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**Estimating the Effect of the Order of Information Revelation on Purchases:
Expectations and Subjective Experience in the Wine Market**

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*Selected Paper prepared for presentation at the American Agricultural Economics
Association Annual Meeting, Orlando, FL, July 27-29, 2008.*

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Recent research on consumer behavior has indicated that, contrary to most models in economics, information can affect consumers' subjective experience with a good. When consumers receive information about the quality of a good before experiencing the sensory characteristics of the good, the consumers' stated preferences for the goods have been affected. However, a study has yet to examine whether this affects consumers' purchasing decisions, or is limited to stated preference. This field experiment looks at the release of appellation information prior to and after tasting of wine, and uses sales of the two wines tasted as a dependent variable.

In economic models of consumer choice, the role of information about a product is potentially germane in two ways: it may refine the consumer's assessment of the product set, and/or it may enter as a utility-bearing input itself (e.g. one might value the Napa Valley appellation attached to a bottle of wine for the prestige that accompanies it). The introduction of information should be a-temporal and independent of order. It ought not to matter whether a consumer receives information about the contents of a product before tasting or after; according to theory, their valuation of the product should be the same.

Since utility is based on the consumption of goods, the way consumers interpret their experiences with goods is an underlying component of the utility generating process. In psychology, the quality of an experience is thought to be influenced by both bottom-up and top-down processes. Bottom-up processes represent the interpretation of the intrinsic attributes of the good by the sensory organs, and correspond to the subjective, or experienced, utility derived from consuming that good. Top-down processes are the framework of beliefs, expectations, and desires constructed by the extrinsic qualities of a good. Top-down processes reflect the utility derived from extrinsic attributes, dealing with reputation or signals of quality.

A considerable literature examining the influence of bottom-up and top-down processes on subjects' experiences has developed. Biederman (1972) and Palmer (1975) provided evidence that the process of visual perception combines both prior conceptual structures and attributes of the visual stimulus itself. Expectations of a person's abilities, in addition to objective measures of performance affect assessments of his/her abilities (Darley and Gross

1983, Goldin and Rouse 2000, Jones et al. 1968). For extended events (e.g. health and well-being), Brief et al. (1993) and David et al. (1997) found that the quality of one's experiences, and the interpretation of those experiences, determined people's subjective liking. Klaaren, Hodges, and Wilson (1994) reported that enjoyment of a film is influenced by expectations of the film's quality, by its true quality, and by the conditions under which it was viewed. Even memories are subject to the influence of top-down processes—what the individual felt should have happened—in addition to what actually happened.

Food and drink have proven to be a useful medium for these types of studies, and a number of authors have undertaken studies to examine the effects of intrinsic and extrinsic information on participants' reported liking of a good. Makens (1965) found that turkey meat is liked better if thought to be from a popular brand than from an unpopular brand; Perrier was preferred by consumers to Old Fashioned Seltzer when consumed with labels, but not otherwise (Nevid 1981); beer-drinkers' preferences for their favorite brands disappeared when samples were tasted blind (Allison and Uhl 1964); Olson and Dover (1978) examined consumers' evaluation of bitter coffee and found that consumers perceived the coffee as being less bitter if that idea was repeatedly reinforced. Bowen et al. (1992) and Wardle and Solomons (1994) observed differences in stated liking and consumption of dairy products depending on whether it was labeled as high fat or low fat. Examining the effects of top-down and bottom-up processes separately, Vigne and Gergaud (2007) found that consumers' preferences for champagne differed significantly when they stated their preferences based on extrinsic information only (producer name, expert opinion) versus intrinsic information only.

An extension of this literature has used functional magnetic resonance imaging (fMRI) to examine activity in the brain when subjects are exposed to different stimuli. McClure et al.

(2004) found that providing information about the brand of cola (Coke versus Pepsi) delivered to participants in an fMRI study recruited additional areas of the brain versus when the cola was delivered blind. In the blind condition, preferences were predicted by relative activity in the ventromedial prefrontal cortex (VMPFC); in the informed condition, the hippocampus, the dorsolateral prefrontal cortex (DLPFC), and the mid-brain were also active, particularly when the brand was revealed to be Coca-Cola. The authors interpreted these results as suggesting that the VMPFC functioned independently from the hippocampus, DLPFC, and midbrain, and that the two systems represent different processes affecting a subject's preferences for the product. A recent study by Plassman et al. (2008) indicated that even with access to the intrinsic characteristics of a product—in this case, wine—participants in an experiment evaluated the same wine much more positively when it was reported to the participants to be a wine retailing for \$90 per 750ml than when told that the wine sold for \$10 per 750ml. Additionally, brain scans taken of the participants while tasting the wine showed that reporting a higher price led to higher activity in the medial orbitofrontal cortex (MOFC), an area of the brain active during experienced pleasure. Gal et al. (2007) reported on three experiments that found evidence that peripheral perceptual systems (for a specific product type) may, surprisingly, influence the primary perceptual mode. For instance, it was found that participants who sampled mouthwash poured from sharp-edged bottles found the mouthwash to be more acidic than those who tasted mouthwash poured from round-edged bottles.

The question of how extrinsic and intrinsic information contribute to shaping stated preference remains. Do consumers value the extrinsic information itself (e.g. enjoy drinking Coca-Cola with the label more than un-labeled Coca-Cola)? Does the extrinsic information focus consumers' attention? Or does the extrinsic information interact with intrinsic information

to alter consumers' experiences? Hoch and Ha (1986) examined the effect of exaggerating the quality of JC Penney shirts before and after participants had examined the shirts, but before the participants had reported their impression of the shirts. Exaggerating the quality of the shirts before examination led to participants spending more time examining the shirts, and higher overall quality perceptions of the shirts, implying that part of the effect of extrinsic information may be to reallocate consumers' attentions.

Lee et al. (2006) wanted to see if extrinsic information could actually affect consumers' experiences with the good. They used three experimental treatments to examine that question. First, in the blind treatment, a group of consumers tasted two beers (a commercially available beer, and that same beer spiked with a small amount of balsamic vinegar) and reported their preferences without being informed of the differences between the two beers; in the before condition, a separate group was told of the difference before they tasted the two beers, and were then asked to submit their preferences; in the after condition, participants tasted the two beers, were told of the difference, and then reported their preferences. They found that consumers' evaluation (in terms of stated liking) of beer versus the same beer spiked with balsamic vinegar depended significantly on the order in which consumers received the sensory information (by tasting the beer) and information on the ingredients. Consumers who learned of the difference before tasting the two beers reported liking the balsamic-spiked beer significantly less than those who received the ingredient information after tasting the beer and those who did not receive the information.

While these studies may lead to questions about the basic roles of information and innate product attributes in consumer choice, thus far, these studies have focused solely on "pleasure-based", hedonic ratings, such as stated preference or liking. None of these studies has examined

whether a change in the order of information revelation will lead to a change in purchase decisions. Just as these minor changes in order affect the way participants in the experiment experience a product, there may be differences between stating a hedonic rating and being willing to pay one's own money for a good. Even the use of hypothetical valuation decisions has inspired a great deal of debate in the economic literature, from the earliest elicitation of consumer choice in a non-binding scenario (Thurstone 1939, Wallis and Friedman 1942), to attempts to value non-market goods (see for instance Diamond and Hausman 1994).

Without real consequences to decisions, it is felt—or at least recognized as a potential outcome—that the responses to hypothetical questions will suffer from bias. There are a number of papers that investigate hypothetical bias, including List (2001), who examines the difference between stated (hypothetical) and actual willingness to pay (WTP) for sports cards, and Lusk (2003), who examines WTP for Golden Rice in hypothetical and real scenarios. Both authors find statistically significant differences between hypothetical and actual WTP. Since there is evidence that the salience of the decision matters, it remains to be seen whether the informational order effects found in hedonic rating questions would hold in a market setting.

A second issue with sensory science hedonic rating studies is that the treatments lack a commonality that would allow inter-treatment comparability. Even if people prefer the low reputation good to the high reputation good when consumed blind, it is not clear how the utility derived from that consumption compares to the utility provided from the consumption of either good when information is provided prior to consumption. There is experimental evidence that people make judgments based on the items being compared (see Gneezy 2005, or Sedikides et al. 1999), which lends credence to the idea that conditions are not inter-comparable without a common element.

This study provides a first look at the effect of expectations and the order in which intrinsic and extrinsic information is received on purchase decisions. Furthermore, using sales data, I will be able to examine comparative utility between treatments. Finally, I will provide a measure of the effect of increasing attention to the hedonic qualities of the good.

Motivation

This research is relevant to any experience good, defined as a good whose qualities are difficult to ascertain or cannot be determined prior to consumption (Nelson 1970). As was mentioned before, prior research has examined consumers' hedonic ratings for goods such as wine, soft drinks, beer, turkey, yogurt, and clothing. In the current research, I examine the effect of extrinsic and intrinsic attributes of wine on consumers' hedonic liking and purchase decisions. In the wine industry, there are many potential extrinsic indicators of quality, ranging from expert opinion (e.g. the Wine Spectator), to the year the grapes were grown, to winery reputation. In this study, I focus on wine appellations for two reasons. First, a number of researchers have found that appellation, or region of origin, is an important variable in consumers' purchase decision (see for instance, Batt and Dean (2000), Johnson and Bruwer (2007), Lockshin et al. (2006), or Tustin and Lockshin (2001)). Secondly, although winery reputation is also potentially important in a consumer's purchase decision, it is a harder variable to control. Given the number of bonded winery premises in the United States, 4929 in 2005, it is less likely that all, or even most, consumers would know a given winery (WI 2007).¹ Appellation is a more accessible reputational device for many consumers than is winery brand. For this experiment to have any

¹ Bonded winery premises include every licensed production facility of single firms or individuals, licensed warehouses, experimental wineries and wineries with no casegoods production or fermentation capacity. Though this number over-counts bonded wineries, it does not include virtual wineries, which have separate management and a specific physical location, but which must use bonded facilities to produce their wines. A Wine Business Monthly count came up with 1905 bonded wineries and 1018 virtual wineries in California, and 4383 bonded and 1587 virtual wineries in the United States in 2006.

meaning, the extrinsic attribute must induce an expectation for participants, and the specific attribute needs to be interpreted similarly by all participants.

Napa Valley, particularly renowned for Cabernet Sauvignon, is arguably the most famous wine-producing region in the United States. Hedonic pricing studies of the wine industry have consistently estimated premiums for wines labeled with the Napa Valley appellation over the prices that wines from other major California wine producing regions demand, controlling for other observable variables (see, for instance, Bombrun and Sumner (2003), or Costanigro et al. (2007)). However, there is some evidence that wine writers feel that the intrinsic quality of Napa Valley Cabernet Sauvignon does not merit the prices it commands (Asimov 2008).

If recent findings in evaluation of beer and wine obtain when consumers are making purchasing decisions, the expectation created by a particular appellation, a high rating from Wine Spectator, or a particular winery might affect both the purchase decision, and the subsequent sensory evaluation of the wine. If two systems in the brain affect consumers' experiences with a good, attempts by unknown wine-producing regions to build a reputation could be hindered by the hippocampus/DLPFC/mid-brain system, which seems to incorporate cultural knowledge into people's subjective experiences (as in the Coke vs. Pepsi study).

The experimental design is as follows. I measure the effect on sales of two commercially available wines offered at a wine tasting event. The experiment is a 3X2 design, or 6 total treatments. Participants in all treatments tasted the same two wines and received promotional coupons that could be applied to the purchase price of one of the two wines. Participants were exposed to one of three informational conditions: one group received no appellation (or other non-sensory information) at any point during the experiment; a second group received appellation (but no other non-sensory information) before they tasted the two wines; the last

group first tasted the wines, then learned of the appellation. Furthermore, half of the participants were asked to give each wine a hedonic score before receiving their coupon and leaving, while the other half simply received the coupon and left the experiment after tasting. In one treatment, participants will be told of the appellation before tasting the wine samples; in the other, appellation information will be withheld until after participants have tasted the wines. Participants will then be offered a promotional coupon good for one of the two bottles of wine, and only applicable during the tasting event.² The variable of interest (the dependent variable) is the total number of bottles of each wine sold under each treatment.

The tasting occurred at a grocery store—one of a chain—in Northern California’s San Joaquin Valley.³ Customers were invited to reserve a space at a “Store Feedback and Tasting” event, and were then randomly assigned to one of the six experimental sessions. At each session, the store wine steward and attendees had a conversation about the store’s wine section, and ways that it could be improved, followed by the tasting. After the tasting and hedonic rating occurred, each customer received a coupon for \$5 off one of the two bottles of wine, and was free to leave.

The implications for the wine industry (and other, expanding industries with established, differentiated producers) are very important. If consumers’ preconceived notions of the quality of a product affect the consumers’ experience with the product, it will make it more difficult for new wine-producing regions to establish a similar reputation. It also affects the perceived competitiveness between products. If appellation information—or high expert ratings, or a particular vintage—induces an expectation in consumers that affects their post-purchase

² Temporal and product-specific coupons are offered to induce enough sales to yield statistically significant estimates of the effect of order of information. If a participant were to purchase both bottles (using only the one coupon offered to each participant), both sales would be counted.

³ Many of this chain’s stores hold weekly tasting events. However, the tastings tend to be more of a relaxed, social event. The experiment needed to balance normalcy, so that participants did not feel as though they were taking part in an experiment, with attentiveness, so that participants would pay attention to the intrinsic and extrinsic information presented to them.

evaluation of a wine, it will reduce the substitutability of products labeled with different appellations as perceived by consumers, and lead to a higher difference in price (controlling all other variables) required before the customer will choose the wine with the unknown or less prestigious appellation.

The same is true for any industry or group attempting to add value to their product and create higher expectations of quality. If signals—appellations in this case—prime consumers' subjective experiences by creating an expectation of product quality, it suggests a higher level of optimal investment in product quality associated with that signal; alternatively, producers facing low expectations will want to reveal the inherent characteristics of their product to consumers prior to releasing the signal.

Corroboration of the expectation-based model also suggests very simple potential strategies for wineries both in prestigious appellations and in unknown or less prestigious appellations, retailers, and even individuals purchasing wine for a dinner party, depending on whether they want to generate an expectation (release information first), or highlight the sensory attributes (taste first).

Theory

Consumers, indexed by i , maximize utility. While the consumer's experienced pleasure, which is presumed to inform the process of computing their stated liking, may differ from the utility maximization process, there ought to be a number of commonalities between the pleasure generated from consumption of a good with and without purchase. What follows is a short discussion of the salient differences between the decision processes underlying stated utility as defined by the psychology literature discussed previously and economic utility. Then I will

discuss the similarities between some of the concepts reviewed earlier in psychology with respect to a model of consumer utility maximization. Finally, I will lay out a descriptive model of consumer choice relevant to this experiment.

Utility in sensory science and economic spheres should be similar in many respects; one could think of sensory science utility measures as a subset of economic utility measures, specifically those parts of the product interpreted by the sensory organs involved in processing taste and smell. The hedonic evaluation of a product intuitively should represent a component of utility. If examined under equivalent conditions, the intrinsic attributes of the good should be present in the determination both of hedonic preferences and of utility.⁴ Similarly, inasmuch as different “reputational” attributes—like appellation, expert rating, or brand name—proxy for quality, the expectations created by those attributes should affect hedonic liking and the utility function in the same way.

However, there are a number of other attributes on a bottle of wine that might signal something about the consumer that would not be a factor in the consumer’s determination of a hedonic rating. Attributes potentially included in this category include any that have prestige associated with them; this includes a particular producer or brand, appellation, expert rating, or vintage. Consumers may also derive utility from the shape of the bottle, the label design, the name of the wine, or the bottle closure.

Additionally, the task presented to the consumer is markedly different in the two scenarios. In the hedonic task, consumers are asked to consider the pleasure they derive from two samples presented to them, and to assign to each a rating; in the latter, consumers consider the pleasure they derive from the two samples, any other attributes they value of either sample,

⁴ This statement is conditional on identical consumption scenarios. If an individual evaluates two beverage samples in isolation, but only consumes that type of beverage with a meal, that individual’s preferences may differ based on the difference in consumption settings.

the prices associated with the products, and other uses for their resources.

Given that the economic and the hedonic evaluation of these goods have some commonalities, reconciling differences in concepts and terminology would seem to be a useful exercise, particularly with respect to the model of consumer behavior. Utility is described according to Rosen's model of consumer behavior in a differentiated products market (Rosen 1974).⁵ The utility of an individual i from the consumption of a numeraire good, x , and a differentiated product characterized by a vector of m attributes, $z = (z_1, \dots, z_M)$ is determined by the function

$$(1) \quad U(x, z_1, z_2, \dots, z_M)$$

which is assumed to be strictly concave in each of its arguments. To reconcile with the hedonic terminology, we could partition the vector of attributes, z , into sensory attributes and reputational attributes. Let $s = (s_1, \dots, s_K)$ be a vector of all attributes perceived with the senses, e.g. taste, smell, or sight, and let $a = (a_1, \dots, a_L)$ be a vector of all extrinsic attributes such that $z = (s, a)$.

The standard utility maximization problem for individual i , who is choosing from a set of products large enough as to approximate continuousness in each of the attribute categories is

$$(2) \quad \text{maximize } U_i(x, s_1, \dots, s_K, a_1, \dots, a_L) \text{ subject to } y_i \geq p(s, a) + x.$$

The price of the numeraire is normalized to one, and $p(s, a)$ is a function ascribing a price to any combination of product attributes. Optimization occurs when the ratio of the marginal utility of any attribute to another is equal to the ratio of the marginal implicit prices of those same attributes.

In this experiment, I investigate the effect of the order in which participants receive two pieces of information on their consumption choices of two wines, so that the vectors s and a are

⁵ Rosen's model is universally known as the hedonic pricing model. To avoid confusion with the hedonic ratings elicited in sensory science studies, I will discuss Rosen's model in terms of differentiated goods and the attributes that characterize the differences in those goods.

not indexed by attribute.⁶ Participants receive sensory information, s_j , and appellation information, a_j , where j indexes the wine; with two wines, $j = (1, 2)$. In the sensory literature discussed earlier, evaluation of the sensory information, the s_j , is a bottom-up process, in which the intrinsic attributes of the wine act on the consumers' sensory receptors. The reputational variables, a_j , effect top-down evaluation processes.

$$(3) \quad u_t = U_t(x, s_j, a_j)$$

Additionally, I consider that the order in which participants access the information may affect the utility derived from each attribute. To account for this possibility, I add a parameter, λ , to the utility function, which unconsciously alters the role of each type of attribute in the utility function, and is dependent on the treatment t , where $t = 0, 1$, or 2 . The treatment t corresponds to the three informational treatments in the experiment, where $t=0$ when tasting and evaluation are conducted blind, $t=1$ corresponds to the scenario in which consumers are informed of the differences before tasting, and when $t=2$, consumers taste blind, but are informed of the appellation before evaluating the products. Each customer's experienced utility may also depend on whether they were explicitly asked to assign a hedonic rating to each wine or not, so to account for that possibility, utility is modeled as being conditional on $h = 0$ (not asked to report a hedonic rating) or $h = 1$ (asked to report a hedonic rating).

$$(4) \quad u_{tjh} = U_t(x, s_j(\lambda_t), a_j(\lambda_t) | h)$$

Note that λ is modeled as affecting the way that intrinsic and extrinsic information impinge upon the consumer's utility, and is expected to affect each attribute, and therefore overall experienced utility, differently.

Since the choice set is restricted to two goods, the consumer's decision will be a comparison of the relative utility of the two goods, and each with respect to the buy nothing

⁶ That is, $z = (s, a)$ where s and a are singletons.

option.⁷ We can describe each consumer's three potential outcomes (with respect to utility) from the experiment. Consumer i receives utility $u_{ijt} = U_i(y_i - p_j, s_j(\lambda_t), a_j(\lambda_t))$ when good j is purchased under condition t . If consumer i chooses to purchase nothing in condition t , utility is represented as $u_{i0t} = U_i(y_i, 0, 0)$. For any consumer, the condition under which they are making decisions will always be constant, so we will only observe between-subject variation in the informational condition. For goods j and k , we expect consumers to make decisions according to the following rule:

$$\text{Consumer } i \text{ will } \begin{cases} \text{purchase } j \text{ if } u_{ijt} > u_{ikt} \text{ and } u_{ijt} > u_{i0t} \\ \text{purchase } k \text{ if } u_{ikt} > u_{ijt} \text{ and } u_{ikt} > u_{i0t} \\ \text{purchase neither if } u_{i0t} > u_{ijt} \text{ and } u_{i0t} > u_{ikt} \end{cases}$$

We will be able to test three hypotheses, assuming that the sample in each treatment was randomly drawn from the same population. The first concerns the order in which information is received by participants and sales of each wine in conditions 1 (appellation and then taste) and 2 (taste, then appellation). If extrinsic and intrinsic information affect utility independently of the other, then each wine should be purchased approximately equally in each condition, or $\text{prob}(j|t=1) = \text{prob}(j|t=2)$. If, however, extrinsic information induces expectations that subsequently alter the customer's interpretation of the sensory information, we would expect to see relatively more purchases of the high expectation wine than the low expectation wine. Secondly, we examine evidence on inter-treatment utility. The utility provided by the "no purchase" option should be equivalent across conditions, so by comparing the frequency that each option is chosen under each condition ($t = 1, 2$, or 3), we will get a measure of relative utility. A lower frequency of purchase in any condition implies a lower total utility on average. This will allow comparison between treatments. Finally, by looking at choices when hedonic

⁷ Price differences for the two products under consideration are small enough that they should not affect demand for other goods outside goods differentially.

values have been elicited versus when hedonic assessment was not emphasized, we can test to determine if providing an evaluative framework affects decisions.

Experiment and Results

Customers of a grocery store in northern California’s Central Valley were invited to participate in a special wine tasting event at the grocery store’s tasting facility. Located between Napa Valley to the west, and the Sierra Foothills wine region to the east, consumers in the Sacramento area have good access to wine tasting opportunities, and are exposed to articles about the wine industry in the local media on a regular basis. We expected that consumers would be familiar enough with wine to know of Napa Valley’s reputation. Once enough participants had signed up to fill six experimental sessions, each participant was randomly assigned to one session. All six sessions were completed over two weeks, and lasted approximately one hour each. The total number of participants was (N=XXX), with an almost equal number assigned to each session (CREATE A TABLE WITH CONDITIONS, TOTAL NUMBER ASSIGNED, ETC.). Total number of participants, as well as a breakdown by treatment and gender is shown in figure 1.

Figure 1: Participation in experimental sessions

Session	Total Participants	Male	Female	Age
	<i>Hedonic Scoring</i>			
Blind	XXX	XXX	XXX	XX
Informed before taste	XXX	XXX	XXX	XX
Informed after taste	XXX	XXX	XXX	XX
	<i>No Hedonic Scoring</i>			
Blind	XXX	XXX	XXX	XX
Informed before taste	XXX	XXX	XXX	XX
Informed after taste	XXX	XXX	XXX	XX

Total	XXX	XXX	XXX	XX
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There are no significant differences in gender per treatment. [TRY TO GET ACCESS TO NUGGET GOLD CARD DATA FOR PARTICIPANTS]. One limitation of this research is that in order to provide as natural an environment as possible, I did not administer questionnaires to participants, and do not have data on some demographic characteristics that I would ideally have. However, as a condition for admittance to the tasting, would-be participants had to provide proof that they were over 21, the legal drinking age in California. The average participant age per treatment and over-all are listed in table 1.

After providing proof of their age, participants were directed to a dedicated tasting area in the store. The experiment was a 3X2 design. At half of the sessions, participants were asked to give a hedonic rating to each wine; at the other half, participants did not face this task. The entire sample was divided into three conditions under which they tasted and evaluated the wines. One group tasted and evaluated the wines given only the sensory information, *s*. That is, these participants were given the wine samples, tasted and smelled them, and then evaluated them (either by deciding whether to buy a bottle, or by rating them and then deciding whether to buy a bottle) without receiving appellation information. A second group learned each wine's appellation before tasting and smelling a sample of each, so that they examined the wines under the influence of the expectations induced by the reputation. The third group first received the sensory information, then the appellation information, and then made their decisions.

Discussion

We find that customers...

Conclusion

We find evidence that expectations induced by reputational information affect consumers' experienced utility, as represented by hedonic ratings, and subsequent purchase decisions. This has interesting implications for modeling reputation and reputation investment decisions on the part of firms. Future research will examine the implications of dynamic reputation investment decisions when reputation affects consumers' sensory evaluation of a good, as well as spillover effects from disconfirmed expectations.

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