The Impact of Context Variables in the Measure of Willingness-to-pay for Omega 3 milks:
A Comparative Study of Four Value Elicitation Methods

Mémoire

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Résumé

Nous nous sommes intéressés dans cette recherche à comprendre l'effet de quatre méthodes d'élicitation sur la mesure du consentement à payer en lien au biais hypothétique, principalement, et dans un second ordre, à évaluer l'impact du positionnement de l'information sur ces valeurs. Nous constatons que les valeurs de consentement à payer ainsi élicitées sont plus élevées dans les deux situations hypothétiques, et que l'usage du texte dit de « cheap talk » ne réduit pas le biais hypothétique observé. Nos résultats indiquent également que la participation, une caractéristique importante de notre schéma expérimental, était plus élevée en situation hypothétique parmi les individus consentant à participer alors qu'ils déclarent ne pas consommer le produit spécifique à évaluer, ce qui supporte davantage la présence du biais hypothétique. De plus, l'effet du « cheap talk » a été principalement capturé à travers une participation plus élevée dans une des situations hypothétiques faisant usage du « cheap talk ». Un autre élément important de notre schéma expérimental évalue l'effet d'un référentiel sur les prix de proches substituts à certains produits de spécialité. Nos résultats sur le référentiel sont à double titre : il assiste les individus dans le processus cognitif d'élicitation des valeurs propres pour des produits non familiers ; et il réduit l'incertitude associée aux mécanismes non familiers tels les enchères de nième prix. L'objectif secondaire dans cette étude s'intéresse à l'impact de l'information. Nous observons des effets dû au positionnement de l'information, dans la mesure où une description neutre des attributs de produits présentée expressément dans des angles différents aboutit en des résultats par ailleurs différents sur le niveau de participation ainsi que le consentement à payer.

Abstract

We are interested in this study in understanding the effect of four elicitation methods on the measure of willingness to pay in relation to the hypothetical bias, primarily, and secondary, to assess the impact of the framing of information on those valuations. We find elicited values of willingness to pay to be higher in the two hypothetical settings, and that the employment of a cheap talk script does not reduce the observed hypothetical bias. Our results also indicate that participation, an important feature of our experimental design, was higher amongst individuals in hypothetical settings willing to participate although they state not to consume a specific product to value, which further supports the presence of hypothetical bias. Furthermore, the effect of the cheap talk was mainly captured in an overall increased participation in the one hypothetical setting where cheap talk was used. Another key element of our experimental design tested the effect of a referential of prices of close substitute of certain specialty products. Our results on the referential are twofold: it helped individuals in the cognitive process of eliciting homegrown values for unfamiliar products; and it reduced the uncertainty associated with unfamiliar mechanisms such nth price auctions. Secondary objective to this study was the assessment of the impact of information. We find framing effects to be present in the sense that neutral descriptions of products' attributes with purposely different angles resulted in different outcomes on the level of participation as well as on willingness to pay.

Table of Contents

Table List

Figure List

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Introduction, Background and Objectives

Methodologies used in the fields of consumer behaviour and environmental economic studies have been the subject of numerous research. Methodological issues have motivated research on hypothetical bias, especially related to public goods using contingent valuation method (List, 2003; Carson et al., 2007; Vossler et al. 2010). More recently, hypothetical bias in the evaluation of private goods has also raised interest. More broadly, the literature shows an array of research that aims at improving homegrown value measurements, taking into account the importance of framing effects in valuation questions (Shogren, 2001), to the use of explicit warnings and/or cheap talk script (List, 2001; 2003), and to comparisons between stated and revealed valuations methods (Neill et al., 1994; Cummings et al., 1995; List, 2003). Some of these studies reveal the existence of hypothetical bias, and that the employment of a cheap talk eliminates hypothetical bias for inexperienced subjects (List, 2003) or diminishes willingness to pay for unknowledgeable respondents (Lusk, 2003). Few examples of studies involving private goods also exist in the literature where no hypothetical bias was found (Johannesson et al., 1998; and for a summary of selected studies see, e.g. List, 2003). Generally in those studies with private goods, revealing valuations methods lead to willingness to pay that are lower in comparison to measures using stated valuations methods, and this appears so regardless of the various mechanisms employed to elicit values: Cummings et al. (1995) have used a dichotomous choice (DC) in hypothetical and real situations; Neill et al. (1994) employed an open-ended contingent valuation question and a real valuation; and List (2003) used both hypothetical and real auctions.

Increasing consumer interest in the process and health related dimensions of food have motivated research that investigates the consumer degree of acceptance and valuation of specific products' attributes. For these matters, many studies have analyzed the variables likely to influence consumers' attitudes towards products' attributes like health-related or functional foods (Bower et al., 2003; Urala et al., 2004; Labrecque et al., 2006), or production process such as conventional or ecological or organic (Clarke et al., 2000; Loureiro et al., 2002). Generally, it was found that providing information on products' attributes or process, among other factors, can change consumers' attitudes.

Others studies have taken attribute-based approaches to assess consumers' willingness-to-pay (WTP), to predict or directly see change in consumers' behaviour. Louviere et al., (2000) defines two main approaches to measure consumers' willingness-to-pay, namely stated preference methods (e.g., by asking respondents their hypothetical willingness-to-pay through surveys or questionnaires) and revealed preference methods (e.g., by using data on in-store purchases of consumers to indirectly assess consumers' preferences for specific products' attributes). Another approach to measure willingness-to-pay is to use incentive-compatible valuation methods,

more specifically, by asking respondents their willingness-to-pay and using mechanisms such as auction, that allow respondents to face the consequences of their choices, either in laboratory or field environments.

In this context, the value consumers place on new product attributes is a variable of interest for both the private sector and public policy makers. This value can be assessed through the measure of consumers' willingness-to-pay for characteristics-differentiated products. While several different methodological tools are commonly used to measure willingness-to-pay for private goods, their equivalence is not insured. In fact, the literature indicates potential divergence between hypothetical surveys and incentive-compatible mechanisms. In fact, even within incentive compatible mechanism a question remains as what is being measured versus what researchers think they are measuring (home grown value). The measurement of home grown value is thus in question.

This study addresses the question of the sensitivity of the measure of consumers' willingness-to-pay for new product attributes, or newly revealed attribute, to the elicitation method. Our aim is to identify the impact of context variables on the measure of consumers' willingness-to-pay for specific product attributes, with a focus on two context variables: information and consequences. We introduce a study comparing the valuation of consumers' willingness-to-pay for omega-3 milks under different information and consequences conditions. Four variations of valuation methods are compared:

1) A questionnaire

2) A questionnaire with a cheap talk script

3) A fifth price sealed bid auction

4) A fifth price sealed bid auction with information on prices of substitutes of the auctioned product.

With methodological objectives in mind, in each treatment, we also have six different levels of information that are designed with the intent of capturing framing and information effects. It seems that numerous elicitation methods suffer from hypothetical declarative context and (or) saliency problems. Our design should allow to isolate these problems and to identify how sensitive our selected elicitation methods are to these problems. We expect measures of willingness-to-pay to be higher for the methods with no incentive in hypothetical situations and lower for the incentive-compatible methods in real-laboratory situations. In a continuum, willingness-to-pay's should be highest to lowest from methods 1 to 4. We expect the framing effect to also be decreasing from methods 1 to 4. As for the information variable, we cannot fully presume how different the four valuation methods will perform for products' characteristics such as process and health-related attributes. In fact, the process, as one characteristic of the food product, is to be presented in different angles. More precisely, although in essence

a product containing DHA omega-3 derives, in our case, from fish meal/flour, presenting this information separately, in a two-step design, and then matched in a third step aims at showing the framing effect.

Hence the focus is on the impact of two main context variables, the value elicitation method (incentive compatible or not) and the information (framing), on the measure of willingness-to-pay. Research questions for this study are the following:

- Do we observe differences between incentive compatible methods and hypothetical methods on the measure of willingness-to-pay for a private good?

- Do we observe differences, within hypothetical methods, between a questionnaire and a questionnaire for which a cheap talk script is provided?

- Do we observe differences, within incentive-compatible methods, between an auction and an auction for which a referential on prices of substitute products is provided?

- Under the four elicitation methods, how does the framing of information affect the measure of willingness-to-pay?

1 Literature Review

Adequately assessing the maximum price a consumer would be or is willing to pay for a private good is of interest for consumer behaviour, marketing and economic studies, especially if one can better understand the influence of factors on declared homegrown values.

Willingness-to-pay (WTP) is a measurement of the maximum amount one would pay for a good or a service. For private goods, consumers are assumed to know their preferences (homegrown values) for usual products. As expenses, when available, can prove useful to estimate willingness-to-pay for a given product with all of its characteristics, they are less suitable when the interest is on new products or specific attributes of a product or among products.

In fact, the valuation research on the individual consumer's decisions evolves in the conceptual framework of rational utility of microeconomic theory. Theoretically, when facing several options, consumers are assumed to be able to compare, order and chose the one(s) giving them greater satisfaction, hence maximizing utility. The rational choice theory conjectures consumers to have well-ordered preferences and that they seek to maximize utility derived from preferences subject to certain constraints such as budget and information.

Studying consumers' preferences through valuation within economic contexts is of interest in experimental methods. In fact, experiments serve many purposes, from valuing environmental goods and services challenged by the absence of traditional markets, to studying existing markets and/or proposing alternative institutions, among other things.

In the conceptual framework of the consumer's decision making process, utility is derived from known preferences under constraints, such as budget and information. Some experimental literature has been interested by the role of economic commitments or constraints, and of methods used in valuation studies (Neill et al., 1994; Cummings et al., 1995; List, 2003), or by the impact of different information contexts (Fox et al., 2002; Noussair et al., 2004; Lecocq et al., 2004)[1]. Whether consumers' choices involve expenses on usual goods or not, it seems that experimental methods are suited for studying valuation process, since control in designs can be achieved, making comparisons possible.

In valuation research, one of the motives can be to identify factors that would cause respondents to give answers breaching from rational theory, and alternatively recognize behavioural patterns (Shogren, 2001). More broadly:

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[1] There are research fields in the experimental literature that had been interested by the role of economic commitments or constraints, and of methods in valuation studies (Neill et al., 1994; Cummings et al., 1995; List, 2003), and by the impact of different information contexts (Fox et al., 2002; Noussair et al., 2004; Lecocq et al., 2004). The findings of these studies are noted in sections 1.2 and 1.3.

"If people do not follow rational theory, and instead make irrational or inconsistent choices or if values are momentary declarations, one becomes concerned that preferences and stated values are transient artifacts of context" (Shogren, 2001, citing Tversky and Simonson, 1993, p. 9). When this is an obvious methodological concern in valuing environmental goods and services because of, for example, inexistent "referential" markets, the interest also remains in the case of valuation for private goods for which most markets exist—outside markets in laboratory studies. This would also apply to the case of new products arriving on the market, or to products that offer new characteristics. How do consumers individually value, for example, a credence[2] attribute is not easily verifiable. On a theoretical basis, people are assumed to have preferences, to be able to evaluate products given attributes and to make choices according to their individual preferences. On another hand, there is also evidence in valuation research that revealing information about products' characteristics affects bids (Lange et al., 2002). How values assumed to reflect preferences are affected by external variables can also be studied using experimental methods if such variables are part of a controlled design, whether statements of value are actual or hypothetical.

1.1 Valuation methods

In valuation work, tasks are completed in an environment[3] where subjects have preferences (induced or private) and under institutions defining the precepts of the exchange mechanisms' (Friedman and Sunder, 1994; Shogren, 2001). But whether preferences are based on cash-induced values or private values, Smith (1991) noted, that it does not imply they are of different type, or that some are more "real" than others (p.262). Rather, it is a matter of how much control can be claimed over the values measured and other factors, given the environment of a specific study, and the ability of the researcher to make the inferences he or she pretends to (Smith, 1991; Shogren, 2001; Harrison et al., 2004a).

The choices consumers make in real markets and values they place on products reflect their preferences. When market data are not available on an individual basis, or when study objectives do not permit the use of market data, various tools can be used in valuation research applied to private goods to describe preferences through behaviour.

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[2] As define in Lusk et al (2001): "For credence goods, the consumer cannot judge quality prior to purchase, as is the case with search goods, nor can the producer establish a quality reputation, as they can for experience goods" (p.6). Moreover, they are goods "in which consumers cannot detect quality after consumption" (p.19).

[3] What the environment is composed can unlikely be a definitive list of elements. Friedman and Sunder (1994) define the environment as: "All circumstances relevant to agents' decisions, including the economic institution, the resource and information endowments, the number and type of interacting agents, etc. Often the word is used to refer to circumstances other than the economic institution. For example, in a *private values* environment, some parameters of each agent's payoff function are known by the agent but are not known (except probabilistically) by other agents" (p. 212). In Shogren (2001), "the environment includes basic economic endowment like preferences, technology, physical constraints, property rights, and information structure" (p. 5).

Often used in the literature is the measure of willingness to pay, asked as the maximum amount of money that an individual is or would be willing to pay to obtain a good, as an indication of the value placed on a good. Some of the tools that can be used to capture or reveal homegrown values will briefly be presented in this sub-section. A distinction of methods is drawn between stated and revealed preference methods (for a more detailed discussion see Louviere et al., 2000). Data derived from stated choices, such as survey-based tools, are stated preference data, whereas revealed preference data denote market observed choices. Moreover when evoking these distinctions with other nuances, Harrison (2004b, p.3) refers to stated preferences as to "responses that do not entail any real economic commitment by the subject or[4] real economic consequences", whereas revealed preferences "entail a real economic commitment, a real consequence, or both".

Experimental methods are also used to estimate willingness-to-pay in consumers' preference studies, derived from observed choices within specific settings, and can further be distinguished whether they are implemented in a field or a laboratory. It can be viewed as a matter of degree if experiments, particularly laboratory experiments, fully fall in the classification of revealed preference methods, as choices are obtained from a constructed environment and are, to borrow from Shogren (2001), "stylized". They are not, borrowing from List (2006), "naturally occurring data".

1.1.1 Stated preference methods

Stated preferences data derived from survey-based methodologies are often used to measure willingness to pay for products, as well as their attributes in hypothetical contexts. Some of the tools frequently used to measure consumer homegrown value for private goods are contingent valuation, choice surveys and conjoint analysis.

In the <u>contingent valuation method</u> (CVM), respondents are presented with descriptions of products and their attributes, and are asked to state their willingness to pay. Though largely used in environmental valuation studies with non-market goods, contingent valuation is also used to study the value associated with new and/or improved quality attributes or different attribute levels. In its most basic form, open-ended questions are used to provide a direct measure of willingness to pay. However, the contingent valuation elicitation mechanism includes variants of closed-ended forms with follow-up questions (Carson and Groves, 2007). In the latter variants, the question takes a binary choice form, where respondents can be asked if "yes" or "no" they would be willing to pay a product at a given price, or at a fixed or an interval premium in cases where the product under study is compared to a conventional alternative (Gil et al., 2000; Boxall et al., 2007). Dichotomous choice (DC) formats can also consist of a single or a double choice question followed by various type of questions about certainty or more information in case of "no" responses. The double-bounded response format provides more information for the estimation of WTP, since participants who indicate a "no" response to the first question are typically offered a

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[4] His Emphasis.

second choice with a lower amount, whereas yes responses are followed by a higher proposition (Lusk, 2003). To achieve more precision on the interval response from the double choice format and extend response possibilities, trichotomous and multiple bounded choice models have also been used in the literature (Loomis et al., 1999).

The conjoint analysis is often used in multiple attributes profiles. Generally respondents are asked to rank or rate the presented products profiles, to estimate the contribution of the each of the attributes and their values to the overall respondent's preference, in order to predict consumers' choices (Louviere et al., 2000; Hailu et al., 2009). Furthermore, the underlying assumption to estimate values is that consumers' choices are function of various attributes, and preferences are decomposed based on additive utility, or "part-worth" utilities. The most preferred levels of attributes weigh more in predicting consumers' choices and are given large part-worth utilities in the analysis, while the least preferred are allocated small part-worth utilities. Conjoint analysis tasks are realistic and appeal to real consumer behaviour because they relate to the way in which choices and trade-offs are made in actual transactions (see, e.g., a straightforward conjoint design for ranking golf balls with combinations of levels of attributes such average driving distance, average ball life, and possibly price, in Curry, 1996). However, on another hand, the more attributes and levels of attributes are added, the heavier the valuation task can become.

Choice surveys share some basic features with the conjoint analysis. Both methods are often used in the valuation of products with multiple attributes, but in choice survey respondents are presented with series of choices scenarios and are asked to make choices based on attributes, rather than rank all profiles. Each scenario proposes various attribute combinations. In a given scenario one attribute usually has different levels across the proposed alternatives, and others attributes can vary between the choice scenarios (see Lusk et al., 2001a, pp. 25-26 for an illustration of a choice question).

The chosen alternative in a choice question is assumed to provide a level of utility superior to the non-chosen alternatives. Choice surveys are referred to choice experiment (CE) in the literature, or sometimes to contingent valuation (CV) choice experiment to mention the survey nature of the valuation (Louviere et al., 2000; Lusk et al., 2001a), and also stated-choice experiment (West et al., 2002). Surveys of choice experiment have been found to produce results that are "comparable to consumers' revealed preferences" (Adamowicz et al., 1997, cited in Lusk et al., 2001a, p.10). Choice experiments can also have particular features, for example West et al. (2002, p. 72) used in their study a number of repeated choices from every respondent, creating a panel structure in the data, Lusk et al. (2001a) included in their choice scenarios an option for respondents to choose neither of the alternatives, or Vossler et al. (2012) who used varying provision rules with respect to consequentiality of influencing policy.

Hypothetical settings are common in stated preferences methods, they do not entail any commitment from respondents which can cause bias in answers as will be further developed in section 1.2, such that what people state would differ from what they would actually do. On the other hand, stated preference techniques provide flexibility in contexts of multiple attributes, and questionnaire structures enable researchers to implement large-sample studies in many forms such as mail surveys, telephone interviews, one-on-one interviews. Likewise, time and cost are also factors relatively advantageous with stated preference methods.

1.1.2 Revealed preferences from market observations

Revealed preferences represent actual behaviour and choices. Revealed preference data are obtained from market transactions based on consumers' real purchases. Market data give, for example, information on the type of goods bought by consumers, as well as the quantities and amounts spent, over a certain period of time. However, even when available, the use of market data could be limited by little variability from explanatory variables such as prices, or be plagued by co linearity. In other words, market data are not control and not easily replicable. On another hand, scanner data or household panel can be used to aggregate market behaviour predictions because of the reliability in their external validity, since they come from actual behaviour (Ben-Akiva et al., 1994). When research objectives also centre on assessing the importance of attributes, Ben-Akiva et al. (1994) had proposed approaches to combine revealed preference and stated preference data in order to fill the gap, for instance, of the limited information on attributes levels from revealed data. The authors also address the practical issues in the search for complementarities of different data types and increasing the efficiency of econometric choice models, such as the survey design to be used, with what sample and of what size in relation to the revealed data sample, in a realistic context to get closer to an actual choice situation or in an abstract one, etc.

1.1.3 Revealed preferences with experimental methods

Preference revelation with experimental methods is based on observation of behaviour with real propositions and their outcomes. Economic experiments can be conducted in a simplified market setting designed and controlled to observe behaviour or in a field environment where market choices are normally made. Described below are a few experimental set up used in laboratory to measure the homegrown value for private goods. The institutions discussed are incentive compatible, implying that participants' incentive is to reveal their true homegrown value. Two categories regroup the methodologies to measure consumers' willingness to pay, real choice-based experiments which count numerous variants of incentive-compatible choice approaches, and experimental auctions.

Real choice experiments share the same design structure as stated choice experiments described previously, at the difference that monetary incentives are used and the valuation tasks are non hypothetical. The respondents make choices in the entire series of choice scenarios, and only one alternative choice in each scenario is selected as instructed. The respondents are also instructed in advance that only one scenario will be realized, and that it will be picked at random, they hence have an incentive to take all choice tasks as possible outcomes and truthfully reveal their preferred alternative in every task. When all choice tasks are completed, every respondent draws one binding scenario, and he or she purchases the product of his or her chosen alternative or product in that scenario (Alfnes et al., 2005; Lusk and Schroeder, 2006).

Vickrey auctions

The Vickrey (1961) auction has been largely used to elicit independent private values for private goods since the mechanism and its properties had been put forward (see, e.g., a summary of a selection of studies from 1972 up to 2001 in List, 2003, p.195; Lange et al., 2002). The principle in the Vickrey auction is that one product is to be auctioned to a number of bidders who individually submit their sealed bids at once, and the highest bidder to purchase one unit of the product pays a price not equal to his or her bid, but equal to the second highest bid. As the selling price is the second price, the Vickrey auction is referred to second-price auction (Friedman and Sunder, 1994). Vickrey auctions, or variants of the second-price auction, refer to selling prices superior to the second price (nth- price auctions: 3rd price, 4th price, etc.). The properties in the latter are the same as those of the second-price auction: each bidder submits a bid, bids are ordered, and one unit of the product is sold to the each of the n-1 highest bidders, at the determined nth price. When the auctioneer (the seller; the researcher) conducts a 2nd price auction, or the classic figure of the Vickrey auction, n equals 2, and one unit of the product is sold to the only first highest bidder at the 2nd price (the 2nd highest bid, submitted by the 2nd highest bidder). When the seller determines at first that the selling price will be the 3rd price, the n is equal to 3, and one unit of the product is sold to each of the first and the second highest bidders at the 3rd price (the bid submitted by the 3rd highest bidder). The same principle applies to other nth-price auctions with their specific ns. In Vickrey auctions, only bidders who submit bids greater than the sale price are allowed to purchase one unit of a product; the others, whose bids are equal to the sale price, or lower, neither receive products nor make any payment. Vickrey auctions other than the second-price allow a few more subjects to make a transaction.

The auction is theoretically incentive-compatible, since each bidder knows in advance that his or her bid is separated from the price to be paid, whether or not the bidder has the opportunity to purchase the product at the conclusion of the auction. As the selling price derived from a distribution of bids from the bidders, Vickrey auctions have to be conducted with multiple bidders.

Random *n*th price auctions

The properties of random *n*th price auctions were demonstrated by Shogren et al. (2001b) as valuation institution to elicit individual willingness to pay values. As many other auctions, a random *n*th price auction works in a group setting. Once sealed bids are submitted, each bid is ordered from highest to lowest. A random number *n* is then drawn between 2 and the number of bidders, and it becomes the *n*th price or the selling price. Following, one unit of the product is sold to the each of the *n*-1 highest bidders at the *n*th price.

Random nth price auctions are theoretically incentive-compatible. However, compared to another valuation mechanism such as the second-price auction where only the unique highest bidder has the opportunity to purchase the good, random *n*th price auctions may engage more bidders in the valuation task, even those who believe to have low valuations (Shogren et al., 2001b; List, 2003).

Becker-DeGroot-Marschak mechanism

The Becker, DeGroot, and Marschack (BDM, 1964) mechanism, sometimes referred to as BDM auction, is a procedure that also allows the elicitation of individual values through a direct measure of willingness to pay. The BDM procedure consists in selling one unit of a given commodity by asking subjects to submit their respective sealed bids; corresponding to the maximum amount they are willing to pay to acquire the product. The guiding principle in a BDM is that every subject who bids an amount surpassing a subsequent drawn random number from a pre-determined interval, which becomes the selling price, purchases one unit of the commodity. Though the product still goes to the highest bidder(s), which is the basis in an auction, unlike typical auctions bidders in a BDM procedure do not bid against one another, but rather against one exogenous price (Noussair et al., 2004b; Lusk, 2003b).

There are variants and applications of the BDM mechanism, as such in the valuation literature of private goods, which adapt about the random number. In Noussair et al. (2004b) for example, the selling price is randomly drawn from a pre-determined interval of prices, from zero to a price greater than the maximum willingness to pay that the researcher thinks could likely be submitted by bidders. Next, one unit of the product is sold to each bidder whose bid is greater than the randomly drawn price, and each pays an amount equal to the selling price. The other bidders who submit bids equal to or lower than the selling price are not allowed to purchase the product. Another variation can consists of a fixed pre-determined selling price, rather than an interval known by the seller, but only revealed to bidders who submit bids higher than the selling price (see, e.g., Lusk et al., 2001b).

The incentive-compatible property of the BDM mechanism is that subjects' bids are independent from the selling price. Theoretically, subjects do not have an incentive to misrepresent their homegrown values. Another appeal of the BDM procedure is that it can be used with one subject at the time.

<u>Limits and advantages of experimental methods</u>

In choice experiments, tasks are likely to look familiar to participants and preferences over different alternatives can be known. On the other hand, auctions mechanism can be theoretically incentive compatible and directly measure willingness to pay, but those mechanisms are not the most common to individuals, and are generally designed for the valuation of one product (Shogren, 2001; Lusk, 2003b; Harrison, 2004b). Additionally, it is difficult to obtain population representativeness with experimental methods, and they are also expansive in time and involve considerable cost. However, experimental methods offer the advantages of control and replication.

1.2 Consequences versus evidence of hypothetical bias

<u>Money is</u> used in experiments, as real consequences help to elicit sincere bids from participants in a valuation task and the exchange of money for goods appear to be the easiest way to induce consequence in a private good setting. Theoretically, an incentive-compatible valuation method provides incentives for respondents to truthfully reveal their WTP, in ways that respondents do not have incentives to misrepresent their preference by either overstating or understating their homegrown values. In the same vein, Shogren, (2001, p.34), notes that the economic theory of incentive compatibility is an individual concept. Although individual valuation tasks can be realistic in hypothetical situations, they contrast with real situations in regards to consequentiality of choices—or the lack of it. In respective studies, Neill et al. (1994) and Cummings et al. (1995) had examined bidding and choice behaviour in situations where a real economic commitment was entitled as compared to hypothetical statements of value. In general in both studies, hypothetical statements of value were higher than those obtained when monetary cash payments were requested, and the overstatement observed is qualified hypothetical bias.

As experimental evidence of disparities between hypothetical and actual WTP estimates was raised (Neill et al., 1994; Cummings et al., 1995; Blumenschein et al., 1997; Johannesson et al., 1998; Harrison and Ruström, 1999 cited in Shogren, 2001), the role of information and experience in a broad sense in relation with hypothetical bias had been explored in some following studies. Paradiso and Trisorio (2001) evaluated the distinct effects of direct and indirect knowledge acquisition of a good in the construction of preferences, in both hypothetical and real settings with a private good (antique print). They found that direct knowledge of the good, in the physical inspection of the good, reduced the disparities between hypothetical and actual WTP responses even so the hypothetical bias persisted.

The notion of how market experience – at least part of it that can be observed – plays in a valuation task had been explored in one of List's studies (2003). With the issue of hypothetical bias in background, List explored the notion that the bias could be due to both hypothetical and actual elicitation techniques (particularly Vickrey second-price auctions). Thus, he also has in treatments a random nth price auctions and a second price auction. The valuation task throughout treatments involved a sportcard (a private good). Some of his findings is that mean bids obtained from hypothetical auctions were greater than those from actual Vickrey auctions, for both experienced (i.e. sportscard dealers) and ordinary (i.e. non-dealers) type of customers, thus, overstatement in bids were observed even for experienced bidders.

1.2.1 Mitigation of the hypothetical bias using cheap talk

In an attempt to reduce the potential hypothetical bias, one approach, commonly known as the employment of cheap talk, was taken in early works as in Cummings and Taylor (1999, cited in List, 2003) and proved successful in some studies. Basically, the cheap talk informs respondents of potential hypothetical bias and asks that they think of the valuation task as if their answers were consequential.

List (2003) found that cheap talk eliminated the hypothetical bias for non-experienced participants with Vickrey second-price and random nth price auctions; but was not found to significantly impact bids of participants who had trading experience in sportscards dealing. In the same kind of work within the context of private goods, Lusk (2003) found that cheap talk reduced WTP for respondents who were unknowledgeable of the good (rice developed with biotechnology). However, Lusk (2003) could not conclude that cheap talk eliminated the hypothetical bias since a non-hypothetical treatment was not conducted. While there are studies suggesting that the cheap talk diminishes willingness to pay at least for certain respondents, there is also evidence with private goods that found cheap talk to have no significant impact. The latter would be the field experimental study of Blumenschein et al. (2006) who used diabetes management program. As well, Brummett et al. (2007) found cheap talk had no significant effect in valuating irradiated mangoes only hypothetically, as the good could not be delivered through actual settings.

1.3 Information and Willingness-to-pay

While there is evidence that economic consequentiality stands out as a decisive factor in value elicitation amongst institutions, some comparative empirical literature of valuation of homegrown value for private goods bring forth indication that knowledge and available information about the good's characteristics affect WTP responses . In theory, bid should reflect both the value of consumption of a good and the information value of the good (Crocker and Shogren, 1991, cited in Shogren, 2001, p.22).

Information can be treated at two levels, first by looking at the impact of improving the level of information available on measures of WTP second by looking at how information is presented. In this latter case, we would refer to framing information.

Improvement of the level of information

There is evidence in the literature that indicates the effect of external information about goods on values of willingness to pay. For instance, Noussair et al. (2004) showed that participants in a non-hypothetical setting demonstrated more heterogeneous behaviour after receiving information about genetically modified organism (GMO) in food products ,while the general context as suggested by opinion polls portrayed an unfavourable attitude from the public towards GMO. Lange et al. (2002) found that revealing information about products (champagne) had the same kind of positive effect on measures across different elicitation mechanisms (auctions and hedonic scores).

In the same vein, Lecocq et al. (2004) verified that for wine, additional information about label characteristics and wine guides after blind tasting significantly increased individuals' willingness to pay, while no additional impact on willingness to pay was found when tasting took place after reading the labels.

Presentation of information or framing

Effects of frames occur when behaviour is influenced by variations of formulations or descriptions of a same situation or task. In addition, the norms, habits, and expectancies of the individual making the decision control framing (see Tversky and Kahneman, 1986, for numerous framed choice problems).

Fox, Hayes, and Shogren (2002) examined the effects of information on WTP, weighing framing of different descriptions (favourable versus unfavourable) on the matter. In their experiment, they studied how revealed information about benefits and risks of food irradiation—on pork sandwiches—for consumers affects their behaviour and used several trials of second-price auction to elicit their values. Separately in distinct treatments, their results show that favourable information increased values submitted for the irradiated product (or the irradiated pork sandwich), while the unfavourable information on irradiation had the opposite effect. Also, they reported that when confronted with both positive and negative descriptions about the food technology at the same moment during the experiment, consumers' perceptions had been more influenced by the negative information, resulting in a decrease of bids.

In a "natural field experiment"[5], Gächter et al. (2009) verified if there were framing effects associated with describing a task in either a positive or negative light (description of the fee for late registration to a conference as either a "discount" or a "penalty", before or past a certain date). Their study comprised a sample of junior and senior experimentalists with a majority of economists, and their results indicated that junior researchers were prone to framing effects. The authors advanced experience as one of the possible reasons to explain why they observed a drop for early registration in the "discount" frame among the junior participants, while in contrast juniors in the "penalty" frame registered early.

Many of these results from part of the literature can find resonance in Shogren (2001): "Most researchers involved in valuation surveys know that how a question is asked is as important as what is asked. These so-called framing effects show up in many forms in valuation questions: the description of the good, the payment mechanism, the description of available outside options and substitutes, and reminders of budget constraints." (p.31). In fact, experimental methods are well suited to examine the impact of information on subjects' bidding behaviour because the information, as an element of the design, can be isolated and controlled (p.27), and permit researchers to make (more) "direct" inferences.

As the applied experimental research progressed, sometimes using private values to better tackle difficulties which arose with public goods, some specific methodological issues appeared and timely analysis resulted in the literature about this particular valuation work. By contrast with the control that induced values permit, homegrown values of individuals are not known a priori (Harrison et al., 2004a, p.124).

1.3.1 Market prices

The potential effect of field market prices on bidding behaviour needs to be considered, particularly in cases of valuation for products that exist outside the laboratory. In these situations, respondents can answer to valuations questions not necessarily giving their homegrown values, but rather censoring their responses by a market price known or perceived individually (Harrison et al., 2004a; Anderson et al., 2007). This methodological issue is referred to as "field-price censoring" (see Harrison et al., 2004a), but the basis of their argument also applies when respondents in a laboratory valuation task are not certain of the field market price or the quality of the commodity, and are given the opportunity to observe others' statements of value. In such series laboratory designs where results are publicly shown and respondents are continuing the valuation exercise in subsequent periods, the uncertain respondents may revise their answers based on the others' evaluations, or by "affiliated beliefs".

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[5] A terminology used by List (2006) (and in others publications) to describe an environment where subjects are not aware they are participating in an experiment.

In receptive environments where homegrown values are of interest and can potentially be affected, these difficulties can be controlled for by avoiding the use of methods with sequential revelation of values. Moreover, providing product information prior to the valuation task, and training respondents about the mechanisms with goods other than those to be valued can reduce the affiliation of homegrown values. However, "field-price censoring" is a more difficult problem of controlling context: "A subject's response could depend on his perception of which field substitute corresponds to the laboratory commodity, what the price of the field substitute is, and how the relative quality of the field substitute compares to the laboratory commodity. Without careful design the experimenter cannot hope to observe the price at which censoring arises" (Harrison et al, 2004a, p. 128).

Colson et al. (2010) also addressed the question of price censoring and examined whether participants' bids in a field experimental auction were influenced by perceived or actual market prices. They found that consumer bidding behaviour was more affected by their perceptions of the prevailing market prices. Moreover, their study enlightened the fact that even when eliciting homegrown values for a good that is believed to be quite familiar (bananas) for the majority of consumers, consumers' perception of what's the cost of the product varied considerably across individuals from the actual market price.

1.3.2 Disparities

In a meta-analysis by List and Gallet (2001), experimental parameters appear systematically to have a role in the observed disparities found in the valuation literature between actual and hypothetical stated values. In their meta-analysis, List and Gallet (2001) used 29 experimental studies that comprised design variables which could affect stated preferences within the context of valuation, to search if those experimental parameters played a role in the disparities observed in the literature between actual and hypothetical stated values. The authors find that the calibration factor, defined as mean hypothetical bids divided by actual bids, is sensitive to the nature of WTP versus WTA designs, of private versus public goods, and to elicitation methods, but is not affected by differences of laboratory versus field settings, or of between-subject versus within-subject designs. Specifically, results indicate less discrepancy in bids between hypothetical and incentive compatible mechanism for WTP than for WTA and for private versus public goods.

On another hand, other factors including the context of instructions, the framing, and the stakes of the decision influence behaviour in laboratory studies (Levitt and List, 2007). However while the particular environment of the laboratory is a concern to generalize the observed behaviour, it is less so when the experiment is used for methodological purposes.

<u>Substitute prices</u>

Value elicitation in experimental studies involving one good, in constructed environments, had raised limitations given the absence of complement or substitute products, both in terms of the capacity to generalize observed behaviour to real-world contexts (Chang et al., 2009), and of the effect such complements and substitutes have or would have had on observed bids (Rousu et al., 2008). In a laboratory setting, Rousu et al. (2008) found that when participants had the opportunity of buying multiple combinations of products, they bid more for a particular product when also bidding on a complement, and less when also bidding on a substitute. This implies that the presence of complements has a potential effect of overstating the values of the products when considered distinctly or in isolation, while the presence of substitutes may lead to understating. Chang et al. (2009) had used substitutes in choice experiments in both hypothetical and real settings, and found external validity in all cases in predicting actual in-store behaviour.

2 Research Questions and Hypotheses

This study is motivated by methodological objectives about mechanisms used to elicit homegrown values for private goods. It will be focusing on measures of willingness to pay obtained from hypothetical valuations or from incentive compatible methods, with respect to the impact of consequentiality and information about goods' characteristics on willingness to pay.

Research questions for this study are the following:

- Do we observe differences between incentive compatible methods and hypothetical methods on the measure of willingness-to-pay for a private good?

- Do we observe differences, within hypothetical methods, between a questionnaire and a questionnaire for which a cheap talk script is provided?

- Do we observe differences, within incentive-compatible methods, between an auction and an auction for which a referential on prices of substitute products is provided?

- Under the four elicitation methods, how does the framing of information affect the measure of willingness-to-pay?

The research hypotheses for the study are presented below.

Hypothesis 1: Willingness to pay amounts are expected to be higher in laboratory hypothetical situations, as compared with laboratory real situations.

The experimental literature in which private goods are used indicates that there are disparities between hypothetical and actual WTP, the observed hypothetical values being higher than the actual values (Neill et al., 1994; Cummings et al., 1995; Paradiso and Trisorio, 2001; List, 2003). The present study proposes an experiment design with two hypothetical treatments and two real treatments, which will permit build on the preceding literature. The design will also enable the comparison of hypothetical and real values possibly several times across various information about the goods used in the experiment, as every participant in both hypothetical and real situations had the opportunity of evaluating the proposed goods on six occasions.

Hypothesis 2: The usage of a cheap talk will result in lower values of WTP in the hypothetical situations where the script was used, compared to the hypothetical situations without the cheap talk.

Experimental studies with private goods suggest various outcomes concerning the employment of cheap talk and its relation to hypothetical amounts of WTP. The cheap talk was found successful in eliminating hypothetical bias for non-experienced participants in List (2003), reduced willingness to pay for respondents unknowledgeable about the good in Lusk (2003), and found to have no significant impact in Blumenschein et al. (2006) and Brummett et al. (2007). Our design implements both hypothetical and actual treatments with respect to cheap talk in a private good setting.

Hypothesis 3: The usage of a referential on prices of substitute products in a real treatment will have an impact on bringing WTP closer to field prices as compared to amounts of WTP obtained from a real treatment without the information on prices of substitute products.

As suggested by the literature, market prices whether known or perceived, may influence participants' behaviour in an experiment, in censoring their responses (Harrison et al., 2004a; Anderson et al., 2007; Colson et al., 2010). In another study (Chang et al., 2009), valuation exercises in settings that included choices of substitutes had demonstrated external validity with respect to behaviour from consumers as observed in actual markets. Research indicates that participants in an experiment would not place bids that exceed the market price of the product valued or of substitutes. In cases where resale opportunities exist, bids may rather be censored at the resale price. In our study, there are unlikely resale opportunities for the product used in the experiment (whether regular or specialty milk), we are only concerned about controlling for the field price censoring (the market prices whether known or perceived). Our design provided the market price for one product to value (regular milk) across all 4 treatments, whereas the referential on prices of substitute products for the other products to value (specialty milks) was only provided in only one of the two real treatments. Our expectations are two-folds: i) we expect that bids for the regular milk to be censored by the provided field price in a similar way across all 4 treatments; and ii) bids for the specialty milks might exceed the provided field prices of substitutes in the real treatment using the referential (this is possible if participants perceive a higher value as we are not in presence of perfect substitutes).

Hypothesis 4: The usage of a negative or positive description has the same impact on measures of WTP across the four valuations methods employed.

A number of studies have showed that revealing information about the characteristics of the good to value has a positive impact on valuations in various elicitation mechanisms (Lange et al., 2002; Noussair et al., 2004; Lecocq et al., 2004). The perspective in which the information is presented also has an impact on willingness to pay. In another study, Fox, Hayes, and Shogren (2002) found that when presented at once, negative information had a greater impact on bids than positive information, decreasing bids. Gächter et al. (2009) had also found framing effects associated with positive or negative descriptions for specific type of participants. The experimental design employed in this study should allow seeing how descriptions that could either be perceived

negatively or positively weigh in WTP after participants learn that the information implies the same. For this, we make the assumption that participants would perceive the negative or positive description about products' characteristics as the researchers expect, whereas the perception might not be necessarily as such for all participants.

3 Methodology

Following the literature review, our methodology compares participants' responses from hypothetical and real payment contexts, hence splitting samples for a "between-subjects" analysis of the sensitivity of information across valuation mechanisms. In practice, we elicit willingness-to-pay for milks with various attributes with our study's participants. The attributes for the milk differ in the process involved in milk production in terms of feed supplementation, and in the nutritional information. Similarly to other experimental studies, which have analysed the impact of the introduction of information on individuals' valuations (Fox et al., 2002; Lange et al., 2002; Noussair et al., 2004, Doyon et al., 2012), our aim is to see if new information compared to a baseline level affects bidding behaviour, and what are the effects of potentially perceived negative or positive information on values of WTP (framing) and their trade-off given the hypothetical or revealed preference (real) contexts.

3.1 Research design

Four distinct treatments were implemented following a 2 x 2 design[6], using two setting, one with and one without consequences (real exchange of money for a unit of the good auctioned) , and two additional information conditions consisting of a cheap talk script in one case and a referential, an illustration of substitute products with their price, in one other case. Hence, the study comprised one hypothetical treatment, one other hypothetical treatment with a cheap talk script, one experimental auction, and one experimental auction with a referential. All instruments elicited direct valuation questions on willingness-to-pay to test for differences on measures obtained, given incentives and information conditions. All valuation questions on WTP were also preceded by a question on participation or willingness-to-participate in the market. In this manner, respondents in both hypothetical and real auction settings had the opportunity to think and choose if they would like the good, and were not under an obligation to state any amount had they chosen not to be involved. The two hypothetical treatments elicited values for WTP using open-ended questions without the possibility to purchase any product, and they only differed in the employment of an extra information condition of a cheap talk in one of the treatments. On the other hand, two treatments used auction mechanisms eliciting bids of WTP with the requirement of the commitment to buy one product if respondents chose to bid. The two auctions distinguished from the usage of a referential in one treatment. The values of WTP were asked based on the provided descriptions about the products' attributes given different levels of information. These products' descriptions did not vary across the four treatments.

The treatments were distributed among 8 different groups of subjects, that is to say 4 sessions in a hypothetical setting and 4 sessions in a real setting where products were sold. The design allowed for comparisons between

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[6] The experimental design and sessions were written and run in French; the material presented is the author's translation.

treatments since each subject only participated in one session. This likely reduced the order effects that could occur in in-sample designs when subjects know that they would be involved in more than one type of valuation setting (e.g., in this design, it could have led to a bias if subjects participated in a hypothetical valuation followed by real consequential valuation). Shown in Figure 1 are the treatments of the research design and the repartition of the effective sample. We used two stated valuation methods with no monetary incentives, which differed by the employment of a cheap talk script in one of the hypothetical settings. From the 178 participants, 44.94% of individuals took part in the hypothetical valuations, and among these 20.79% participated in the hypothetical valuation without cheap talk, while 24.15% formed the group exposed to the cheap talk treatment. Two revealed valuation methods were also used using experimental auction where participants' decisions were consequential in monetary terms. One experimental auction used a referential in which prices of close substitute products were provided and 27.53% of our participants took part in this setting. The other experimental auction did not the referential and was composed of 27.53% of participants.

FIGURE 1 – TREATMENTS AND SAMPLE REPARTITION

No monetary incentive	Hypothetical (20.79%)	Hypothetical w/ Cheap talk (24.15%)
Monetary incentive	Experimental auction (27.53%)	Experimental auction w/ Referential on prices of substitute products (27.53%)

We expect measures of willingness to pay to be higher for the methods with no incentive in hypothetical situations and lower for the incentive-compatible methods in real-laboratory situations, based on empirical evidence (Neill et al., 1994). In a continuum, willingness-to-pay's should be highest to lowest from methods not using incentives to the methods using monetary incentives, and we expect the framing effect to move price according to the positive or negative positioning of the presented information.

3.2 Treatments and choice of valuation mechanisms

3.2.1 Open-ended contingent valuations

We used open-ended questions to elicit values of willingness to pay in two hypothetical treatments. In its open-ended format, the contingent valuation method had been for the most part used to assess willingness to pay of non-market goods in valuation research on the environment, or on public goods in general (for examples, see, e.g., Carson and Groves, 2007). It had less been applied to private goods, and to sometimes investigate the hypothetical bias associated with the method (see, e.g., Neill et al., 1994). In some other cases, variants of the contingent valuation had been used to assess willingness to pay for the improved quality attributes of products,

often in comparison with base products, such with organic products (Gil et al., 2000; Boxall et al., 2007). A similarity in valuing attributes that have no reference in the market can be found with alike valuation for public goods, and it can be argued that attributes for private goods relating to health, or the environment, can also be perceived by respondents as beneficial to them individually but also to society. However, in referring to private goods in the present design, we do not consider such other(s) possible passive values, since we do not control for them.

The main methodological issue in using contingent valuations is the hypothetical nature of the task. Regardless of the format of the valuation question, the hypothetical bias can be found in open-ended as well as dichotomous choice variants. One of the advantages in using open-ended valuation questions over dichotomous choice is that they permit to obtain direct measures of willingness to pay, whether it is high or low, whereas DC measure intervals. But, still, with an a priori knowledge of potential bias, the question one could ask is why use it in the first place? We are interested in studying behavioural patterns in both incentive and non-incentive settings with respect to valuing products' attributes and acceptance of products. We are interested in seeing if the valuation tools used are more or less sensitive to attributes changes or to framing. In order to be able to make direct comparisons with values of open-ended bids to be obtained from auctions, we chose to elicit open-ended values in the two hypothetical settings as well.

In one of the hypothetical setting, we used in addition a cheap talk script to see if it would have an effect on values of willingness to pay. The script was distributed to respondents before the valuation exercise commenced and was read aloud by the experimenter. All sessions were conducted by the same person.

3.2.2 Nth price auctions

We used a 5th price auction, a variant of the second-price Vickrey auction, in two non-hypothetical treatments. Vickrey auctions are incentive-compatible mechanisms, however the 2nd price auction may engage less bidders in the valuation task. Shogren et al. (2001b) showed the properties of random nth price auctions, in that they are incentive-compatible and are mechanisms that engage more bidders than the second-price auction. We considered using random nth price auctions in the design and employed them in a pre-test experiment. The first limitation we found concerned the selection of the selling price at random. For good or bad reasons there was a puzzling perception from our participants—if not unfairness, about chance in the determination of a market price. When the random drawing of the nth price should involve people, at the same time in practice the mechanism had an aspect of a gamble. And as we were using pens in the training phase with subsequent real transactions, and milks for the proper design, both types of products which have relatively low values, we faced various ex-

æquo bids. The winning bids were lengthy to sort, and as they were determined at random too[7], this added, per our observations and feedback from participants, to the perception of randomness to yet a random mechanism. Another operational challenge was more related to the goods we were to use; milk not being as handy and demanding in refrigeration space for as many potential buyers in group sessions.

Because of the limitations we faced with the nth random price auction in practice, we chose to implement an nth price auction at the 5th highest price in two non-hypothetical settings.

A referential consisting of information on the market prices of close substitutes was used in one of the non-hypothetical treatment, to see the effect of the presence of those price references on bids. Even if the substitutes were not being valued and were not available for purchase, we expected that giving information about prices of others enhanced milks would increase bids for the products proposed in the design, because it would increase the acceptance of the products to value.

3.3 Materials and methods

3.3.1 Products and attributes' descriptions

Six descriptions of product attributes were used across the four treatments, and respondents were asked first their willingness-to-participate, and the participants were then asked their willingness to pay following each description, therefore six values were elicited per individual. The products used for the study were milks, and the attributes were related to production process (animal feed) and health (benefits for humans). Milk was chosen for this study because for one, as is the case for a large variety of foods, it is a product people frequently buy and can be assumed to have constructed preferences. Further, it is a product for which appear in the market innovations or improvements involving new or added characteristics, which can be in the form of credence attributes. Hence as a credence good, the information which is provided about the attributes plays a role in signalling consumers about those characteristics. The experimental design was constructed to allow seeing how consumers, assuming stable preferences, react and value newly revealed attributes given different incentive settings. For this purpose, milk seemed suitable, although other food products could have been used.

Two milks were used in the design: one regular milk which could be found in supermarkets of the Quebec City area, and one specialty milk containing DHA fatty acids which could be found at few food retailers and in small

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[7] For example, if we had two $5.50 bids, and tree $4.99 bids, and all were above the nth price, then we had to determine at random which one of the bidders between the two was to receive the good and pay the nth price (a price necessarily below $4.99). Then again for the other tie, we also had to do the same to determine which one of the tree persons was to acquire and buy the product at the nth price.

volume[8]. No brand of milk was mentioned to avoid framing effects associated with product presentation (also see, e.g., Doyon et al., 2012). Though the two milks used were available in the market, the research design provided to respondents information about the product attributes that could not generally be read on the physical products. This concedes the point that the chosen described attributes were hence highlighted, however one of the objective was to know if patterns of behaviour could be observed across treatments, or if there were mechanisms/instruments that were more or less sensitive towards this context.

Six levels of information, concerning milk process and health-related attributes, were presented in each of the four treatments (Figure 2). Products were not shown, presented to respondents in a generic fashion defined sequentially by numbers (milks #1 to #6) and solely differentiated by the information on the process and health-related attributes. It was not told to respondents that the product #1 was the regular milk, and that all the subsequent products from #2 to #6 were the same DHA milk. In short, it was said that there would be six descriptions of milks successively, that none of the descriptions affected the taste of milk, and that the maximum amount one would be willing to pay would be asked following each description (last column of Figure 2).

FIGURE 2 – DESCRIPTIONS OF ATTRIBUTES

Regular	#1	To produce this milk, hay for the dairy cattle is supplemented with grains
Fish meal/flour based	#2	To produce this milk, hay for the dairy cattle is supplemented with fish meal/flour[1] based
DHA omega-3	#3	To produce this milk, hay for the dairy cattle is supplemented with DHA omega-3 fatty acids
Matching	#4	The fish meal/flour[1] based is the source of DHA omega-3 fatty acids that are found in this milk. Milks #2 and #3 are hence the same product.
Info+	#5	Additional information on nutritional facts and health benefits of omega-3.
Info-	#6	Additional information on the concentration of DHA omega-3 in milk.

(1) The experiment was conducted in French, the term used being "Farine de poisson". Had the language been English, there would have been more research for the sake of non-ambiguity in our respondents' minds on the term to use, between "flour" used for grain versus "meal" technically employed for animal origin based products such bone, blood or feather.

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[8] The research team ordered in advance at the store enough quantity of the specialty milk to be available throughout the period of the study.

Across the four treatments, the valuation tasks followed a common sequence as follows below; except for some order inversion of two descriptions in each half of the 8 group sessions.

<u>Milk #1 / Regular</u>

The product was used as an identifiable reference point, a base product in terms of attributes, for which was given in the description the supermarket's list price of $3.07, the format of a 2 litres, the fat content of 2%, and the feed supplement (cereals) used to the produce the milk. The outside market price was only given for the first product and not repeated for the remaining of the session, the intent was to provide the same reference price to study subjects for all treatments, and to avoid "field price censoring" (Harrison et al., 2004a; Anderson et al., 2007).

<u>Milk #2 / Fish meal</u>

From this point on, no reference to price was given in the description. The format and fat content of the milk was repeated, and the information about feed supplement (animal based fish meal/flour) used to produce the milk was given. For half of the sessions, this description was presented in third place (milk #3).

<u>Milk #3 / DHA</u>

The description consisted of the milk format, the fat content, as well as the information on feed supplement (DHA/EPA omega 3 fatty acids). Here also, this description was presented in second place (milk #2) for four out of the eight sessions.

<u>Milk #4 / Matching</u>

The description matched those of the previous two, in stating that the DHA/EPA omega 3 fatty acids feed supplement was used in producing milk as earlier, and that however in reality, the DHA/EPA omega 3 fatty acids (consumed by the dairy cattle) were in the form of fish meal/flour. It was then clearly mentioned that the milks #2 and #3 previously described were one and the same product. The milk was again presented in a 2 litres format and had 2% of fat content. The matching of the descriptions of milk #2 and #3 was the reason they alternated positions, to balance for a possible order effect where the correspondence would have just been preceded by an attribute that could potentially be perceived negatively and inversely.

<u>Milk #5 / Info+</u>

The description entailed information on health benefits associated with DHA/EPA fatty acids such the prevention of cardiovascular diseases, and on nutritional deficiencies in the adult population of Quebec based on a survey.

It was repeated that the milk contained DHA/EPA fatty acids obtained from supplementing the feed with fish meal/flour. Still the same, the milk's format and fat content were mentioned.

<u>Milk #6 / Info-</u>

The description consisted in providing the nutrition recommendation of the daily intake in DHA/EPA for adults to maintain a good cardiovascular health (500 mg/day) as well as the needs fulfilled per the consumption of one portion of the milk with respect to the recommendation (5%). Again, it was mentioned that the milk contained DHA/EPA fatty acids obtained from supplementing the feed with fish meal/flour, that it was a 2 litres format and had 2% of fat content.

3.3.2 Consumers' recruitment

The study was conducted in June 2009, with a sample of 178 subjects, in Quebec City, Quebec, at *l'Institut des Aliments Fonctionnels et des Nutraceutiques* (INAF). Subjects were recruited via email invitation using a list of voluntary registered individuals for nutrition studies, mostly clinical. The invitation briefly introduced the research field of the academic study in consumer behaviour towards food products and specified that it was not a marketing research. The letter indicated that in order to participate in the study, individuals needed to be at least 18 years old, and to consume milk. Subjects who wanted to participate had to contact the research team to register for one single session among the height proposed in the invitation. It was mentioned the dates, hours, place and type of sessions. The sessions differed by their duration and accordingly monetary compensation: (i) four different dates for "type 1" sessions to last 40 minutes and with a compensation of $20; and (ii) four others for "type 2" sessions of a length of 60 minutes and $28 of compensation. The maximum size intended per session was of 25 individuals, so as to have 200 participants for the study, which was not reached. No requirement was put for signing up for sessions. Participants who were recruited for the "type 2" session were only told, after signing the consent forms for the ethic committee and entering the room, that they were in an economic experiment where they would be given the opportunity to buy products. For this purpose, only these participants were in fact given $33 to avoid the frustration of bidding for products from their «allocation». However, participants were told that they had at least $33 to buy a maximum of 1 product, if they wished to. This was done to ensure that participants see all 6 auctions as independent and do not either underbid or overbid, since out of the 6 auctions, only one was drawn randomly and was binding. Individuals who participated in the "type 1" session were also told that they were in an economic study, but that they would not buy products.

3.3.3 In-session procedures

The research design followed common steps and varied some procedures depending on specific treatments (Figure 3). The explanations of the procedures and the instructions were read aloud by the experimenter and were projected as well. All sessions were conducted by the same experimenter.

FIGURE 3 – EXPERIMENTAL DESIGN

Step	Hypothetical	Cheap talk	Auction	Auction w/ ref.
1	Socio-demographic survey			
2		Cheap talk	Auction explanations + practice round with pens	
3				Information on substitutes' prices
4	Three hypothetical questions on WTP		Three incentive-compatible auctions	
5	Knowledge test			
6	Three hypothetical questions on WTP		Three incentive-compatible auctions	
7	Survey on purchase and consumption habits			

Instructions

Upon arrival and validation of the registered individuals, they were each given two copies of the consent form as requested by research ethics committees of Université Laval, and invited to read and sign them if they approve. Before the session could begin properly and subjects were paid, the experimenter explained aloud that each subject was to be solely identified by a number from that moment on. Subjects were then invited to randomly pick a number in a box as they were entering the laboratory and sat at the chair corresponding to their number. At this point, subjects only knew that they were participating in an academic study.

The session began with explanations of the context of the study and the progression of the main steps. At this early stage, it was detailed if the type of economic research on consumers' preferences involved purchasing

products in the laboratory or not, and the amount announced in the recruitment letter was given in envelopes to respondents right away ($5 more than announced was given in "type 2" sessions). Subjects were invited to verify the amount. It is common to use monetary incentives to motivate subjects in an economic experiment (Friedman and Sunder, 1994). The house money effect was mitigated by reminding participants that the money was theirs and they were actually asked to put it in their pocket. The participants were also told that they could leave with their money at any time. Furthermore, respondents were not constrained to value any product for which they were not willing to participate.

It was reminded that responses given during the study were anonymous and confidential, and could not be linked to one's identity. It was furthermore expressed to respondents that they could leave the session anytime, keeping their copy of the consent form and the money. During the eight sessions conducted, lasting either 40 minutes or 60 minutes, no individual left before the end.

Socio-demographic questionnaire

The data collection began with a socio-demographic questionnaire, printed and distributed to respondents who were invited to answer individually. The questionnaires were collected by assistants in the room as soon as a respondent signalled she or he had completed.

Auction mechanism

Prior to valuing products, it was explained to respondents in four sessions that they would be provided with products' descriptions and would then be asked the maximum amount they will be willing to pay to acquire those products. It was explained that an auction mechanism was going to be used for them to state their amount. For this purpose, theoretical explanations on the logic of the auction and the best bidding strategy for participants were given. Examples were used illustrating what was a fifth highest price, how it was determined, what it meant for participants who bid above (those will get the product and pay the fifth price), who bid the fifth price and below (those will not receive a unit of the product and will not pay anything). It was further explicitly pointed out, still using examples, how it was not into one's interest to bid an amount different from his/her true willingness to pay, stating that in cases of overbidding the risk was to purchase the product at a price higher than the true valuations, or pass by an affordable purchase when one underbid. To make sure the theoretical properties were understood and to allow respondents to familiarize with the mechanism, one practice round using pens followed. Seven generic small size answer sheets were then distributed to respondents, ordered as they would be needed during the session. Next the pen was showed and described (writing and highlighter pen; retractable point). After that participants were invited to take their first answer sheet, answer first if they wanted to participate in buying the product, and if it was the case, subsequently write their bid. Research assistants collected the papers. The

experimenter then ordered the bids, inscribed on the board the amounts and the corresponding participants'
session number, and announced which participants would purchase the product. For ease of procedure, the
participants who were to each receive one pen and pay the fifth price were to wait at the end of the session to
complete transactions, unless they decided to leave the experiment before. For this reason, the results of the
auction were to be kept on the board through the remaining of the session(s).

<u>Successive valuations of the first three milks</u>

Before the valuation could begin, it was explained to respondents that consumers' preferences was the field of
interest in the study, and that their valuation on products through their maximum amount of willingness to pay
would be asked. A pack of six answer sheets was handed out to respondents by research assistants—seven
had already been distributed in the auction sessions at this stage. What a valuation answer sheet looked like
was slide shown, and the experimenter explained that all forms would appear similar during the session (Figure
4). The difference between formularies used given the two types of sessions was the employment of the
conditional wordings *would you like…*, *if…*, *would be willing…*, in the hypothetical settings versus *do you want…*,
are willing…, in real settings.

FIGURE 4 – EXAMPLE OF A VALUATION ANSWER SHEET

ID: 00

Milk #00

Would you like to participate in purchasing the described product if it was
available? Please mark.

Yes   ☐

No   ☐

If you answered "yes", indicate how much you would be willing to pay for
this milk. It is important to note the exact amount, to the nearest cent.

Your amount: $ ⎯⎯⎯.⎯⎯

In the hypothetical sessions, it was explained that six descriptions of milks were going to be provided one after
another, that the information originated from validated independent scientific sources, and that none of the

described variations changed the taste of milk. For two hypothetical sessions, a one page cheap talk script was distributed to respondents and read aloud by the experimenter.

The valuations for milks occurred after the training phase in the four treatments where auctions were used, and the same explanations as in the hypothetical treatments about the six descriptions of milks were then given. Additionally, it was made clear that there would only be one binding auction among the six, and that this will be determined at random at the end of the session. For two of the auction treatments, a referential (Appendix 1) summarily illustrating substitute products with prices was distributed.

It was noted that no products would be shown. The description for the first milk (milk #1was read aloud as projected, and respondents were invited to take their answer sheet and complete (first answer sheet in hypothetical sessions; second answer sheet in auction sessions). Assistants collected papers and put them aside up front. No results were displayed between the valuation tasks. The same steps were done for the following two milk descriptions.

Knowledge questionnaire

At this point of the session, an intermediate questionnaire was distributed to respondents, to gather information about their knowledge on the supplementation processes described and their usage. The one page long questionnaire did not take long to complete, and papers were collected as respondents finished.

Successive valuations of the last three milks

After the descriptions were read, the successive valuations for the remaining three milks followed the same steps as previously. As before, no results were shared during the progression of the valuation tasks. At the end, one auction among the six was randomly chosen using a dice for the four treatments with incentives, bids were ordered, the 5th highest price was announced as well as the participants who would purchase one pack of milk.

General questionnaire on consumption habits

A final questionnaire which aimed at collecting information on the respondents' general food consumption habits was administered.

4 Results

The objective of the study is to appreciate the effect of context variables, in terms of the level and presentation of information, and of the monetary incentives, on the valuation of milk products.

The impact of the treatment (stated method vs. incentive-compatible) and of the level of information is measured in terms of two variables:

- Willingness to participate in the purchase of the product (dummy variable);

- Willingness to pay for the product (continuous variable).

The first decision task respondents had to make about participation—hypothetically or actually— allows considering afterwards in the analysis all amounts for willingness to pay. In this manner, an amount as low as $0.01 can be interpreted as a very low WTP.

4.1 Summary statistics

4.1.1 Sample

Some demographic variables show that the age of participants, across treatments, varies from 35 to 40 years old on average. The sample's gender is predominantly composed of women, for over 59% in each case. Among other data regarding the respondents' general diet habits, over a third declare buying 2% milk most of the time. It is worth noting that as milk at 2% of fat content was used in the design, the fact that not the majority of respondents consume this type of milk could have had an impact on participation in the market (Table 1). This information is in fact later used as further evidences of hypothetical bias in stated preference setting. Positioning, for information, this sample's profile in relation to the overall milk consumers is in contrast of 38.79 litres of per capita disappearance for 2% milk in Canada in 2005 on a total of 83.84 litres for fluid milk (Agriculture and Agri-Food Canada, 2009). Although this indicator is not measured at Quebec level, production and sales records indicate consumption of 3.25% and 2% milks had been diminishing throughout the years however still important in general figures, while the consumption of 1% milk had stabilized and that of specialty milks which includes omega-3 is potentially growing (MAPAQ, 2009a; MAPAQ, 2009b).

TABLE 1 – SAMPLE CHARACTERISTICS BY TREATMENT

Treatment	Mean age (sd)	Gender (%)		2% milk consumption (%)	Size (n)
		M	F		
Hypothetical	39.30 (17.45)	40.54	59.46	32.43	37
Hypothetical w/ Cheap talk	40.09 (16.14)	34.88	65.12	39.53	43
Experimental auction	34.96 (13.79)	38.78	61.22	46.94	49
Experimental auction w/ Referential on prices of substitute products	38.88 (12.96)	34.69	65.31	34.69	49

4.1.2 Data on Participation

Respondents had the opportunity to participate or not in the actual or hypothetical market after taking notice of the products' descriptions. For all four treatments, Figure 5 shows that the participation drops for the milk involving fish meal in the process. In general, there seems to be higher levels of participation for the cheap talk treatment. Looking at the six products individually, differences on participation between the hypothetical and real treatments appears to stand out for the first milk valued which described a process with cereals as feed supplement. Participation is 70% for the hypothetical treatment and 72% for the hypothetical treatment with a cheap talk, whereas it's almost the inverse proportions when monetary incentives were employed, with 63% and 59% of non-participation for the experimental auction and the experimental auction with a referential, respectively. The possible impact of monetary incentives on participation is less striking for the others descriptions of products.

Comparisons of the observed frequencies of participation given the treatments show that the employment of hypothetical or actual value elicitation method has a statistical significant relationship with participation (p= 0.0228, Fisher exact test, two-tailed; Table 6, Appendix 2). Thus, the null hypothesis that the outcome of participation is not associated with the treatment should be rejected; participation is higher in hypothetical treatments. To build on these findings, further non-parametric tests were conducted given the treatments and the participation at each of the six occasions where WTP was asked to participants in the laboratory experiments. In line with what is suggested in Figure 5, when looking at the six products individually, this difference in participation between hypothetical and real treatments is driven by the regular milk (p=0.0000, Fisher exact test, two-tailed; Table 9, Appendix 2), where participation is higher in hypothetical treatments. The null hypothesis of

equal proportion of participation between stated valuation methods and actual auctions should thus be rejected for the regular product.

In determining whether there is an association between the usage or not of a cheap talk in hypothetical treatments and participation, the null hypothesis of independence of treatment and participation should be rejected (p= 0.0061, Fisher exact test, two-tailed; Table 7, Appendix 2). Thus, when comparing those two hypothetical treatments together, participation is higher in the Cheap talk treatment. When participation was analyzed for the two hypothetical treatments looking at the six products individually, we found that the null hypothesis of no association between treatment and participation should be rejected for the "negatively perceived" information on the product (p= 0.0411, Fisher exact test, two-tailed; Table 10, Appendix 2). In this latter case where information was provided on the nutritional daily intake fulfilled by the consumption of one portion of the enriched DHA/EPA milk (5%), participation was higher in the Cheap talk treatment as compared with the other hypothetical treatment with no cheap talk. Further, distinct tests given all the other five descriptions of attributes on the product did not permit to reject the null hypothesis of no association between the two hypothetical treatments and the outcome on participation at a critical value of α = 0.05.

However, we fail to reject the null hypothesis of association of real treatments and participation, suggesting there is no real relationship between actual elicitation methods that use or not a referential on price of close substitutes and the outcome on participation (p= 0.5622, Fisher exact test, two-tailed; Table 8, Appendix 2). Hence, there is no difference in participation when those two real treatments are compared. Further, there was no significant statistical difference in participation between the two real treatments when the six products were analysed individually at a critical value of α = 0.05.

FIGURE 5 – LEVEL OF PARTICIPATION BY TREATMENT AND PRODUCT
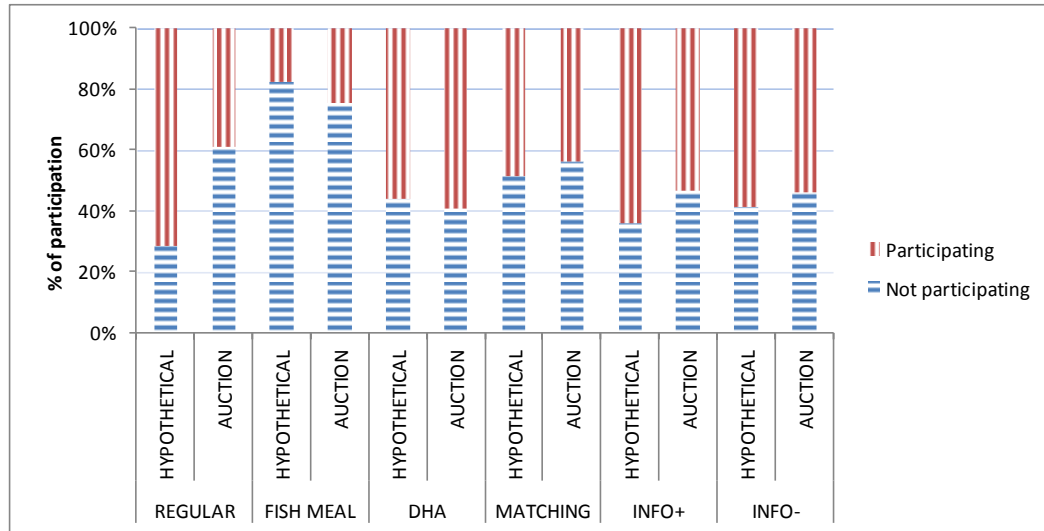
Participation can be contemplated in relation to the knowledge that the respondents had about the processes used in feed supplementation for the dairy cattle (Figure 6). Of the 80 respondents who took part in the hypothetical treatments, 59% stated that grains/cereals were the most common feed supplement used; and all milks considered, 47% of them chose not to participate in purchasing while 53% were willing to. Similar percentages were observed amongst the 41% of individuals who thought that other feed supplements were used instead or did not know, where 48% did not chose to participate while 52% did. The results seem to indicate that the knowledge that respondents had about the processes used in supplementing the cattle feed did not influence participation in a clear direction in hypothetical contexts.

On the other hand, 65% of the 98 individuals who joined the real treatments with auctions stated that grains/cereals were the most common feed supplement, and 49% of those did not wish to participate while 51% did. Participation was less for the 35% of respondents who considered that either other feed supplements were the most used or ignored which process was prevalent, with 65% of them declining to participate whereas 35% wished to and placed actual bids for the milks put on auctions. This seems to suggest that an actual valuation context may have a dissuasive effect on participation when respondents have less knowledge about the products.
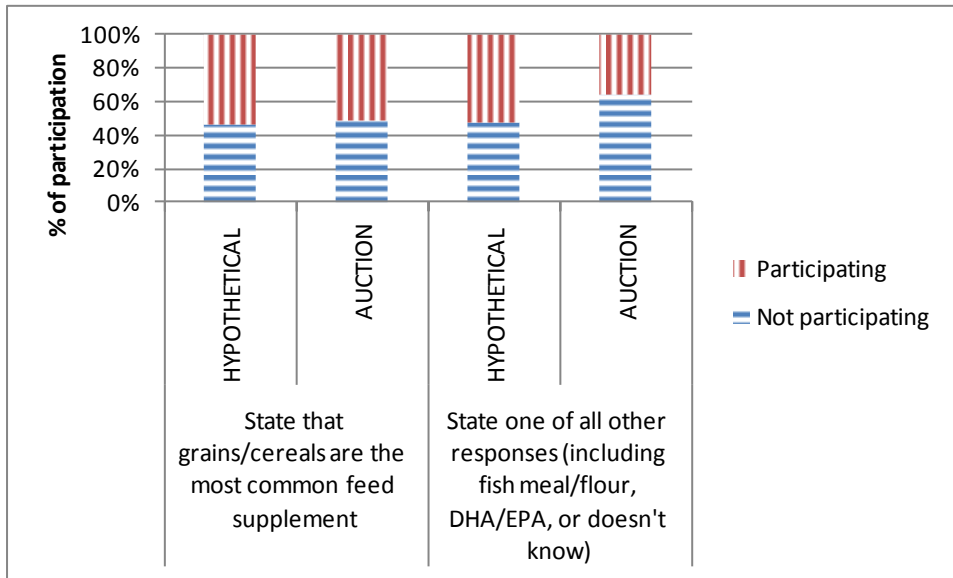
The respondents were asked what type of milk they frequently bought in a questionnaire that was distributed after the valuation phase was completed (Figure 7). All the milks that had been proposed in our experiment were 2% of fat milk content.

In the hypothetical treatments, 36% of the respondents stated to buy 2% fat milk most frequently and 40% of them chose not to participate in purchasing the proposed milks while 60% participated and submitted hypothetical willingness-to-pay amounts. Of the 64% who declared to buy other types of milks or in combinations with 2% milk, 51% did not participate whereas 49% chose to in the hypothetical setting.

In the actual auctions, 41% of the individuals stated to buy 2% fat milk on a frequent basis, and 43% of them were not willing to participate when 57% participated. On the other side, out of the 59% who responded to buy other types of milks, 62% chose not to participate while 38% did and submitted actual bids amounts.

These observations seem to indicate that the type of milk may have an effect on participation in all treatments. Globally, the respondents who frequently purchase 2% fat milk participated more than the individuals whose purchasing habits are different. When examining the impact of the consumption of 2% fat milk on the participation, results indicate a statistical significant difference between the groups of individuals who consume 2% milk and those who do not in the hypothetical treatments (McNemar Chi2= 28.50, p= 0.0000; Table 11,

Appendix 2). The proportion of individuals who are willing to participate although they do not consume 2% milk is significantly higher than the participation of individuals who consume 2% milk in the hypothetical treatments. On the other hand, no statistical significant difference is found on participation between individuals who consume 2% milk and those who do not consume that type of milk in the real treatments (McNemar Chi2= 3.35, p = 0.0672; Table 12, Appendix 2). In these non hypothetical contexts, the individuals who do not frequently purchase 2% milk less participated than individuals who do, but these results are not statistically significant.

FIGURE 7 – LEVEL OF PARTICIPATION BY TYPE OF MILK FREQUENTLY BOUGHT BY RESPONDENTS
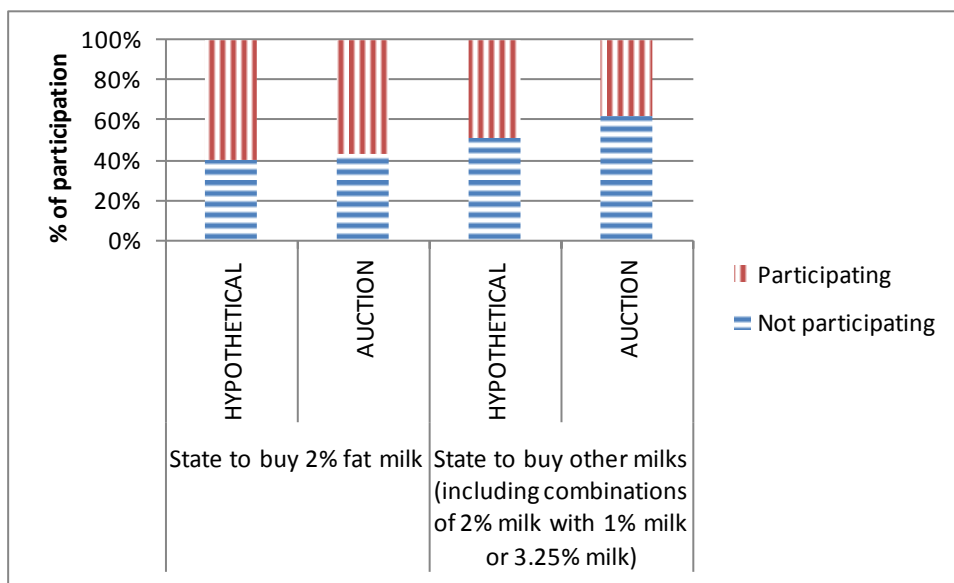
4.1.3   Data measures of WTP

Comparisons of mean amounts for WTP as in Figure 8 offer some first indications of average bids by treatment and by product. Across treatments, mean bids for the "regular" milk have lower values in treatments with monetary incentives than with hypothetical settings. Moreover, WTP with auctions are much below the reference price of $3.07. There appears to be an evolution in mean values of WTP across the four treatments based on the successive six descriptions of products.

There does not seem to be, when comparing the two stated preference methods which differed in the employment of cheap talk in one of the hypothetical questionnaire, much difference in mean values of willingness to pay for all descriptions of products. This might suggest that the cheap talk does not have an effect in reducing a hypothetical bias in this design.

40

However, apart from the first product, when comparing the two incentive-compatible methods, it seems that the provision of a referential on prices of substitute products motivates higher values of willingness to pay. At first sight, this might suggest that the relative acceptability of the product being valued rises with the knowledge about other products and prices. It might also suggest that the valuation process in the context of a referential is more close to a familiar reality of posted prices for respondents. However, this difference in observations poses the question of what homegrown values are being elicited in both treatments. Does it mean that participants' homegrown values were being "affiliated" or revised by the prices of the referential? In the case where a referential was not provided, does it mean that those are the true homegrown values at that moment in the laboratory?

Figure 9 gives the data dispersion and the direction of values obtained for the willingness-to-pay given the four treatments. The medians are below the mean bids for the two hypothetical treatments, suggesting that the distributions of WTP are more elongated towards higher values. The distributions of values of willingness to pay are more spread out in the case of the two auctions.

FIGURE 8 – MEAN BIDS BY PRODUCT DESCRIPTION GIVEN THE TREATMENT
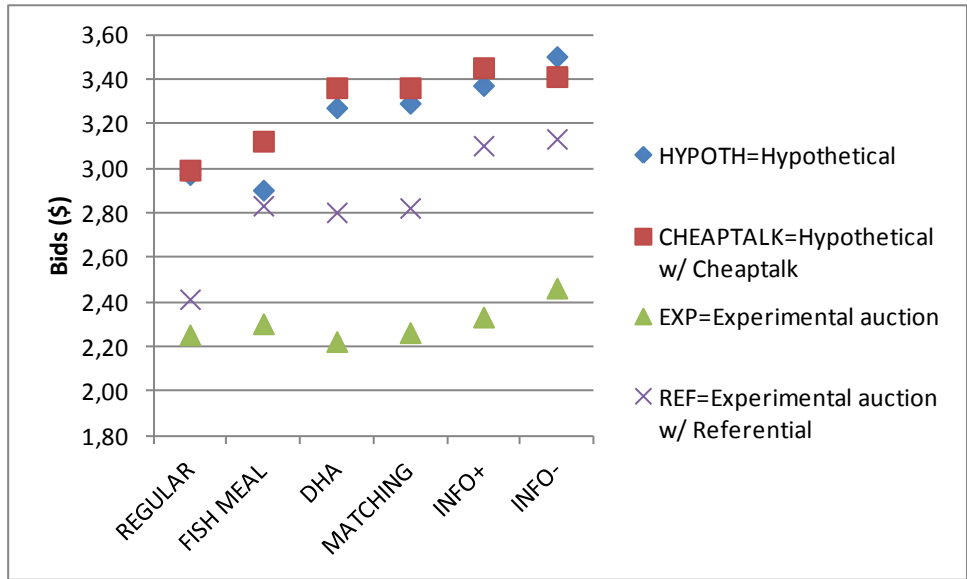
FIGURE 9 – COMPARISON OF MEDIAN AND MEAN BIDS BY TREATMENT
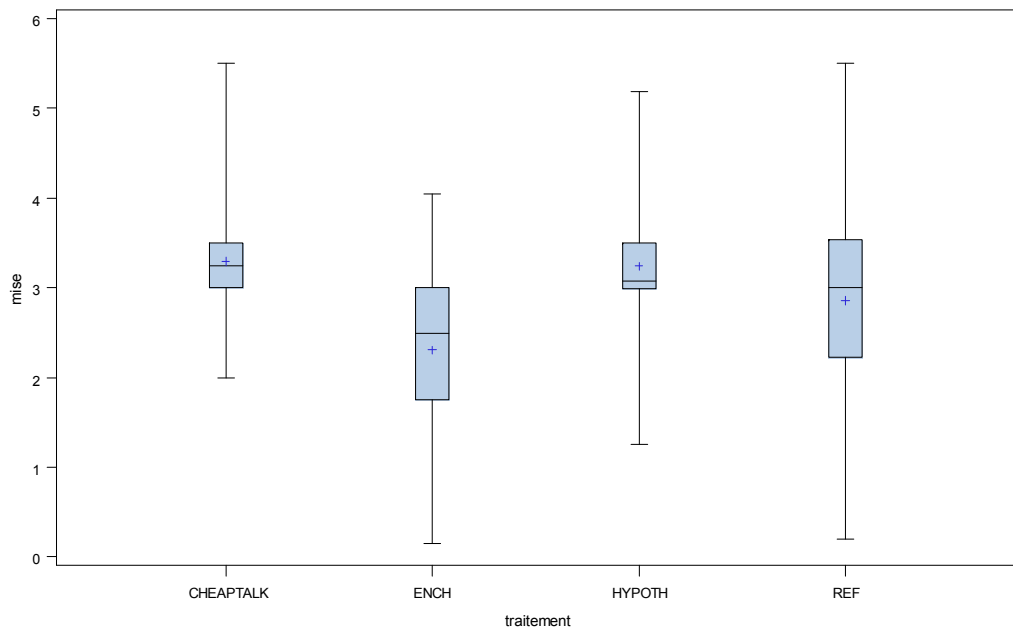
4.2 Participation analysis of participation variables

Participation as a dichotomous dependant variable is analyzed with a logit model that allows random and fixed effects (XT logit Table 2, and Table 13 & Table 14 in Appendix 2). Included in the model are the exogenous variables to explain the probability to participate in the market: treatment; milk description; order; age; income; milk usually consumed according to the percentage of milk fat content; body mass index; gender. The random effect is due to the individual.

The treatment variable has 4 categories. Results show that the cheap talk treatment (CHEAPTALK) significantly increases the probability to participate in purchasing products (β=1.635, z=2.46, p=0.014, OR=5.132) when compared to the other treatments, multiplying the odds of participating by 5 times. Regarding the milk descriptions, providing information about fish meal/flour (FARINE) significantly reduces the probability to choose to participate in purchasing the milk (β=-2.485, z=-6.86, p=0.000, OR=0.083), reducing the odds of participating by about 92% in comparison to learning about the other types of information on milk. The sequence of milk descriptions about fish meal/flour feed supplement preceding DHA omega 3 fatty acid feed supplement was inverted for DHA before fish meal in half of the sessions conducted. The order effect shows that giving "negatively perceived" information on fish meal/flour right before "positively perceived" information about DHA-omega 3 fatty acids significantly reduces the probability to participate in the market by 77% (β=-1.468, z=-3.53, p=0.000, OR=0.230). Regarding education, lower diploma, meaning less than a college degree (diplomecla~1) as compared to other degrees, is found to be significantly a factor for participating less in the market by 96% (β=-3.235, z=-3.42, p=0.001, OR=0.039). Likewise, age plays a role, younger individuals (born after 1970) significantly participate less by about 80% (β=-1.621, z=-2.85, p=0.004, OR=0.197). Consuming 2% fat milk (consolait2) significantly rises the probability to choose to participate in the market (β=1.173, z=2.85, p=0.004, OR=3.233) by 3 times against other types of consumption habits combined (skimmed; 1%, 3.25%; and plausible combinations). Gender also plays a role, being a woman rises the probability of participation in purchasing milk, multiplying the odds of willingness-to-participate by almost 3 when compared to men (β=1.025, z=2.44, p=0.015, OR=2.788).

Dependent variable	Participation
Number of observations	942
Number of groups	157

```
------------------------------------------------------
participat~n |    Coef.          OR          P>|z|
-------------+----------------------------------------
       ENCH |  -.2752811      .7593586       0.668
   CHEAPTALK |  1.635488*     5.131962        0.014
        REF |  -.5648134      .5684662        0.358
   MATCHING |  -.4053402      .6667499        0.204
   INFOPLUS |   .5152195      1.674006        0.110
  INFOMOINS |   .3590013      1.431899        0.263
     FARINE |  -2.484791***   .083343         0.000
        DHA |   .4108822      1.508148        0.201
   ordrelait |  -1.467655***   .2304653       0.000
 classeage_1 |  -.7118726      .4907244       0.299
 classeage_3 |  -1.621696**    .1975633       0.004
diplomecla~1 |  -3.235473**    .0393416       0.001
diplomecla~3 |  -.0929606      .9112294       0.835
revenuclas~1 |   .0522672      1.053657       0.921
revenuclas~3 |  -.1319085      .8764211       0.815
  consolait2 |  1.173347**     3.232795       0.004
  option_cpt2 |   .8898736      2.434822       0.053
   imc_classe |  -.6171507      .5394794       0.199
      gender |  1.025212*      2.787685        0.015
       _cons |  1.260929       1.060319        0.234
-------------+----------------------------------------
Note. *p<0.05, **p<0.01, ***p<0.001
```

Description of variables
- ENCH: Real treatment
- CHEAPTALK: Hypothetical treatment with cheap talk
- REF: Real treatment with referential
- MATCHING: milk #4, information variable describing that milk #2 (Fish meal) and milk #3 (DHA/EPA omega 3) are the same product
- INFOPLUS: milk #5, information variable describing health benefits associated with DHA/EPA omega 3
- INFOMOINS: milk #6, information variable describing nutritional recommendation on the daily intake of DHA/EPA omega 3
- FARINE: milk #2, information variable describing feed supplement with animal based fish meal/flour
- DHA: milk #3, information variable describing feed supplement with DHA/EPA omega 3 fatty acids

44

- ordrelait: variable that alternate order of milk #2 and milk #3 to balance order effect
- classeage_1: age if born before 1950
- classeage_2: age if born between 1950 and 1970 (Variable dropped due to co linearity)
- classeage_3: age if born after 1970
- diplomeclasse_1: education variable if lower than college degree
- diplomeclasse_2: education variable if college degree (Variable dropped due to co linearity)
- diplomeclasse_3: education variable if bachelor degree or higher
- revenuclasse_1: household income up to $35,000
- revenuclasse_2: household income between $35,000 and $75,000 (Variable dropped due to co linearity)
- revenuclasse_3: household income higher than $75,000
- consolait2: variable for the type of milk usually consumed, whether 2% fat milk, or otherwise (including combinations of 2% milk with other types of milk)
- option_cpt2: variable for knowledge on milk production process, whether knows that dairy cattle hay is usually supplemented with cereal grains, or otherwise (including whether individual states dairy feed is usually supplemented with animal based fish meal/flour; DHA/EPA omega 3 fatty acids; or doesn't know)
- imc_classe: variable for body mass index, whether up to 25, or superior to 25
- gender: gender variable

4.3 Willingness to pay analysis

Willingness to pay is analyzed with a linear mixed model that accounts for random-effects due to the individual and fixed effects for the known levels used on repeated measures (SAS procedure MIXED with REML estimation method Table 3, and Appendix 3).

As only participation data are used, the procedure is run with 521 observations. Fixed effects are found to have significant impact on the level of amounts of willingness to pay. The treatment which accounts for four levels has a significant effect on the level of amounts of willingness to pay ($F=16.78$, $p <.0001$). The information or description on milk attribute (Type of milk) also has a significant effect on levels of values of willingness to pay ($F=30.22$, $p <.0001$).

TABLE 3 – MIXED PROCEDURE WITH WTP AS DEPENDENT VARIABLE

Covariance Parameter Estimates		
Cov Parm	Subject	Estimate
Intercept	ID(date_session)	0.4557
date_session	ID(date_session)	0.08539
Residual		0.09200

Type 3 Tests of Fixed Effects						
Effect	Num DF	Den DF	ChiSquare	F Value	Pr > ChiSquare	Pr > F
Treatment	3	138	50.35	16.78	<.0001	<.0001
Type of milk	5	359	151.11	30.22	<.0001	<.0001
Treatment*Type of milk	15	359	32.93	2.20	0.0048	0.0063

Comparisons between stated and revealed preference methods show the impact of these treatments on amounts of willingness to pay (Table 4, and Section K, Appendix 3). The results suggest that the auction without the referential significantly lowers the values of willingness to pay when compared to the hypothetical elicitation method without cheap talk ($t(138)=-5.61$, $p<0.0001$), and that the hypothetical method without cheap talk significantly increases amounts of WTP vis-à-vis the auction involving a referential ($t(138)=2.32$, $p=0.0218$). WTP amounts are also significantly higher in the hypothetical treatment with cheap talk when contrasted both to the auction without referential ($t(138)=6.43$, $p<0.0001$) and the auction with referential ($t(138)=2.94$, $p=0.0039$). Since both of the two hypothetical treatments result in significantly higher WTP as compared to real treatments, and that there is no significant difference between the two hypothetical treatments when compared together, these findings support the idea of the existence of a hypothetical bias from stated preference methods.

46

Comparisons between the two stated preference methods used in the laboratory experiment, meaning the hypothetical questionnaire that employed a cheap talk versus without the cheap talk do not show significant difference in the means from the two samples (t(138)=0.048, p=0.6336). These findings indicate that the employment of a cheap talk script does not reduce the observed hypothetical bias.

TABLE 4 – COMPARISON OF WTP BETWEEN CONTINGENT VALUATION AND REVEALED PREFERENCE METHODS

	Hypothetical questionnaire	Hypothetical questionnaire w/ Cheap talk	5th price auction	5th price auction w/ Referential
Hypothetical questionnaire		idem R1	idem R2	idem R3
Hypothetical questionnaire w/ Cheap talk	R1: No significant difference between Hypothetical questionnaire (mean $3.22) and Hypothetical questionnaire w/ Cheap talk (mean $3.28)		idem R4	idem R5
5th price auction	R2: Significant difference between 5th price Auction (mean $2.30) and Hypothetical questionnaire (mean $3.22)	R4: Significant difference between Hypothetical questionnaire w/ Cheap talk (mean $3.28) and 5th price Auction (mean $2.30)		idem R6
5th price auction w/ Referential	R3: Significant difference between 5th price Auction w/ Referential (mean $2.85) and Hypothetical questionnaire (mean $3.22)	R5: Significant difference between Hypothetical questionnaire w/ Cheap talk (mean $3.28) and 5th price Auction w/ Referential (mean $2.85)	R6: Significant difference between 5th price Auction w/ Referential (mean $2.85) and 5th price Auction (mean $2.30)	

Contrast between the two revealed preference methods, namely a fifth price auction that did not use a referential of prices of substitute products and a fifth price auction that used the referential, demonstrates that the fact of not using the information on prices of substitutes lowers the amount of willingness to pay (t(138)=-3.32, p=0.0012). The results from the study suggest that the referential globally raised the levels of amounts of willingness to pay, suggesting that the referential helped participants in the valuation of unfamiliar products (here a new specialty milks). This opens a discussion on elicitation of homegrown values. Given that auctions, although incentive compatible, are not a mechanism familiar to participants, the lower than market price observed in the

base treatment might in fact reflect a bias in the laboratory elicitation with nth price auction. In such case, the referential reduces the bias by putting the consumer in a more familiar environment.

Regarding information, several attributes on the food process as well as on nutrition were compared to the baseline, milk for which the production process involved supplementing the cow's forage diet with grains (regular product). All attributes but the one describing the feed supplementation with fish meal/flour have a significant positive impact on levels of amounts of willingness to pay when compared with the regular milk (Table 5, and section K, Appendix 3).

TABLE 5 – CONTRAST ANALYSIS OF EFFECT OF OTHER MILK ATTRIBUTES COMPARED TO BASELINE REGULAR MILK ON WTP

Least-square means differences			
	Estimate	Std.error	t value	Pr > |t|
FARINE	0.1001	0.06854	1.46	0.1450
DHA	0.3700***	0.04811	7.69	<.0001
MATCHING	0.3420***	0.05090	6.72	<.0001
INFOPLUS	0.4872***	0.04776	10.20	<.0001
INFOMOINS	0.4988***	0.04815	10.36	<.0001

Note. *$p<0.05$, **$p<0.01$, ***$p<0.001$

Baseline = Regular milk #1

Description of variables
- FARINE: milk #2, information variable describing feed supplement with animal based fish meal/flour
- DHA: milk #3, information variable describing feed supplement with DHA/EPA omega 3 fatty acids
- MATCHING: milk #4, information variable describing that milk #2 (Fish meal) and milk #3 (DHA/EPA omega 3) are the same product
- INFOPLUS: milk #5, information variable describing health benefits associated with DHA/EPA omega 3
- INFOMOINS: milk #6, information variable describing nutritional recommendation on the daily intake of DHA/EPA omega 3

Concluding Remarks

The objective of this study is to primarily analyze the effect of elicitation methods on valuations in laboratory settings. The elicitation methods materialized in four treatments, consisting of two stated preference methods differing in the usage of a cheap talk script, and of two revealed preference methods which differed in the usage of a referential of prices of close substitute products. The purpose of the four treatments was to evaluate whether there are differences in WTP across valuation methods; and whether there is presence of hypothetical bias. The elicitation of willingness to pay took the form of an open-ended amount ($) question in the two hypothetical settings, and of an open-ended bid ($) in the two real settings where fifth price auctions occurred subsequently. A participation question was asked prior to giving amounts of willingness to pay, where individuals had to choose whether or not to they wished to participate in the market, further implying that no amounts were asked when individuals chose not to participate.

A secondary objective of the study is to assess the effect of information on valuations; in what direction the levels of information brings additional insights on the observed measures of WTP. In each of the four treatments, willingness to pay was asked at six occasions, where in each case the information that was provided on the milk to value differed according to the cow feed involved in the production of the milk, or to the nutritional information of the milk. The study's experimental design aimed at assessing whether there is a framing effect associated with the presentation of the information.

The study shows that both of the two hypothetical treatments result in significantly higher WTP as compared to real treatments, and that there is no significant difference between the two hypothetical treatments when compared together. These findings support the idea of the existence of a hypothetical bias from stated preference methods and align with the literature with respect to disparities between hypothetical and actual willingness to pay (Neill et al., 1994; Cummings et al., 1995; Paradiso and Trisorio, 2001; List, 2003).

As a potential mechanism to eliminate or reduce hypothetical bias, we found no significant difference between the two hypothetical treatments whether or not cheap talk was used. Hence the study indicates that the use of a cheap talk does not reduce the observed hypothetical bias. In this way this study adds to mixed experimental findings regarding the usage of cheap talk to eliminate or reduce the hypothetical bias. In particular, participants in our experiments were not familiar with the products to value (specialty milks), whereas some of the literature indicates that cheap talk should have worked in such situation. List (2003) found that cheap talk eliminated hypothetical bias for non-experienced subjects and Lusk (2003) had shown that it reduced WTP for respondents who were unknowledgeable about the good to value, whereas the cheap talk had no significant impact in other studies (Blumenschein et al., 2006; Brummett et al., 2007). On the other hand, the study's results show that the cheap talk treatment has an effect of increasing the probability to participate in the market when compared with

the other hypothetical treatment where no cheap talk was employed. This suggests that the effect of the cheap talk was mainly captured in the increased participation, and not in reducing the amount of WTP as expected in the research hypothesis. This type of results showing the impact on participation was not captured in previous studies from the literature, since participation is typically hypothesized to be expressed as zero bids.

The experimental design used a referential of prices of close substitute of specialty milks in one of the two real settings where auctions took place. The study shows that the employment of the referential resulted in higher level of amounts of willingness to pay when compared to the case where the referential was not used. The literature indicates that known or perceived market prices may cause censoring in WTP (Harrison et al., 2004a; Anderson et al., 2007; Colson et al., 2010). The link of our study's results to the literature is of showing that the referential, by means of providing market prices of substitute specialty milks, helped individuals to situate the relative value of the products to value rather than assigning a precise price in such cases where they are unfamiliar with the products (specialty milks). This implies that the uncertainty related to the valuation of unfamiliar products would at the contrary lead individuals to bid lower to minimize risks of being wrong with a WTP amount that could otherwise be higher than an unknown market price. Presumably, this behaviour of biding low in uncertainty would then have been expected in the other three treatments where the referential was not provided to participants. Our results show significant differences in average WTP between each of the two hypothetical treatments as compared to the one real treatment not using the referential, supporting the existence of hypothetical bias. Further, the study's results do open a discussion on elicitation of homegrown values. Although auctions are incentive compatible, they are not a mechanism familiar to participants. Besides the elicitation of WTP for unfamiliar products (specialty milks), our experimental design also included the valuation of a more conventional product (regular milk). The market price of the regular milk was provided to participants in all four elicitation settings. The study finds that the market price of the regular milk censored from above WTP in all four elicitation settings. However, WTP was much lower than the actual market price in the two real settings where auctions were used (as opposed to the two hypothetical settings where WTP was closer but still below the market price). Furthermore, the comparison between the two real settings shows that WTP was the lowest in the treatment not using the referential. This result might in fact reflect a bias in the laboratory elicitation with nth price auction. In such case, the referential reduces the bias by putting the consumer in a more familiar environment.

The secondary objective of this study dealt with the framing of information and if it affected WTP. The study's results show that the framing effect not only materialized in WTP but through participation as well. Compared to the baseline information (regular milk), information has a positive impact on the values of willingness to pay for the four descriptions of attributes of milk with the exception of the process which included fish meal/flour as feed supplement. The study also indicates that when information describing a positively perceived attribute of

DHA/EPA omega 3 fatty acids was in the form of fish meal/flour, the latter negatively perceived attribute reduced WTP. Our fourth research hypothesis is verified in terms of information exhibiting similar impact on willingness to pay across the four valuations methods used. The results bear some comparison with certain studies from the literature, in ways that revealing information about goods' characteristics have shown to have a positive impact on valuations (Lange et al., 2002; Noussair et al., 2004; Lecocq et al., 2004). In terms of the impact of negative information, however, our results regarding fish meal/flour which could have been perceived negatively have no significant effect on willingness to pay and contrast as such with other studies (Fox, Hayes, and Shogren, 2002; Gächter et al., 2009). But our results have to be put in an additional perspective, in that the impact of negative information had been mainly captured in the participation. In this case, the framing effect materialized in significantly lowering participation when information was negatively perceived (fish meal/flour process). With the reminder that products used in this study were milks with 2% fat milk content, the results indicate that consuming 2% fat milk increased the likelihood of participation. Still, the study's results also show that the proportion of individuals who are willing to participate although they do not consume 2% milk is significantly higher than the participation of individuals who consume 2% milk in the hypothetical treatments, which further supports the presence of hypothetical bias.

In summary, we were interested in this study in understanding the effect of four elicitation methods on the measure of willingness to pay in relation to the hypothetical bias, primarily, and secondary, to assess the impact of the framing of information on those valuations. We find elicited values of willingness to pay to be higher in the two hypothetical settings, and that the employment of a cheap talk script does not reduce the observed hypothetical bias. Our results also indicate that participation, an important feature of our experimental design, was higher amongst individuals in hypothetical settings willing to participate although they state not to consume a specific product to value, which further supports the presence of hypothetical bias. Furthermore, the effect of the cheap talk was mainly captured in an overall increased participation in the one hypothetical setting where cheap talk was used. Another key element of our experimental design tested the effect of a referential of prices of close substitute of specialty products. Our results on the referential are two-folds: it helped individuals in the cognitive process of eliciting homegrown values for unfamiliar products; and it reduced the uncertainty associated with unfamiliar mechanisms such nth price auctions. Secondary objective to this study was the assessment of the impact of information. We find framing effects to be present in the sense that neutral descriptions of products' attributes with purposely different angles resulted in different outcomes on the level of participation as well as on willingness to pay.

Finally, there are methodological considerations that arise from the findings of this study. From a theoretical standpoint, while it is known that auctions are demand revealing, they are not familiar mechanisms and we showed from our study that the referential helped diminishing the associated uncertainty with the valuation

mechanism. There was another empirical implication for our study, which meant that eliciting homegrown values ensuring to use incentive compatible methods was not enough in cases where we did not provide any value/price of reference. We elicited values, but we learned that these are probably not fixed participants' homegrown values; people being best capable with ordering. This suggest that open-ended elicitation type of questions, as far as homegrown value is the concern (e.g. to value particular attributes), need certain points of reference. Further, it may be of interest for future research to assess price referential in hypothetical settings as well. On the topic of hypothetical bias, the cheap talk did not provide the expected results, and if anything, increased the participation. This does not militate for the usage of the cheap talk for the elicitation of homegrown values for private goods. For practitioners using the cheap talk, further research may be warranted, as one wonders how cheap talk interacts with bids in experiments where participation is obligatory (bid of zero, or maybe marginal bids).

References

Alfnes, F., Guttormsen, A., Steine, G. & Kolstad, K. (2005). Consumers' Willingness To Pay For The Color Of Salmon: A Choice Experiment With Real Economic Incentives, *2005 Annual meeting, July 24-27, Providence, RI 19126, American Agricultural Economics Association* (New Name 2008: Agricultural and Applied Economics Association).

Anderson, S., Harrison, G.W., Lau, M.I. & Rutstrom E.E. (2007). Valuation using multiple price list formats. *Applied Economics*, vol. 39(6), pp. 675-682.

Agriculture and Agri-Food Canada. (2009). Comparison Tables between Canada and United States – Per Capita Disappearance of Selected Commodities. April 2009.

http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1171474842228&lang=eng

Ben-Akiva, M., Bradley, M., Morikawa, T., Benjamin, J., Novak, T., Oppewal, H. & Rao, V. (1994). Combining Revealed and Stated Preference Data. *Marketing Letters*, 5(4), pp. 335-350.

Blumenschein, K., Blomquist, G. C., Johannesson, M., Horn, N. & Freeman, P. (2006). Eliciting Willingness to Pay Without Bias: Evidence from a Field Experiment. DRAFT version online.

Bower, J.A., Saadat, M.A. & Whitten, C. (2003). Effect of liking, information and consumer characteristics on purchase intention and willingness to pay more for a fat spread with a proven health benefit. *Food Quality and Preference*, 14(1), pp. 65-74.

Boxall, P., Cash, S., Wismer, W.W., Muralidharan, V. & Annet, L.E. (2007). The Role of Sensory Experiences and Information on the Willingness to Pay for Organic Wheat Bread. Research Project Number CMD-07-01, Department of Agricultural, Food and Nutritional Science, University of Alberta.

Brummett, R.G., Nayga, Jr., R.M. & Wu, X. (2007). On the Use of Cheap Talk in New Product Valuation. *Economics Bulletin*, Vol. 2, No. 1, pp. 1-9.

Carson, R.T, & Groves, T. (2007). Incentive and informational properties of preference questions. *Environmental and Resource Economics*, 37, pp. 181-210.

Chang, J.B., Lusk, J.L., & Norwood, F.B. (2009). How Closely do Hypothetical Surveys and Laboratory Experiments Predict Field Behavior? *American Journal of Agricultural Economics*, Vol. 91, No. 2, pp. 518-534.

Clarke, A., Harvey, M.L. & Kane, D.J. (2000). Attitudes and behavior: Are produce consumers influenced by eco-labels? Conference paper presented at the International Institute of Fisheries Economics and Trade (IIFET) Conference, Corvallis, Oregon, July 10-15, 2000. Retrieved from www.ssi.nrcs.usda.gov/ssienvpsy/nrcs/research.html

Colson, G., Corrigan, J.R. & Rousu, M.C. (2010). The Impact of Perceived Prices on Willingness to Pay in Experimental Auctions. Journal of Agricultural & Food Industrial Organization, Vol. 8: Iss. 1, Article 9.

Cummings, R.G., Harrison, G.W. & Ruström, E.E. (1995). Homegrown Values and Hypothetical Surveys: Is the Dichotomous Choice Approach Incentive Compatible? *The American Economic Review*, 85(1), pp. 260-266.

Curry, J. (1996). Understanding Conjoint Analysis in 15 Minutes, Sawtooth Software Research Paper Series, Sawtooth Technology, Inc. www.sawtoothsoftware.com

Doyon, M., Julien, C. & Labrecque, J. (2008). Mesure des propensions individuelles à payer pour les aliments fonctionnels : une approche expérimentale auprès de consommateurs français. Série de

recherche SR.2008.02.01, Centre de recherche en économie agroalimentaire (CRÉA), Faculté des sciences de l'agriculture et de l'alimentation, Université Laval.

Doyon, M., Jullien, C. et J. Labrecque. (2012). Mesure des propensions individuelles à payer pour les aliments fonctionnels : Une approche expérimentale auprès de consommateurs français. *Revue Française d'Économie*, vol. XXVI, no 3, pp. 95-119.

Fox, J., Hayes, D. & Shogren, J. (2002). Consumers preferences for food irradiation: how favourable and unfavourable descriptions affect preferences for irradiated pork in experimental auctions. *Journal of Risk and Uncertainty*, 24(1), pp. 75-95.

Gächter, S., Orzen, H., Renner, E. & Starmer, C. (2009). Are experimental economist prone to framing effects? A natural field experiment. Journal of Economic Behavior & Organization, Vol. 70 (3), pp. 443-446.

Gil, J.M., Gracia, A. & Sanchez, M. (2000). Market Segmentation and Willingness to Pay for Organic Products in Spain. *International Food and Agribusiness Management Review*, 3, pp. 207-226.

Hailu, G., Boecker, A., Henson, S. & Cranfield, J. (2009). Consumer valuation of functional foods and nutraceuticals in Canada: a conjoint study using probiotics. *Appetite*, 52(2), pp. 257-265.

Harrison, G.W., Harstad, R.M. & Rutström, E.E. (2004a). Experimental Methods and Elicitation of Values. *Experimental Economics*, 7, pp.123-140.

Harrison, G.W. (2004b). Experimental Evidence on Alternative Environmental Valuation Methods. January.

Johannesson, M., Liljas, B. & O'Conor, R.M. (1997). Hypothetical versus real willingness to pay: some experimental results. *Applied Economic Letters*, 4, pp. 149-151.

Johannesson, M., B. Liljas, and P. Johansson. (1998). "An Experimental Comparison of Dichotomous Choice Contingent Valuation Questions and Real Purchase Decisions." *Applied Economics*, 30, pp. 643-647.

Labrecque, J., Doyon, M., Bellavance, F. & Kolodinsky, J. (2006). Acceptance of functional foods: A comparison of the French, the American and the French Canadian consumer. *Canadian Journal of Agricultural Economics*, 54, pp. 647-662.

Lange, C., Martin, C., Chabanet, C., Combris, P. & Issanchou, S. (2002). Impact of the information provided to consumers on their willingness to pay for champagne : Comparison with hedonic scores. *Food Quality and Preferences*, 13, pp. 597-608.

Lecocq, S., Magnac, T., Pichery, M.-C. & Visser, M. (2004). The impact of information on wine auction prices : results of an experiment. J.E.L. classification numbers: C93; D8; D44, February.

Levitt, S.D. & List, J.A. (2007). What Do Laboratory Experiments Measuring Social Preferences Reveal About the Real World? *Journal of Economic Perspectives*, 21, pp. 153-174.

List, J.A. (2001). Do Explicit Warnings Eliminate the Hypothetical Bias in Elicitation Procedures? Evidence from Field Auctions for Sportscards. *American Economic Review*, 91(5), pp.1498-1507.

List, J.A. (2003). Using random *n*th price auctions to value non-market goods and services. *Journal of Regulatory Economics*, 23(2), pp. 193-205.

List, J.A. (2006). Field Experiments: A Bridge between Laboratory and Naturally Occurring Data. *Advances in Economic Analysis & Policy*: Vol. 6 : Iss. 2, Article 8.

Loomis, J., Traynor, K. & Brown, R.C. (1999). Trichotomous Choice*:* A Possible Solution to Dual Response Objectives in Dichotomous Choice Contingent Valuation Questions*. Journal of Agricultural and Resource Economics,* 24(2), pp. 572-583.

Loureiro, M.L., McCluskey J.J. & Mittelhammer, R.C. (2002). Will Consumers Pay a Premium for Eco-Labeled Apples? *Journal of Consumer Affairs*, 36(2), pp.203-219.

Louviere, J.J., Hensher D.A. & Swait, J.D. (2000). *Stated choice methods: analysis and applications*. Cambridge University Press.

Lusk, J.L., Roosen, J. & Fox, J.A. (2001a). Demand for Beef from Cattle Administered Growth Hormones or Fed Genetically Modified Corn: A Comparison of Consumers in France, Germany, the United Kingdom, and the United States. *Paper presented at the American Agricultural Economics Association annual meeting Chicago, Illinois, August*.

Lusk, J.L., Fox, J.A., Schroeder, T.C., Mintert, J. & Koohmaraie, M. (2001b). In-Store Valuation of Steak Tenderness. *American Journal of Agricultural Economics*, 83, (3), pp. 539-550.

Lusk, J. L. (2003). Effects of Cheap Talk on Consumer Willingness-to-Pay for Golden Rice. *American Journal of Agricultural Economics*, 85(4), pp. 840-856.

Lusk, J.L. (2003b). Using Experimental Auctions for Marketing Applications: A Discussion, *Journal of Agricultural and Applied Economics, Southern Agricultural Economics Association*, 35(02), pp. 349-360.

Lusk, J.L. & Schroeder, T.C. (2006). Auction Bids and Shopping Choices. *Advances in Economic Analysis & Policy*: Vol. 6 : Iss. 1, Article 4.

MAPAQ. (2009a). Profil sectoriel – Fabrication du lait de consommation. Transformation Alimentaire Québec, Juin 2009. www.agrireseau.qc.ca/bovinslaitiers/documents/ProfilLaitdeconsommation.pdf

MAPAQ. (2009b). Dépenses alimentaires des Québécois dans la grande distribution au détail en 2009.

www.**mapaq**.gouv.qc.ca/fr/Publications/**Depensesalimentaires**ACNielsen.pdf

Neill, H.R., Cummings, R.G., Ganderton, P.T., Harrison, G.W. & McGuckin, T. (1994). Hypothetical Surveys and Real Economic Commitments. *Land Economics*, 70(2), pp. 145-154.

Noussair, C., Robin, S. & Ruffieux, B. (2004). Do Consumers Really Refuse to Buy Genetically Modified Food? *Economic Journal*, 114, pp. 102-120.

Noussair, C., Robin, S., & Ruffieux, B. (2004b). Revealing consumers' willingness-to-pay: A comparison of the BDM mechanism and the Vickrey auction, *Journal of Economic Psychology*, 25 (6), pp. 725-741.

Paradiso, M. & Trisorio, A. (2001). The Effect of Knowledge on the Disparity between Hypothetical and Real Willingness to Pay. *Applied Economics*, 33(11), pp. 1359-1364.

Rousu, M.C., Beach, R.H. & Corrigan, J.R. (2008). The Effects of Selling Complements and Substitutes on Consumer Willingness to Pay: Evidence from a Laboratory Experiment. *Canadian Journal of Agricultural Economics/Revue canadienne d'agroéconomie*, 56, pp. 179-194.

Shogren, J.F. (2001). *The X-Chapter. Experimental method and Valuation*. Handbook of Environmental Economics, K.G Mäller and J. Vincent, eds., Amsterdam.

Shogren, J.F., Margolis, M., Koo, C. & List, J.A. (2001b). A random nth-price auction. *Journal of Economic Behavior & Organization*, 46, pp. 409-421.

Smith, V.L. (1989). Theory, Experiment and Economics. *The Journal of Economic Perspectives*, 3(1), pp.151-169.

Smith, V.L. (Ed.). (1991). Papers in Experimental Economics, Cambridge, Cambridge University Press, 812 p.

Tversky, A. & Kahneman, D. (1986). Rational Choice and the Framing of Decisions. The Journal of Business, Vol. 59, No. 4, Part 2: The Behavioral Foundations of Economic Theory (Oct.), pp. S251-S278.

Urala, N. & Lähteenmäki, L. (2004). Attitudes behind consumers' willingness to use functional foods. *Food Quality and Preference*, 15, pp.793-803.

Vossler, C.A, Doyon, M. & Rondeau, D. (2012). Truth in Consequentiality: Theory and Field Evidence on Discrete Choice Experiments. *American Economic Journal: Microeconomics*, 4(4), pp. 145-171.

West, G.E., Larue, B., Gendron, C. & Scott, S.L. (2002). Consumer Confusion Over the Significance

of Meat Attributes: The Case of Veal. *Journal of Consumer Policy,* 25, pp. 65-88.

Appendix 1 – Reference price of close substitutes

Instruction (in French as displayed during the experiments) : À titre indicatif, nous vous rappelons que vous trouvez les produits suivants à l'épicerie.

Lait 2%
Carton 2 L

Ultra-filtré
Nature /pur

3,89$

Avec bouchon

Lait 2%
Carton 2 L

3,07$

Avec bouchon

Lait 2%
Carton 2 L

Ultra-filtré
Avec probiotioques

4,19$

Avec bouchon

Lait 2%
Carton 2 L

Ultra-filtré
35% de calcium en

4,19$

Avec bouchon

Lait 2%
Carton 2 L

Pasteurisé
Bio

5,19$

Avec bouchon
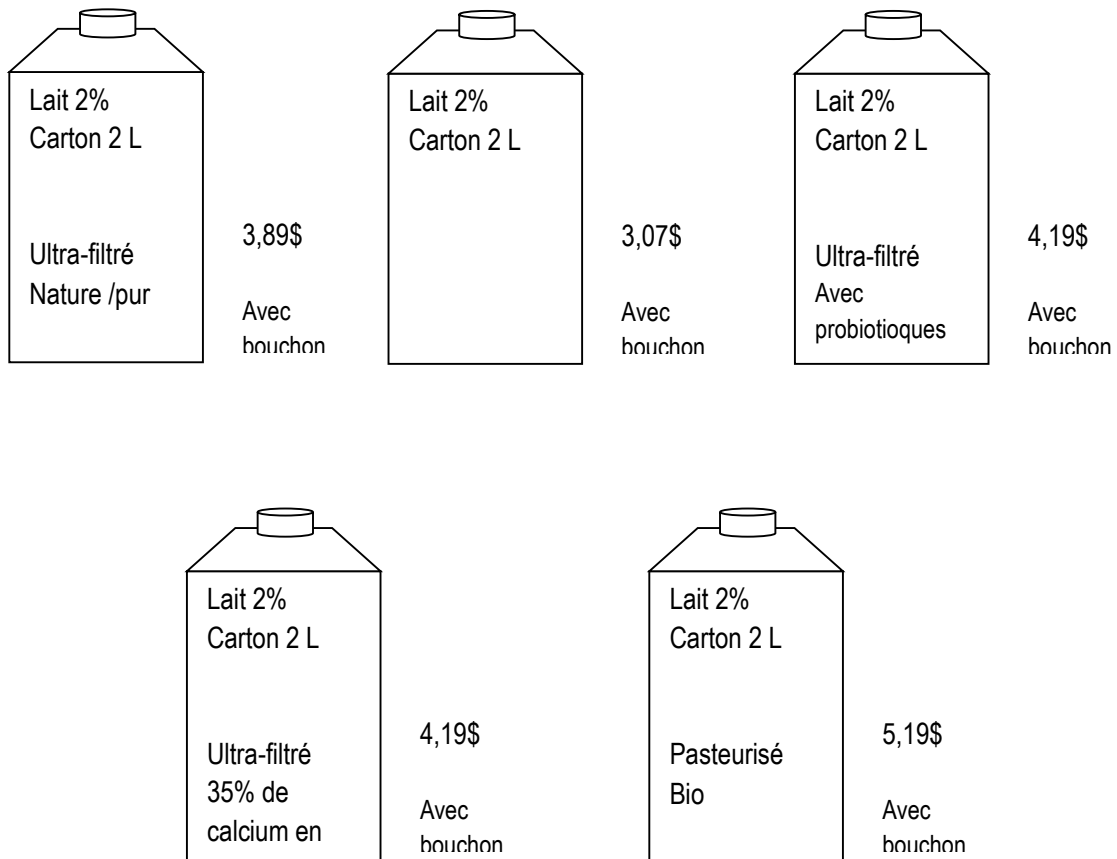
Appendix 2 – Participation probability

TABLE 6 – 2X2 FOR ALL DESCRIPTIONS OF ATTRIBUTES, OUTCOME (PARTICIPATION) BY TREATMENT (HYPOTHETICAL OR AUCTION)

```
                                                      Proportion
                | PART.: NO  PART.: YES |     Total    PART.: NO
----------------+-----------------------+-----------------------
  HYPOTHETICAL  |     227         253   |       480       0.4729
      AUCTION   |     320         268   |       588       0.5442
----------------+-----------------------+-----------------------
        Total   |     547         521   |      1068       0.5122
                |                       |
                |    Point estimate     |   [95% Conf. Interval]
                |-----------------------+-----------------------
   Odds ratio   |        .7514328       | .5857064   .9640311 (exact)
Prev. frac. ex. |        .2485672       | .0359689   .4142936 (exact)
Prev. frac. pop |        .1352747       |
                +-----------------------------------------------
                          1-sided Fisher's exact P = 0.0120
                          2-sided Fisher's exact P = 0.0228
```

TABLE 7 – 2X2 FOR ALL DESCRIPTIONS OF ATTRIBUTES, OUTCOME (PARTICIPATION) BY TREATMENT (HYPOTHETICAL W/O OR W/ CHEAP TALK)

```
                                                      Proportion
                | PART.: NO  PART.: YES |     Total    PART.: NO
----------------+-----------------------+-----------------------
       HYPOTH   |     120         102   |       222       0.5405
    CHEAPTALK   |     107         151   |       258       0.4147
----------------+-----------------------+-----------------------
        Total   |     227         253   |       480       0.4729
                |                       |
                |    Point estimate     |   [95% Conf. Interval]
                |-----------------------+-----------------------
   Odds ratio   |       1.660253        | 1.137409   2.423908 (exact)
Attr. frac. ex. |        .3976821       | .1208087   .5874432 (exact)
Attr. frac. pop |        .2149633       |
                +-----------------------------------------------
                          1-sided Fisher's exact P = 0.0039
                          2-sided Fisher's exact P = 0.0061
```

TABLE 8 – 2X2 FOR ALL DESCRIPTIONS OF ATTRIBUTES, OUTCOME (PARTICIPATION) BY TREATMENT (EXPERIMENTAL AUCTION W/O OR W/ REFERENTIAL)

```
                                                    Proportion
               | PART.: NO  PART.: YES |    Total   PART.: NO
---------------+----------------------+----------------------
           EXP |    156        138    |     294      0.5306
           REF |    164        130    |     294      0.5578
---------------+----------------------+----------------------
         Total |    320        268    |     588      0.5442
               |                      |
               |   Point estimate     |   [95% Conf. Interval]
               |----------------------+----------------------
    Odds ratio |      .8960764        |   .6391059  1.256304 (exact)
 Prev. frac. ex. |    .1039236        | -.2563041   .3608941 (exact)
 Prev. frac. pop |     .057971        |
               +----------------------------------------------
                          1-sided Fisher's exact P = 0.2811
                          2-sided Fisher's exact P = 0.5622
```

TABLE 9 – 2X2 WHEN DESCRIPTION=REGULAR, OUTCOME (PARTICIPATION) BY TREATMENT (HYPOTHETICAL OR AUCTION)

```
                                                    Proportion
               | PART.: NO  PART.: YES |    Total   PART.: NO
---------------+----------------------+----------------------
  HYPOTHETICAL |     23         57    |      80      0.2875
       AUCTION |     60         38    |      98      0.6122
---------------+----------------------+----------------------
         Total |     83         95    |     178      0.4663
               |                      |
               |   Point estimate     |   [95% Conf. Interval]
               |----------------------+----------------------
    Odds ratio |      .2555556        |   .128923   .5028195 (exact)
 Prev. frac. ex. |    .7444444        | .4971805    .871077 (exact)
 Prev. frac. pop |    .4557823        |
               +----------------------------------------------
                          1-sided Fisher's exact P = 0.0000
                          2-sided Fisher's exact P = 0.0000
```

TABLE 10 – 2X2 WHEN DESCRIPTION=INFO-, OUTCOME (PARTICIPATION) BY TREATMENT

(HYPOTHETICAL W/O OR W/ CHEAP TALK)

```
                                                          Proportion
                    | PART.: NO  PART.: YES  |     Total   PART.: NO
----------------+-----------------------+-----------------------
         HYPOTH |      20          17   |        37      0.5405
      CHEAPTALK |      13          30   |        43      0.3023
----------------+-----------------------+-----------------------
          Total |      33          47   |        80      0.4125
                |                       |
                |     Point estimate    |   [95% Conf. Interval]
                |-----------------------+-----------------------
     Odds ratio |       2.714932        |  .9879696  7.540991 (exact)
 Attr. frac. ex.|        .6316667       | -.0121769  .8673914 (exact)
 Attr. frac. pop|        .3414414       |
                +-----------------------------------------------
                          1-sided Fisher's exact P = 0.0266
                          2-sided Fisher's exact P = 0.0411
```

TABLE 11 – 2X2 FOR HYPOTHETICAL TREATMENTS, OUTCOME (PARTICIPATION) BY TYPE OF

MILK CONSUMPTION (WHETHER OR NOT CONSUME 2% MILK)

```
                | Controls                      |
Cases           | Cons 2% (No)  Cons 2% (Yes) |      Total
----------------+-------------------------------+------------
      Part (No) |     157            70         |      227
     Part (Yes) |     149           104         |      253
----------------+-------------------------------+------------
          Total |     306           174         |      480

McNemar's chi2(1) =     28.50    Prob > chi2 = 0.0000
Exact McNemar significance probability      = 0.0000

Proportion with factor
      Cases        .4729167
      Controls      .6375      [95% Conf. Interval]
                  ---------    -------------------
      difference -.1645833     -.2252722  -.1038945
      ratio       .7418301      .6645224   .8281314
      rel. diff. -.454023      -.6550278  -.2530181

      odds ratio  .4697987      .3484607   .6281836   (exact)
```

TABLE 12 – 2X2 FOR REAL TREATMENTS, OUTCOME (PARTICIPATION) BY TYPE OF MILK CONSUMPTION (WHETHER OR NOT CONSUME 2% MILK)

```
                   | Controls                        |
Cases              | Cons 2% (No)  Cons 2% (Yes) |     Total
-----------------+-------------------------------+------------
      Part (No)  |     217            103        |      320
      Part (Yes) |     131            137        |      268
-----------------+-------------------------------+------------
         Total   |     348            240        |      588

McNemar's chi2(1) =      3.35    Prob > chi2 = 0.0672
Exact McNemar significance probability      = 0.0773

Proportion with factor
      Cases       .5442177
      Controls    .5918367      [95% Conf. Interval]
                  ---------     -------------------
      difference -.047619       -.1001635   .0049254
      ratio       .9195402       .8405272  1.005981
      rel. diff. -.1166667       -.2486766  .0153432

      odds ratio  .7862595        .6014098  1.025631   (exact)
```

62

TABLE 13 – RANDOM-EFFECTS LOGISTIC REGRESSION ON PARTICIPATION PROBABILITY

```
Random-effects logistic regression          Number of obs      =        942
Group variable (i): id                      Number of groups   =        157

Random effects u_i ~ Gaussian               Obs per group: min =          6
                                                           avg =        6.0
                                                           max =          6

                                            Wald chi2(19)      =     111.18
Log likelihood  = -454.13824                Prob > chi2        =     0.0000

------------------------------------------------------------------------------
participat~n |    Coef.    Std. Err.      z    P>|z|    [95% Conf. Interval]
-------------+----------------------------------------------------------------
        ENCH | -.2752811   .6427336    -0.43   0.668   -1.535016    .9844537
   CHEAPTALK |  1.635488   .6652482     2.46   0.014    .3316257    2.939351
         REF | -.5648134   .6149956    -0.92   0.358   -1.770183    .6405558
    MATCHING | -.4053402   .3191893    -1.27   0.204    -1.03094    .2202593
    INFOPLUS |  .5152195   .3224358     1.60   0.110    -.116743    1.147182
   INFOMOINS |  .3590013   .3209583     1.12   0.263   -.2700654    .9880681
      FARINE | -2.484791   .362255     -6.86   0.000   -3.194797   -1.774784
         DHA |  .4108822   .3214064     1.28   0.201   -.2190627    1.040827
    ordrelait| -1.467655   .4156841    -3.53   0.000   -2.282381   -.6529289
  classeage_1| -.7118726   .6853193    -1.04   0.299   -2.055074    .6313286
  classeage_3| -1.621696   .5690855    -2.85   0.004   -2.737083   -.5063091
  diplomecla~1| -3.235473  .946044     -3.42   0.001   -5.089686   -1.381261
  diplomecla~3| -.0929606  .4452783    -0.21   0.835   -.9656901    .7797689
  revenuclas~1|  .0522672  .5248378     0.10   0.921    -.976396    1.08093
  revenuclas~3| -.1319085  .5640387    -0.23   0.815   -1.237404    .9735869
   consolait2 |  1.173347  .4114113     2.85   0.004    .3669958    1.979698
  option_cpt2 |  .8898736  .460233      1.93   0.053   -.0121664    1.791914
   imc_classe | -.6171507  .4809636    -1.28   0.199   -1.559822    .3255207
      gender  |  1.025212  .4194467     2.44   0.015    .203111     1.847312
       _cons  |  1.260929  1.060319     1.19   0.234   -.8172579    3.339117
-------------+----------------------------------------------------------------
    /lnsig2u |  1.50659    .1825763                     1.148747    1.864432
-------------+----------------------------------------------------------------
     sigma_u |  2.123987   .1938948                     1.776017    2.540132
         rho |  .5782862   .0445251                     .4894763    .6623054
------------------------------------------------------------------------------
Likelihood-ratio test of rho=0: chibar2(01) =   196.73 Prob >= chibar2 = 0.000
```

TABLE 14 – RANDOM-EFFECTS LOGISTIC REGRESSION ON PARTICIPATION PROBABILITY (ODDS RATIOS)

```
Random-effects logistic regression          Number of obs     =        942
Group variable (i): id                      Number of groups  =        157

Random effects u_i ~ Gaussian               Obs per group: min =         6
                                                           avg =        6.0
                                                           max =          6

                                            Wald chi2(19)     =     111.18
Log likelihood  = -454.13824                Prob > chi2       =     0.0000

------------------------------------------------------------------------------
participat~n |      OR     Std. Err.      z    P>|z|    [95% Conf. Interval]
-------------+----------------------------------------------------------------
        ENCH | .7593586   .4880653    -0.43   0.668   .2154523   2.676349
    CHEAPTALK | 5.131962   3.414029     2.46   0.014   1.393231   18.90357
         REF | .5684662   .3496042    -0.92   0.358   .1703019   1.897535
    MATCHING | .6667499   .2128194    -1.27   0.204   .3566716     1.2464
    INFOPLUS | 1.674006   .5397594     1.60   0.110   .8898138   3.149306
   INFOMOINS | 1.431899   .4595798     1.12   0.263   .7633295    2.68604
      FARINE | .083343    .0301914    -6.86   0.000   .0409748   .1695201
         DHA | 1.508148   .4847283     1.28   0.201   .8032713   2.831558
    ordrelait | .2304653   .0958008    -3.53   0.000    .102041    .520519
 classeage_1 | .4907244   .3363029    -1.04   0.299   .1280834   1.880107
 classeage_3 | .1975633   .1124304    -2.85   0.004    .064759    .602716
diplomecla~1 | .0393416   .0372189    -3.42   0.001     .00616   .2512615
diplomecla~3 | .9112294   .4057507    -0.21   0.835   .3807204   2.180968
revenuclas~1 | 1.053657   .5529991     0.10   0.921   .3766662    2.94742
revenuclas~3 | .8764211   .4943354    -0.23   0.815   .2901364   2.647424
   consolait2 | 3.232795   1.330008     2.85   0.004   1.443392   7.240559
  option_cpt2 | 2.434822   1.120585     1.93   0.053   .9879073   6.000926
   imc_classe | .5394794     .25947    -1.28   0.199   .2101735   1.384752
       gender | 2.787685   1.169285     2.44   0.015   1.225208   6.342748
-------------+----------------------------------------------------------------
    /lnsig2u | 1.50659    .1825763                    1.148747   1.864432
-------------+----------------------------------------------------------------
     sigma_u | 2.123987   .1938948                    1.776017   2.540132
         rho | .5782862   .0445251                    .4894763   .6623054
------------------------------------------------------------------------------
Likelihood-ratio test of rho=0: chibar2(01) =   196.73 Prob >= chibar2 = 0.000
```

Appendix 3 – Mixed procedure with WTP as dependent variable

A.

Informations sur le modèle	
Table	WORK.PARTICIPANTS
Variable dépendante	mise
Structure de covariance	Variance Components
Effet du sujet	ID(date_seance)
Méthode d'estimation	REML
Méthode de variance résiduelle	Profil
Méthode SE des effets fixes	Basé(e) sur le modèle
Méthode des degrés de liberté	Between-Within

B.

Informations sur le niveau de classe		
Classe	Niveaux	Valeurs
ID	142	1 2 3 4 …166 167 169 171 172 175 176 177
		CHEAPTALK
		ENCH
		HYPOTH
traitement	4	REF
		DHA
		FARINE
		INFOMOINS
		INFOPLUS
		MATCHING
typelait	6	REGULIER
		04JUN2009
		08JUN2009
		10JUN2009
		12JUN2009
		15JUN2009
		16JUN2009
		17JUN2009
date_seance	8	22JUN2009

C.

Dimensions	
Paramètres de covariance	3
Colonnes dans X	35
Colonnes dans Z par sujet	9
Sujets	142
Max. obs par sujet	6

D.

Nombre d'observations	
Nombre d'observations lues	521
Nombre d'observations utilisées	521
Nombre d'observations non utilisées	0

E.

Historique des itérations			
Itération	Evaluations	-2 Log-vrais. des rés.	Critère
0	1	1237.45760744	
1	2	705.16119352	0.07331059
2	1	704.12328131	0.00233116
3	1	704.07825814	0.00000545
4	1	704.07814546	0.00000000

Critères de convergence remplis mais l'hessien final n'est pas un nombre positif défini.

F.

Estimations du paramètre de covariance		
Param de cov	Sujet	Valeur estimée
Intercept	ID(date_seance)	0.4557
date_seance	ID(date_seance)	0.08539
Residual		0.09200

66

G.

Statistiques d'ajustement	
-2 fois log-vraisemblance	704.1
AIC (préférer les petites	710.1
AICC (préférer les petites	710.1
BIC (préférer les petites	718.9

H.

Solution pour effets fixes							
Effet	traitement	typelait	Valeur estimée	Erreur type	DDL	Valeur du test t	Pr > |t|
Intercept			2.2399	0.1464	138	15.30	<.0001
traitement	CHEAPTALK		0.7233	0.1971	138	3.67	0.0003
traitement	ENCH		-0.2363	0.2047	138	-1.15	0.2504
traitement	HYPOTH		0.7236	0.2054	138	3.52	0.0006
traitement	REF		0	.	.	.	.
typelait		DHA	0.6422	0.09755	359	6.58	<.0001
typelait		FARINE	0.1624	0.1118	359	1.45	0.1473
typelait		INFOMOINS	0.8226	0.09512	359	8.65	<.0001
typelait		INFOPLUS	0.8372	0.09904	359	8.45	<.0001
typelait		MATCHING	0.5915	0.09905	359	5.97	<.0001
typelait		REGULIER	0	.	.	.	.
traitement*typelait	CHEAPTALK	DHA	-0.2502	0.1311	359	-1.91	0.0572
traitement*typelait	CHEAPTALK	FARINE	0.08986	0.1644	359	0.55	0.5849
traitement*typelait	CHEAPTALK	INFOMOINS	-0.4301	0.1266	359	-3.40	0.0008
traitement*typelait	CHEAPTALK	INFOPLUS	-0.3815	0.1293	359	-2.95	0.0034
traitement*typelait	CHEAPTALK	MATCHING	-0.1943	0.1334	359	-1.46	0.1461
traitement*typelait	CHEAPTALK	REGULIER	0	.	.	.	.
traitement*typelait	ENCH	DHA	-0.4399	0.1388	359	-3.17	0.0017
traitement*typelait	ENCH	FARINE	-0.2543	0.1683	359	-1.51	0.1315
traitement*typelait	ENCH	INFOMOINS	-0.5065	0.1385	359	-3.66	0.0003
traitement*typelait	ENCH	INFOPLUS	-0.5376	0.1401	359	-3.84	0.0001
traitement*typelait	ENCH	MATCHING	-0.4271	0.1457	359	-2.93	0.0036
traitement*typelait	ENCH	REGULIER	0	.	.	.	.
traitement*typelait	HYPOTH	DHA	-0.3985	0.1399	359	-2.85	0.0047
traitement*typelait	HYPOTH	FARINE	-0.08457	0.2118	359	-0.40	0.6899
traitement*typelait	HYPOTH	INFOMOINS	-0.3587	0.1414	359	-2.54	0.0116

traitement*typelait	HYPOTH	INFOPLUS	-0.4808	0.1406	359	-3.42	0.0007
traitement*typelait	HYPOTH	MATCHING	-0.3766	0.1485	359	-2.54	0.0116
traitement*typelait	HYPOTH	REGULIER	0	.	.	.	.
traitement*typelait	REF	DHA	0	.	.	.	.
traitement*typelait	REF	FARINE	0	.	.	.	.
traitement*typelait	REF	INFOMOINS	0	.	.	.	.
traitement*typelait	REF	INFOPLUS	0	.	.	.	.
traitement*typelait	REF	MATCHING	0	.	.	.	.
traitement*typelait	REF	REGULIER	0	.	.	.	.

I.

Type 3 Tests des effets fixes						
Effet	Degrés de lib. num.	Degrés de lib. de dens.	Khi-2	Valeur F	Pr > Khi-2	Pr > F
traitement	3	138	50.35	16.78	<.0001	<.0001
typelait	5	359	151.11	30.22	<.0001	<.0001
traitement*typelait	15	359	32.93	2.20	0.0048	0.0063

J.

Moyennes des moindres carrés							
Effet	traitement	typelait	Valeur estimée	Erreur type	DDL	Valeur du test t	Pr > |t|
traitement	CHEAPTALK		3.2781	0.1238	138	26.47	<.0001
traitement	ENCH		2.1521	0.1237	138	17.40	<.0001
traitement	HYPOTH		3.1896	0.1376	138	23.17	<.0001
traitement	REF		2.7492	0.1307	138	21.03	<.0001
typelait		DHA	2.9126	0.06999	359	41.61	<.0001
typelait		FARINE	2.6427	0.08651	359	30.55	<.0001
typelait		INFOMOINS	3.0414	0.07060	359	43.08	<.0001
typelait		INFOPLUS	3.0298	0.07027	359	43.12	<.0001
typelait		MATCHING	2.8845	0.07240	359	39.84	<.0001
typelait		REGULIER	2.5426	0.07072	359	35.95	<.0001
traitement*typelait	CHEAPTALK	DHA	3.3551	0.1365	359	24.58	<.0001
traitement*typelait	CHEAPTALK	FARINE	3.2154	0.1594	359	20.17	<.0001
traitement*typelait	CHEAPTALK	INFOMOINS	3.3557	0.1335	359	25.13	<.0001
traitement*typelait	CHEAPTALK	INFOPLUS	3.4188	0.1330	359	25.70	<.0001

traitement*typelait	CHEAPTALK	MATCHING	3.3604	0.1372	359	24.49	<.0001
traitement*typelait	CHEAPTALK	REGULIER	2.9632	0.1319	359	22.46	<.0001
traitement*typelait	ENCH	DHA	2.2060	0.1324	359	16.67	<.0001
traitement*typelait	ENCH	FARINE	1.9117	0.1559	359	12.26	<.0001
traitement*typelait	ENCH	INFOMOINS	2.3198	0.1341	359	17.30	<.0001
traitement*typelait	ENCH	INFOPLUS	2.3032	0.1331	359	17.30	<.0001
traitement*typelait	ENCH	MATCHING	2.1680	0.1404	359	15.45	<.0001
traitement*typelait	ENCH	REGULIER	2.0037	0.1430	359	14.01	<.0001
traitement*typelait	HYPOTH	DHA	3.2072	0.1501	359	21.36	<.0001
traitement*typelait	HYPOTH	FARINE	3.0413	0.2135	359	14.25	<.0001
traitement*typelait	HYPOTH	INFOMOINS	3.4275	0.1540	359	22.26	<.0001
traitement*typelait	HYPOTH	INFOPLUS	3.3199	0.1506	359	22.05	<.0001
traitement*typelait	HYPOTH	MATCHING	3.1784	0.1572	359	20.22	<.0001
traitement*typelait	HYPOTH	REGULIER	2.9635	0.1440	359	20.58	<.0001
traitement*typelait	REF	DHA	2.8821	0.1403	359	20.54	<.0001
traitement*typelait	REF	FARINE	2.4023	0.1564	359	15.36	<.0001
traitement*typelait	REF	INFOMOINS	3.0625	0.1423	359	21.53	<.0001
traitement*typelait	REF	INFOPLUS	3.0771	0.1446	359	21.29	<.0001
traitement*typelait	REF	MATCHING	2.8314	0.1436	359	19.71	<.0001
traitement*typelait	REF	REGULIER	2.2399	0.1464	359	15.30	<.0001

K.

Différences des moyennes des moindres carrés								
Effet	traitement	typelait	traitement	typelait	Valeur estimée	Erreur type	DDL	Valeur du test t	Pr > |t|
traitement	CHEAPTALK		ENCH		1.1260	0.1750	138	6.43	<.0001
traitement	CHEAPTALK		HYPOTH		0.08847	0.1852	138	0.48	0.6336
traitement	CHEAPTALK		REF		0.5289	0.1801	138	2.94	0.0039
traitement	ENCH		HYPOTH		-1.0376	0.1850	138	-5.61	<.0001
traitement	ENCH		REF		-0.5972	0.1799	138	-3.32	0.0012
traitement	HYPOTH		REF		0.4404	0.1898	138	2.32	0.0218
typelait		DHA		FARINE	0.2699	0.06763	359	3.99	<.0001
typelait		DHA		INFOMOINS	-0.1288	0.04575	359	-2.81	0.0052
typelait		DHA		INFOPLUS	-0.1172	0.04480	359	-2.62	0.0093
typelait		DHA		MATCHING	0.02805	0.04757	359	0.59	0.5558
typelait		DHA		REGULIER	0.3700	0.04811	359	7.69	<.0001
typelait		FARINE		INFOMOINS	-0.3987	0.06745	359	-5.91	<.0001

typelait		FARINE		INFOPLUS	-0.3871	0.06656	359	-5.82	<.0001
typelait		FARINE		MATCHING	-0.2418	0.06886	359	-3.51	0.0005
typelait		FARINE		REGULIER	0.1001	0.06854	359	1.46	0.1450
typelait		INFOMOINS		INFOPLUS	0.01160	0.04442	359	0.26	0.7942
typelait		INFOMOINS		MATCHING	0.1568	0.04774	359	3.28	0.0011
typelait		INFOMOINS		REGULIER	0.4988	0.04815	359	10.36	<.0001
typelait		INFOPLUS		MATCHING	0.1452	0.04678	359	3.10	0.0021
typelait		INFOPLUS		REGULIER	0.4872	0.04776	359	10.20	<.0001
typelait		MATCHING		REGULIER	0.3420	0.05090	359	6.72	<.0001