Experimental auctions, collective induction and choice shift: Willingness-to-pay for rice quality in Senegal

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Abstract

We propose a collective induction treatment as an aggregator of information and preferences, which enables testing whether consumer preferences for food quality elicited through experimental auctions are robust to aggregation. We develop a two-stage estimation method based on social judgment scheme theory to identify the determinants of social influence in collective induction. Our method is tested in a market experiment aiming to assess consumers' willingness-to-pay for rice quality in Senegal. No significant choice shift was observed after collective induction which suggests that consumer preferences for rice quality are robust to aggregation. Almost three quarters of social influence captured by the model and the variables was explained by social status, market expertise and information.

Keywords: Vickrey auctions; social decision schemes; group decision-making; word-of mouth communication; Sharpe style weights

JEL classification: C24; C91; C92; D12; D71

1. Introduction

Economists have typically focused on markets and auctions as disseminators and aggregators of information and preferences. Despite their competitive nature, auctions have been found to induce similar learning effects to those in cooperative group interactions (Maciejovsky and Budescu, 2007). Repeated auctions with price posting are often used in experimental economics to endogenise information and preferences: 'The repeated signal sent by the prices creates a common information pool on the upper end of the value distribution, thereby supplying information on the implicit set of preferences and beliefs behind these bids' (Shogren *et al.*, 1994a: 1091). However, some authors have questioned whether the role of

such experimental treatments as information and preference aggregators is not undermined by bid affiliation bias (Corrigan and Rousu, 2006).

Whereas economists have focused on auctions, environmental economists have chosen interactive cooperative group treatments as aggregators. Inspired by democratic theory (Dryzek, 2000), they argued that preferences are socially constructed (or uncovered) through the process of deliberation (Howarth and Wilson, 2006: 7): 'In contrast with valuation methods that embrace rigid methodological individualism, group deliberation can potentially tap into the diverse store of knowledge and experience held by different group members'. In designing their group treatment, they are in fact implicitly following in the footsteps of social psychologists' old tradition of small group research (SGR) on collective induction. Collective induction is defined as 'the cooperative search for descriptive, predictive, and explanatory generalizations, rules, and principles' (Laughlin and Hollingshead, 1995: 94). In the social combination theory of collective induction, a group is viewed as a combinatorial mechanism, and interaction between participants as a social combinatorial process during which individuals with different initial preferences collectively reach consensus.

Marketing researchers have similarly recognised that 'cognitions not only are the product of the individual's cognitive activities occurring in a social vacuum but also are strongly affected by social interaction,' and hence have questioned whether '[consumer] decisions should be studied from a group as well as from an individual perspective' (Ward and Reingen, 1990: 246-260). Marketing research on the influence of social cognition on preferences dates back to Arndt's (1967) field experiment on the impact of word-of-mouth (WOM) communication on product acceptance. Since then, there has been a broad agreement among managers, marketing researchers, and sociologists that WOM can have a major impact on consumer awareness, expectations, perceptions, attitudes, trust, behavioural intentions and

behaviour (Arndt, 1967; Herr, Kardes, and Kim, 1991; Buttle, 1998; Allsop, Bassett, and Hoskins, 2007; Sweeney, Soutar, and Mazzarol, 2008). At its core, WOM is a process of interpersonal influence, in which communications between a sender and a receiver can change the receiver's behaviour or attitudes (Sweeney, Soutar, and Mazzarol, 2008). WOM is more credible than marketer-initiated communications because receivers perceive it as having passed through the unbiased filter of their peers (Allsop, Bassett, and Hoskins, 2007). Negative WOM is more informative than positive WOM, in the sense that it helps consumers discriminate between low- and high-quality products (Herr, Kardes, and Kim, 1991).

The flow of information about new ideas or products often occurs through informal social networks, in which early adopters act as an opinion leader, spreading information via WOM to others (Czepiel, 1974). Cosmas and Sheth (1980) show that there is a set of common dimensions by which opinion leaders are evaluated, but that different cultures assign varying weights to these dimensions. The effectiveness of WOM within a consumer network is influenced by the strength of social ties. Despite their relative weakness, 'weak ties' seem to play a key role in the transmission of information throughout social networks, bridging the gaps between more socially cohesive primary groups (Ellison and Fudenberg, 1995; Sweeney, Soutar, and Mazzarol, 2008). However, despite its long recognised role as an information and preference aggregator, and its interpersonal and group-risk-reduction aspects (Arndt, 1967), to the best of our knowledge the interface between WOM communication and collective induction—although similar processes of social learning—has never been explored.

The fundamental question for researchers—and the main motivation for this paper—is how can we elicit those social processes in an experimental setting? Imagine we want to test a new product for its marketability. In the lab, the auction mechanism elicits preferences

through a process of individual cognition, yet in the real world, those preferences would be further shaped through social cognition (Ward and Reingen, 1990). Once we have elicited individual preferences in the lab, analysing how they are aggregated beyond the individual level would provide a useful preview of those social processes and may reveal the existence of negative WOM. It is critical to examine WOM in relation to the product early on, in order to encourage the spread of positive WOM and minimise the damage of negative WOM (Allsop, Bassett, and Hoskins, 2007). Hence, the question boils down to how we can tap into consumers' pool of shared knowledge and test whether preferences are robust to aggregation. A logical strategy would be to open social psychologists' SGR toolbox and elicit WOM exchange directly through collective induction. Since we are interested in the effect of collective induction on valuation, we need to design our experimental treatment in a way that it provides incentives for exchanging WOM on willingness-to-pay (WTP). The most straightforward way to accomplish this is by giving the group an unambiguous task, namely to reach consensus on valuation, i.e. to elicit collective WTP (CWTP), for the products under research (Demont *et al*., 2012). Based on the premise that influence is motivated by our human social need to be helpful by giving advice, and that people share a common enjoyment in seeking out valuable information (Smith *et al*., 2007), the collective induction treatment as described above provides incentives for participants to reveal knowledge, information and opinion leadership about the value of the products under research. In other words, it aggregates both information and preferences.

The additional benefit of the collective induction treatment is that it generates data which can be used to analyse the determinants of social influence on valuation. However, whether social influence affects group decisions is a function of the nature of the task. According to Laughlin and Hollingshead's (1995) third postulate, cooperative group tasks may be arranged

on a continuum with highly intellective tasks on one side and highly judgmental tasks on the other. Intellective tasks possess objectively correct answers that can be shown to be correct (demonstrability) to others. Judgmental tasks do not possess objectively correct answers or for which it is not possible to demonstrate that the alternative is correct to others. In a judgmental task, such as our collective induction treatment, reaching consensus is the goal of the group. Bonner (2000) further distinguishes between highly and moderately judgmental tasks. Highly judgmental tasks are at the extreme end of the continuum, for which meaningful consensus cannot be reached. These tasks possess no objective correct answer and there are no meaningful or rational criteria for judging the relative worth of potential answers or opinions. The psychology literature predicts that in the case of highly judgmental tasks, social influence is unlikely to affect the group decision-making process. From previous research, however, we learned that the collective induction treatment is a typical moderately judgmental task (Demont *et al*., 2012), i.e. a task that may or may not have objectively correct answers, but for which meaningful consensus can be reached. In these tasks it is likely that social influence will play a role in collective induction (Bonner, 2000).

Analysing whether consumer preferences are robust to aggregation is similar to assessing the impact of WOM on preferences in marketing research or analysing choice shift and group polarisation in social psychology. Figure 1 provides a non-exhaustive epistemological representation of cross-cutting research themes and key papers in which the concept of collective induction treatment is embedded. The informational and interpersonal properties of the collective induction treatment naturally connect WOM and stated and revealed preference research to SGR. One of the most controversial findings from SGR is that group decisions tend to be riskier than individual decisions. This phenomenon rapidly gained notoriety under the umbrella ‘risky shift’ (Cartwright, 1971). Risky and cautious shifts are both a part of a

more generalised idea known as group-induced attitude polarisation. Though group polarisation deals mainly with risk-involving decisions and/or opinions, discussion-induced shifts have occurred on several non-risk-involving levels. Choice shift has come to mean the difference between individual and collective decisions, whereas group polarisation is essentially group-to-individual transfer (Zuber, Crott, and Werner, 1992).

< INSERT FIGURE 1 HERE >

Attempts to explain choice shift and group polarisation fall mostly into one of three approaches: (i) the normative approach of the social comparison theory (SCT), (ii) the informational approach of the persuasive arguments theory (PAT) and the information integration theory (IIT), and (iii) the social decision scheme (SDS) theory (Myers and Lamm, 1976). SCT explains choice shift through normative processes. It states that people are motivated both to perceive and present themselves in a socially desirable way and may move closer to the social norm when acting in a group than when acting in isolation. Accumulating scientific evidence, however, suggests that informational influence produces more frequent and stronger shifts than does normative influence (Isenberg, 1986; Kaplan and Miller, 1987). Informational influence explanations such as PAT and IIT argue that groups process, weigh and integrate information (Anderson and Graesser, 1976) and that shifts are attributed to persuasive arguments that are generated during group discussion that were only partially available to the average subject prior to discussion. Finally, SDS theory suggests that shifts are explained by social decision schemes for combining individual choices. While a variety of possible SDSs have been outlined by Davis (1973), most prominent has been the suggestion of majority voting. Due to skewness in the distribution of initial individual choices, some group members find themselves in the minority. If individuals have single-peaked preferences and employ majority voting in their decisions then the group decision is

equal to the median of the group members' decisions (Moulin, 1980). SDS theory includes a rule of aggregation and an explicit formal model that allows the degree of choice shift for a given decision rule to be calculated (Davis, 1973). However, the comparable literature for consensus models addressing continuous decisions, such as CWTP, is quite small. Davis (1996) later adapted the SDS model to the continuous case resulting in the social judgment scheme (SJS) model. In this paper we will extend this line of research.

Other cross-cutting research fields have also attempted to tackle choice shifts. Marketing researchers have attempted to explain the phenomenon by linking the information-processing approach to the study of cognition and social networks (Ward and Reingen, 1990). Similarly, sociologists advanced social influence network theory to explain that choice shifts are a ubiquitous product of the inequalities of interpersonal influence that emerge during discussions (e.g. Friedkin, 1999). Social influence network theory integrates important features of SCT, PAT and SDS to the extent that the effects of an argument, social comparison, and prototypical position can be represented directly as interpersonal influences, or as mediated by such influences. Linking the theory to WOM processes has interesting implications for viral marketing (Smith *et al*., 2007). Ellison and Fudenberg (1995) provide a formal model to study the way that WOM communication aggregates the information of individual agents and conclude that WOM may allow efficient social learning. Some economists have attempted to explain choice shift by developing utility-based theories for group decision-making, focusing on aggregation of either preferences (e.g. Eliaz, Ray, and Razin, 2006) or information (e.g. Sobel, 2006). Others have applied similar theories on households, relating choice shift to the property of income pooling (e.g. Munro, 2005; Bateman and Munro, 2009). Finally, environmental economists have similarly invoked a concept of choice shift to question whether individual preferences are robust to aggregation:

'[…] group willingness to pay for a project that enhances environmental quality will systematically differ from the sum of individual net benefits' (Howarth and Wilson, 2006: 3).[1]

The contribution of the present paper is that it extends the research question of choice shift to private goods by proposing to use collective induction as a treatment (Demont *et al*., 2012) to test whether consumer preferences for food quality elicited through experimental auctions are robust to aggregation. The second contribution of this paper is that we develop a multivariate SJS model inspired by classic investment style analysis (Sharpe, 1988; 1992) for identifying the determinants of social influence on collective preferences. The results have interesting implications for viral marketing which uses WOM delivery to exploit pre-existing social networks in order to produce exponential increases in brand awareness, through viral processes similar to the spread of an epidemic (Smith *et al*., 2007; Even-Dar and Shapira, 2011). Our method is tested in a market experiment of rice quality and branding in Senegal.

The remainder of the paper is organised as follows. Section 2 proceeds with a description of the market experiment, including experimental design, sampling, procedures and econometric models. Section 3 analyses the data and discusses the results. Section 4 draws implications and conclusions from the prior sections.

[1] However, unlike our collective induction treatment where identifying and measuring the determinants of social influence is a central research question, social influence is considered a challenge to the democratic principles that justify their group treatment: 'A key procedural challenge facing deliberative valuation though is thus to overcome social status inequalities, so that group members can effectively pool their unique, unshared information' (Howarth and Wilson, 2006: 7).

2. Market experiment

In Senegal, urban consumers have developed a marked preference for imported 100 per cent broken rice as a result of the historical influence of the French colonial administration which encouraged the import of cheap broken rice from Asia (Brüntrup, Nguyen, and Kaps, 2006). Because of its market dominance, we focus on broken rice, termed simply 'rice' hereafter for brevity. In particular, there is a widespread belief that urban consumers continue to prefer imported rice due to the inferior post-harvest grain quality of local rice which is notorious for its heterogeneous grain size composition and impurity (Seck *et al*., 2010; Demont and Rizzotto, in press). However, in 2007 a quality rice brand '*Rival*®' (*Riz de la Vallée*) was introduced in the Senegal River Valley (SRV). Governance of quality (processing, cleaning and packaging) and provision of micro-financing is being conducted by the Oxfam-funded platform of farmer organisations PINORD (*Platforme d'appui aux Initiatives du Nord*). Branded quality rice is an emerging product in the SRV. In 2008, a total volume of 1,800 tons of milled rice (less than 1 per cent of total SRV rice production) was marketed as *Rival*®. However, the product was only available at the level of the milling factories in the Senegal River Delta (at 50 km from Saint-Louis) and did not reach the urban market of Saint-Louis, the closest large city to the SRV. Hence, it remains to be seen whether and how much urban consumers are willing to pay for quality and branding of local rice and whether these preferences are robust to aggregation. Therefore, in this study we use an experimental auction market (Shogren *et al*., 1994b; Lusk and Shogren, 2007) with a collective induction treatment (Demont *et al*., 2012) designed to elicit WTP and CWTP for alternative rice qualities.

2.1 Experimental design

We purposely selected four different rice types available in the SRV such that they differed only in a bundle of quality attributes which are relevant to rice value chain upgrading (Demont and Rizzotto, in press): (i) conventional SRV rice (benchmark), (ii) imported Thai rice, (iii) unlabelled quality SRV rice and (iv) labelled quality SRV rice (*Rival*®). Analogously to Roosen *et al*. (1998), we used a fixed benchmark; we chose the standard mediocre quality (conventional) SRV rice type which is commonly available on the market. It is easily recognisable as it consists of a mix of varieties (Sahel 108 and 201) and grain sizes (broken, medium and long grain) and contains a fair amount of impurities (foreign matter such as stones, dirt and husks). In terms of quality and price, this rice type is inferior to the three alternatives in the auctions. The unlabelled and labelled quality SRV rice types are the same product. Both are the rice variety Sahel 108 and have been purified and carefully sifted to obtain a homogenous grain size of 100 per cent broken rice, with the latter being branded and marketed as *Rival*®. Hence, the difference between (i) and (iii) is grain quality (purity and homogeneity) and the difference between (iii) and (iv) is the mere presence of a label. The imported Thai rice has a grain quality somewhere between the benchmark and quality SRV rice and contains some impurities.

We chose the Vickrey (1961) second-price auction because of its weakly dominant strategy for participants to bid their true value for the goods. We ran three auctions simultaneously following Melton *et al*. (1996) and Roosen *et al*. (1998) and used the endow-and-upgrade method, i.e. each participant was endowed with one kilogram of the benchmark rice and was asked three times to submit a bid for upgrading this kilogram to a kilogram of an alternative rice type. We explained to participants that one product and one bidding round would be binding. This decision was made to avoid the substitution effect that might arise if

participants could win more than one product, which would in turn compromise bidding their true value for the products.

After purchases are made, consumers will often make comparisons between their expectations and the product performance they experience. If performance is below expectation, the customer might end up dissatisfied and might sense an imbalance in his/her cognitive system, a phenomenon called 'cognitive dissonance' (Festinger, 1957). One available strategy for customers who experience discomfort from cognitive dissonance is to share their discomfort via WOM and to seek information via WOM from sources which can reduce the discomfort (Buttle, 1998). In order to capture this phenomenon, we insert a tasting session designed as a within-subjects information treatment and followed by a second auction round between the first individual auction round and the collective induction treatment. Finally, by making the collective induction treatment non-binding and positioning it after the binding individual rounds, participants are assumed to have reduced incentives to strategically withhold information (Maciejovsky and Budescu, 2007) and misrepresent their preferences ('strategy-proofness', e.g. Moulin, 1980; Steinel and De Dreu, 2004) during collective induction.

2.2 Sampling

In November 2008, we conducted 10 experimental sessions over the course of five days in Saint-Louis' youth centre, which is located 500 m from the central market. To minimise costs, we conducted two sessions per day, i.e. one in the morning and one in the afternoon. This enabled us to check whether bids change during the day in the Senegalese context. We focused on women as they are the major decision makers in rice purchasing in Senegal as well as in other rice consuming West-African countries (see review by Demont *et al*., 2012).

Although mixed-gender and naturalistic studies are more likely to capture the processes of real, functioning groups, their use would sacrifice experimental control (e.g. over group membership, status structures) (Rao and Steckel, 1991) and would introduce complicating factors related to the property of income pooling (Munro, 2005). Therefore, in order to balance out extraneous status variables or other individual difference influences during collective induction (Kirchler and Davis, 1986), for each session, we recruited an *ad hoc* group of 10 female participants using a purposive non-probability sampling method; women were selected and recruited on the spot, most of whom were going to or returning from the market. In order to include a random factor during sampling, every third female passer-by with an estimated age between 18 and 65 was approached. Whenever we approached a group, we selected maximally one participant to ensure that the participants would not know each other.

2.3 Procedures

Each experimental session involved eight steps:

Step 1. During recruitment, we told participants they were going to participate in a two-hour market test and receive a participation fee of 3,000 FCFA (EUR 5) 'for their taxi back home.' The latter pretext is commonly used in Africa to detach pecuniary endowments from their 'gift' or 'payment-for-service' context. It elegantly avoids the fee being seen as a *quid pro quo* for which participants should reciprocate (Lusk and Shogren, 2007), and which may bias the bids (Loureiro, Umberger, and Hine, 2003).

Step 2. We conducted the experimental session in the national language of *Wolof* with translations to *Pulaar* and French when necessary. The four rice types were presented in 50 kg bags on a table in front of a meeting room and in four plates on each participant's table.

Each plate contained one kilogram of the rice type and corresponded to a bag on the front table. Only the Thai and *Rival*® bags on the front table were labelled; the other rice types were presented in plain white bags. We explained to participants that we endowed them with one kilogram of the benchmark rice. During the experiment, participants could examine the visual (purity and homogeneity) and sensory (taste and aroma) quality attributes of the uncooked rice types.

Step 3. We explained the auction procedures to the participants. First, we explained the endow-and-upgrade method. We used the analogy of buying new jewellery in exchange for old jewellery, where only the price for 'upgrading' is paid, a buying method commonly applied by Senegalese women in the jewellery market. We learned from the trial session that price premiums elicited through the endow-and-upgrade method were more reliable after 'calibration,' i.e. providing the absolute market price of the benchmark rice (300 FCFA/kg or EUR 0.46/kg in November 2008). However, we did not reveal and asked the participants not to reveal any price information on the alternative rice types. Both calibration and the use of an analogy considerably accelerated the learning process of the endow-and-upgrade method. Secondly, we explained the second-price auction mechanism.

Step 4. Following Shogren *et al.* (1994b), we used commonly known brands of biscuits to familiarise the participants with the auction procedure. Each participant received a small package of biscuits and was then asked to bid on two alternative, superior types of biscuits. We conducted two rounds with an evaluation after each round in order to ensure that all participants fully comprehended the system.

Step 5. We explained to participants that we would use a similar procedure for the four rice types, i.e. two auction trials without price posting, and that we would randomly select one rice type and one individual bidding round as binding. We used a two-stage approach to

elicit WTP (Haines, Guilkey, and Popkin, 1988). For each alternative rice type we first asked which product the participant preferred between the benchmark and the upgrade. If she chose the benchmark, the value was automatically set to zero (Lusk *et al*., 2001). If the alternative was chosen, we asked her WTP to upgrade to one kilogram of the alternative rice type. Responses were recorded privately for each participant. Between the two rounds, we included a tasting session during which the participants could experience the sensory quality attributes (aroma, taste, texture and stickiness) and observe the swelling capacity of the cooked rice types. To ensure equal sensory experience, the rice representing unlabelled and *Rival*® rice came from the same cooking pot.

Step 6. We asked the participants to gather around a table and attempt to achieve a consensus on their CWTP to upgrade the benchmark rice to each alternative rice type. Following common practice in SGR, no specific method of doing so was imposed or implied. Groups were left alone during the discussion that followed to avoid bias from the researchers. After consensus, the group reported the CWTP values.

Step 7. We conducted a short survey through a one-page questionnaire to collect socio-demographic data. We conducted the survey after the rice auctions to avoid revealing the study's objectives (Corrigan and Rousu, 2008). To test group success, the survey included a question on whether or not the participants agreed with the CWTP values reached through group consensus (Cartwright, 1971; Sniezek and Henry, 1989; Ito *et al*., 2009).

Step 8. We randomly selected one rice type, one biscuit type and one bidding round as binding, deducted the second price from the participation fees of the winning bidders and distributed the rice and the adjusted participation fees to the participants.

2.4 Determinants of WTP

To identify the factors that influence the individual bids, the Tobit model can be used because of the mass of non-positive bids. However, since we followed a two-stage approach for eliciting WTP (Step 5 in Section 2.3), we adopted the double hurdle model by Cragg (1971).

Let m_{ijpr} be the variable representing the desirability of upgrading an endowed kilogram of rice and let WTP_{ijpr} be the amount spent on the purchase by the *i*th consumer (i = 1, …, 10) in the *j*th session (j = 1, …, 10) for the *p*th rice type (p = imported, unlabelled, labelled) in the *r*th bidding round (r = 0 before tasting, r = 1 after tasting):

$$m_{ijpr} = \boldsymbol{\alpha}'\mathbf{x}_{ijpr} + u_{ij} + v_{ijpr} \quad (1)$$

$$WTP_{ijpr} = \boldsymbol{\alpha}'\mathbf{x}_{ijpr} + u_{ij} + v_{ijpr} \quad (2)$$

where $\mathbf{x}_{ijpr}$ is a vector of independent variables including two dummy variables (imported and labelled) identifying the three alternative rice types (unlabelled is set as the numeraire), a dummy variable for the bidding round, and a vector of socio-demographic variables $\mathbf{x}_v$ (v = 1, …, s = 13), $\boldsymbol{\alpha}$ is a conformable vector of coefficients, u_{ij} is an individual specific disturbance for participant i in session j, and v_{ijpr} is the overall error term.

WTP_{ijpr} is the consumers' bid to upgrade the benchmark rice to the three alternatives. The first hurdle is the consumer's decision of whether or not to pay for the three alternatives. The probability of the respondent choosing not to bid a positive amount (WTP_{ijpr} = 0) is expressed by:

$$Prob\left(WTP_{ijpr} = 0\right) = \Phi(-\boldsymbol{\alpha}_1'\mathbf{x}_{ijpr}) \quad (3)$$

where Φ is the standard normal density function. The second hurdle determines the effect of independent variables on WTP_{ijpr}, given $WTP_{ijpr} > 0$. The distribution of WTP_{ijpr} conditional

on being positive is truncated at zero with mean $\boldsymbol{\alpha}_2'\mathbf{x}_{ijpr}$ and variance σ^2. The second hurdle is formulated as:

$$f\left(WTP_{ijpr}\middle|WTP_{ijpr}>0\right)=\frac{(1/\sigma)\Phi\left[(WTP_{ijpr}-\boldsymbol{\alpha}_2'\mathbf{x}_i)/\sigma\right]}{\Phi(\boldsymbol{\alpha}_2'\mathbf{x}_i/\sigma)} \quad (4)$$

where Φ is the standard normal density function and $\boldsymbol{\alpha}_2$ is a vector of coefficients.

2.5 Determinants of social influence on CWTP

In order to assess the determinants of social influence on CWTP, we may reasonably assume that the lower the distance between the individual and the group response, the higher the intra-group influence of the individual (Davis, 1996; Bonner, Sillito, and Baumann, 2007). Factors that increase (decrease) the distance increase (decrease) divergence between group and individual bids. Therefore, we regress the absolute differences (distances) between WTP and CWTP to the same set of independent variables through ordinary least squares (OLS):

$$\left|WTP_{ijpr}-CWTP_{jp}\right|=\boldsymbol{\alpha}'\mathbf{x}_{ijpr}+u_{ij}+v_{ijpr} \quad (5)$$

where $CWTP_{jp}$ represents the collective WTP for product *p* in session *j*.

However, the 'naïve model' of group influence in equation (5) may not capture the complex internal mechanism of collective decision making. Therefore, we develop a two-stage approach inspired from social combination theory of collective induction in which we assume that group decisions are weighted sums of individual preferences (Davis, 1973; Kerr *et al.*, 1975; Sniezek and Henry, 1989; Laughlin and Hollingshead, 1995; Davis, 1996; Bonner, Sillito, and Baumann, 2007). In SJS models, it is sometimes assumed that the individual weights in group decisions, i.e. the intra-group influence of individuals, are exponential in nature (e.g. Davis, 1996; Bonner, Sillito, and Baumann, 2007). However, since the majority of our socio-demographic variables are dummy variables, we opted for linear

weights to preserve the dummy character of the variables (zero versus an equally shared weight). We also observed that for continuous variables (age, household income, and household size) linear weights produced a better response in the analysis proposed below and even more so when the continuous variables were transformed to dummy variables relative to the group average:

$$d_{ijv} = \begin{cases} 0, x_{ijv} < \frac{1}{n}\sum_{i=1}^{n} x_{ijv} \\ 1, x_{ijv} \geq \frac{1}{n}\sum_{i=1}^{n} x_{ijv} \end{cases} \quad (6)$$

Analogously to Bonner, Sillito and Baumann (2007), in a first stage the CWTP for each session *j* and each product *p* was predicted by transforming each of the alternative socio-demographic variables of the vector $\mathbf{x}_v$ (v = 1, …, s = 12) to individual weights which are used to compute the weighed group average of the individual post-tasting (r = 1) WTP estimates:

$$CWTP_{jpv} = \sum_{i=1}^{n} \chi_{ijp} * WTP_{ijp1} = \sum_{i=1}^{n} \frac{d_{ijv}}{\sum_{i=1}^{n} d_{ijv}} * WTP_{ijp1} \quad (7)$$

where $CWTP_{jpv}$ represents the CWTP in session *j* for product *p*, predicted through a univariate SJS model based on the variable $\mathbf{x}_v$, χ_{ijp} is the weight of participant *i* in session *j* for product *p*, and d_{ijv} is the dummy value of the transformed socio-demographic variable $\mathbf{x}_v$ for participant *i* in session *j*. It is interesting to note that the univariate SJS model as a preference and (implicit) information aggregator in equation (7) is similar to Ellison and Fudenberg's (1995: 98-99) theoretical conceptualisation of WOM communication in social learning: 'When agents do re-evaluate their choice, they ask *N* other individuals chosen at random from the population distribution about their current choice and current payoff. The sampling agents then compute the average payoff […].'

The empirical psychology SDS and SJS literature typically analyses group decision-making by assessing the goodness-of-fit (Kolmogorov-Smirnov test) of univariate models (e.g. Davis, 1996; Bonner, Sillito, and Baumann, 2007), as in the first stage of our approach presented in equation (7). However, the possibility of group decisions being formed through the simultaneous weighting and interaction of multiple univariate SJS models has not yet been explored to the best of our knowledge. Therefore, as a second stage we propose the following multivariate SJS model for identifying the determinants of social influence in collective induction:

$$CWTP_{jp} = \sum_{v=1}^{s} \xi_v * CWTP_{jpv} + \varepsilon_{jp} \quad \text{s.t.}\, \xi_v \in [0,1], \sum_{v=1}^{s} \xi_v = 1 \tag{8}$$

where $CWTP_{jp}$ represents the observed CWTP for product p in session j, ξ_v the weight of each univariate SJS model based on the socio-demographic variable $\mathbf{x}_v$, s the number of socio-demographic variables and ε_{jp} the unsystematic residual for product p in session j.

The model and coefficient restrictions presented in equation (8) are analogous to classic investment style analysis, where the relationship is analysed between fund returns and a collection of index returns (Sharpe, 1988; 1992). In this literature, equation (8) is typically estimated through quadratic programming techniques. The resulting coefficients, called 'Sharpe style weights,' are used to form inferences about a portfolio's behaviour and composition. The objective is to find the 'best' set of weights that lie between zero and one and add up to one. The best set of weights is the one for which the variance of ε_{jp} in equation (8) is lowest. Thus equation (8) is rearranged as follows:

$$\min_{\xi_v} \left(\varepsilon_{jp}\right)^2 = \min \left(CWTP_{jp} - \sum_{v=1}^{s} \xi_v * CWTP_{jpv} \right)^2 \quad \text{s.t.}\, \xi_v \in [0,1], \sum_{v=1}^{s} \xi_v = 1 \tag{9}$$

In this way, this technique is similar to OLS estimation. However, the constraints on the weights make regression analysis unsuitable and require the use of quadratic programming.[2] The weights finally represent the share of each socio-demographic variable in explaining social influence in collective induction.

3. Data and results

3.1 Descriptive analysis

The recruitment procedure resulted in a participation rate of approximately 50 per cent which suggests that urban consumers were on average indifferent between participating and not participating. A total of 99 participants participated in the 10 experimental sessions; one of the women participated twice, thus we cancelled the results of her second participation. Table 1 shows the key summary statistics of the participants' socio-demographic characteristics recorded by the questionnaire. We did not find any statistically significant differences between the characteristics of the morning and afternoon samples. The average age recorded was 37 years; 21 per cent of the women were employed and another 32 per cent were small traders. The majority had only completed primary school or had not followed any formal education. These figures are consistent with Fall and Diagne (2008) and demographic surveys (ANSD, 2008). The average monthly household earnings were around 145,000 FCFA (EUR 221) and the average household size was 10. Less than one fifth of the women had a cooking housemaid and the average time spent on lunch preparation, including going to the market,

[2] See Atkinson and Choi (2001) for a practical application of Sharpe's style analysis using Excel's Solver function.

preparation and actual cooking, was more than four hours per day. More than 80 per cent of the women were aware of the existence of quality SRV rice. This is in line with the results from Fall *et al*. (2007) who observed that the awareness of local rice is quite high in urban areas close to production zones.

< INSERT TABLE 1 HERE >

Descriptive statistics of the individual and collective bids are shown in Table 2. Bids represent WTP to upgrade conventional rice to quality rice or, in other words, price premiums for quality attributes. Due to the mass of non-positive bids and the censored character of our WTP estimates, we report the mean of the positive bids in addition to the mean of all bids. We rarely encountered the case where the participant preferred the upgrade, but was not willing to pay a price premium (WTP = 0). Therefore, similarly to Lusk *et al*. (2001), we did not distinguish between zero bids and the case where the participant preferred the benchmark and was not willing to upgrade (non-positive bids). Average positive individual bids ranged from 122 to 165 FCFA/kg (EUR 0.19–0.25/kg), depending on the product and the bidding round. Bids were lower for imported rice than for quality SRV rice. After tasting, the propensity for upgrading declined and bids dropped. We did not find evidence in support of a choice shift; collective bids were not significantly different from individual group means or group medians based on a pairwise t-test and a significance level of 5 per cent. Table 2 suggests that, analogously to Demont *et al*. (2012) and Ito *et al*. (2009), individual preferences were reflected as a collective choice more in a consensus rule than in a majority rule, as CWTP only slightly departs from mean WTP towards group medians. Only in the case of imported rice, the departure towards group medians is more pronounced. Although the effect is not statistically significant, feedback from the groups suggested two potential explanations. First, since the experiment was conducted close to a rice production zone,

normative and affective processes may have driven participants closer to the social norm of devaluing foreign, imported rice (Obermiller and Spangenberg, 1989). We may find a different effect in urban consumption zones closer to the port and remote from production zones (e.g. Dakar). Secondly, some groups feared that their responses were consequential and would be used by the government as a justification to raise import taxes and therefore strategically proposed low collective bids for imported rice, a potential bias which was also described by Lusk and Shogren (2007).

< INSERT TABLE 2 HERE >

3.2 Determinants of WTP

The determinants of WTP identified through the double hurdle model are presented in the first two columns of results in Table 3. The first column shows the effects of the rice characteristics and consumer demographics on the probability that a consumer will upgrade the benchmark rice, while the determinants of the WTP are presented in the second column. Three observations can be made. First, conducting the experiment during the morning not only increased the buying probability but also positively affected the WTP. Our results are consistent with similar findings in Benin (Demont *et al*., 2012), and suggest that time of day affects valuation of rice in the Senegalese context. For most participants, the morning sessions meant an interruption in their daily routine of going to the market and preparing rice dishes for lunch, which is invariably the most important meal of the day in Senegal (Fall *et al*., 2007). Those who still had rice purchasing[3] in mind may value rice higher than those in

[3] More than a quarter of the women purchase rice on a daily basis (Table 1).

the afternoon who just had their lunch and completed their daily rice purchases in the morning.

< INSERT TABLE 3 HERE >

Secondly, the propensity of upgrading dropped by 14 per cent after the tasting session. Bids also dropped, but the effect was only weakly significant at 10 per cent. As the benchmark rice was purified before cooking, it was less discounted in cooked form than in non-cooked form. Several participants particularly appreciated its sensory qualities and some even considered its mixed composition as an advantage because it allows them to obtain different grain types (broken, medium and long) from a single rice product by separating them on their own.

Thirdly, the participants were 33 per cent less likely to upgrade to imported rice than to unlabelled quality SRV rice and discounted imported rice by 43 FCFA/kg (EUR 0.07/kg) relative to unlabelled quality SRV rice. They were further willing to pay an average price premium of 29 FCFA/kg (EUR 0.04/kg) for *Rival*® relative to the unlabelled quality SRV rice. Prices recorded on the urban Saint-Louis market in November 2008 were 300 FCFA/kg (EUR 0.46/kg) for conventional SRV rice (benchmark) and 360 FCFA/kg (EUR 0.55/kg) for Thai 100 per cent broken rice. Our findings suggest that roughly three quarters (Table 2) of consumers in Saint-Louis are willing to upgrade from conventional to branded, quality SRV rice and consumers are willing to pay price premiums (calibrated to market prices) of 34 per cent for quality rice and 44 per cent for branded quality rice such as *Rival*®. At the time of the experimental auctions, *Rival*® was only sold at the level of the milling factories in the SRV (at 50 km from Saint-Louis) at 300 FCFA/kg (EUR 0.46/kg), i.e. at no price premium relative to conventional SRV rice, and did not reach the urban market of Saint-Louis because the limited quantities that were available had been sold-out immediately. Given that manual

cleaning, purification and homogenisation of rice was done at the Saint-Louis market at 7–13% of the price of conventional SRV rice, i.e. still smaller than the average price premium of 16% for imported rice (Demont and Rizzotto, in press), our econometric results suggest that value chain initiators have some price flexibility for introducing branded quality SRV rice on the Saint-Louis market and capturing part of the consumer surplus.

Traders, who are more familiar with the local rice market and available substitutes, were 28 per cent more reluctant to upgrade. Moreover, indigenous *Wolof* and *Pulaar* participants bid less for quality SRV rice than non-indigenous participants, probably because they have grown up with the mediocre-quality SRV rice and are comfortable with its visual and sensory attributes. Comparatively lower bids were also recorded for highly educated participants. Surprisingly and in contrast to rural Beninese consumers (Demont *et al*., 2012), income did not affect either the propensity of upgrading or WTP for rice quality.

3.3 Determinants of social influence on CWTP

The collective induction treatment achieved a high rate of consensus as 96 per cent of the participants agreed with the group decisions (Table 1), which is the criterion for group success in judgmental tasks (Laughlin and Hollingshead, 1995). In order to analyse the determinants of the distances between WTP and CWTP, we present the results of the 'naïve model' (equation 5) in the last column in Table 3. Negative coefficients suggest convergence and positive coefficients suggest divergence. We find more divergence in the morning sessions and more convergence for post-tasting valuation. Participants tended to converge more on the value of imported rice, due to greater familiarity with this rice type, in contrast to an emerging, less familiar product, such as quality SRV rice. Branding further caused

divergence among women indicating that larger concessions needed to be made to reach consensus on the added-value of a rice brand.

However, as expected the 'naïve model' does not allow us to identify any socio-demographic variables (except higher education) that significantly influence the individual within-group distances. Therefore, we present the Sharpe style weights estimated through our multivariate SJS model in Table 4, representing the share of each socio-demographic variable in explaining participants' social influence during collective induction. The model identifies six non-binding univariate SJS models interacting in group decision-making, explaining 34 per cent of social influence by social status and general experience (age), 28 per cent by trading experience, 20 per cent by household experience (housewife), 11 per cent by knowledge (having received prior information about local rice) on the topic, 6 six per cent by social networking experience, and 1 per cent by higher education.[4] Age is a directly observable determinant of social status and experience and market expertise is revealed by traders during the session. The dominance of social status and expertise in group decision-making is consistent with typical findings in SGR literature (Kirchler and Davis, 1986; Ohtsubo and Masuchi, 2004; Bonner, Sillito, and Baumann, 2007). Other socio-demographic variables in our experiment were either unobservable (trader, household size, group membership, housewife, employment and daily purchase), unless they were revealed during group discussion, or only *quasi*-observable (household income, cooking housemaid, higher

[4] It is important to note that our model is only able to identify determinants that have been captured through our limited set of socio-demographic variables and hence ignores other factors of social influence (e.g. extroversion) not captured in our survey (Bonner, Sillito, and Baumann, 2007).

education and indigenous) to other participants. For example, income is *quasi*-observable through women's behaviour or dressing style. For some participants, estimating household earnings was problematic and probably subject to upwards social desirability bias (Lusk and Shogren 2007). To facilitate estimation, we asked participants to identify their total household earnings among seven income classes. Nevertheless, neither the continuous, nor the dummy, nor the reversed dummy variable (to check the possibility of income being inversely related to influence) yielded a satisfactory outcome, neither did the dummy 'cooking housemaid' which was expected to be a convenient alternative proxy for income. The social influence of traders is consistent with the finding that product involvement is an important antecedent to opinion leadership (Richins and Root-Schaffer, 1988). The results may explain earlier findings, e.g. traders may have partly been responsible for driving down CWTP of imported rice (Table 2) as they represented 32 per cent of the participants (Table 1), featured a lower propensity to upgrade (Table 3), and captured 28 per cent of influence in explained collective decision-making (Table 4).

< INSERT TABLE 4 HERE >

4. Implications and conclusions

In this paper we test whether consumer preferences for food quality elicited through experimental auctions are robust to aggregation through collective induction and develop a multivariate social judgment scheme model for identifying the determinants of social influence in collective induction. A market experiment of rice quality and branding in Senegal is used to test the method. It is believed that the preference of urban Senegalese consumers for imported rice is due to the inferior post-harvest grain quality of local rice. Quality needs to be governed at different levels, i.e. from on-farm varietal purity to post-harvest cleaning, sorting, homogenising, and packaging (Demont and Rizzotto, in press).

Assessing WTP for rice quality would therefore provide crucial end-market information for rice value chain upgrading in Senegal.

Consumers' bids elicited through experimental auctions suggest that there are three major market segments of rice consumers in Saint-Louis: (i) a segment of consumers who prefer conventional SRV rice (roughly one quarter of the bids);[5] (ii) a segment of consumers who are willing to upgrade from conventional to branded, quality SRV rice (roughly three quarters of the bids), and (iii) a sub-segment of the second segment of consumers who are also willing to upgrade to imported rice (roughly half of the bids). We found that consumers are willing to pay an average price premium of 34 per cent for quality SRV rice and 44 per cent for branded quality SRV rice such as *Rival*®. This indicates that investment in quality tailored to end-market standards, and branding can render local rice competitive with imported rice. Moreover, stakeholders who are willing to invest in rice value chain upgrading in Senegal have some price flexibility for introducing branded quality SRV rice on the Saint-Louis market and capturing part of the consumer surplus. However, after tasting, the propensity of upgrading—a proxy for repeat purchase intentions—declined due to the improved sensory quality of the cooked benchmark rice, which suggests there may be limits to post-harvest grain quality upgrading. Nevertheless, the existence of a substantial market segment of conventional SRV rice consumers suggests that any strategy of value chain upgrading to increase food security for the poor should serve both market segments (conventional and

[5] In Ghana, Tomlins *et al*. (2005) identified a similar market segment (14 per cent) for traditional local rice.

quality rice) in order to consider the trade-off between adding value and increasing affordability (Tomlins *et al*., 2007).

Collective induction revealed that while consumers tended to converge on the value of a long established product such as imported rice, they tended to diverge on their valuation of branding. This may indicate the existence of market segments with different preference patterns. Therefore, from a marketing perspective, further profiling of the three market segments is recommended, as a targeted product positioning and communication is likely to be more effective than a generic strategy (Verbeke, 2005; Pieniak *et al*., 2010). Nevertheless, no significant choice shift was observed for any of the quality attributes, suggesting that the consumer preferences for rice quality elicited through our experimental auctions are robust to aggregation through collective induction.

Almost three quarters of captured social influence was explained by social status, market expertise and information. Senegalese women are highly involved in trading and social networking; 32 per cent of the participants were traders and 46 per cent were active members of a formal group. Marketing strategies based on WOM and viral processes need to (i) identify influential existing social networks (e.g. female networks, tontines, trader associations, religious networks), and (ii) target key influential persons (e.g. opinion leaders) in those networks to convince them of the product's value. More than half of women had received prior information on SRV rice. 44 per cent of this information came from WOM exchange, versus 56 per cent from traditional media (TV, radio and newspapers), suggesting that any successful marketing strategy will need to target both channels simultaneously in order to be effective and credible. Further research is needed to determine the rates of return to promotion through both channels to determine the optimal mix of advertising expenditures. Nevertheless, the findings presented in this paper provide useful information for rice value

chain upgrading in Senegal. They can assist rice value chain investors in designing labelling and marketing strategies and provide useful information for rice traders, retailers and local rice farmers in the SRV and national policy makers who are currently implementing an ambitious food self-sufficiency program.

Our experiment provides useful information for future experimental consumer research. It shows that experimental auctions can be complemented by a collective induction treatment at almost no incremental cost (achieving consensus took at most ten minutes). The collective induction treatment provides an *ex ante* tool for marketers to test at an early stage whether consumer preferences for a new product are robust to aggregation, such that they can guide the spread of positive WOM and minimise the damage of possible negative WOM (Allsop, Bassett, and Hoskins, 2007). In the same way that experimental auctions do not focus primarily on the outcomes of the auction (e.g. first and second bid), but rather on obtaining true WTP estimates, the collective induction treatment is not centred on the outcome (CWTP value), but on the individual-group difference (choice shift) and the individual-into-group process (determinants of social influence).

Moreover, the mechanism of individual induction elicited by the experimental auction procedure encouraged participants to invest more cognitive effort in determining their 'true' valuation of food quality. This method improves the quality of moderately judgmental consensus tasks, such as the collective induction treatment. However, future research is required in order to make the collective induction treatment incentive compatible, such that participants have greater incentives to exchange WOM and express opinion leadership on valuation. A necessary step will also be to add an individual auction round after the collective induction treatment in order to capture post-treatment group polarisation effects (impact of WOM on individual WTP). This will not only generate information on the WOM source

(social influence), such as in this paper, but also on the receiver (susceptibility to WOM and influence). It will be important to randomly choose one of the auction rounds as binding, in order to make the procedure strategy-proof (Moulin, 1980; Steinel and De Dreu, 2004; Maciejovsky and Budescu, 2007). Moreover, the treatment may need to be analysed by switching regression models, as WOM may be positive or negative depending on the group. Such research may substantially contribute to both the economic literature on revealed preference methods and the social psychology literature on choice shift and group polarisation.

Finally, the study faces some limitations inherent to its research approach and data collection procedure, e.g. its non-probability sampling methods, which restrict generalisation of the findings to a broader population level. Therefore, it is recommended to perform further studies with a similar focus, targeted at similar population groups, in different environmental settings. The empirical evidence reported in this study should therefore be interpreted within its specific context and setting.

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experimental auctions were filmed by the French National TV channel 'France 2' for its news reportage on rice in Senegal and in March 2011, Maïmouna Ndour was awarded the Dr Robert Carsky Award by AfricaRice for her outstanding work in animating the experimental auctions.

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Table 1. Summary statistics of socio-demographic variables in the experimental sample

Variable	Definition	Mean (st. dev.)
Age	Age in years	36.6 (12.0)
Household income	Monthly income (1,000 FCFA)[a]	145 (110)
Household size	Number of individuals in household	10.2 (5.45)
Indigenous	1 = indigenous (*Wolof, Pulaar*); 0 = otherwise	0.77 (0.42)
Education	0 = none; 1 = primary; 2 = secondary; 3 = tertiary	1.18 (1.11)
Higher education	1 = secondary and tertiary; 0 = otherwise	0.27 (0.45)
Daily	1 = daily rice purchase; 0 = otherwise	0.27 (0.45)
Employed	1 = employed; 0 = otherwise	0.21 (0.41)
Trader	1 = trader as profession; 0 = otherwise	0.32 (0.47)
Housewife	1 = housewife; 0 = otherwise	0.30 (0.46)
Student	1 = student; 0 = otherwise	0.06 (0.24)
Cooking housemaid	1 = has a cooking housemaid; 0 = otherwise	0.18 (0.39)
Cooking time	Total time in hours spent on preparing lunch (going to the market, preparation and actual cooking)	4.30 (1.10)
Group membership	1 = member of a formal group; 0 = otherwise	0.46 (0.50)
Information	1 = received information on SRV rice; 0 = otherwise	0.58 (0.50)
Awareness[b]	1 = awareness of quality SRV rice; 0 = otherwise	0.82 (0.38)
Agreement	1 = agreed with group consensus; 0 = otherwise	0.96 (0.20)
Sample size		99

Notes: [a] fixed exchange rate: EUR 1 = 655.957 FCFA

[b] based on a sample size of 79 participants as during the first two sessions this question was not yet included

Table 2. Descriptive statistics of individual and collective willingness-to-pay

	Rice type	Pre-tasting WTP	Post-tasting WTP	CWTP
Propensity of upgrading (per cent)	Imported	51	43	80
	Unlabelled	81	70	100
	Labelled	80	67	100
Mean of positive bids (FCFA)	Imported	134 (98)	122 (80)	51 (28)
	Unlabelled	155 (100)	129 (83)	88 (38)
	Labelled	165 (107)	154 (112)	100 (37)
Mean of all bids[a] (FCFA)	Imported	68 (97)	53 (80)	41 (33)
	Unlabelled	125 (109)	90 (91)	88 (38)
	Labelled	132 (116)	103 (117)	100 (37)
Mean of group medians[a,b] (FCFA)	Imported	39 (34)	33 (41)	41 (33)
	Unlabelled	110 (63)	74 (66)	88 (38)
	Labelled	113 (66)	80 (64)	100 (37)

Notes: WTP = willingness-to-pay; CWTP = collective willingness-to-pay; fixed exchange rate: EUR 1 = 655.957 FCFA; price of the benchmark rice = 300 FCFA/kg (EUR 0.46/kg) in November 2008; standard deviations are in parentheses

[a] We set the non-positive bids to zero. CWTP was not significantly different from group means or group medians of WTP based on a pairwise t-test and a significance level of 5 per cent.

[b] In the case of CWTP, we take the mean of all group bids.

Table 3. Determinants of consumers' individual and collective willingness-to-pay

	First hurdle	Second hurdle	
Independent variables	Propensity of upgrading	Amount paid	|WTP – CWTP|
Constant	0.706 (0.034)**	96.877 (17.023)**	93.128 (30.809)**
Morning	0.279 (0.077)**	81.484 (27.896)**	21.964 (8.242)**
Imported	–0.328 (0.053)**	–43.414 (17.314)*	–15.885 (5.704)**
Labelled	–0.030 (0.027)	28.795 (12.791)*	21.719 (5.440)**
Post-tasting	–0.135 (0.037)**	–29.644 (16.124)	–10.434 (5.454)*
Age	–0.002 (0.004)	–0.223 (1.058)	–0.426 (0.331)
Household income	–0.000 (0.000)	0.032 (0.178)	–0.026 (0.028)
Household size	–0.006 (0.007)	0.063 (2.971)	0.719 (1.009)
Indigenous	–0.118 (0.079)	–60.114 (30.108)*	–14.584 (12.025)
Higher education	0.030 (0.095)	–83.776 (40.709)*	–26.715 (10.622)*
Daily	–0.035 (0.084)	–9.647 (32.889)	–3.742 (9.954)
Employed	–0.140 (0.141)	38.260 (47.624)	2.301 (16.849)
Trader	–0.285 (0.138)*	28.007 (43.968)	–9.825 (14.497)
Housewife	–0.214 (0.138)	6.884 (41.548)	–12.731 (13.785)
Student	0.347 (0.232)	186.648 (71.843)**	56.589 (41.669)
Cooking housemaid	–0.075 (0.092)	59.449 (34.348)	13.085 (11.092)
Cooking time	–0.004 (0.034)	10.431 (12.596)	2.035 (3.609)
Group membership	0.056 (0.076)	–5.695 (28.342)	1.724 (8.490)
Information	–0.153 (0.079)	–16.927 (31.643)	–8.380 (10.079)
Sigma[a]		116.592 (11.601)**	
Number of observations	576	376	576

Notes: Marginal effects of changing the explanatory variables are evaluated at the mean of the explanatory variables. Values in parentheses are standard errors which are robust and cluster corrected. Asterisk (*) and double asterisk (**) denote variables significant at 5 per cent and 1 per cent, respectively. WTP = willingness-to-pay; CWTP = collective willingness-to-pay; fixed exchange rate: EUR 1 = 655.957 FCFA; price of the benchmark rice = 300 FCFA/kg (EUR 0.46/kg).

[a] Sigma is the error variance; log pseudolikelihood of first hurdle = –289.8; log pseudolikelihood of second hurdle = –2,172.

Table 4. Estimated weights of the multivariate social judgment scheme (SJS) model

Socio-demographic variable used to predict collective willingness-to-pay	Sharpe style weights
Age	0.341
Trader	0.284
Housewife	0.196
Information	0.113
Group membership	0.059
Higher education	0.007
Daily	0.000
Household income	0.000
Household size	0.000
Cooking housemaid	0.000
Employment	0.000
Indigenous	0.000
Sum	1.000
Sample size	30

Notes: Four participants did not agree with the CWTP values convened during the consensus session (Table 1); for those cases we set their group weights equal to zero for all variables. In case when a dummy variable was zero for all participants, e.g. a group without traders, we attributed equal weight to all participants for that variable.

Social psychology	Cross-cutting research	Economics
Small group research (SGR) (Baron, Kerr, and Miller, 1992) Theory of collective induction (Laughlin and Hollingshead, 1995) Choice shift and group polarisation (Cartwright, 1971; Myers and Lamm, 1976; Zuber, Crott, and Werner, 1992) 1. Social comparison theory (SCT) (Levinger and Schneider, 1969) 2. Persuasive arguments theory (PAT) (Burnstein, Vinokur, and Trope, 1973), and information integration theory (IIT) (Anderson and Graesser, 1976) 3. Social decision schemes (SDS) theory (Davis, 1973; Kerr *et al*., 1975; Sniezek and Henry, 1989; Davis, 1996; Bonner, Sillito, and Baumann, 2007)	Utility-based theories of choice shift, preference aggregation (Eliaz, Ray, and Razin, 2006), information aggregation (Sobel, 2006)	Individual decision theory, expected utility theory
	WOM information aggregation and social learning (Ellison and Fudenberg, 1995)	Marketing research, WOM (Arndt, 1967; Buttle, 1998; Sweeney, Soutar, and Mazzarol, 2008) Opinion leadership (Czepiel, 1974; Cosmas and Sheth, 1980) Viral marketing (Smith *et al*., 2007)
	Social network and social cognition (Ward and Reingen, 1990)	
	Social influence network theory (Friedkin, 1999)	
	Collective induction treatment (Demont *et al*., 2012)	
	Individual versus household valuation (Bateman and Munro, 2009)	Stated and revealed preference research, experimental auctions
	Democratic theory, deliberative valuation (Sagoff, 1988; Howarth and Wilson, 2006), market stall (MS) approach (Macmillan *et al*., 2002)	Valuation of public goods, environmental economics

Figure 1. Epistemological representation of research disciplines and cross-cutting themes connected to the empirical concept of the collective induction treatment