

## Overpredicting and Underprofiting in Pricing Decisions

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### ABSTRACT

This research examines sellers' price-setting behavior and discovers a naturally occurring mismatch between sellers and buyers: Sellers who make a price decision often consider alternative prices and engage in the joint evaluation mode, whereas buyers who make a purchase decision see only the finally set price and are in the single evaluation mode. This mismatch in evaluation modes leads sellers to overpredict buyers' price sensitivity and underprice their products. However, these effects apply only to products unfamiliar to buyers and without salient reference prices and can be alleviated if sellers are encouraged to mimic single evaluation when making pricing decisions. These propositions are empirically tested and verified. Copyright © 2011 John Wiley & Sons, Ltd.

KEY WORDS evaluability; joint evaluation; preference reversal; prediction error

Suppose that a seller introduces a new product to the market — for example, a new board game, and seeks to set a price so that he or she can maximize his or her profit. Suppose also that the seller has his or her exclusive channel to sell the product, and the product can only be sold at the price he or she sets. Will the price the seller sets be profit maximizing? If not, will it be too high or too low?

Whereas there is a large behavioral literature on how consumers make purchase decisions, less is known about how sellers make price decisions (see Liu & Soman, 2009 for a review). In this research, we examine how sellers set prices and explore when the prices they set fail to maximize profit.

In what follows, we first propose that sellers and buyers are naturally in different evaluation modes. Second, we demonstrate that the difference in evaluation modes can lead sellers to underprice their product and compromise their revenue or their profit. Third, we show that this underpricing effect occurs only for new and unfamiliar products and not for familiar products. Of these three sets of findings, the first one (different evaluation modes between sellers and buyers) is, to the best of our knowledge, a new discovery; the other two findings (the underpricing effect and the familiarity effect) are based on yet extended from the attribute evaluability and the projection-bias literatures.

### DIFFERENT EVALUATION MODES

In our observation, there is a naturally occurring difference between sellers who make pricing decisions and buyers who make purchase decisions. When a seller sets a price, he or she consciously or unconsciously entertains different possible alternative prices and predicts how many potential buyers will buy his or her product at different prices, and

hence, how much profit he or she can extract. He or she may intuitively say to himself or herself, "If the price is too high, nobody will buy my product. If the price is too low, then I will forego some profit." In other words, he or she is in joint evaluation (JE) of alternative prices. In contrast, when a potential buyer decides whether to purchase a given product, he or she encounters only one price, the price set by the seller, and decides whether to buy the product at that price. In other words, he or she is in single evaluation (SE) of one price.

The aforementioned analysis can be summarized as follows, which constitutes our first hypothesis:

*H1* : Sellers who make a price decision engage more in JE of alternative prices than do buyers who make a purchase decision.

A few clarifications are necessary here. First, our proposition that buyers are in SE appears contradictory to existing research findings and casual observations suggesting that consumers engage in price comparison when making purchase decisions. For example, the literature on reference price (Winer, 1986) and transaction utility (Thaler, 1985) indicates that consumers make purchase decisions by comparing the target price with some reference prices. Research by Carmon and Ariely (2000) finds that buyers are more heavily influenced by reference prices (such as list prices) than sellers. Casual observations also suggest that buyers are price conscious and use price-comparison publications such as *Consumer Reports* and price-comparison websites such as NexTag.com to guide their decisions.

Nevertheless, as we will further explain later, our proposition applies to different situations than these observations. We are interested in goods (products or services) that do not have a readily available reference price; these goods typically have the following two characteristics. First, the marketer (or the company) has control over their prices, and retailers have little or no leeway to alter it. Many goods fall into this category. Examples include Apple computers, IKEA

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furniture, admission to Disney World. If you search NexTag.com, either you cannot find the price of these goods or you find little or no price variations. Second, these goods are new, unique, or otherwise highly different from other goods in the category so that the buyers cannot easily relate the prices of these goods to the prices of other goods. Again, many goods share these characteristics. Examples include the artworks of a particular artist, a medicine that treats a special disease, a unique boat tour of a city, a new gadget (such as a GPS system when it was first introduced). In fact, thousands of new products are added to the Global New Products Database every month, although not all the products are eventually successful on the market (<http://www.gnpd.com>). Although occasionally, consumers may still engage in price comparison when shopping for such goods (e.g., tourists may compare the price of a boat tour with the price of a bus tour), such comparisons are indirect (i.e., not comparing alternative prices for the same good, but comparing the price of one good with the price of something else) and uncommon. Whether a consumer will pay for such goods depends largely on how much he or she wants it. In contrast, when sellers price such goods, we believe that they more directly entertain alternative prices for such goods: "Charging how much per person for the boat tour is most profitable, \$30, \$50 or what?"

A second clarification we wish to make is that not all sellers set prices intuitively. If the seller represents a big firm, he or she may conduct systematic market research to find the optimal price. However, even market research firms often use JE to determine prices, for example, to run a conjoint analysis, in which respondents are asked to compare and rank-order alternative products (Green & Rao, 1971; Green & Srinivasan, 1990). Moreover, many sellers represent small companies or are small-store owners who have neither the resource nor the desire to do systematic market research.

Third, there is a distinction between JE of different *products* and JE of different *prices*, although both are value comparisons. Oftentimes, buyers engage in JE of different products at the time of purchase (e.g., Dhar & Nowlis, 2004). For instance, when a buyer shops for a book in a bookstore, he or she faces a multitude of titles and can compare them in JE. However, if the buyer is interested in a particular title and decides whether to buy it, he or she typically sees only one price for that book and is in SE of that price. In this article, when we say that buyers are in SE, we mean that they are in SE of price.

#### UNDERPRICING

The mismatch in evaluation modes between sellers and buyers can lead to a systematic pricing bias: Sellers will price their product too low and sacrifice their profit.

Here is why. According to prior research on evaluation mode (e.g., Ariely, Loewenstein, & Prelec, 2003; van Buiten & Keren, 2009; Chatterjee, Heath, & Min, 2009; Hsee, 1996; Hsee, Loewenstein, Blount, & Bazerman, 1999; Okada, 2005), people in JE of a variable are more sensitive to that variable than people in SE. Moreover, when a person in JE predicts the value sensitivity of someone in SE, the predictor

will fail to put himself or herself in the shoes of the predictee and projects his or her own preference onto the predictee (e.g., Gilovich, 1990; Hsee & Zhang, 2004; Ross, Greene, & House, 1977; Van Boven & Loewenstein, 2003). The phenomenon that people in one state who make a prediction for somebody else or oneself in another state tend to project their preferences in their own state onto the predictee is well documented and is dubbed the projection bias (Loewenstein, O'Donoghue, & Rabin, 2003).

In the context of marketing, we expect sellers in JE to project their own high price sensitivity onto buyers in SE: Sellers may mistakenly believe that buyers are price sensitive because sellers themselves are price sensitive (Figure 1A).

The aforementioned proposition was tested and verified in two pilot studies. In one pilot study, research participants (130 business students from a large university in China) were asked to assume the role of either a seller or a buyer of a herbal medicine that treats minor crab bites. Respondents in the seller condition were given two possible prices for the lotion, either ¥9 or ¥19 for a bottle, and were asked to predict the percentage of potential buyers who would purchase the product at each price without knowing the other price. Respondents in the buyer condition were given the same information about the lotion, either told that it costs ¥9 a bottle or told that it costs ¥19 a bottle (i.e., in SE), and were asked whether to buy it at that price. Notice that in this study, the sellers were experimentally put in the JE condition; namely, they were given two possible prices, and the buyers were experimentally put in the SE condition; namely, they faced only one of the prices. The result revealed a serious overprediction of buyers' price sensitivity by the sellers: On average, sellers predicted that 70% of the buyers would buy the lotion at ¥9, and only 24% would buy it at ¥19 (paired  $t(54)=14.70$ ,  $p<.0001$ ),<sup>1</sup> whereas the buyers were almost as likely to buy the lotion at ¥9 (51%) as at ¥19 (55%;  $\chi^2 < 1$ , not significant (NS)). Further evidence indicates that the misprediction was not due to the role difference between the sellers and the buyers but due to their difference in evaluation modes. When the sellers ( $N=44$ ) were put in the SE mode and given only one of the two prices (either ¥9 or ¥19), their prediction became rather accurate (52% for ¥9 and 56% for ¥19). Conversely, when the buyers ( $N=46$ ) were put in the JE mode and given both prices, their purchase intention became highly sensitive (67% at ¥9 and 30% at ¥19, McNemar test  $p<.001$ ). A potential alternative explanation for the finding is that the quality (utility) of the lotion was not well defined, and those in the SE may have inferred the quality of the medicine from its price.

In the second pilot study (involving 100 business students from a large university in the USA), we used a product whose utility was unequivocal: an upgrade from a regular

<sup>1</sup>We used a  $t$ -test rather than a chi-squared test because each seller made a continuous percentage estimate rather than a yes/no prediction. To test for significance, we calculated a prediction error score for every individual seller. For example, if a seller predicted that 40% of the buyers would purchase a given product whereas in fact only 30% would, then that seller's prediction error was 10%.

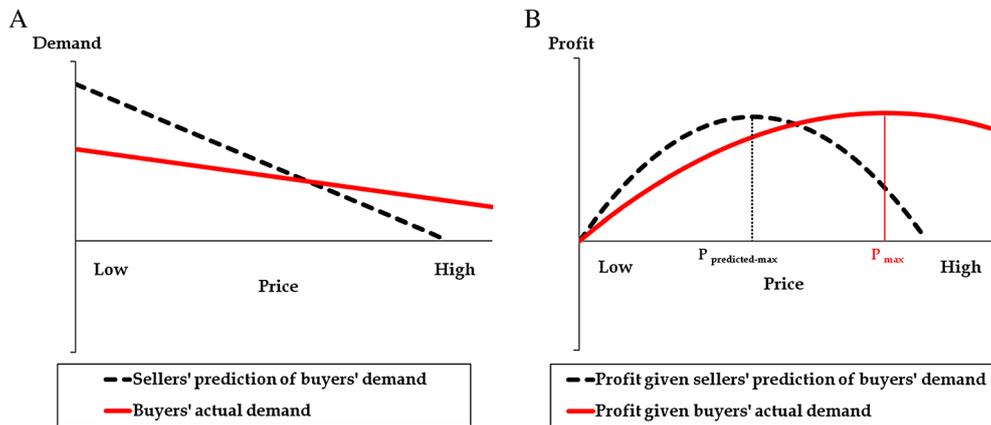


Figure 1. Demand and profit. (A) depicts buyers' demand curve and sellers' prediction of buyers' demand curve and shows that buyers are less price sensitive than sellers would predict. (B) depicts the profit curves derived from the demand curves in (A) and shows that the predicted profit-maximizing price ( $P_{\text{predicted-max}}$ ) is lower than the actual profit-maximizing price ( $P_{\text{max}}$ ). These figures are based on the assumptions that sellers are in JE and buyers in SE, and the product is price inevaluable. See text for what would happen if sellers are in SE or the product is price evaluable

economy-class seat to an economy-class seat with an AC socket on a Chicago–London flight. Some participants were given two alternative possible prices for the upgrade (\$50 or \$75) and were asked to predict the percentage of travelers who would upgrade at each price, and others were shown only one of the two prices and were asked to indicate their willingness to upgrade. Those in JE predicted the likelihood of upgrading to be significantly lower when the fee was \$75 than when the fee was \$50 (12% vs. 29%;  $t(34)=5.18$ ,  $p<.0001$ ), but those in SE were virtually insensitive to price (24% vs. 24%;  $t<1$ , NS).

In summary, the two pilot studies confirmed our proposition that if sellers are in JE and buyers in SE, sellers will overpredict buyers' price sensitivity.

In the main studies we will report later, we do not and cannot directly test the proposition that sellers in JE overpredict buyers' price sensitivity. The reason is that to test that proposition, we have to experimentally give the sellers multiple prices, as we did in the pilot study. But in the main studies, we are interested in how sellers *freely* set prices, and therefore, we cannot experimentally give them multiple prices.

Although the main studies cannot directly show sellers' misprediction, they test for its consequences, and it is these consequences that we are most interested in. One consequence is a relationship between sellers' evaluation mode and the price they set. Specifically, we surmise that even among sellers who freely set prices, some spontaneously engage more in JE than do others. Our theory suggests that those who engage in JE will be more conservative in their price decisions than those who engage in SE.

**H2 :** When setting prices, sellers who engage in the JE mode will set lower prices than sellers who engage in the SE mode.

Because on average, sellers engage more in JE than do buyers, a more serious consequence is that the price sellers

set will be, on average, lower than what buyers are willing to pay, hence lower than what would maximize profit.

**H3 :** The prices sellers set are lower than what would be profit maximizing.

We consider a price as profit maximizing if it maximizes  $P \times D - C$ , where  $P$  is the price,  $D$  (demand) is the percentage (or likelihood) of potential buyers who will buy the product at  $P$ , and  $C$  is the cost of the product. Note that  $P \times D$  indicates revenue. For the sake of simplicity, we will focus on situations where  $C$  is a constant regardless of how many units of the product are sold, and the seller cannot change  $P$  during the sales period. An example of this type of situation is a case where a concert organizer has paid a fixed fee ( $C$ ) for the performers regardless of how many tickets are sold and cannot change the price of the ticket once it is set and publicized. Because  $C$  is a constant under these circumstances, maximizing revenue ( $P \times D$ ) is equivalent to maximizing profit ( $P \times D - C$ ).

Figure 1(A) and (B) explains why sellers underprice; that is, why combining H1 and H2 produces H3. In Figure 1(B), both the solid and the dotted curves are profits, and both are derived from the demand curves in Figure 1(A) by multiplying price with demand ( $P \times D$ ). The demand curve used to calculate the solid profit curve in Figure 1(B) is the "buyers' actual demand" curve in Figure 1(A), and the demand curve used to calculate the dotted profit curve in Figure 1(B) is the "sellers' prediction of buyers' demand" curve in Figure 1(A). Therefore, the solid curve in Figure 1(B) represents what the profit would be at different prices given buyers' actual demand at these prices; in this case, the profit peaks at price  $P_{\text{max}}$ . In contrast, the dotted curve in Figure 1(B) represents what the profit would be at different prices given sellers' prediction of buyers' demand at these prices; in this regard, the profit peaks at price  $P_{\text{predicted-max}}$ . Notice that  $P_{\text{predicted-max}}$  is lower than (i.e., to the left of)  $P_{\text{max}}$ , indicating that seller's predicted profit-maximizing price is lower than the actual profit-maximizing price. This explains why the seller would underprice.

The notion that sellers would ever underprice seems at odds with the well-established endowment effect, suggesting that willingness to buy (the price one is willing to pay for the goods) is lower than willingness to accept (the price one is willing to accept to give up the goods; Thaler, 1980). However, the endowment effect differs from our proposition in several ways. First, the endowment effect is traditionally explained as a result of loss aversion, and experienced marketers and professional sellers do not consider the sale of goods as a loss (e.g., List, 2003, 2004). Second, the endowment effect is about value judgment—how much one values a product when he or she is about to lose it versus when he or she is about to gain it, whereas the effect explored in this research is about strategic pricing—whether the price that sellers strategically set to maximize their profit is too high or too low. Third, in existing studies showing the endowment effect, those who indicate willingness to pay and those who indicate willingness to accept are typically in the same evaluation mode; for example, both are given a list of prices and asked to choose one (Kahneman, Knetsch, & Thaler, 1990). In our experiments as well as in many real-world situations, however, sellers and buyers are in different evaluation modes. It is this difference that is responsible for the underpricing effect.

In addition to the hypotheses proposed earlier, we submit another hypothesis. According to our theory, the reason why sellers underprice is that they engage in JE and fail to adequately put themselves in the shoes of the buyers in SE. Thus, if sellers are encouraged to mimic the SE mode of the buyers, they will be less likely to underprice their product. In other words, empirically manipulating the sellers' thought processes can influence the prices they set. This is our fourth hypothesis:

*H4* : Encouraging sellers to mimic SE will lead them to set higher and more profitable prices.

We now report the studies that tested our hypotheses.

#### STUDY 1 (CAMERA) TESTING H1 AND H2

Study 1 sought to test H1 that sellers and buyers engage in different evaluation modes and H2 that sellers engaging in JE set lower prices than sellers engaging in SE.

#### Method

Participants were 102 executive Master of Business Administration (MBA) students from a large business school in China. Most of them had more than 10 years of business-related experiences. They were assigned to either a seller condition or a buyer condition. Both groups of participants received the same introductions about a newly launched camera called Face Reader. The unique feature of this camera is that it can identify the emotions of the people in the photos it takes.

Participants in the seller condition were told that the cost of the camera could be omitted, that their only goal was to maximize their profit, and that profit could be calculated by

multiplying the price they set by the likelihood that a typical consumer would purchase the camera under that price. They were first asked to set a price that would be most profitable to them and were then (on a separate page) asked to report on their thought process during the price-setting deliberation. They were asked whether they (a) “just came up with a price, thought it is most profitable, and set the price at that level” or (b) “considered various alternative prices, thought that one of them is most profitable, and set the price at that level.” Relatively speaking, choice (a) reflects an SE process and choice (b) a JE process.

Participants in the buyer condition were asked to decide whether they would purchase a Face Reader at ¥3000. (We picked this price because in an informal pre-test interview with different respondents, the median willingness-to-pay price for the camera was ¥3000. This price was not important, because in this study, we were interested only in buyers' thought processes, not in how many buyers decided to buy the camera.) After the buyers made the purchase/not-purchase decision, they were asked to report on their thought process during the decision; they were asked whether they (a) “just read the given price, and decided whether to buy the camera at that price” or (b) “read the given price, considered various possible alternative prices, and decided whether to buy the camera at the given price.” Again, choice (a) reflects an SE process and choice (b) a JE process.

#### Results and discussion

The results confirmed both H1 and H2. Consistent with H1 that sellers engage more in JE than do buyers, 79% of the sellers versus only 44% of the buyers chose the JE-process option ( $\chi^2(1, N=102)=12.17, p<.001$ ). Confirming H2 that engagement in JE leads to lower prices, sellers who reported having engaged in the JE mode set significantly lower prices than sellers who reported having engaged in the SE mode ( $M_s = ¥2159$  vs. ¥3625,  $t(69)=2.22, p<.05$ ).

In summary, Study 1 confirmed the proposition that sellers and buyers naturally engage in different evaluation modes and that among sellers, those who engage in the JE mode set lower prices.

#### STUDY 2 (PHOTO) TESTING H3 AND H4

Whereas Study 1 only showed that the prices set by sellers in the JE mode were lower than prices set by sellers in the SE mode, Study 2 sought to show that the prices set by sellers were less than profit maximizing (H3). In addition, whereas Study 1 elicited sellers' self-reported evaluation mode, Study 2 empirically encouraged sellers to engage in JE or simulate SE and sought to show that the manipulation can influence the prices they set (H4).

In particular, we asked sellers to either engage in JE, or to simulate SE, or neither (i.e., let them freely set a price). According to our previous analysis and the finding of Study 1, sellers who freely set prices would spontaneously (i.e., by default) engage in JE. Therefore, we predicted that those in the free-pricing condition would behave similarly to those in

the JE-encouraged condition and that both groups would underprice the photo. However, if sellers are explicitly encouraged to simulate SE, they are more likely to empathize with the buyer and be more accurate. Therefore, we predicted that those in the SE-encouraged seller condition would set a higher price than participants in both the control and the JE-encouraged seller conditions.

The study had two other noteworthy features. First, all the participants had real marketing experiences. Second, the study entailed real consequences: Sellers had an opportunity to receive proceeds from the sales, and buyers had to pay the price if they decided to buy the target product.

## Method

The study consisted of two phases, the seller phase and the buyer phase. In the seller phase, we elicited prices from sellers; in the buyer phase, we provided buyers with the elicited prices. In what follows, we describe the two phases in turn.

### *The seller phase*

Participants in this phase were 122 executive MBA students who were recruited from a large business school in China and answered “yes” to our screening question, “Have you had any marketing or sales experience?”

The participants were randomly assigned to one of three conditions: control, JE encouraged, and SE encouraged. In all the conditions, the participants were presented with a 10-inch artistic photo and were told that it was taken by an amateur photographer. They were instructed to assume the following. First, there were 50 free copies of this photo; second, somebody would sell these copies at a fixed price to a group of 50 other executive MBA students from their school, and tell those 50 students that each student could buy only one copy and that they could not buy it from anywhere else; third, any unsold copies would have no value and have to be destroyed. The participants were then asked to set a price (per copy) so as to maximize sales profit. They were told that we would randomly pick the price of one of them, sell the photos at that price, and give the proceeds to that person.

In the control seller condition, the participants did not receive any additional instructions. In the JE-encouraged condition, before deciding on a price, the participants were instructed to come up with and list “several possible prices.” We provided them with four lines on the questionnaire, suggesting that they should list four prices, which, indeed, was what most participants did. After having listed these prices, the participants were asked to compare them, to predict how many of the 50 potential buyers would buy the photo, and how much profit they could accrue under these different prices.

In the SE-encouraged condition, prior to deciding on a price, the participants were instructed to come up with and write down “one possible price” to predict how many of the 50 potential buyers would buy the photo, and how much profit they could accrue at that price. The participants were

reminded that the potential buyers could see only that price. After having made the estimates, the participants were asked to generate and list “another possible price” and to make the same estimates as with the first possible price. We repeated these instructions four times, suggesting that they should repeat the procedure four times, which, indeed, was what most participants did. It should be noted that the SE-encouraged condition was not an SE condition. In this condition, as in the other seller conditions, the participants may also have considered multiple alternative prices. However, by asking the participants to focus on one price at a time and estimate the corresponding demand and profit and by reminding them that the potential buyers could see only that price, we believe that the participants were more likely to put themselves in the shoes of the potential buyers and stimulate SE.

### *The buyer phase*

Participants in this phase were 103 executive MBA students recruited from the same school as the participants in the seller phase. They were randomly assigned to two conditions: low price and high price. In both conditions, the participants were presented with the same photo, given the same information about it as were the sellers, told that each person could buy only one copy and that they could not buy it from anywhere else, and asked whether they would buy it at a given price. They were reminded that if they said yes, they had to pay that price.

In the low-price buyer condition, the given price was ¥20; in the high-price buyer condition, it was ¥50. These two prices were derived from the responses in the seller conditions. Specifically, ¥20 was the median price set by both the participants in the control (free pricing) seller condition and the participants in the JE-encouraged seller condition, and ¥50 was the median price set by the participants in the SE-encouraged seller condition (see later for details).

## Results and discussion

We had two predictions for the study, one derived from H3 and one from H4. From H3, we predicted that prices set by sellers in the control condition (who freely set prices) would be lower than what would be profit maximizing. From H4, we predicted that the prices set by sellers in the SE-encouraged condition would be higher than the prices set in either the control or the JE-encouraged condition.

For ease of exposition, we report our analysis regarding the second prediction first. We compared the prices set by the participants in the three seller conditions. As expected, the prices set by the SE-encouraged sellers (median=¥50.00; mean=¥59.40) were significantly higher than both the prices set in the control condition (median=¥20.00; mean=¥28.54;  $t(65)=2.17, p<.05$ ) and the prices set in the JE-encouraged condition (median=¥20.00; mean=¥29.12;  $t(68)=2.11, p<.05$ ). Also, as expected, the prices set in the control seller condition were not significantly different from the prices set in the JE-encouraged seller condition ( $t<1$ , NS), indicating that sellers who freely set the prices behave

similarly to sellers who engage in price comparison (JE). (The prices generated by the participants in these conditions were highly skewed and contained some extremely high values, such as ¥5000. In our significance tests, we excluded responses more than 3 standard deviations from the original mean in each condition. However, these extreme values did not affect the medians, and it was the median prices that we were most interested in and we utilized in the subsequent buyer phase.)

We now report the analysis regarding our first prediction—that the prices set by the sellers in the control condition were less than profit maximizing. In this research, we are not interested in pinpointing exactly what the profit-maximizing price is; we are only interested in relative underpricing. Thus, to show that the sellers underpriced their product, we only needed to show that there existed a price that was higher than the one the sellers set and was more profitable. Specifically, we compared the profits from the low-price buyer condition, where the price was derived from the control and JE-encouraged seller condition, with the profits from the high-price buyer condition, where the price was derived from the SE-encouraged conditions. If our prediction was correct, profits in the high-price buyer condition should be higher.

To compare the profits between the two buyer conditions (low price versus high price), let us first examine the percentage of potential buyers in each condition who opted to buy the photo. In the low-price condition, the percentage was 41%; in the high-price condition, it was 33%; and the two were not significantly different ( $\chi^2 < 1$ , NS). To calculate profit per potential buyer, we multiplied the percentage in a given condition with the price of that condition. (We could not compare the total profits between the two buyer conditions because the number of participants in the two conditions was slightly different, with  $n=51$  in the low-price buyer condition and  $n=52$  in the high-price buyer condition). As predicted, profit per potential buyer in the high-price buyer condition was significantly higher than that in the low-price buyer condition (¥16.35 vs. ¥8.24;  $t(102)=2.59$ ,  $p < .05$ ). In other words, the price set by the sellers in the control seller condition and used in the low-price buyer condition (i.e., ¥20) was too low.

In summary, Study 2 supported our hypothesis that sellers underprice products, and it did so by using the participants with real marketing experience and involving real financial consequences. Moreover, Study 2 empirically manipulated the underlying mechanism—the evaluation mode of the sellers and found that sellers who intuitively set prices behaved similarly to sellers encouraged to engage in JE but that both groups made significantly less profit than sellers encouraged to simulate SE. These results attest to the importance of evaluation modes in pricing decisions. At the same time, they also suggest that prompting sellers to simulate SE can be a useful debiasing mechanism.

#### PRICE EVALUABILITY AS A MODERATOR

The underpricing effect occurs only for goods that do not have a readily available reference price and not for goods that have a readily available reference price.

Why is that the case? According to our theory, the underpricing effect arises because the buyers are less price sensitive than the sellers. If the buyers are as price sensitive as the sellers, the sellers will not underprice.

Price sensitivity is multiply determined. For example, price sensitivity depends on consumer income and personal taste. The price of a baby formula has a greater effect on its demand among low-income parents than among high-income parents. Ferrari fans would buy an autographed Michael Schumacher Formula One cap regardless of its price, whereas non-fans would buy it only if it was cheap enough. Price sensitivity also depends on the nature of the goods (whether it is functional or hedonic) and social context (whether the goods will be consumed alone or with others; Wakefield & Inman, 2003).

Here, we focus on another determinant of buyers' price sensitivity—price evaluability. The price evaluability of goods refers to the extent to which potential buyers have reference price information (e.g., mean price, price range, price variance) for the given goods or their related goods. For most grocery shoppers, the price evaluability of chicken eggs is higher than that of quail eggs.

On the basis of prior research showing that attribute sensitivity depends on attribute evaluability (González-Vallejo & Moran, 2001; Hsee, 1998; Hsee & Zhang, 2010; Hsee, Yang, Li, & Shen, 2009; Morewedge, Kassam, Hsee, & Caruso, 2009; Okada, 2005; van Buiten & Keren, 2009; Yeung & Soman, 2005), we propose that if the price of goods is evaluable, buyers' price sensitivity will be high, and if the price is not evaluable, their price sensitivity will be low. For instance, most grocery shoppers would find the price of chicken eggs more evaluable than the price of quail eggs. Thus, the shoppers will be more price-sensitive to chicken eggs than to quail eggs. In other words, the price of chicken eggs will have a greater impact on the shoppers' willingness to buy chicken eggs than the price of quail eggs on their willingness to buy quail eggs. It is interesting to note that chicken eggs are usually considered more necessary in everyday life than quail eggs, and they should entail lower price sensitivity. But because quail eggs are less price evaluable, buyers may well be less price sensitive to quail eggs.

For ease of expression, we refer to products whose prices are highly evaluable to buyers as *price-evaluable products* and products whose prices are not highly evaluable as *price-inevaluable products*.

In the previous sections of the article, we focused only on price-inevaluable goods. For price-evaluable products, buyers will behave differently. Specifically,

*H5* : Buyers are more price sensitive toward price-evaluable products than toward price-inevaluable products.

For price-evaluable goods, both sellers and buyers are price sensitive. Therefore, sellers will not exhibit the projection bias discussed earlier. Sellers will not mispredict buyers' price sensitivity and will not underprice. Thus, we have the following hypothesis, which can be viewed as a qualification to H2 (that the price sellers set is too low):

*H6* : Sellers are less likely to underprice their product if its price is evaluable to buyers than if it is inevaluable to buyers.

*H5* and *H6* can also be represented graphically. In current Figure 1(A) and (B), the solid curves are for price-inevaluable goods only. For price-evaluable goods, the solid demand curve in Figure 1 would be steeper, reflecting greater price sensitivity, which is *H5*. Consequently, the corresponding solid profit curve in Figure 1(B) would shift leftward, rendering  $P_{max}$  closer to  $P_{predicted-max}$ , which is *H6*.

We now report a study that tested *H5* and *H6*.

STUDY 3 (LECTURE) TESTING *H5* AND *H6*

Whereas studies 1 and 2 focused on price-inevaluable products, Study 3 included both price-inevaluable and price-evaluable products and sought to test *H5* (that buyers are less price sensitive for price-inevaluable products than for price-evaluable products) and *H6* (that the price sellers set is less profit maximizing for price-inevaluable products than for price-evaluable products).

Method

This study consisted of two phases: the seller phase and the buyer phase. We first elicited prices during the seller phase and then used the elicited prices during the buyer phase. We describe the two phases in turn. In this study, we did not manipulate evaluation modes; all prices were set freely as they typically are in reality.

The seller phase

Participants in this phase were 103 college students recruited from a large urban university. They were assigned to one of two conditions: price inevaluable and price evaluable. In both conditions, the participants were asked to imagine that a famous chef would deliver a cooking lecture at their university, that entrance to the lecture required a paid ticket, and that their task was to set the price of the ticket so as to maximize the chef's profit. In the price-inevaluable condition, the participants were not given any reference price for the lecture. In the price-evaluable condition, they were told that the ticket price of a similar cooking lecture at another university was ¥15. This price was actually the median of the prices set by the sellers in the price-inevaluable condition; thus, it was an "unbiased" price, not influenced by other reference prices.

The buyer phase

Participants in this phase were 376 college students recruited from the same university as the participants in the seller phase. They were randomly assigned to one of six conditions that constituted a 2 (price: inevaluable versus evaluable) × 3 (price: low versus sellers' versus high) factorial design. In all the conditions, the participants were given the same information about the cooking lecture as were the participants in the seller condition, and their task was to indicate their likelihood to attend the lecture on a 4-point scale ranging from 1 ("definitely no") to 4 ("definitely yes").

Like the sellers, the buyers in the price-inevaluable condition were not given any reference price information about the cooking lecture, and the buyers in the price-evaluable condition were told that a similar lecture at another university cost ¥15. In each of these conditions, the participants were given one of three prices: sellers' price, low price, and high price. In the sellers'-price condition, the participants were given the median price set by the sellers in the corresponding evaluability condition, and it happened to be ¥15 in both the low-evaluable and price-evaluable conditions. In the low-price condition, the participants were given a lower price than the sellers': ¥10. In the high-price condition, they were given a higher price than the sellers': ¥20. We included these different prices to see whether the price set by the sellers was profit maximizing.

Results and discussion

We had two predictions for the study. One was that buyers were less price sensitive in the price-inevaluable condition than in the price-evaluable condition (as derived from *H5*). The other was that the price the sellers set was less profitable in the price-inevaluable condition than in the price-evaluable condition (as derived from *H6*). Specifically, in the price-inevaluable condition, the price the sellers set (¥15) would be less profitable than the higher price (¥20) and more profitable than the lower

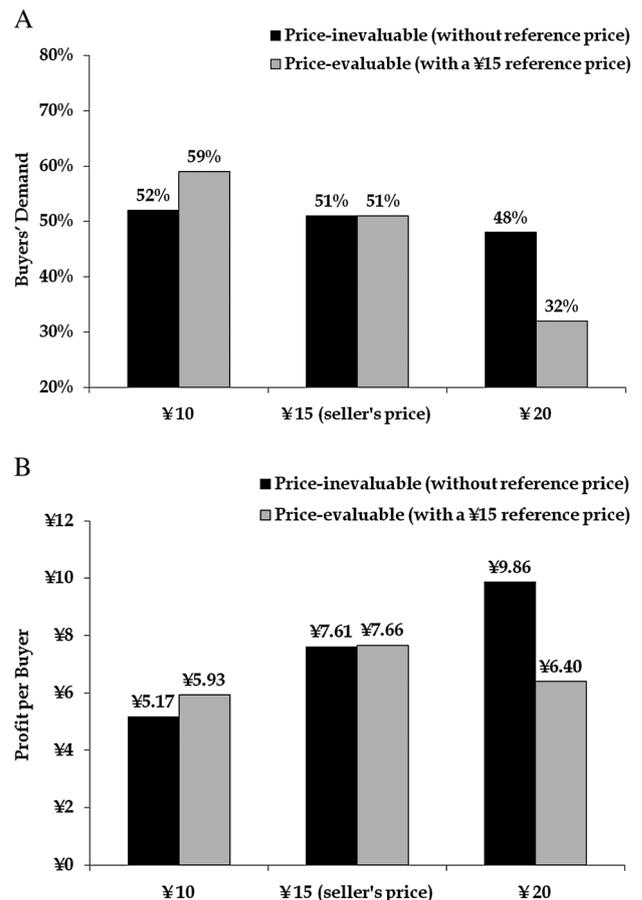


Figure 2. (A) Buyers' demand at different price levels in Study 4. Buyers were less price sensitive in the price inevaluable than in the price-evaluable condition. (B) Expected profits at different price levels in Study 4. For price-inevaluable products and not for price-evaluable products, sellers could make more profits if they set a higher price than they actually do

price (¥10), indicating that the price set by the sellers was too low. In the price-evaluable condition, the price the sellers set (also ¥15) would be at least as profitable as the high price (¥20), indicating that their price was not too low.

We first examine the findings pertaining to the first prediction, as summarized in Figure 2(A). The *y*-axis in the graph is buyers' demand, namely their likelihood of purchase. To calculate likelihood, we converted the original likelihood ratings (on the 4-point scale) into percentages, with 1 converted to 0%, 2 to 33%, 3 to 67%, and 4 to 100%. To test the prediction, we performed a 3 (price: low versus sellers' versus high)  $\times$  2 (evaluability: low versus high) analysis of variance on buyers' demand and found a significant 3  $\times$  2 interaction effect ( $F(2, 370)=4.45, p<.05$ ). Supporting H5, the buyers were indeed less price sensitive in the price-inevaluable condition than in the price-evaluable condition. Further analyses revealed that in the price-inevaluable condition, buyer demand was virtually flat across the three price levels ( $F<1, NS$ ), whereas in the price-evaluable condition, it sharply declined as the price increased ( $F(2, 201)=13.45, p<.001$ ).

We now turn to our second prediction, regarding profit. Figure 2(B) summarizes the findings. In the figure, the *y*-axis is "profit per potential buyer." We calculated profit per potential buyer by multiplying the potential buyers' likelihood to attend the lecture at a given price by that price. Thus, if in a given condition the mean likelihood to attend the lecture was 50% and the price was ¥10, then the profit per potential buyer in that condition would be ¥5. To test our second prediction, we performed a 2 (price: seller's price versus high price)  $\times$  2 (evaluability: low versus high) analysis of variance on profit per potential buyer and found a significant 2  $\times$  2 interaction effect ( $F(1, 272)=5.97, p<.05$ ), indicating that in the price-inevaluable condition but not in the price-evaluable condition, sellers could have garnered more profit had they set a higher price than they did.

To further test our theory, we examined the effect of price on profits separately for the price-inevaluable condition and for the price-evaluable condition. In the price-inevaluable condition, the sellers' price generated more profit than the low price ( $t(114)=2.96, p<.01$ ) but less profit than the high price ( $t(130)=2.96, p<.05$ ), indicating that the sellers' price was too low. In the price-evaluable condition, the sellers' price generated more profit than both the high price (although not significantly,  $t(142)=1.31, NS$ ) and the low price ( $t(128)=2.48, p<.05$ ), indicating that the sellers' price was optimal. These results lent support to H6.

In summary, whether the buyers were sensitive to the price of goods depended on whether they had reference price information. That finding per se was not interesting. What is interesting about the result is that even though the sellers were informed about whether the buyers knew the reference price not, the sellers did not incorporate that information in their pricing decisions. In other words, we manipulated the reference price information in both the seller and buyer conditions, but it affected the buyers more than it affected the sellers. Consequently, for products without clear reference prices (e.g., new and unfamiliar products), the sellers tended to underprice and forgo profit.

## GENERAL DISCUSSION

This research generates both theoretical and practical implications. Theoretically, it enriches our understanding of how behavioral factors influence pricing decisions (e.g., Chernev, 2003; Nunes & Boatwright, 2004). In their recent review, Liu and Soman (2009) identified three such factors: mental accounting, background information, and processing fluency. This research focuses on evaluation modes and evaluability. In particular, it discovers a naturally occurring difference between sellers and buyers: Sellers engage in JE when making price decisions, and buyers are in SE when making purchase decisions. It shows that this mismatch can lead sellers to underprice their products and sacrifice profit. Finally, it identifies price evaluability as a determinant of buyers' price sensitivity and demonstrates its moderating role in sellers' tendencies to underprice their products.

This research should not be confused with the work of Hsee, Dubé, and Zhang (2008), which also studies inconsistencies between pricing and purchasing behaviors. When real estate developers set prices for newly built apartments, they usually assigned lower prices to less attractive units (e.g., units on low floors) so that these units could sell at least as fast as more attractive units, yet the developers usually failed to discriminate the prices of the different units enough and consequently the less attractive units still sold more slowly. Hsee et al. (2008) considered this phenomenon a manifestation of the prominence principle (Tversky, Sattath, & Slovic, 1988)—that developers are in a matching mode when setting prices, whereas buyers are in a choice mode when deciding which unit to purchase and that the buyers (choosers) weighed quality of units (the most prominent dimension) more heavily than the developers (matchers). Although both the real estate research and this research explore discrepancies between sellers and buyers, the two streams are qualitatively different. The real estate research is concerned with relative weight between two dimensions (price and quality), and this work is concerned with the slope of a single dimension (price). In the real estate research, the inconsistency between sellers and buyers is due to their difference in response mode—matching versus choice, and in our research, the inconsistency is due to their difference in evaluation modes—JE versus SE.

Practically, our research offers a set of concrete recommendations for sellers who seek to maximize their profits: They should set a higher price for price-inevaluable products than what they would do intuitively. To find out exactly how high the price can be, marketers should estimate consumers' purchase intention by putting potential consumers in SE, namely by giving each respondent only one price and asking him or her whether he or she would buy the product at that price and thereby determine the profit-maximizing price. This strategy is particularly important when a firm introduces a novel product, such as a phone that transmits smell, and has control over its price so that vendors cannot easily lower the price, and buyers do not have readily available reference prices with which to compare the given price.

Besides the reasons we have put forth so far, setting a high price for price-inevaluable products entails two other benefits that we have not studied in this research

but are pertinent for prescriptive purpose. One benefit is a price-as-cue-for-quality effect. Of most price-inevaluable products—for example, new products and one-of-a-kind products—not only is price difficult to evaluate, quality is also difficult to evaluate. For such a product, buyers may use its price as a cue to infer its quality. Another benefit is a spillover effect. If buyers consider the quality of one price-inevaluable product as high, they may also consider the quality of other price-inevaluable products carried in the same store or manufactured by the same company as high.

The notion that price may serve as a cue for quality is not new and has been studied extensively (e.g., Huber & McCann, 1982; Kirmani & Rao, 2000; Milgrom & Roberts, 1986; Rao, 2005; Scitovsky, 1944/1945; Shiv, Carmon, & Ariely, 2005).

However, our discussion here extends the existing literature in two directions. First, as discussed, we believe that the price-as-cue-for-quality effect can spill over from the cue product to other related products. Second, we predict that the price-as-cue-for-quality effect will apply more to price-inevaluable products than to price-evaluable products. For price-evaluable products, we posit that price will likely serve as a cue for how fair and how good the price of the target product as well as the prices of related products are.

In sum, the analysis earlier suggests the following hypothesis: the price of a price-inevaluable product largely serves as a cue for how good the *quality* of related products is, whereas the price of a price-evaluable product largely serves as a cue for how good the *prices* of related products are.

This proposition has been tested and confirmed in a recent study involving 101 college students from a large university in the USA. The study consisted of 2 (price: low versus high) × 2 (evaluability: low versus high) between-participants conditions. In all of the conditions, respondents were asked to imagine that they happened to enter a newly opened clothing store, and the store carried a new brand of golf shirts (the cue product). Half the respondents were told that the price of the shirts was \$15 each (low price), and the other half were told that the price was \$60 (high price). Within each price condition, half the respondents were told that the same shirts were sold at \$30 each in a nearby department store (high price evaluability), and the other half were not given this information (low price evaluability).

The participants were then asked three questions about their impression of the clothes the store carried in general (not just the golf shirts): (i) how high the quality of those clothes was (1=poor; 2=average; 3=good); (ii) how good the prices of those clothes were (1=bad; 2=average; 3=good); and (iii) how much they were willing to shop in the store in general (0%=definitely not; 100%=definitely yes). The order of the questions was randomized.

The results supported our proposition. First, the participants perceived the quality of the clothes the store carried in general as higher when the price of the golf shirt (the cue product) was high than when it was low ( $M=1.91$  vs.  $2.42$ ,  $t(100)=4.66$ ,  $p<.001$ ), and this effect was significantly stronger when there was no reference price for the golf shirt than when there was ( $F(1, 100)=3.99$ ,  $p<.05$ ). Second, the participants perceived the prices of the clothes in general as worse when the price of the golf shirt was high than when it

was low ( $M=1.25$  vs.  $2.72$ ,  $t(100)=17.07$ ,  $p<.0001$ ), and this effect was significantly more pronounced when there was no reference price for the golf shirt than when there was ( $F(1,100)=22.76$ ,  $p<.0001$ ). Third, in terms of purchase intention, when there was no reference price for the golf shirt, the participants were more willing to shop in the store when the price of the golf shirt was high than when it was low ( $M=17\%$  vs.  $35\%$ ,  $t(52)=2.30$ ,  $p<0.05$ ), but when there was a reference price for the golf shirt, the participants were *less* willing to shop in the store when the price of the golf shirt was high than when it was low ( $M=70\%$  vs.  $18\%$ ,  $t(45)=5.83$ ,  $p<.001$ ; two-way interaction,  $F(100)=36.35$ ,  $p<.0001$ ).

The prescriptive implication of these findings for profit-seeking sellers is as follows: They should set the price of a cue product high if buyers have little reference price information for the cue product, and they should set the price of the cue product low if buyers have rich reference price information for it.

There is a caveat to this recommendation, though. If sellers set too low a price for a price-evaluable product, they will not be able to make any profits. However, in many cases, what the seller cares about is not the profit from the cue product per se (e.g., the golf shirt in the study described earlier) but from its related products (e.g., jackets, coats in the store). Thus, our recommendation still holds: Even though setting a low price for a price-evaluable cue product may prevent the seller from making a profit from that product per se, it may still increase their likelihood to make a profit from its related (and possibly bigger ticket) items.

In real life, sellers do not always follow the recommendation we proposed earlier. For example, hotels often charge a very high price for price-evaluable products such as Coca-Cola and wireless Internet service. If our theory is correct, we suggest that hotels should charge a high price for price-inevaluable products, such as imported wines and exotic massages, and charge a low price or no price for price-evaluable products, such as familiar drinks and wireless Internet service. This way, buyers will perceive the quality of the hotel as high and its price as fair.

Obviously, in the aforementioned analysis, we are only concerned with the profitability of the seller and not concerned with the welfare of the buyer or the ethicality of this strategy. Although the latter issues are beyond the scope of this research, they deserve to be seriously considered in practice.

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