Special Session Summary  Consumer Biases in Estimations of Product Quantity, Distance, and Currency Value

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SPECIAL SESSION SUMMARY

Consumer Biases In Estimations of Product Quantity, Distance, and Currency Value

Pierre Chandon, INSEAD
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Consumers regularly perform lower-order quantifying judgments about quantity, distance, and value and biases in these estimations can influence a wide spectrum of consumption and purchase decisions. Errors in inventory estimates can bias in-home consumption decisions and in-store purchase timing and quantity decisions (Chandon and Wansink 2000, Chandon and Wansink 2002). Errors in distance estimation can bias home purchasing, shopping, and traveling decisions (Raghurib and Krishna 1996). Inaccurate evaluations of unfamiliar currencies can influence spending behavior and perceptions of transaction value (Raghurib and Srivastava 2002).

The objective of this special session is to present recent studies showing how all these estimations rely on a reduced number of psychophysical principles (e.g., Stevens’ power law), decision heuristics (e.g., the anchoring and adjustment, the availability, and the numerosity heuristics), and statistical phenomena (e.g., the regression principle). In aggregate, these three papers provide evidence for systematic biases in three important estimation decisions, in-home product inventory level, value of foreign currencies, and length of direct and indirect paths. They also examine the processes, mediating mechanisms, moderators, and boundary conditions of these biases. In doing so, they re-introduce important findings and methods from sensory psychophysics to the consumer research community.

This session first examines the basic foundations of consumer biases in quantifying judgments. Chandon and Wansink’s research, titled “Quantity and Salience Biases in Inventory Estimation,” provides a foundation for this session by developing a quantity-salience model of inventory estimation that builds on sensory psychophysics research, signal detection theory, and the heuristics and biases literature. It doing so, it shows how inventory estimates are systematically biased, how they influence consumption behavior, and how product quantity and perceptual salience influence these estimation biases.

The second research, by Dilip Soman, Klaus Wertenbroch, and Amitava Chattopadhyay, examines the impact of currency numerosity (e.g., high versus low nominal values) on the perceived value of transactions when people are working with unfamiliar currencies (e.g., the Euro). This research nicely complements the first presentation by showing how rescaling the measurement unit by reducing or increasing the nominal value of a quantity influences quantity estimations (e.g., measuring quantity in servings vs. weigh). It also takes into account the impact of rescaling not only on the target evaluation (e.g., the transaction expressed in the new currency), but also on the reference level (e.g., income). The research finds that consumers evaluate the numerosity of the nominal difference between the price of the transaction and the reference standard and not the ratio. This results in underspending when the new (target) currency is less numerous than the original (base currency) and overspending when the new currency is more numerous than the original one.

The third presentation, by Aradhna Krishna, examines the boundaries of estimation biases by studying the extent to which they are automatic or controllable. Her research looks at the direct distance bias, according to which paths with a shorter direct distance between end-points are estimated to be shorter than paths with a longer direct distance (the direct distance of paths varies either due to the angularity between path segments or due to the paths retracing versus being unidirectional). She shows that the retracing bias is not moderated by people’s preference for visual versus verbal styles of processing, but is moderated by their visual ability, such that individuals with higher visualizing ability rely less on direct distance. Her findings also rule out motivation as a control mechanism by showing that both the angularity and retracing biases persist even when people are highly motivated and when they believe that direct distance is an unreliable estimator of actual distance. These results are consistent with those of Chandon and Wansink showing that consumers are unaware of their estimation biases, which explains why they have not been able to learn from their past errors.

INDIVIDUAL PAPER ABSTRACTS

“Quantity and Salience Biases in Inventory Estimation”

Pierre Chandon, INSEAD
Brian Wansink, University of Illinois

Inventory estimations are performed frequently and influence consumption, purchase timing, and purchase quantity decisions. In this research, we examine three questions: 1) How are inventory estimates biased? 2) Do biases in inventory estimation influence consumption? and 3) How do product quantity and perceptual salience bias inventory estimation? Building on the psychophysical literature on quantifying judgments, we propose a quantity-salience model that examines how biases change across different levels of inventory quantity and perceptual salience. In the absence of different pay-offs for different biases (such as overestimating or underestimating), we build an asymmetric quantity-salience model of inventory estimation bias and test it under different contexts in six field studies and lab experiments.

In doing so, a number of conceptual contributions are made. This research extends the psychophysical literature by showing that quantity estimations exhibit an asymmetric contraction bias—whereby low levels of inventory are slightly overestimated and high levels of inventory are strongly underestimated, and that this bias is stronger when products are not perceptually salient. Second, we model the relationship between estimated and actual quantities (as opposed to simply testing for differences at some pre-determined levels using ANOVAs). This enables us to measure the magnitude of the quantity and salience biases for any level of inventory, and not only at a few pre-determined levels and to use model parameters to derive contraction indices enabling comparisons and generalizations across multiple product categories. Third, we provide support for two explanations of the quantity and salience biases. We show that quantity biases can be due to consumers anchoring on average inventory level and failing to adjust, and that salience biases can be caused by the higher availability of perceptually salient products. Finally, we show that consumers are aware of the effects of salience on their estimations (but unable to correct them) and completely unaware of the effects of quantity.

The presentation is organized as follows. We first review the literature on biases in quantifying judgments to derive two competing models of quantity biases (Poulton 1989; Stevens 1986). On the one hand, signal detection theory would predict an expansion bias, i.e., consumers underestimating low inventory levels to avoid stock...
outs and overestimating high inventory levels to avoid overstocking. However, we predict that in the absence of clear payoffs for different types of estimation errors, inventory estimations will exhibit an asymmetric contraction bias, according to which consumers slightly overestimate low quantities and strongly underestimate high quantities. We also predict that the contraction bias will be smaller for perceptually salient products, which are easier to recall.

We test the quantity-salience model of consumer inventory estimation through six studies. The first three studies examine the quantity biases by collecting inventory estimates and actual inventory levels for 23 different products and 344 adult consumers. Study 1 establishes the basic finding of an asymmetric contraction bias with eight product categories. Study 2 replicates the asymmetric contraction bias with eight new categories and 100% response rate. Study 3 further documents the robustness of the asymmetric contraction effect with high non-countable levels of inventory measured in ounces. Study 4 is a field experiment, which shows that people with a tendency to overestimate their inventories consume stockpiled products faster than people who underestimate inventories. Study 5 is a laboratory study, which experimentally manipulates perceptual salience and inventory levels and shows how both internal and external anchors predictably bias inventory estimations. Study 6 examines how salience and quantity bias inventory estimations by influencing, respectively, the likelihood of recalling the product, and the quantity estimates given that the product has been recalled.

―Currency Numerosity Effects on the Perceived Value of Transactions‖
Dilip Soman, University of Toronto
Klaus Wertenbroch, INSEAD
Amitava Chattopadhyay, INSEAD

Market transactions require individuals to make decisions about the monetary value of the goods or services to be exchanged. Shafir, Diamond, and Tversky (1997) showed that people rely on the nominal value of money rather than on its real value when making such decisions. In particular, the face value of an amount of money (in dollars) influenced consumer preferences to a greater extent than the purchasing power of that amount (accounting for interest and inflation). This focus on nominal rather than real value when making economic decisions was described in the economics literature over 70 years ago by Fisher (1928), who coined the term ‘money illusion’ to describe it. The economics literature has focused on delineating possible macro-economic implications of money illusion. The scant experimental research on money illusion has documented its existence and implications (Fehr and Tyran 2001). Less attention has been paid so far to the psychological processes that cause money illusion. Shafir et al. (1997) suggested that money illusion arises because people find it easier to think in nominal rather than real terms. Similarly, Raghunir and Srivastava (2002) proposed that consumers anchor on, and insufficiently adjust for, the face value of foreign prices when they convert these foreign prices into prices in their home currency. Their conceptualization of money illusion in terms of anchoring and adjustment processes applies to comparisons between currencies, subject to an exchange rate.

We attempt to shed more light on the psychological processes, through which money illusion operates in general. We present a theory and evidence of currency numerosity effects on the perceived value of transactions. Numerosity effects occur when consumers use the number of units into which a given stimulus is divided rather than the size of each unit in evaluating quantity (Pelham, Sumarta, and Myaskovsky 1994). In line with standard consumer choice theory, we propose that consumers evaluate transactions vis-à-vis salient reference standards, such as a budget or the price of a competing product. However, consumers deviate from standard theory by evaluating the numerosity of the nominal difference between that reference standard and the price of the transaction in order to estimate the real value of that transaction. We test these predictions in six experiments.

Studies 1 and 2 show that consumer preferences and willingness to pay for products and services that are priced in different currencies depend on the nominal rather than the real value of the posted prices. These results are consistent with our theory but also replicate recent findings by Raghunir and Srivastava (2002). Importantly, we did not vary participants’ nominal budget in studies 1 and 2. To more specifically test the predictions of our theory, studies 3 and 4 then showed that Raghubir and Srivastava’s (2002) effect of the nominal value of prices reverses when budgets are also varied in nominal terms. These findings demonstrate that consumers evaluate transactions in line with the numerosity of the difference between budgets and prices (an approximate measure of their purchasing power), extending previous theorizing on money illusion. Similarly, study 5 showed under incentive-compatible conditions that, holding the real expected value of the bet constant, participants real willingness to bet increases with the numerosity of the difference between nominal budgets and nominal willingness to bet, again contrary to what Raghunir and Srivastava’s (2002) anchoring and adjustment mechanism predicts. Finally, study 6 applied our theory to comparisons of prices of competing products instead of prices and budgets, demonstrating that the perceived price premium of national brands over store brands shrinks the less numerous the nominal difference is between the two types of brands. Specifically, the choice share of national brands vis-à-vis store brands was higher when prices were posted in (less numerous) Euros than in (more numerous) Pesetas.

Our findings add to the fledgling literature on the psychological processes underlying money illusion by providing evidence that consumer evaluations of transactions are driven by the numerosity of the nominal difference between prices and reference standards that are salient in the evaluation context. Our findings qualify the conclusions from existing research about the role of anchoring on the face value of nominal prices in evaluating products in foreign currencies. Our reversal of the effect of numerosity on price perceptions when reference standards are salient suggests that money illusion can be explained within the framework of standard consumer choice theory (e.g., Deaton and Muellbauer 1980). Consumers evaluate transactions against their budget but they assess their purchasing power by judging the numerosity of the nominal difference between prices and budgetary or other reference standards, that is, by the number of units, into which that difference is divided.

―The Automatic and Controlled Components of Visual Perception: Examining Moderators of the Direct Distance Bias‖
Aradhna Krishna, University of Michigan

Visual cues are a highly salient, vivid and strong input to many decisions. On occasion, the use of such visual cues leads to systematically biased judgments. The purpose of this paper is to examine whether such biases are controllable or automatic. We do so by examining the moderating effects of individual differences in visual imagery ability, preferences for visual versus verbal styles of processing, accuracy motivation, and de-biasing on the direct distance bias. The direct distance bias is a perceptual bias based on
visual cues, in which paths with a shorter direct distance between end-points are estimated to be shorter than equally long paths with a longer direct distance.

Given that the use of direct distance as a source of information leads to biased judgments, we identify conditions under which consumers can make more accurate judgments. If the direct distance bias is controllable, then factors such as de-biasing and training, or increasing accuracy motivation should attenuate the use of this heuristic in distance judgments. On the other hand, if the direct distance cue is used as an initial anchor in an automatic manner, then such factors may be ineffective at controlling the bias. Instead, factors that attenuate the attention paid to the direct distance heuristic may be more effective at controlling the bias.

Study 1 investigates the effect of individual differences in visual information processing ability. The study is based on earlier research proposing that chronic imagery vividness may attenuate the effects of vivid and salient information. We look at situations where subjects are given visual/pictorial information, and are asked to estimate distance in feet—a ratio scaled measure with an external accuracy criterion. We find that individual preferences for visual versus verbal processing do not reduce reliance on direct distance as a source of information to make distance judgments. In contrast, individuals with more vivid imagery ability are less likely to be prone to the direct distance bias.

The next two studies examine the role of contextual interventions designed to make subjects disregard the use of direct distance as a source of information. Study 2 examines the role of motivation. Typically, more normative processing of information can be encouraged under higher accuracy motivation conditions, for example, by increasing the stakes involved in making a more accurate decision. However, if one or more of the inputs used to make a decision are used in a non-conscious manner, outside of awareness, then respondents may not consciously be able to reduce their reliance on them. Further, if the use of such inputs is uncontrollable, then respondents may be unable to reduce their reliance on them. We find that the direct distance bias persists even when subjects are highly motivated. This pattern is consistent with the definition of uncontrollability of an effect. If the effect was controllable, higher motivation to be accurate should have led to an attenuation of the effect, even if it persisted in the high motivation condition.

Finally, Study 3 examines whether reliance on direct distance reduces when it is perceived to be an unreliable estimator of distance. Classic de-biasing techniques in the social judgment arena have shown that increasing people’s attention to the biasing nature of a stimulus and encouraging them to use alternate sources of information for making a judgment lead to an attenuation of the bias. Again, this argument presupposes that if the use of the input is outside awareness, bringing it within awareness will lead to normatively appropriate processing. Increasing awareness of the biasing nature of a stimulus on a judgment and encouraging disregard of it should be extremely successful strategies if biases are consciously controllable. If they are uncontrollable, then de-biasing as a strategy may not be effective. We find that the bias persists even when subjects believe direct distance is an unreliable estimator of actual distance. This adds to the evidence that the bias is due to an inability to ignore the perceptually salient direct distance information.

We conclude that the use of direct distance due to its perceptual salience is “automatic,” in as much as it appears to be uncontrollable, except when people are less likely to attend to it—while it can be reduced under some conditions, it is near impossible to eliminate. In the presentation, our three studies will be described, followed by a discussion of theoretical implications of our research.

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REFERENCES


