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RESERVATION PRICE AS A RANGE:

AN INCENTIVE COMPATIBLE MEASUREMENT APPROACH

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ABSTRACT

Drawing on the literature on buyers' uncertainty in preference and product knowledge, the authors make, and empirically test, the proposition that an individual consumer's reservation price for a product is more meaningfully and accurately represented as a range than as a single point. Given this conceptualization, they propose an approach for incentive compatible elicitation of an individual's reservation price range (ICERANGE) that builds on the Becker, DeGroot, and Marschak (BDM, 1964) point-of-purchase method. Two empirical applications of the approach provide an assessment of its practicality and its predictive performance relative to current methodologies for reservation price elicitation. Results demonstrate that the proposed method significantly outperforms the benchmark approaches in terms of predictive validity, while yielding valuable incremental information about uncertainty in product valuation.

Key Words: *Pricing; Measurement; Reservation Price; Valuation; Willingness to Pay*

Reservation price is a well-known and widely invoked economic concept (cf. Varian 1992). In common parlance, a consumer's reservation price represents the maximum price s/he is willing to pay for one unit of a good or service. Value pricing, product design, negotiations and bundling are some substantive areas that depend on understanding the reservation prices of individual consumers.

While the concept of reservation price has appeared in the economics literature for well over a century (e.g., Davenport 1902), there is growing interest in advancing the understanding and measurement of the construct, particularly in marketing (Chung and Rao 2003; Jedidi, Jagpal, and Manchanda 2003; Jedidi and Zhang 2002; Wertenbroch and Skiera 2002). We attribute this interest to three factors. First, the advent of e-commerce has paved the way for mass customization and personalized pricing in several industries (Choudhary et al. 2005), motivating accurate individual-level reservation price measurement. Second, marketing researchers are applying recent methodological advances in such areas as experimental economics and Bayesian statistics to the measurement of reservation prices. Third, there is a lack of consensus on the "right" way of measuring (and, we contend, even defining) a consumer's reservation price that has left open avenues for further research. These factors, especially the third, provide the motivation for our study.

Consider, for illustration, the following definitions of reservation price (italics added):

(a) "The minimum price at which [a consumer] would *no longer* purchase the [product]" (Hauser and Urban 1986, p. 449);

(b) "The price at which a consumer is *indifferent* between buying and not buying the product" (Moorthy, Ratchford, and Talukdar 1997, p. 265); and

(c) "The price at or below which a consumer will demand one unit of the good" (Varian 1992, p. 152).

These three definitions differ from each other in the sense that in each case the reservation price maps on to a different propensity to buy on the part of the consumer. They converge only if the consumer's propensity to buy transitions from a *definite yes* to a *definite no* at a single price point rather than over a range of values.

We propose that it is more reasonable to conceptualize an individual consumer's reservation price as a range, with each of the above definitions representing specific supports within the range. As discussed in the next section, the literature on consumers' preference uncertainty (e.g., Fischer, Luce, and Jia 2000) and performance/quality uncertainty (e.g., Rust et al. 1999) lends theoretical support for this proposition. If a consumer's reservation price for a particular product is a range tied to the probability of purchase rather than a point, then the seller's best price for the consumer depends on this range and its mapping onto purchase probability. Stated differently, ignoring the range in an individual consumer's reservation price when it exists is likely to lead to problems such as suboptimal pricing.

The primary contribution of our study is methodological. We propose an approach called ICERANGE – short for *i*ncentive *c*ompatible *e*licitation of the *range* in a consumer's reservation prices. Our approach, tied to actual choice and motivated by Becker, DeGroot, and Marschak's (hereinafter BDM, 1964) point-of-purchase methodology, is the first in the literature to measure individuals' reservation prices as a range. The range measurement is significant because the theory of uncertainty and related literature in experimental economics (and other areas) underscore that the point representation of reservation price is tenuous. The range characterization retains the point measure as a special case. We demonstrate that ICERANGE performs better than multiple benchmarks in two studies where subjects (college students) had the opportunity to actually buy the product (Belgian chocolate in one study and Australian wine in the other). The two studies confirm the existence of the reservation price range. Further, data from the more elaborate chocolate study support our premise that individuals' reservation price ranges are positively related to their respective levels of performance- and preference-related uncertainty. While the elicitation procedure for ICERANGE is somewhat more involved than that for BDM, we address possible concerns on this count.

We elaborate on the conceptual and theoretical underpinnings of our range characterization in the next section. We then compare and contrast alternative routes to reservation price measurement, and draw on this discussion to propose ICERANGE. In the two subsequent sections we describe the applications in the chocolate and wine categories. Our concluding section outlines the scope and implications of ICERANGE, as well as the study's limitations and future research directions.

CONCEPTUALIZING RESERVATION PRICE AS A RANGE

We first review the alternative definitions of reservation price and cite theoretical support for our contention that the construct is better represented as a range of valuations. Establishing these bases for the range is an essential prerequisite for motivating the ICERANGE approach.

Review and Synthesis of Extant Definitions

The basic idea of reservation price is that there exists a maximum price a consumer would be prepared to pay for one unit of a product (or service). Thus the reservation price represents a consumer's value threshold. Her propensity to buy depends on whether the actual price is above, below or equal to this threshold. As in much of the extant literature, we will use the term "willingness to pay" interchangeably with reservation price.

The economics literature interprets reservation price as the combined economic value to a consumer of all the benefits that would accrue from the product (Ryan and Miguel 2000). To marketers, the reservation price represents "an indirect measure of utility" (Hauser and Urban 1986) or "a direct monetary measure of product value" (Kalish and Nelson 1991).

One commonality among the three definitions of reservation price cited in the preceding section from Hauser and Urban (1986), Moorthy, Ratchford, and Talukdar (1997), and Varian (1992) is that they link – at least implicitly – the definition to the consumer's probability of purchase at a particular price point. The difference lies in the implied purchase probability: 0%

in Urban and Hauser's definition, 50% in Moorthy et al.'s, and 100% in Varian's. The lack of consensus goes beyond these three studies.[7]

In our conceptualization, a consumer's reservation price is explicitly tied to his/her probability of purchasing the good. Based on the implied probability of purchase in current definitions, we identify the following three significant reservation price points:

(a) *Floor Reservation Price*, the maximum price at or below which a consumer will definitely buy one unit of the product (i.e., 100% purchase probability);

(b) *Indifference Reservation Price*, the maximum price at which a consumer is indifferent between buying and not buying (i.e., 50% purchase probability); and

(c) *Ceiling Reservation Price*, the minimum price at or above which a consumer will definitely not buy the product (i.e., 0% purchase probability).

Our motivation for the range representation comes from the uncertainty literature and related work in experimental economics (e.g., Ariely, Loewenstein, and Prelec 2003), resource economics (e.g., Gregory, Lichtenstein, and Slovic 1993), psychology (e.g., Jacowitz and Kahneman 1995) and marketing (e.g., Urbany, Dickson, and Wilkie 1989). This range conceptualization seems able to unify the various definitions of reservation price (as a range of thresholds). We note that utility theory has axiomatically treated reservation price as a single point measure, under the assumption that subjects know their preference structures with certainty (thus, there may be uncertainty related to product performance, but not to one's preference structure). Our conceptualization allows for both sources of uncertainty. We next examine the theoretical bases for this conceptualization.

Theoretical Underpinnings for Reservation Price as a Range

The single-point representation of reservation price requires the central assumption that a consumer knows with *certainty* how much she would be willing to pay for one unit of the

[7] For example, the implied purchase probability is 100% in Kristensen & Garling's (1997) definition of reservation price, 50% in the definitions of Casey and Delquie (1995) and Jedidi and Zhang (2002), and 0% in Scherer's (1980).

product (cf. Hanemann 1984). This is a strong assumption because consumers may lack a well-defined preference structure or the cognitive ability to make such an assessment (Heiner 1985; Gregory, Lichtenstein, and Slovic 1993), except perhaps in the most familiar contexts (Fischhoff 1991).

On the other hand, the vast literature on consumers' uncertainty – about product *performance* and individual *preference* – underscores that neither type of uncertainty is ever fully resolved in practice (Urbany, Dickson, and Wilkie 1989). Simon's seminal theory of bounded rationality (Simon 1955) – that individuals have limited capacity for processing information – guides the work in this area.

Buyers' product *performance uncertainty* is due to imperfect information about the product's quality or future performance. While decision making under imperfect information demands greater cognitive resources (Shugan 1980), the nature and extent of the search is constrained by many factors such as search cost and experience (e.g., Stigler 1961; Ratchford 1982; Wathieu and Bertini 2005) and the individual's ability to do so (Simon 1955). In the presence of uncertainty, consumers consider not only the average (or expected) outcome but rather the entire range (Rust et al. 1999).

Consumer's *preference uncertainty*, also referred to in the literature as choice uncertainty (e.g., Urbany et al. 1989), is the ambiguity the consumer has over what exactly s/he wants (cf. Luce 1959; March 1978), making the consumer unsure of "what value to assign to the alternative" (Fischer, Luce, and Jia 2000, p. 88). Even when the consumer has perfect information about a product, she may still be uncertain about her own preference (March 1978). Parallel work in agricultural economics draws on "ambivalence" (cf. Ready, Whitehead, and Blomquist 1995) as when individuals make "difficult tradeoffs." Opaluch and Segerson (1989) point out that the cost of overcoming ambivalence may be prohibitively high. Preference uncertainty may be attributed to various sources. For example, preferences may be *constructive* (Bettman, Johnson, and Payne 1990; Gregory and Slovic 1997), the choice situation may be novel or unfamiliar (March 1978), or there may exist attribute conflict within a single alternative when it is good in some respects but bad in others (Fischer, Luce, and Jia 2000). When an individual's preferences are uncertain, Dubourg et al. (1997) argue in favor of a "personal confidence interval" of the individual's willingness to pay.

In a related vein, experimental economists argue for a threshold price up to which a consumer definitely buys the product, another threshold above which the consumer simply walks away, and a range of prices in which consumer response is more ambiguous (cf. Ariely et al. 2003, p. 77). Loomes (1988) finds that people have *regions* of indifference instead of clearly defined indifference curves. The interval idea of the above studies is also seen in Jacowitz and Kahneman (1995) and Luce, Jia, and Fischer (2003, p. 466). Recognizing the individual level distribution, Li and Mattsson (1995) propose eliciting a "post-decisional confidence measure" (i.e., a "subjective probability" measure) between 0% and 100% tied to reservation price elicitation. Hanemann (1984) notes that an individual-level value distribution, "though not strictly consistent with utility theory," fits empirical data better.

Taken together, the above evidence, drawn from diverse domains, lends strong theoretical support to the notion of reservation price as a range rather than a single value. Our conceptualization formalizes this idea by specifically mapping this range into purchase probabilities, in a choice context.

THE ICERANGE PROCEDURE

Our primary objective is to propose a new individual-level reservation price measurement approach that captures an individual's reservation price as a range, tied to the probability of purchase. To motivate our approach, we first review the extant approaches for reservation price measurement. Beyond the methodological differences and framing distinctions, these approaches differ in the types of biases that they ignore or control for, and the purchase probabilities that the estimates map on to. We position ICERANGE as a "better" alternative for measuring individual-level reservation price, as it controls for at least two key biases and is able to capture reservation price as a range. We briefly discuss the principal extant approaches, and then present ICERANGE. Empirical demonstration of the superior performance of ICERANGE (along with evidence supporting the existence of a reservation price range) is presented in the following two sections.

A Comparison of Extant Approaches for Reservation Price Measurement

We review three prominent direct elicitation methods for reservation price measurement at the individual level: direct self-explication (e.g., Park and Srinivasan 1994), Vickrey auction (e.g., Vickrey 1961; Hoffman et al. 1993), and Becker, DeGroot, and Marschak's (BDM, 1964) point-of-purchase procedure (e.g., Wertenbroch and Skiera 2002). For completeness, we also consider the main indirect estimation methods: conjoint analysis (e.g., Kohli and Mahajan 1991; Jedidi and Zhang 2002) and choice experiment and related hybrids (e.g., Chung and Rao 2003). Our empirical applications, using chocolate and wine as the product categories, focus on direct elicitation methods: given the hedonic nature of both products, the conjoint-based indirect estimation methods would not be appropriate. Extant studies point to differences in estimates across methods. These may be attributable to a combination of factors such as the differences in the purchase probabilities that the methods map on to, the biases that the methods ignore or overcome, semantic differences among elicitation measures, and measurement error.

Two important types of biases examined in the reservation price literature arise from the absence of incentive compatibility in elicitation owing to the hypothetical nature of the responses and from the tendency of respondents to act strategically. These biases, discussed below, could lead to overbidding or underestimation of reservation price.

The first is the absence of *incentive compatibility* on account of hypothetical response bias.[8] An incentive-compatible mechanism gives the respondent the incentive to respond truthfully

[8] Hypothetical response bias (Nape et al. 2003) exists when values elicited in a hypothetical context, such as a survey, differ from those elicited in a real context, such as an actual purchasing situation. The usual concern with this bias is that people will overstate their true valuation in hypothetical settings.

(Lusk and Schroeder 2004). Incentive incompatibility arises, for example, when respondents are not responsible for paying their stated (or inferred) reservation price. The willingness to pay is higher in such instances than when respondents are required to pay (Posavac 2001). Cummings et al. (1995), among others, show that this upward bias extends to such other non-incentive-compatible methods as open-ended and double-ended contingent valuation.

The second type of bias is tied to *strategic response.* This arises when respondents anticipate a link between their response and the ultimate outcome and act so "as to maximize their utility taking into account how their responses may affect the decision" (Carson, Groves, and Machina 1999). The direction of strategic response bias depends on the context of elicitation. When consumers perceive that stating a higher reservation price will increase the likelihood of subsequently receiving a good, they are more likely to state a higher value than their true value (Posavac 2001, p. 95). On the other hand, when anticipating a higher final price for a product, buyers might state a value lower than their true reservation price.

While Vickrey auction is theoretically incentive compatible, there is some evidence in the literature that it induces overbidding (cf. Kagel, Harstad, and Levin 1987). Simple self-explication suffers from both kinds of biases (see Monroe 1990; Posavac 2001). Unlike direct elicitation, indirect methods such as conjoint analysis and choice experiments avoid the increased attention to the pricing question and mitigate the effect of strategic bias. These approaches are at best incentive neutral – they do not provide the respondent the (dis)incentive for (not) revealing the true willingness to pay. We see the BDM approach as the "best" method among available options as it tackles the above sources of bias (Plott and Zeiler 2005). BDM provides for incentive compatibility by rewarding respondents for telling the truth and penalizing them for lying (i.e., for over- or understating reservation prices). It addresses strategic bias by making respondents aware that there is no link between their stated willingness to pay and the price they might have to pay during the enforcement phase of the procedure.

Another relevant issue is the probability of purchase that the reservation price measure (or estimate) implicitly maps on to.[9] As BDM and Vickrey auction procedures are tied to real choice (i.e., one *has* to buy the good if certain conditions are met), respondents may be expected to provide a value corresponding to their floor reservation price with 100% purchase probability. On the other hand, the nature of trade-off analysis in conjoint analysis and choice experiments—tied to indifference between buying and not buying—is likely to yield an estimate of reservation price close to the indifference reservation price, with 50% purchase probability. To the extent that there is a range in an individual's reservation prices, one can see the different approaches measuring distinct supports within the range.

We position ICERANGE approach as one that is rooted in theory, and builds on the "best" characteristics of the BDM approach (e.g., Wertenbroch and Skiera 2002). Our focus on incentive compatible elicitation (in actual buying situations), avoidance of strategic bias, and our choice of protocols resemble those of BDM (especially Wertenbroch and Skiera). The core distinctions of our paper are that we draw on the theory of uncertainty to conceptualize individual reservation price as a range (in contrast to the point representation in BDM), and our ICERANGE approach captures this reservation price range with associated purchase probabilities. As we will show later, ICERANGE predicts actual behavior better than BDM.[10]

Specifics of the ICERANGE Procedure

ICERANGE is tied to the point of purchase of the product of interest. In the mold of Vickrey auction, BDM, and other direct elicitation methods, ICERANGE treats reservation thresholds as

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[9] For illustration, the Vickrey auction, under which the respondents submit independent sealed bids for a real product and the winning (i.e., highest) bidder pays the second highest price, arguably maps on to the floor reservation price (i.e., 100% probability of purchase). This is because the winning bidder (potentially *any* one of the respondents) must purchase the product *and* the second bid could be only infinitesimally less than the highest bid.

[10] Our focus on ICERANGE distinguishes our study from Ariely et al. (2003) as well. Unlike theirs, our primary contribution is methodological. On the theoretical side, we build on Ariely et al.'s proposal for the existence of the reservation price range by drawing on the literature on uncertainty, and by linking specific supports within an individual's range to his/her purchase probability.

deterministic.[11] The elicitation of reservation price information is followed in quick succession by the "enforcement" phase during which a respondent is either required to buy one unit of the product at an incentive-compatible price or is denied the opportunity to purchase. Respondents should not be paid any money for participation to avoid possible endowment effects (cf. Thaler 1985). The point-of-purchase elicitation means that, as in BDM, we are able to avoid the hypothetical response bias, by linking responses to real choice.

The product (or brand) for which consumers' reservation prices are being ascertained is not in short supply. Thus, unlike in a Vickrey auction setting (say), the overbidding bias (cf. Kagel, Harstad, and Levin 1987) is avoided by not making product choice a "competition" to be won.

To control against strategic response, respondents are informed that the seller has already set a price that is not disclosed to them. As a guarantee that the price will not be changed during the reservation price elicitation, this price is written on an index card within a sealed envelope placed in front of the respondent. In a slightly different vein, Wertenbroch and Skiera (2002) tell each respondent that the transaction price would be the one that the respondent randomly picks from an urn. Our use of the secret, pre-selected price in a sealed envelope follows Schade and Kunreuther (2001). The price is revealed to the respondent at the end of the study.

Ensuring incentive compatibility over a respondent's entire range of reservation prices forms the crux of ICERANGE. To achieve incentive compatibility we must ensure that the respondent's dominant strategy is to tell the truth over the entire range of purchase probabilities. We clarify how we do so while outlining the elicitation steps.

The respondent is given an opportunity to examine the product in factory packing and use (or taste) a demonstration piece to gain familiarity. The elicitation involves three steps to capture the respondent's floor, indifference, and ceiling reservation prices.[12] The reservation price

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[11] Rooting reservation price measurement in a random utility framework is an alternative perspective, shared by indirect elicitation methods such as conjoint analysis and choice experiments.

[12] Alternatively, we could ask respondents for their purchase probabilities at various price points. However, while both routes can be structured to avoid the strategic- and incentive incompatibility-bias, our approach is the more

elicitation questions are accompanied by graphical representations of the relationship between reservation price and purchase probability, so that the idea is clear and intuitive to respondents (the elicitation instrument in Figure 1 is described later). Details of each step are as follows:

Step 1: A respondent is asked to state the maximum price *A* at or below which s/he would *definitely* buy the product (i.e., 100% purchase probability, equivalent to the floor reservation price in our framework). To ensure incentive compatibility, the respondent is told that if the price *P* (in the sealed envelope) is found at the end of the study to be less than or equal to the respondent's stated price *A*, s/he would be required to purchase at price *P*.

Step 2: The respondent is asked to reveal price level *B* at which s/he is indifferent between buying and not buying the product (i.e., 50% probability of purchase, corresponding to the indifference reservation price). The respondent is informed that if the posted price *P* is later found to be equal to *B*, s/he has to pick a ball from an urn containing one green ball and one red ball. If s/he picks the green ball, s/he would be required to buy at the price *P*. If s/he picks the red ball, s/he would not have the opportunity to buy (Ellsberg 1961). That is, the respondent is made aware that P = B implies a draw from the urn with a 50% purchase probability.

Step 3: Next, the respondent is asked to state price level *C* at which there is only a 10% (i.e., small) probability that s/he would purchase the product. Because it is impossible to ask the respondent for an *incentive compatible* price level with a 0% purchase probability, we rely on the price with the 10% purchase probability to extrapolate the ceiling reservation price. If the posted price *P* (in the sealed envelope) is later found to be equal to this price, the respondent would be asked to pick a ball from an urn containing one green and nine red balls. The respondent is required to buy at the price *P* (or forgo purchase) if s/he picks a green (or red) ball. That is, P = C implies a draw from the urn with a 10% purchase probability. (As discussed later, we find from our applications of ICERANGE that we can approximate the ceiling reservation price by extrapolating

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efficient, requiring a small, fixed, number of elicitation questions, given that the task is to elicit specific supports in the RP range corresponding to specific purchase probabilities (e.g., 0, 50, and 100%). In contrast, the alternative approach would be more of an open-ended "trial and error" process, likely requiring several questions.

through the 100% and 50% purchase probability points, with no significant loss in predictive ability. Thus, to simplify the approach, Step 3 may be eliminated)[13]

Our approach of operationalizing uncertainty by asking respondents to pick up a ball from an urn is supported by earlier studies (cf. Elliott and McKee 1995; Ellsberg 1961). Grether and Plott (1979) take a slightly different route in which a random dart is thrown at a circle; the respondent "wins" if the dart hits a small shaded area within the circle. Novemsky and Kahneman (2005) point to the conceptual similarity between uncertain buying situations and a game of poker.

Two additional clarifications are provided. First, if the respondent states the same reservation price for two or more successive elicitations, then the enforcement decision (buy or forgo) is tied to the higher probability if the sealed price *P* equals the tied reservation prices. In other words, a respondent cannot strategically lower his/her probability of purchase by keeping multiple reservation price levels the same. Second, as the sealed price *P* might fall between a respondent's A and B levels (or between B and C, and so on), the respondent is shown graphically the interpolation rule that would apply if the sealed price *P* were to fall between X_α and X_β, the levels corresponding to α% and β% probability levels ($\beta > \alpha$). In this case, s/he would be asked to pick a ball from an urn corresponding to a probability of purchase equal to $a + (ß - a)(X_a - P)\big/(X_a - X_ß)\,\%$. For illustration, let α and β correspond to purchase probabilities of 50% and 100%. Suppose the sealed price *P* (in the envelope) is between X_{100} and X_{50} ($X_{50} > X_{100}$). The purchase probability at price level *P* (based on the interpolation rule) is $50 + (100 - 50)(X_{50} - P)\big/(X_{50} - X_{100})\,\%$. (Our verbal protocol is discussed later.)

Are these steps adequate to ensure that the respondent answers truthfully? Under the ICERANGE approach, the respondents' dominant strategy is to offer their true reservation price

[13] Two optional Steps 4 and 5 that elicit the RP's *D* and *E* corresponding to the 75% and 25% purchase probabilities may be added if the researcher wishes to calibrate the response curve more accurately and if the respondents are deemed to have the time and resources to provide these values. The procedure to elicit *D* and *E*: If the sealed price *P* matches *D* (or *E*), the respondent picks a ball from an urn containing three green balls and one red ball (or one green and three red balls). The respondent is required to buy (or forgo purchase) if s/he picks a green (or red) ball.

for any corresponding purchase probability of χ% ($0 = \chi = 100$). Since respondents have to indicate price levels X tied to their purchase probabilities χ%, not revealing the "true" levels hurts the respondent. Specifically, under(over)estimating the true reservation price corresponding to a given purchase probability means that it is possible that the respondent has a less(more)-than-ideal chance of being able to purchase the product at the revealed price. In other words, incentive compatibility is maintained over the entire range.

Once the elicitation is complete, the envelope is unsealed and the respondent is subjected to the appropriate outcome as per the instructions (which serve as the "contract"). It follows from the above description that the BDM procedure is nested within ICERANGE; the two approaches converge when the range of an individual consumer's reservation prices is zero.

Link between Individual-level Reservation Price Range and Uncertainty

We have earlier cited as motivation for our reservation price range conceptualization the effect of the consumer's degree of uncertainty with product performance and the level of her own preference-related uncertainty toward the product. Thus, we posit:

- The higher an individual's uncertainty with the product's performance, the greater his/her range in reservation prices for the product.
- The higher an individual's preference uncertainty for the product, the greater his/her range in reservation prices for the product.

APPLICATION OF ICERANGE: THE CHOCOLATE STUDY

In this section, we report on the first of two studies employing different products, chocolate and wine. The primary objectives of the two studies together are (i) to demonstrate the practicability of the ICERANGE approach and (ii) to benchmark ICERANGE's performance relative to several alternative direct elicitation approaches, including BDM and Vickrey auction, for different products. (As mentioned earlier, conjoint-based indirect estimation approaches would not be appropriate given the hedonic nature of the products involved in both studies –

chocolate and wine.) In the process, we seek to confirm the existence of the range in individual-level reservation prices, and test its relationship with the individual-level performance and preference uncertainties.

The first study, described in this section, involves 562 undergraduate students at two major US universities and uses as the product a premium brand of Belgian chocolate, *Galler*. The second study, discussed in the next section, uses a brand of Australian red wine, *The Lucky Country*, with 91 part-time MBA students from one of the above universities as respondents. Several earlier studies on consumers' valuations have used chocolate (e.g., Bhatia and Fox-Rushby 2003; Johannesson et al. 1997; Kaas and Ruprecht 2003) or wine (e.g., Horsky et al. 2004; Lynch and Ariely 2000; Nerlove 1995) as the product category.

Data Collection

Galler retails in the US for $5.25 per 3.5 oz. bar at exclusive candy stores. As the *Galler* brand is not available at most stores (in fact, none of our respondents had heard of the brand before), the influence of reference price effects on consumers' reservation prices should be weak at best. A salient feature of ICERANGE is its linkage to actual choice. Imported chocolates as the product category also ensures that respondents are likely to be in the market[14], thus reducing "wasted" responses (from respondents with no interest in purchasing the product at any reasonable price at the time of the study).

We first collected the data for ICERANGE and BDM, randomly assigning 134 respondents to ICERANGE and 128 to BDM. Then, to benchmark ICERANGE against additional methods, we went back to the same target population to randomly assign a fresh set of respondents to these methods – 104 to Vickrey auction, 54 to the self-explicated floor reservation price measure (cf. Varian 1992), 59 to the self-explicated indifference reservation price measure (cf. Moorthy et al.

[14] Studies have shown that the typical gourmet chocolate consumers are "younger" (www.marketresearch.com/map/prod/112881.html) and that chocolate consumers are overrepresented in the 14-24 age group (oldwww.roymorgan.com/pressreleases/19991/chocolate.html). Moreover, although the retail price is at the high end of the range for chocolates, it is clearly affordable for college undergraduates.

1997), and the remaining 83 to a "general" self-explicated measure that does not state the purchase probability (cf. Park and Srinivasan 1994). The greater number for Vickrey auction is because it is incentive-compatible, like ICERANGE. Among the self-explicated measures, the "general" measure is the most commonly used and hence was assigned more respondents.

The following steps are common to all methods. All respondents were told a week in advance about the study on "consumers' preferences for *Galler* chocolate." They were advised to come with about $10 in cash (i.e., well above the product's price) as they would have an opportunity to buy the product. Respondents were not paid to participate in any of the studies. We wanted to ensure that we did not create an endowment effect (cf. Thaler 1985) that might contaminate the reservation price elicitation. Respondents earmarked for the incentive compatible methods – ICERANGE, BDM, and Vickrey auction – were specifically told that they might be *required* to purchase if the price was "acceptable" to them. On a given study day, each respondent was asked to taste a piece of the chocolate and also examine an unopened bar. No information about the product's typical retail price was provided. The data collection for all methods included an elicitation phase and a debriefing phase. For the three incentive-compatible methods alone, there was an additional enforcement phase in which those respondents that were "required to buy" made the purchase. We now discuss certain method-specific aspects of our data collection. Figure 1 documents the protocol and measurement procedures for the various approaches.

Figure 1 about here

Panel 4 of the figure clarifies how we explained the measurements and implications of the intermediate purchase probabilities to the respondents, including the interpolation of the probability corresponding to the envelope price P.

ICERANGE and BDM. Data collection for these two approaches was via one-on-one interviews (akin to Wertenbroch and Skiera 2002, p. 231). Respondents were randomly assigned to either the ICERANGE or the BDM group. They were alerted to the fact that their responses would be binding in terms of the ultimate purchase outcome, which depended on how their responses compared with the price inside a sealed envelope (placed in front of the respondent). The interviewers also explained to respondents why it would not be in their interest to over- or understate their valuations. These interviewers (recruited from an undergraduate marketing research class) were carefully trained and required to undergo several practice rounds.

In the elicitation phase, respondents in the BDM group only had to provide a single price representing their maximum willingness to pay for the product, with a follow-up option to revise their response (as in Wertenbroch and Skiera 2002) till they reached a price level they were not willing to pay. Respondents in the ICERANGE group provided their floor, indifference, and ceiling reservation prices, following the procedure described in the previous section. ICERANGE respondents were also allowed to revise their floor reservation price estimates similar to those in Desaigues and Rabl (1995, on contingent valuation) and BDM (Wertenbroch and Skiera 2002). The results presented are based on these revised reservation prices. Respondents were encouraged to review their responses before they were "locked in" by the interviewer. The option to revise reservation prices is a desirable feature as it tackles anchoring problems, if any. With ICERANGE, the review stage lets respondents re-look their entire range and not be constrained by their first two responses on floor and indifference levels. The review offers respondents an added level of reassurance.

The enforcement phase was structured to aid benchmarking. To assess how well the respondents' actual purchase decisions correspond to their self-explicated reservation prices, each respondent was asked to pick one of five index cards, with a different price level ($2.50, $2.75, $3.00, $3.25, and $3.50) printed on their backs (thus hidden from the respondent). Respondents were assured that all five index card prices were weakly lower than the price in the sealed envelope. They were instructed to turn over the selected card to reveal the price, and then declare whether they would buy the chocolate at that price or not. A respondent choosing to buy paid the revealed price, received the chocolate, and completed the final debriefing phase of the study. The unmasking of the envelope price has no practical significance for this respondent. For a respondent not choosing to buy at the price revealed on the index card (i.e., the special offer price), his/her stated valuations in the elicitation phase were binding. Depending on how the unmasked envelope price stacked against his/her reservation price(s), s/he was required to buy or not buy based on the procedure discussed in the previous section.

The debriefing phase sought feedback from respondents to benchmark ICERANGE against other approaches on qualitative dimensions. We wanted to see if there are (dis)advantages with ICERANGE that go beyond predictive performance. Accordingly, we surveyed respondents' comfort level with each approach, its clarity of incentive compatibility and the comprehension (or understandability). (Specific measures and results are in Table 2 and will be discussed later.)

Vickrey auction. Respondents were informed of the rules of the auction (see Figure 1(C)). Special attention was drawn to the rules that the bids would be final and binding, and that the winner (i.e., the highest bidder) would pay the second highest bid price. They were told that the winner would be revealed in the following class. Soon after, the respondents submitted their "sealed" bids for a bar of chocolate. In the enforcement phase, and before unsealing their bids, the respondents were told of a special offer. If they chose to buy the chocolate at this special price, their bids would be withdrawn from the auction and would no longer be binding. The special price, predetermined from a pilot study, was then revealed. Respondents who indicated that they would buy at the special price paid the money and collected a bar apiece. The bids of those who chose not to buy at the special offer price were included in the auction. All respondents then participated in the debriefing phase, following the same format as in ICERANGE or BDM.

Self-explicated approaches. The measures corresponding to the three different self-explicated approaches relate to the floor, indifference, and general reservation prices (see Figure 1(D)). Respondents were randomly assigned to answer one of the three corresponding instruments. Under these approaches, respondents are asked directly to state their valuations, without corresponding precautions to maintain incentive compatibility and avoid strategic biases (i.e., the answers are not binding). After respondents had turned in the questionnaires containing their reservation prices for a bar of chocolate, they were informed of a "special offer price" and asked if they wanted to buy the chocolate. As before, this step aids benchmarking. Those who said "yes" collected a bar each after paying the price. The data collection ended with debriefing.

Results

Table 1 about here

Table 1 contains the mean reservation price estimates (and associated standard errors) from ICERANGE and the five other approaches, and the shift in choice likelihood measures indicating predictive performance (discussed later). The mean floor, indifference, and ceiling reservation prices (across respondents) from the ICERANGE approach for a bar of Galler chocolate are $2.97, $3.48 and $4.19 respectively. The mean range (difference between floor and ceiling reservation prices) of $1.22 is significantly different from zero (t = 4.78; p < .01), supporting our range conceptualization. Further, the mean indifference reservation price is significantly greater than the mean floor reservation price (t = 2.30, p < .05), as is the mean ceiling reservation price compared to the mean indifference reservation price (t = 2.58, p < .01). 106 of the 134 respondents under ICERANGE characterized their reservation prices as a range rather than as a point[15] (a range of $.50 or less was classified as a point, following Kagel and Levin 1993).

For the BDM group, the mean reservation price is $2.94, while that under the Vickrey auction procedure is $3.14. The self-explicated mean floor, indifference, and general reservation price estimates are $2.02, $2.71 and $2.39 respectively. As anticipated, we find that BDM yields

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[15] Indeed, our approach does allow respondents to give the same values for all three reservation prices – that is, they could indicate a range of zero if they wish to. In fact, 21% of the 134 respondents for the chocolate study indicated a range of $0.50 or less, demonstrating that respondents could and did exercise the option of indicating same or similar values for all three thresholds.

an estimate closer to the ICERANGE floor reservation price – indeed, they are not significantly different from each other ($t = .14$, $p > .10$). At the same time, the BDM estimate is significantly lower than the indifference reservation price of ICERANGE ($t = 2.33$, $p < .05$).

Comparisons of ICERANGE's predictive performance with those of the other approaches are based on the data collected at the enforcement phase of the study. At the *individual* level, we compared the observed (i.e., actual) choice for each respondent at the offer price with the predicted choice likelihood at that price from ICERANGE or alternative approach, as applicable for the individual. Our specific measure of predictive performance is the shift in choice likelihood (cf. Inman et al. 1990), defined as $SCL_i = OC_i – PCL_i$, where SCL_i is the shift in choice likelihood for respondent *i*, OC_i is the observed choice indicator, and PCL_i is the choice likelihood predicted by the model, all for the i^{th} respondent.

OC_i is one (or zero) if the respondent buys (or does not buy) at the special offer price. PCL_i from ICERANGE can be anywhere between 0 and 1. Specifically, if the offer price is less (or greater) than or equal to the respondent's floor (or ceiling) reservation price, then PCL_i is one (or zero). For any other offer price, PCL_i equals the estimated purchase probability discussed earlier. Under the other methods, PCL_i is one (or zero) if the offer price = (or >) the respondent's stated reservation price. For any approach, a lower SCL (averaged over respondents) implies superior prediction.

ICERANGE provides the best predictive performance with an SCL of .126. Second in our application is BDM with an SCL of .180, followed by Vickrey auction (SCL = .307), self-explicated floor (SCL = .315), self-explicated indifference (SCL = .337), and self-explicated general (SCL = .339). The predictive performance of ICERANGE is significantly better than that of BDM (SCL difference = .054, $p < .10$) and each of the other approaches ($p < .05$).

One could raise the issue that the SCL measure favors ICERANGE as this approach alone allows PCL (predicted choice likelihood) and SCL values anywhere between 0 and 1 for a given respondent. With other methods, PCL and SCL values for any respondent are dichotomous – 0 or 1, representing the miss rate (= 1 – hit rate). To address any concern that SCL might "handicap" the benchmark methods, we also computed the miss rate under ICERANGE. To do so, we used the indifference price (50% purchase probability) as cut off point. If the predicted purchase probability < 50% (or = 50%) under ICERANGE, the predicted choice is treated as "not buy" (or buy). The miss rate for ICERANGE of .112 is significantly less than that of BDM (miss rate difference = .068, $p < .10$) and each of the other approaches ($p < .05$). The results provide greater assurance for the use of ICERANGE. We must emphasize however that SCL is the more appropriate measure of predictive performance.

Table 2 reports the average respondent evaluations of the different methods on three dimensions, collected in the debriefing phase of the study. Note that the superior performance of ICERANGE over BDM comes without sacrificing the comfort level of the respondents in answering the reservation price elicitation questions. Further, there was no significant difference between the two methods in terms of the clarity of incentive compatibility, although respondents did appear to feel that the BDM method was easier to understand (the mean score of 3.85 for ICERANGE is significantly lower than that of 4.39 for BDM at $p < .05$).

Tables 2 and 3 about here

Further, to test the postulates that an individual's performance- and preference-related uncertainty are positively related to his/her reservation price range, we developed measures of performance- and preference-based uncertainty as follows (see Table 3 for details). The six items were drawn from Urbany, Dickson, and Wilkie (1989) and Cordell (1997). Principal components analysis followed by Varimax rotation suggested two factors, corresponding to performance- and preference-related uncertainty, with reasonably strong convergent and discriminant validity. We next ascertained the strength of association between respondents' scores on each of these factors (as measures of performance and preference uncertainty) and their reservation price ranges as estimated by ICERANGE. As predicted, we find that both preference uncertainty and performance uncertainty have significant positive associations with individual ranges in reservation prices (correlation coefficients of .276 and .236 respectively, $p < .05$).

THE WINE STUDY

We conducted the second study with *The Lucky Country* brand of wine (a 55% Shiraz/45% Cabernet Sauvignon blend) from Australia, retailing at approximately $15.00 per 750 ml bottle, to replicate the performance of ICERANGE in a more expensive product category with "older" respondents, specifically, 91 part-time MBA students. We focused on ICERANGE, BDM, and Vickrey auction – the top three approaches from the chocolate category, all providing for incentive compatibility (at least in theory). The protocol was essentially similar to that for the chocolate study with one difference: in view of the respondents' time constraints, we used a questionnaire-based survey methodology (in lieu of one-on-one interviews) to elicit respondents' valuations. This also allowed us to evaluate the relative performance of ICERANGE using the (quicker) survey-based approach, in contrast to the one-on-one interviews used in the wine study. The results are presented in Table 4.

Table 4 about here

Again, we find strong support for the superior predictive performance of ICERANGE, as measured by the shift in choice likelihood (SCL). Specifically, ICERANGE (SCL = .08) significantly outperforms both BDM (SCL = .29) and Vickrey auction (SCL = .21) with $p < .01$ and $p < .05$ respectively. The SCL values of BDM and Vickrey auction are not significantly different from each other. Confirming the range characterization, the mean observed "range" in reservation prices under ICERANGE of $ 4.92 is significantly higher than zero ($p < .01$). Further, we find that both performance- and preference-uncertainty are positively correlated (correlation coefficients of .05 and .12), although in this instance the coefficients are not statistically significant, perhaps due to the relatively small sample size for ICERANGE in the wine study (and possibly greater measurement error under the survey format). Finally, in this study, the feedback from respondents in the debriefing phase indicates no significant difference between ICERANGE and BDM in terms of respondents' comfort levels, comprehension, or clarity with regard to incentive compatibility.

Discussion

Overall, the two studies demonstrate the practicality of the ICERANGE procedure, at least among college-going respondents. Furthermore, we find strong support for the superior predictive ability of ICERANGE over multiple benchmarks. It performs significantly better across two product categories and with undergraduates and MBA students. Consistent with the conceptual framework, a respondent's uncertainty levels – on product knowledge and personal preference – are positively related to his/her range in reservation prices.

We see ICERANGE as an approach that integrates the BDM method with the theoretically and empirically supported idea of reservation price as a range of values on account of uncertainty, avoids strategic bias and incentive incompatibility bias, and most importantly, predicts choice significantly better than multiple extant methods across two categories.

The wine application demonstrates that ICERANGE works well even under a survey format. Yet, if respondents and interviewers have the time, we would recommend personal interviews to make the process very transparent and (at least in theory) reduce measurement error.

In an attempt to further simplify ICERANGE, we checked whether the reservation price elicitation tied to the 10% purchase probability level (arguably the hardest part of ICERANGE) could be extrapolated from the floor and indifference reservation price elicitations, instead of asking an additional question. We find that the extrapolated reservation price for the 10% probability level is almost as good as the measured value for both chocolate ($4.19 actual vs. $4.17 extrapolated, p = .85) and wine ($16.62 actual vs. $17.32 extrapolated, p = .35).

Furthermore, SCL values based on extrapolations from the floor and indifferent reservation prices (i.e., not using the direct elicitations at the 10% probability level) exhibit no significant deterioration. We suggest that when consumers are constrained in terms of time or cognitive resources, eliciting the floor (100% purchase probability) and indifference (50% purchase probability) reservation prices according to the ICERANGE format might suffice.

CONCLUSION

A consumer's reservation price for a product has traditionally been considered to be a single point. However, the literature on consumers' uncertainty – which posits that consumers are not often sure of their own preferences and the performance of the products they intend to purchase – suggests that the above assumption, while analytically convenient, is practically weak. Against this backdrop, we have attempted a synthesis of the literature to propose a conceptualization of an individual's reservation price as a range, tied to purchase probabilities. Extrapolating from this research, we develop an incentive compatible elicitation procedure, ICERANGE, to measure the range in reservation prices at the level of individual consumers. Two empirical applications in the chocolate and wine categories provide validation of the ICERANGE methodology.

Theoretical Contributions

Reservation price is a key construct in understanding and inferring consumer preference. We see our study contributing to this literature stream in the following ways. The primary contribution is methodological. ICERANGE is the first study to measure reservation price as a range. The (ICERANGE) approach is tied to real choice and guards against two common sources of bias. The secondary contributions are theoretical and empirical. Specifically, this study reconciles diverse definitions of reservation price with the range framework, and establishes a link between the individuals' uncertainties and reservation price ranges. The empirical contribution is from demonstrating the superior predictive performance of

ICERANGE, establishing the existence of the range in two different applications, and providing at least partial support for the link between the level of uncertainty and reservation price range.

Managerial Contributions

From a managerial perspective, we believe that ICERANGE holds promise as a practical methodology for reservation price measurement. Our empirical study is encouraging in this regard, both in terms of its performance and its feasibility, notwithstanding the additional steps involved relative to the BDM approach. Respondents stated that they were comfortable with the method and did not appear to find the additional questions difficult to understand or onerous.

While our empirical study used personal interviews for the elicitation process, we realize that such personal interviewing may not always be feasible in real world applications. With the objective of developing ICERANGE as a practical tool for reservation price elicitation, we have designed an interactive online version of the approach, with a user-friendly graphical interface. This online version has undergone an initial pilot test with MBA students (in the context of a consumer electronics product). While the sample size is too small to draw any statistically significant conclusions, the online system worked smoothly, and respondents felt comfortable with it. (Indeed, some of the participants felt that the idea of eliciting a complete range rather than just a single point, actually made respondents feel *more* comfortable with ICERANGE compared to BDM.) The online interface has been posted on the second author's website.

As stated earlier, the ability to estimate individual consumers' reservation price ranges with reasonable accuracy (and minimal systematic bias) is clearly valuable for managers making pricing decisions, particularly in a mass customization setting.

Clarifying the Scope and Limitations of ICERANGE

ICERANGE is arguably the most relevant for products or categories with which consumers have significant levels of performance- and/or preference-related uncertainty. Incentive compatible approaches such as ICERANGE and BDM require consumers to "put their money where their mouth is." For the actual purchase to take place, the products, or at least their working prototypes, must be available for sale. Therefore, for new products still in the design and development stage, conjoint analysis and its variants are likely to remain the preferred methods.

The actual purchase requirement would render ICERANGE and BDM inapplicable to public goods and to big ticket items such as cars and homes. To our knowledge, there is really no good approach to assess consumers' reservation prices for these big ticket items in the pre-purchase stage. This area merits research.

We have implemented ICERANGE for a single product. The meaning of the reservation price range when consumers are planning to buy a basket of goods, and the way in which ICERANGE should be adapted are significant issues that we have not tackled.

ICERANGE's advantage over standard self-explicated approaches lies in its ability to enforce incentive compatibility and overcome strategic bias. Yet the speed and "simplicity" of a typical self-explicated approach are difficult to match. We leave it to a prospective user to weigh the relative costs and benefits of these routes.

A specific limitation with our two applications of ICERANGE is that both are with student samples. This raises the issue of external validity. As Calder, Phillips, and Tybout (1982) observe, it is difficult to establish external validity in any single study. We therefore urge future applications of ICERANGE considering other products and subjects drawn from more diverse populations.

Other Limitations and Future Research Directions

The ICERANGE approach may be employed to study the impact of uncertainty on reservation prices in a variety of contexts. For example: The effect of dynamic learning (e.g., in a new product context) on the range and key supports of the reservation price distribution would be of managerial relevance and theoretical interest.

While we were able to demonstrate the existence of a positive and significant relationship between an individual's reservation price range and associate levels of uncertainty in the chocolate study, our results were inconclusive for the wine study (probably due to a smaller sample and possibly greater measurement error on account of the survey-based elicitation). While acknowledging this limitation, we encourage additional investigation of the link.

When a respondent is faced with uncertainty, could s/he provide precise estimates of the supports of the range? We would contend that in the presence of such uncertainty, it would be harder for consumers to provide single point estimates of the reservation price under the traditional conceptualization. What our notion of the range does is to offer the consumer some "wriggle room" in expressing one's preference intensity. We recognize that there are other ways to extend our conceptualization; for example, the specific thresholds within the range could themselves be treated as fuzzy and modeled as such.

The two different types of buyer's uncertainty (knowledge uncertainty and preference uncertainty) may impact the reservation price range in different ways. Studies may be conducted involving manipulations of both types of uncertainty to examine the differences in their effect on the range as well as the key support points. On a related note, we urge a more thorough investigation on the antecedents of the range in individuals' reservation prices.

Figure 1

PROTOCOL USED FOR ALTERNATIVE ELICITATION METHODS

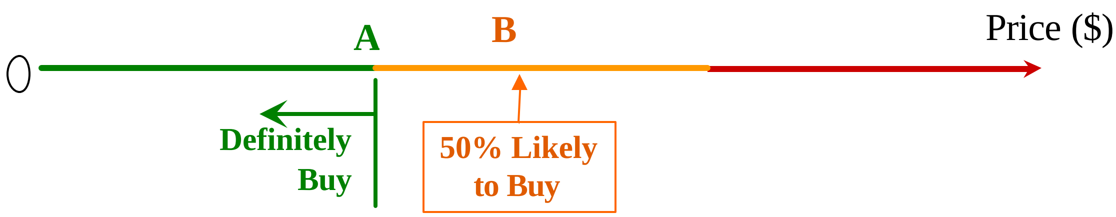
(A) ***Protocol for Respondents in the ICERANGE Group***

Panel 1: **Please reveal a price level *A* at or below which you would <u>definitely buy</u> the bar of chocolate. Later, if the price in the envelope is found later to be lower than or equal to this price *A*, you will be required to purchase at the envelope price. (For example, if your indicated price *A* is $100 and the envelope pri ce is $99, you will be required to purchase the product at $99). Please state your price level *A* below:**

***A*: __________.**

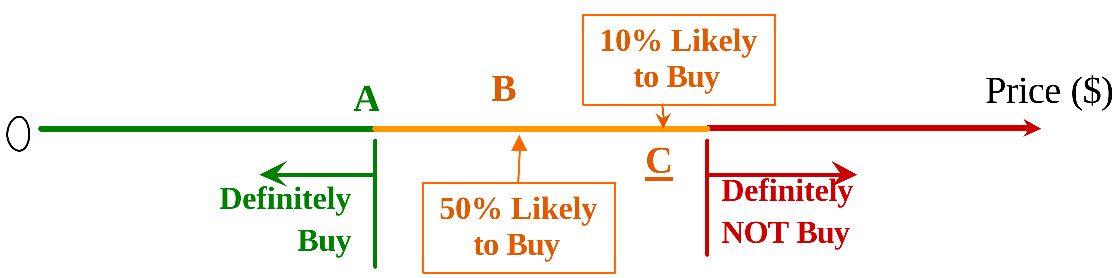
Panel 2: Please reveal a price level *B* at which you would be <u>indifferent</u> between buying and not buying the bar of chocolate. (At this price, you are 50% likely to buy the product.) Later, if the price in the envelope is equal to this price *B*, you will be asked to pick a ball from an urn containing **<u>one green</u>** ball and **<u>one red</u>** ball. If you pick the <u>green</u> ball, you will be <u>required</u> to buy at the price from the envelope. If you pick the <u>red</u> ball, you will <u>not</u> be given the opportunity to buy. (If, however, your price level B is the same as your earlier price level A, the higher purchase probability associated with A will apply.) Please state your price level *B* below:

B: _________

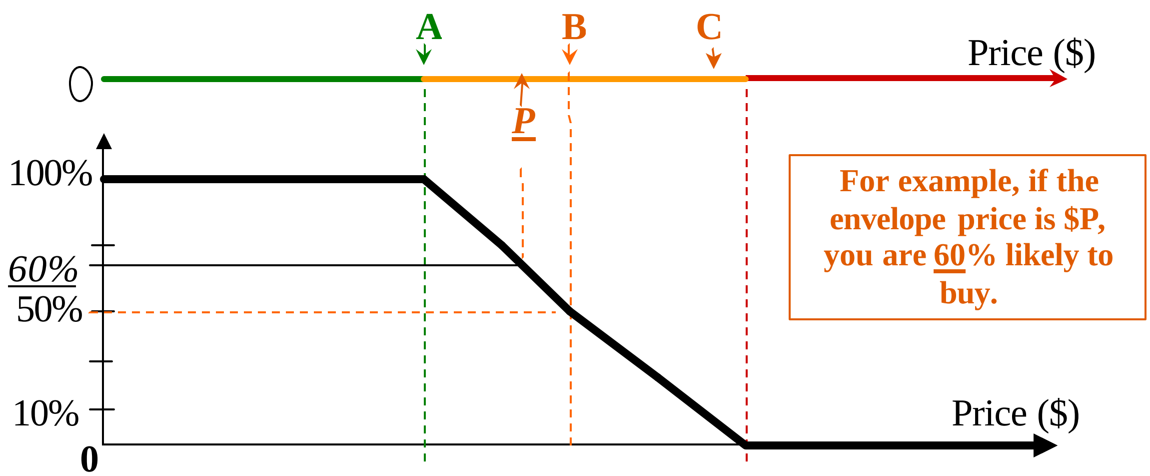


Panel 3: **Please reveal a price level *C* at which you are only 10% likely to buy the bar of chocolate. Later, if the price in the sealed envelope is equal to this price *C*, you will be asked to pick a ball from an urn containing <u>one green</u> and <u>nine red</u> balls. If you pick the <u>green</u> ball, you will be <u>required</u> to buy at the price from the envelope. If you pick a <u>red</u> ball, you will <u>not</u> be given the opportunity to buy. (If, however, your price level C is the same as your earlier price level A or B, the highest associated purchase probability will apply.) Please enter your price level *C* below:**

***C*: ________**



Panel 4: What if the envelope price ***P*** falls within the range of price points you have indicated before?



- For example, if the envelope price ***P*** corresponds to a 60% probability of purchase, you will be asked to pick a ball from an urn containing **three green** balls and **two red** balls.
    - If you pick a green ball, you will be required to buy at the price in the envelope.
    - If you pick a red ball, you will not be given the opportunity to buy.

(B) *Protocol for Respondents in the BDM Group*

For BDM respondents, there is a single reservation price elicitation question:

Please reveal the price level *A* at or below which you will buy the bar of chocolate. (If the price in the envelope is found later to be lower than or equal to this price *A*, you will be required to purchase at the envelope price. Otherwise you will not be given the opportunity to buy the chocolate. For example, if your indicated price *A* is $100 and the envelope price is $99, you will be required to purchase the product at $99). Please state your price level *A* below:

***A*: ________**

(C) *Protocol for Respondents in the Vickrey Auction Group*

Respondents placed a bid for a bar of *Galler* chocolate after reading the following rules.

- You gain the most by revealing the maximum price you are willing to pay for the product.
- All bids are final. You will not be able to change your bid once the auction is closed.
- We will collect all bids. The winner – to be announced in the next class – will be the highest bidder. If you are the winner, you will be required to purchase the chocolate at the second highest bid. For example, if your winning bid is $100 and the second highest bid is $99, you will pay $99 and receive a bar of chocolate. Please make your bid below:

***Bid*: ________**

(D) *Protocol for Respondents in the Self Explication Groups*

Respondents were asked one of the following questions (depending on the group):

For self explication of floor reservation price:

- Please reveal the maximum price *P* at or below which you will definitely buy the bar of *Galler* milk chocolate at this moment.

***P*: ________**

For self explication of indifference reservation price:

- Please reveal the maximum price *P* at which you would be indifferent between buying and not buying a bar of *Galler* milk chocolate at this moment.

  ***P*: ________**

For self explication of general reservation price:

- Please reveal the maximum price *P* that you are willing to pay for a bar of *Galler* milk chocolate at this moment.

  ***P*: ________**

Table 1

CHOCOLATE STUDY: RESERVATION PRICE ESTIMATES AND PREDICTIVE PERFORMANCE MEASURES

	ICERANGE (N = 134)			*BDM* (N = 128)	*Vickrey Auction* (N = 104)	*Self Explicated* (*Total* N = 196)		
Reservation Price Type	*Floor*	*Indifference*	*Ceiling*			*Floor* (N = 54)	*Indifference* (N = 59)	*General* (N = 83)
Mean [$] (*Standard Error* [$])	2.97 (.14)	3.48 (.17)	4.19 (.21)	2.94 (.15)	3.14 (.27)	2.02 (.12)	2.71 (.42)	2.39 (.16)
Mean Difference [$] (*Standard Error* [$])		.51 [1] (.06)	.70 [1] (.11)					
SCL (*Shift in Choice Likelihood*)		.126 [2]		.180	.307	.315	.337	.339

[1] Significantly greater than zero ($p < .05$)

[2] Significantly less than SCL for BDM ($p < .10$) and for all other methods ($p < .05$)

TABLE 2
CHOCOLATE STUDY: RESPONDENTS' EVALUATION OF METHODS ON KEY DIMENSIONS

Key Dimensions (5-point scale: "1" Strongly Disagree; "5" Strongly Agree)	*ICERANGE*	*BDM*	*Vickrey Auction*	*Self Explicated Floor*	*Self Explicated Indifference*	*Self Explicated General*
(a) Comfort level: I am comfortable in answering questions in this survey	4.38 [1]	4.44	4.32	4.54	4.65	4.51
(b) Clarity of Incentive Compatibility: It is clear to me that I would benefit most by stating my true reservation price.[4]	4.14 [2]	4.34	3.29	N/A	N/A	N/A
(c) Comprehension: The procedure is easy to understand.[5]	3.85 [3]	4.39	4.24	4.73	4.53	4.59

[1] Not significantly different from corresponding measures for the other methods

[2] Not significantly different from the BDM measure but significantly higher than the Vickrey auction measure ($p < .05$)

[3] Significantly less than the corresponding measures for the other methods ($p < .05$)

[4] Adapted from Wertenbroch and Skiera's (2002) question "Is it clear why it is in your best interest to state exactly the price you are willing to pay?"

[5] Adapted from Wertenbroch and Skiera's question "Has this procedure been confusing for you?"

Table 3

CHOCOLATE STUDY: MEASURES OF CONSUMER UNCERTAINTY

Measures (5-point scale: "1" Strongly Disagree; "5" Strongly Agree)	*Rotated factor loadings*	
	Factor 1 [1] (*Preference Uncertainty*)	*Factor 2* [2] (*Knowledge Uncertainty*)
U1: I know exactly what kind of chocolate I want to buy	**.872**	−.033
U2: I know for sure which attributes of chocolate are important to me.	**.676**	.355
U3: I know exactly how much I would like to pay for the chocolate	**.775**	.205
U4: I consider myself a knowledgeable person on chocolate	.320	**.559**
U5: I felt sure of the quality of the chocolate	−.090	**.872**
U6: I felt confident about my answers on the survey	.426	**.565**

[1] Variance explained: 43.2%; coefficient alpha (U1, U2, U3) = .74

[2] Variance explained: 17.9%; coefficient alpha (U4, U5, U6) = .53

TABLE 4

WINE STUDY: RESERVATION PRICE ESTIMATES AND PREDICTIVE PERFORMANCE MEASURES

	ICERANGE (*N* = 41)			*BDM* (*N* = 31)	*Vickrey Auction* (*N* = 19)
Reservation Price Type	*Floor*	*Indifference*	*Ceiling*		
Mean [$] (Standard Error [$])	11.69 (1.69)	13.19 (1.79)	16.61 (2.23)	12.71 (1.22)	11.45 (1.55)
Mean Difference [$] (Standard Error [$])	$\underbrace{\text{Floor–Indifference}}$: 1.50[1] (.48)		$\underbrace{\text{Indifference–Ceiling}}$: 3.42[1] (.67)		
SCL		.08[2]		.29	.21
Respondent Feedback Measures					
1. Comfort level		3.61[3]		3.81	4.16
2. Clarity of Incentive Compatibility		3.59[3]		3.58	3.42
3. Comprehension		3.41[4]		3.65	4.63

[1] Significantly greater than zero ($p < .05$)

[2] Significantly less than SCL for BDM ($p < .01$) and Vickrey Auction ($p < .05$)

[3] Not significantly different from corresponding measure for BDM and Vickrey auction

[4] Not significantly different from corresponding measure for BDM; significantly less than that for Vickrey auction ($p < .01$)

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