and negative information (%)	45.2%	59%		
Value of the labeled variety and information about the regular variety $\Delta CSE_{Label}^{S_P}$ (switchers)	€1.03	€0.87		
Value of the labeled variety and information about the regular variety $\Delta CSE_{Label}^{N_P}$ (all participants)	€0.47	€0.51		

Table 3. Income increase for producers (%)[a]

Information revealed by the label	Positive & social information	Positive & environmental information
Participants who switch to labeled varieties	19%	20.5%
Purchasing the regular variety before the label	9.5%	12.8%
Not purchasing shrimps before the label	9.5%	7.7%
Increase in producers' marginal income	14%	11%

[a]: relative variation (%) compared to the total income for year without any label.



[a]: group $Info^{Positive}_{Social\_Environment}$ includes 42 participants; group $Info^{Positive}_{Environment\_Social}$: 39 participants; group $Info^{Negative}_{Social\_Environment}$: 39 participants; group $Info^{Negative}_{Environment\_Social}$: 40 participants.

Figure 1: Experimental design[a]

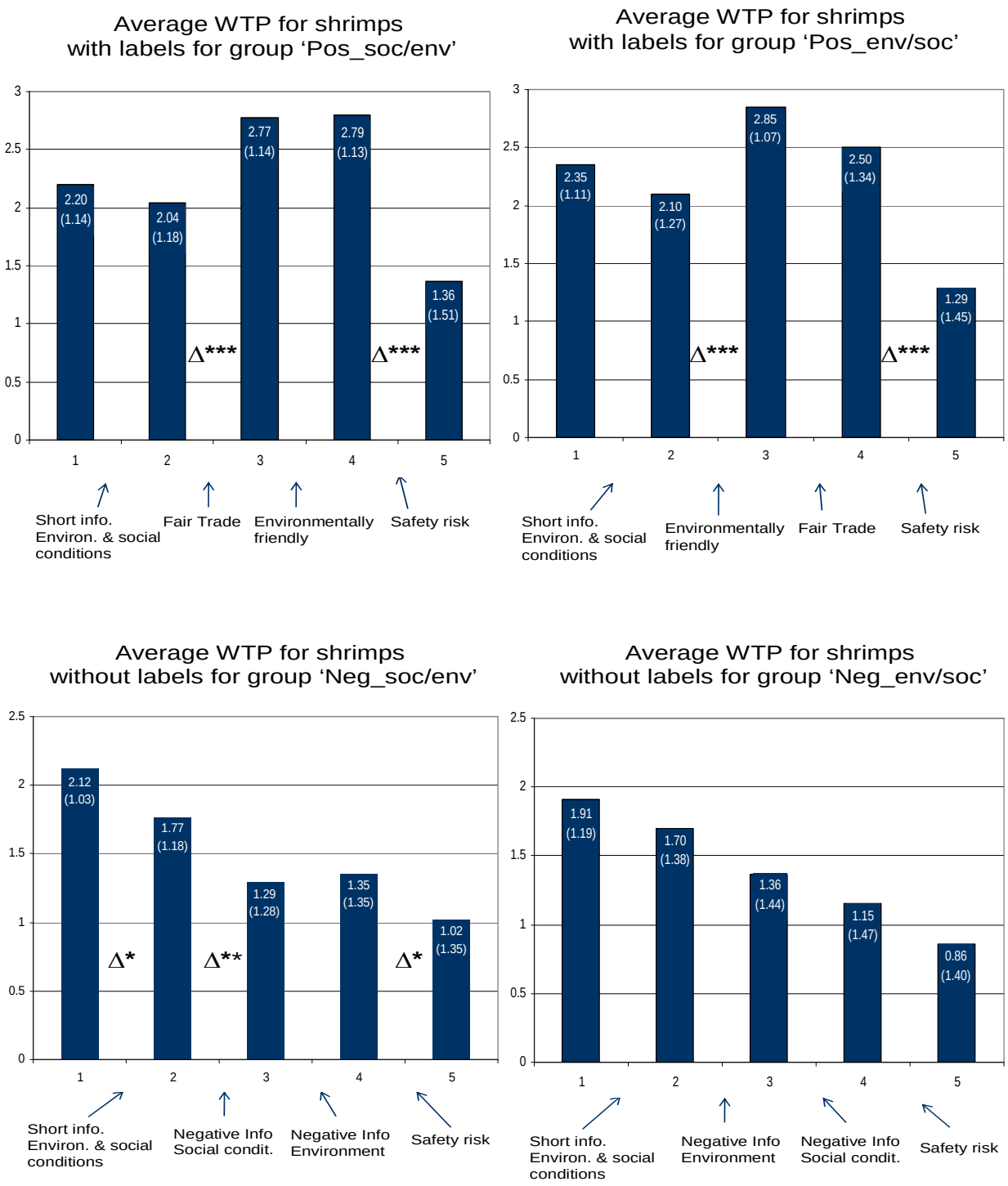


Figure 2. Impact of information on WTP (€/100g)[a]

[a]: Δ***, Δ** and Δ* denote significant differences at the 1%, 5% and 10% level respectively as tested by the Wilcoxon test for comparing paired samples.

Appendix: Revealed information

Initial information before choice #1
"In what follows we will present you information about farmed, midsize, cooked, shelled and refrigerated shrimps. On the market, the average price for 100g of shrimps varies between €1.50 and €4."

General information before choice #2
"There are serious concerns about bad conditions for the environment and workers in shrimp farms from different countries around the world. Many shrimps consumed in France are imported from these countries."

Different types of information before choices #3 and #4
For groups receiving positive information
"Fair Trade Shrimps:
In some countries, shrimp producers develop fair trade production, with decent working hours, decent wages, and controlled handling of chemical products used by workers to treat and to clean the shrimps in order to protect workers' health.
These practices, on average, significantly increase the production costs.
These products are sold with a "fair trade" label in France."

"Environmentally friendly shrimps:
In some countries, shrimp producers develop environmentally friendly production schemes.
Discharges are limited and pollution is controlled. Furthermore, the quality of water and ecosystems around the farms is preserved.
These practices, on average, significantly increase the production costs.
These products are sold with a label in France."

For groups receiving negative information
"Social concerns:
In some countries, among the biggest shrimp producers and exporters, workers in shrimp farms and factories work 12 or 16 hours per day for a very small salary.
Furthermore, without any protection, workers handle chemical products that are toxic to human health and used to treat and clean the shrimps.
Given the difficulties and the cost of inspection of imported products, it is likely that a large share of shrimps sold in France was produced in such conditions."

"Environmental concerns:
Shrimp farms can generate serious environmental problems. In particular, the discharges coming from farms are a source of pollution: deterioration of water quality and of fertility of soils, which were converted into breeding pools.
Given the difficulties and the cost of inspection of imported products, it is likely that the production of a large share of shrimps sold in France generated such pollution."

Information before choice #5

“Health concerns:

Many bacteriological infections affect shrimp breeding pools. The bad production conditions (bad water quality for example) favor the growth of bacteria. To fight against these bacteria, the shrimp producers use antibiotics and other chemical products that are toxic to human health and therefore forbidden in almost all countries.

Given the difficulties and the cost of inspection of imported products, it is likely that some shrimps sold in France were treated with these antibiotics and chemical products toxic to human health.”