

## CHAPTER 2

### SIGN POSTING: THE SELECTIVE REVELATION OF PRODUCT INFORMATION

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Sellers post countless signs to convey information about their wares, ranging from "LO MILEAGE" on a used car, to past performance statistics on a mutual fund, to the experience and education listed on a resume. For reasons we will explore, the information revealed in signs is usually truthful, but the whole truth is rarely presented. The LO MILEAGE car is rusting out underneath; the mutual fund had a few lousy years before the period reported; much of the \$50 million budget mentioned on the applicant's resume is outside his authority.

We refer to the process of providing information to prospective buyers as "sign posting."<sup>1</sup> This process conveys information that would otherwise be costly or impossible to acquire. Though some information is provided and other information hidden, buyers untangle the message, at least to some degree. They may be suspicious that the mutual fund did not mention volatility, nor the job applicant the number of people who report to him, and may draw appropriate inferences. Below we study how the game of sign posting is played.

Our concern originates in a multi-attribute world: Buyers care about many characteristics of a product, and quality is not easily captured in a single number. Moreover, different individuals have different preferences, making it more difficult to convey information,

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say, about customer satisfaction. In many cases, potential buyers will not even know what other information may be relevant. In other cases, buyers will falter in the complex process of statistical inference, though in theory a grand Bayesian approach could handle matters.

When we examine ads in newspapers or on television, or seek to winnow down a list of colleges using their admissions materials, we are engaged in a subtle game. We must be simultaneously expert at inference, multi-attribute utility theory, decision theory, and game theory. Students of Howard Raiffa—who has written books in all of these areas—should be well prepared.

We also examine sign posting as a critical ingredient in a modern economic system. Sign posting helps deal with situations where information flows poorly, and where multiple attributes matter. But it offers only a partial solution to the problem of poor information flow. Recognizing the dangers of, or at least the welfare losses associated with, selective revelation by sellers, government frequently mandates the provision of information. A final section shows that such requirements can significantly affect the market.

#### The Game

We present sign posting as an informal game. Sellers provide signs containing selective, but generally truthful, information about their products. Consumers decode the signs, perhaps imperfectly. Consumers have preferences for products with multiple attributes.<sup>2</sup> Since preferences vary, quality is not a single numeraire. On the basis of what they can infer about particular products, consumers choose what to buy. When posting and decoding are expensive, there will be important effects on product characteristics and market function, no matter how expert the participants.<sup>3</sup>

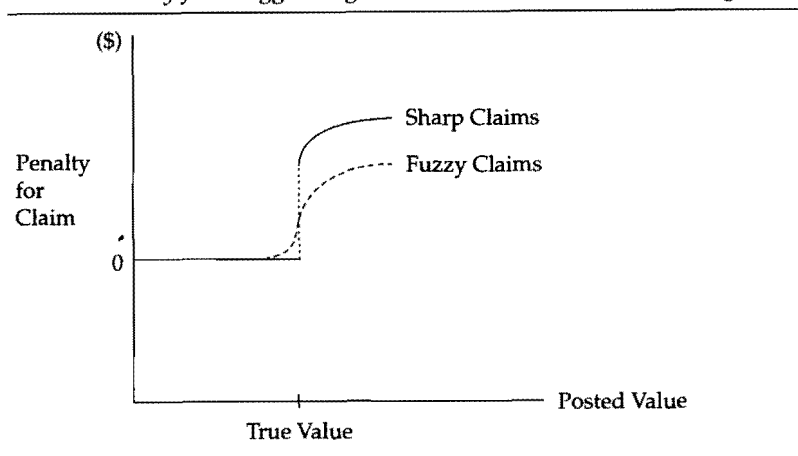
#### The Content of Signs

Sellers provide their prospective customers with selective information about their products; that is, they post signs. This section discusses sellers' choices about what information to post, and how to present it, as well as the limitations on their choices.<sup>4</sup>

As is already evident, advertisements and signs are related but distinct concepts. An advertisement is a notice intended to induce consumers to purchase a good, and is disseminated in printed or electronic media. But signs also include price tags and product tags affixed to goods, job applicants' oral statements about themselves made to prospective employers, resumes, and campus photographs in

Figure 2-1

The Penalty for Exaggerating Claims about Characteristics in Signs



college catalogs. The selection of samples can be a form of sign posting; witness the attractive and diverse students in the catalogs.<sup>5</sup>

*Variable or fixed.* The characteristics posted in signs may either be variable, within the seller's control, or fixed, beyond his control. For example, the price of a condo is normally within the seller's control, but its square footage is not.<sup>6</sup> For fixed characteristics, the seller has one decision: whether or not to post the characteristic. For variable characteristics, the seller must decide which characteristics to post, and at what level to set them. A seller's decision about how much of a variable characteristic to provide may well be affected by his expectations about whether he will post it. Colleges utilizing federal loans have recently been required to inform applicants about the percentage of students graduating within 150 percent of the normal time. Presumably, this gives them an incentive to boost their graduation percentage.

*Sharp or fuzzy.* A good's posted characteristics may also be "sharp" ("magna cum laude graduate of Princeton") or "fuzzy" ("excellent student"). Price is generally sharp, but curiously (to an economist) is frequently not posted.

It is generally more costly to exaggerate about sharp characteristics than about fuzzy characteristics. (See Figure 2-1.) First, false statements may be illegal. For example, while it may be illegal for a breakfast cereal manufacturer to state falsely that "One serving contains 100 percent of the minimum daily requirements," the seller is unlikely to be penalized for claiming that "This cereal is nutritious," no matter

how low the nutritional content of the cereal. Recently, however, the Food and Drug Administration began to regulate terms such as "low cholesterol" and "light" in relation to manufactured foodstuffs.

Second, false statements may injure the sign poster's reputation. For example, even if it were legal to do so, General Motors would be unlikely to state that a car has 18 cubic feet of trunk space if it has only 17. If the misrepresentation became known, it would damage the firm's public image. But the company might be less reluctant to describe the trunk as "large." Similarly, someone selling a used car through a classified ad would be ill-advised to overstate the condition of the body; a prospective buyer will see the body for herself. The seller would hardly be credible stating, "I admit that I lied about the body, but the engine is as good as I claimed."

When a seller posts accurate or even understated information about fuzzy characteristics, a prospective buyer may wrongly conclude that the seller exaggerated. Suppose that someone correctly writes in a letter of recommendation that "John is very smart." The reader, upon meeting John, may erroneously judge John to be less than "very smart," and the possibility of such disagreement may impose a cost even if the writer intended to understate John's qualities.<sup>7</sup> Sign-posters' inclination to exaggerate on fuzzy signs may be tempered by the discomfort caused by so doing; the tug of such costs prevents excessive exaggeration. Marks and Zeckhauser provide a model of the outcome when exaggeration costs are understood, and incurred, and messages get unravelled.<sup>8</sup>

*What characteristics are postable?* As a practical matter, sellers cannot post information about all of a product's characteristics, and buyers cannot confirm all information by inspection. That is, not all of a product's characteristics are both postable and observable. A characteristic is "postable" by a seller if a depiction or brief description of the good, or of the specific characteristic, enables a prospective buyer to assess, at low cost, the good's endowment of the characteristic,<sup>9</sup> or if the seller can assess, at low cost, the good's endowment of the characteristic and convey his assessment to the buyer.

A characteristic is observable by buyers if a prospective buyer can, at low cost, inspect the good and assess its endowment of the characteristic. For example, a car's paint job is observable, but the state of its engine is less so. As a practical matter, the energy efficiency of an air conditioner, though postable by the manufacturer, is unobservable by the consumer. At modest cost, the manufacturer can determine the unit's energy efficiency and post it for all buyers, while for any single buyer the cost of determining the unit's energy efficiency would be prohibitive. In contrast, the flavor of a new prepared food may

be observable but not postable; the seller may be unable to describe the taste.

If a characteristic, such as the energy efficiency of air conditioners, is important and postable but not observable, then government may be tempted to mandate posting. The seller can realize economies of scale in producing information; individual buyers cannot.

Testimonials are one way to post information about characteristics that are not directly postable. For example, it may be impossible to post the charm of a resort, but if a celebrity attests to the resort's charm, then the seller has, in effect, posted the charm. Similarly, celebrity endorsements allow insurance companies to post their soundness, and charities to post their legitimacy.

*Signals as signs.* A "signal" is an observable characteristic (e.g., a college degree) whose cost of adjustment varies inversely with the level of a desirable unobservable attribute (e.g., aptitude). Sellers can use signals to demonstrate that their products possess unobservable attributes.<sup>10</sup>

Signals are a special case of sign posting. Signaling models are concerned with how sellers communicate information about a single underlying characteristic whose level cannot be revealed directly; sign posting models are often concerned with how sellers decide which of many characteristics to post. Signals convey information about unobservable characteristics; signs often post observable characteristics. In signaling models, the seller can vary the amount of the signaling variable that he produces; sign posting models concern both characteristics that the seller can vary and characteristics that are fixed.

Posting signs is frequently inexpensive; generating signals is expensive. The cost of posting a signal differs across individuals; the cost of posting signs is often the same across individuals. Signaling models assume that the seller can costlessly transmit information about the signaling variable; sign posting models typically assume that it is costly for sellers to post, and buyers to decipher, information about characteristics. The key to signaling models is the cost of producing the signal, which depends upon the amount of the underlying characteristic the product possesses; the key to sign posting models is the cost of posting and decoding information about characteristics.

Sellers post "signals" about an underlying attribute, rather than the attribute itself, for several reasons. First, bald assertions that are not objectively verifiable may not be credible; sellers may have little incentive to be truthful in describing characteristics that are difficult for buyers to verify. Signals provide a way to convey credible information about such characteristics. For example, describing oneself as smart may not be credible; displaying a Harvard Business School

diploma may credibly suggest that one is smart. Second, signals may provide an innocuous way to convey information that would be obnoxious if posted. For example, bluntly posting one's wealth would also, as a side effect, suggest that the person is status conscious. But making large donations to the symphony may signal wealth—and generosity and culture—without suggesting status consciousness.<sup>11</sup>

*Posting price.* Though prices play a central role in economic models of competition, signs often omit price, for at least two reasons: First, posting prices only makes sense if the product's other characteristics are posted or understood. With nonstandardized products, it is difficult to quote a price that buyers can compare to others. For example, a physician's services are customized to each patient's needs, making it difficult to state in advance the cost of treatment.<sup>12</sup>

Second, posting a low price may promote unfavorable inferences about a product's quality. One suspects that many prospective patients would be put off by a doctor's claim that he has the lowest prices around. Price is particularly likely to be omitted from a sign when quality is difficult to assess, and is important relative to price, as with medicine, where most consumers pay only a small fraction of the costs they incur. Advertising a good's price as being "X percent off the original price" is presumably intended to negate the unfavorable quality inference.<sup>13</sup>

*Omissions and truth.* Sellers generally post highly incomplete information about their products. First, it is costly to produce and post signs. Posting more information (e.g., by placing a larger ad) costs more. Second, given buyers' finite ability to process information, a less complete sign may actually be more informative. The disclosure requirements of the Securities Act of 1933 are criticized on such grounds; prospectuses that are too complete may be less helpful to investors. California's recent chemical-labeling legislation has been criticized on similar grounds; there may be so many carcinogens that labeling all of them would overwhelm consumers.<sup>14</sup>

Third, as discussed above, certain characteristics are difficult to describe. Fourth, incomplete signs may cause prospective buyers to overestimate a good's undisclosed characteristics. A photograph of a house's beautiful living room may cause buyers to infer that the rest of the house is of comparable quality. The more even the quality of a product, the more information the seller may want to provide, lest prospective buyers wrongly infer that the unposted characteristics are inferior.<sup>15</sup>

While signs tend to be incomplete, they probably tend to be truthful. First, the law may require it. For example, specific statutes prohibit false advertising, and consumer protection legislation prohibits false

and misleading statements by retailers. Second, the prospect of bad publicity, of injury to reputation, and of losing repeat business may deter sellers from posting false signs.<sup>16</sup> Third, in many transactions, the buyer can inspect or test the good before the purchase becomes final, or can return it if dissatisfied. In such cases, the seller would probably gain nothing by lying, and might well suffer.

Fourth, when characteristics are fuzzy, it is difficult to demonstrate that someone lied. A good student can safely describe himself as an "excellent" student, but not as being in the "top 10 percent" of his class. Finally, being truthful may not be expensive. Everyone expects signs to be incomplete; this allows the sign poster to choose, and he can usually find a good characteristic to post.

The choice of how complete to make a sign can have interesting consequences. College applications are, in effect, a sign, though the consumer—the admissions office—can impose requirements on what must be included. Lafayette College made submitting Scholastic Aptitude Test (SAT) scores optional for applicants starting in 1995. One might expect there to be a threshold SAT score, with scores exceeding that threshold being reported, and scores below it not. But then a student whose score was just below the threshold would choose to report rather than have the admissions committee assume his score to be at the mean of the other unreported scores. If he reports, then both the threshold and the mean score among nonreporting applicants declines slightly. The threshold might unravel until only the applicant with the lowest score would not report.

In practice, this complete unraveling process probably does not occur for at least two reasons: First, not everyone is a sophisticated decision theorist expecting everyone else to be the same. If some students with scores of 1200 will not report, perhaps mistakenly, then a rational student who scored 1150 may actually be better off not reporting. Second, it is expensive to take the SAT. In time, people who expect to do relatively poorly will simply avoid the expense.

In a world of fully rational expectations and behavior, where the posting and consumption of information is costless, sign posting will reveal all information. The real world, being neither fully rational nor costless, experiences extensive sign posting with information systematically omitted.

### *How Consumers Decode Signs*

Sellers have considerable leeway in creating the signs they post about their products. They may make truthful but fuzzy statements, and provide only the most favorable facts. So why do prospective buyers look at sellers' signs? First, signs are frequently the only available

source of information. Second, some consumers are gullible, and fail to discount for information not given. Third, many consumers are good Bayesians; they are adept at decoding signs, just as producers are good at constructing them.<sup>17</sup>

A sign is often valuable to a prospective buyer as the first step in learning about a product. For example, a house hunter who sees a house advertisement that includes a beautiful living room will learn more about the property before committing herself to making the purchase. In contrast, when ordering from a catalog, one generally cannot inspect the product before buying. This enhances the importance and value of the vendor's reputation for integrity.

Search costs increase the value to consumers of signs. If a homeowner's display ad featuring his beautiful living room induces a buyer to look at the house, then the seller has a substantial advantage. Similarly, stores do not like to facilitate comparison shopping by quoting prices over the telephone; they know that if a buyer must come into the store, she is more likely to buy. And antiques stores display their beautiful wares in the window, without prices, knowing that there is some stickiness once a prospective shopper steps across the threshold, since stopping in a new store will be costly.

Evidence suggests that individuals search less than they should. John Pratt, David Wise, and Zeckhauser find unreasonably high price variability for standardized goods; the implied search costs are unrealistically high.<sup>18</sup> The cognitive strategies that people use to compensate for their limited ability to absorb information may be less than fully rational. For example, "status quo bias" leads people to stick too much with decisions already made, or with whatever alternatives they encounter early on.

Despite consumers' limited ability to rationally assimilate information, many decode signs well. The reader can try a self-test with the following letter, a redacted version of an actual letter of recommendation received at the Kennedy School from a distinguished economist:

To the Hiring Committee:

Mr. John Doe has taken three graduate seminars with me, was for two years my teaching assistant in an upper-level course on game theory, was head teaching assistant when I taught our introductory economics course, and is writing his dissertation under my supervision.

He is the only student to whom I have given a general examination grade of "distinction" in 20 years of teaching here and at [another major university]. His scholarly work reflects not only his training here but his three years of research at. . .

His dissertation examines . . . [long factual description]. His work cannot fail to attract attention.

The first paragraph of the letter indicates the professor knows Doe well. The naive reader might conclude Doe was selected in some competition for teaching assistant positions; the sophisticated reader might wonder why more was not said about that. Might the better students get fellowships? To identify Doe as the only student in 20 years to get a distinction is certainly to post a sign. Impressive, but it would be more so if we were told that there was no grade above distinction, and that the professor had examined many dozens of students, not just a small number. The careful reader of signs will inquire about information not given. Why does the professor not describe Doe as bright, incisive, or original? Is he merely capable and extremely conscientious? The final sentence appears to be carefully crafted. The thesis may be widely noticed, but have little lasting impact. The naive reader will be wowed by this letter; the savvy reader will be skeptical.<sup>19</sup>

Even if all consumers are skilled at inference and deduction, and even if all information is ultimately communicated, the practice of sign posting still imposes deadweight costs. For example, those who post fuzzy signs must exaggerate their claims if they are to communicate them accurately, since consumers will routinely discount fuzzy claims. The sign posters then must bear the cost of being considered exaggerators.

In reality, of course, most consumers are not perfectly rational decision makers. Rather, they make decisions using a variety of heuristics of the sort explored by Daniel Kahneman, Paul Slovic, and Amos Tversky.<sup>20</sup> Sellers know this and surely capitalize on it when designing their signs. To take an extremely simple example, sellers frequently price goods at a penny below the round dollar figure—\$5.99 instead of \$6.00—presumably because they find that buyers perceive the former figure to be significantly lower than the latter.

### Effects of Sign Posting on Competition

Many markets function where only partial information is provided about competitors' products. The competitors also have the ability to improve selected characteristics of their products, although doing so may be costly. A critical question is how the practice of sign posting affects competition in a market.

In many contexts, one product will be known for one attribute, and a second for another. For example, many colleges have fewer than

2,000 students and are known for having faculties who pay careful attention to students. Other colleges, mostly at research universities, have much larger undergraduate bodies, and focus on the extraordinary intellectual resources available. The middle range is almost unpopulated, though many prospective students might welcome a mix of significant faculty attention and strong research. It would be simply too expensive for a Harvard to restructure itself to give, and get credit for giving, careful attention to students, or for Swarthmore to become, and become recognized as, a research institution.

Given less than perfect information flow, and the practice of sign posting, this outcome is possible even if there are no economies of scale or returns to specialization, and even if the consuming public mostly wants a mix of characteristics. Thus, Harvard Business School is loath to give up its reputation for the case method. Stanford, in part to illustrate its rigor, demands that its students learn calculus; advertising that now 60 percent of its teaching is by the case method would accomplish little.

This phenomenon of strength building in one area is also well known in professional firms. Wesleyan College was recently searching for a new president. It could hire the executive search firm Hedrick and Struggles, a good firm with conventional candidates, or Spencer Stuart, which is best known for nonconventional choices. Wesleyan would have liked a mix of these two worlds, but the producers had differentiated themselves.<sup>21</sup>

On the other hand, sometimes sign posting may only increase *perceived* differentiation: sellers can divide the market by attracting buyers' attention to different features of similar or identical products. For example, one car manufacturer's signs may stress acceleration and another's may emphasize seating capacity, while the cars may be very similar in other respects, or perhaps similar even in acceleration and seating capacity. Those who long for glamour will tend to buy from the first manufacturer, and those with large families will tend to buy from the second.<sup>22</sup> In sum, sign posting may promote product differentiation, both real and perceived.<sup>23</sup>

In some circumstances, the cost of processing information leads the purchaser to ask for selected information. Applicants for teaching positions in economics are asked to present a single paper, since it is costly for the hiring committee to read more materials. The feedback loop has led to a situation where most candidates focus on their job-talk papers to the detriment of the rest of their theses, and many theses now consist of three papers, rather than an integrated analysis.

Sign posting can foster incentives to produce high-quality products.<sup>24</sup> A company that owns a brand name has an incentive to maintain

or improve the quality of its product to protect the value of the brand name. For example, suppose that two competing firms sell similar versions of a product, but that only one firm's product has a brand name. If the brand is well established, consumers will know the quality of the branded good, but will likely assume that the unbranded good has the average quality of unbranded goods of this type. Since shoppers will never know the quality of the unbranded good, the producer has no incentive to improve quality. In contrast, the seller of the branded good has an incentive to improve its quality, so long as the increased price associated with a higher-quality good exceeds the greater cost of producing it.<sup>25</sup> Buyers displaying brand-name products—e.g., wearing Calvin Klein jeans—post signs about themselves.<sup>26</sup>

The role of brand names as signs of quality is reflected in prices for corporate acquisitions. A firm that produces the highest-quality good in a market will command a disproportionate price relative to its earnings. One obvious explanation for this is that the acquirer will be able to use the acquired firm's brand name as a sign of quality for other products. For example, when Beatrice acquired Sara Lee, the former renamed itself the Sara Lee Corporation.

In at least some situations, posting signs yields surprisingly high rewards. Anecdotal evidence suggests that by distributing flyers posting their availability, free-lance house cleaners in Cambridge, Massachusetts, can earn wages considerably above the going rate for such work. Apparently, the buyers do not investigate the market. Similarly, anecdotal evidence suggests that people who place personal ads obtain better results than people who actively read and respond to such ads.

### Government and Sign Posting

To correct for market failures, to ensure that markets are fair, and to pursue other social goals (such as energy conservation), the government frequently exploits the ability of signs to affect buyers and sellers.<sup>27</sup>

Government—federal, state, and local—has long engaged both in sign posting and in regulating sign posting by others.<sup>28</sup> First, the government often posts its own signs regarding sellers' products. For example, the Food and Drug Administration (FDA) posts signs about the efficacy of drugs, and the U.S. Department of Transportation posts signs about airlines' punctuality.<sup>29</sup>

Second, in some contexts, the government requires that sellers' signs be truthful. For example, the Federal Trade Commission (FTC) generally requires that advertising be truthful.<sup>30</sup> Third, the government sometimes regulates the completeness of the information in signs. For

example, as mentioned earlier, the Securities and Exchange Commission (SEC) requires that prospectuses provide complete disclosure.<sup>31</sup>

Fourth, in some cases the government requires that sellers post information about certain characteristics of a product (for example, the energy efficiency of air conditioners) and prescribes a standardized format for posting such information.<sup>32</sup> Such mandated posting has at least two effects: First, it may help consumers to identify products possessing the desirable characteristic. Second, it may induce sellers to produce products that possess the desirable characteristic.<sup>33</sup> Other such characteristics include the tar and nicotine content of cigarettes, automobiles' fuel efficiency, mutual funds' fees and performance, and, under recent legislation in California, carcinogens in the workplace.<sup>34</sup>

Not surprisingly, sellers whose ratings on these standardized scales are particularly high tend to post their ratings prominently. For example, advertisements for low-tar cigarettes tend to highlight their low-tar content, whereas advertisements for high-tar cigarettes tend to focus on other characteristics, such as the product's taste. During the period from 1967 (when the government began requiring tar content to be posted) to 1986, the market share held by low-tar cigarettes in the United States increased from 2 percent to 53 percent.<sup>35</sup>

We suspect that smokers responding to information about tar content, and manufacturers changing their product in response to smoker preferences, played a major role in the growth of market share for low-tar cigarettes. We call this the "C&M" ("consume and manufacture") effect: Consumers increase their demand for products possessing the newly posted characteristic, and sellers increase their production of such products. The C&M effect surely also helps account for the increase in fuel efficiency that followed institution of the Environmental Protection Agency's requirement that automobile manufacturers post fuel efficiency.

Only in recent years have mutual funds been required to post their fees in a standardized format. These fee structures tend to be complex because of the use of "soft dollars" and other arrangements. We expect that the new regulation will lead funds to restructure their fees in ways that reduce reported fees. For example, they might seek to increase their brokerage commissions, which do not count as fees, and reduce other charges that do count as fees.<sup>36</sup>

When the government engages in or requires sign posting, it may not be an ordinary agent for the consumer. It may be engaging in paternalism, say, by requiring that health warnings be posted on cigarette packages. It may be seeking to correct a mispriced resource, such as energy under price controls, or it may just be trying to use increased information to foster competition.

Sometimes the government's posting requirement may be the result, rather than the cause, of increased attention to the importance of particular characteristics. The government may begin to require that sellers post information about particular characteristics after people have decided that the characteristic is important—witness the FDA's recent initiatives with foods listed as "light" or "low in cholesterol."

How effective is government sign posting? Early experience with airline promptness is suggestive. In November 1987, the U.S. Department of Transportation began publishing monthly reports on major airlines' on-time performance to foster the C&M effect, i.e., to enable passengers to make informed choices among flights, and to increase the airlines' incentives to minimize delays.<sup>37</sup>

Some evidence suggests that passengers pay little attention to the reports. For example, a poll of 1,500 travel agents in June 1988 revealed that 72 percent of them had never been asked by a customer for information about on-time performance, even though flight-by-flight ratings had been available for six months on travel agents' computers. There are several possible explanations for this finding: First, many consumers may be unaware of the data's availability. Second, factors other than promptness affect flight choices, including price, customer loyalty to particular airlines, and frequent flier programs.<sup>38</sup>

Nonetheless, airlines with good on-time records often do include this information in their advertisements. And on-time performance among the airlines has improved. For example, in September 1987, 77 percent of flights were on time. In June 1988, 84.3 percent were on time.<sup>39</sup> On the other hand, in at least some cases, airlines have merely increased the stated length of flights to give themselves more leeway, so reported improvements in on-time performance may be overstated.

Government manipulation of sign posting to increase competition or awareness of certain characteristics may decrease the quality of, or competition over, other characteristics. For example, the government's monthly publication of on-time performance data may have succeeded in increasing competition along this dimension. But perhaps focusing competition on promptness has caused airlines to be less attentive to other product features, such as passenger comfort. Similarly, as already mentioned, the SEC's disclosure requirements may cause companies to provide too much information.

### Conclusions

The foregoing discussion suggests several conclusions, drawn on concepts from multi-attribute utility theory, game theory, and decision theory.

First, sellers will tend to overproduce characteristics that can be posted in signs, and underproduce characteristics that cannot be posted. For example, if accounting rules require firms to post current earnings but prohibit them from posting projected earnings, then firms may focus excessively on producing good current earnings, to the detriment of their longer-term interests.<sup>40</sup>

Second, if sellers can choose which characteristics to post, they may post characteristics that their competitors are not posting; that is, sign posting may facilitate actual or perceived product differentiation, reducing competition.

Third, if a firm can vary the level of particular characteristics of its product (in addition to choosing which characteristics to post), then it may choose to differentiate its product by producing more or less of particular postable characteristics than its competitors do. This too could reduce competition.

Fourth, because prices may serve as a signal of quality, sellers may have a disincentive to post low prices.

Fifth, government regulation of signs—for example, requiring truthfulness or completeness, or imposing standardized reporting arrangements—affects not only what information is conveyed but also product design and ultimately market structure.

Throughout our lives—from a toddler's cry to be cuddled, through a college student's careful choice of essay topic, to a corporate executive's skillful explanation of diminished earnings—we are all engaged in the game of sign posting, the selective revelation and partial decoding of information. In our private lives, sign posting plays a pivotal role in activities ranging from casual conversation to courtship. In the business world, the ability to post truthful but likely incomplete signs profoundly affects both product attributes and market structures.

### NOTES

1. The relation between "sign posting" and "signaling," as the term is used in economics, is discussed below.
2. Ralph Keeney and Howard Raiffa, *Decision and Multiple Objectives: Preferences and Value Tradeoffs* (New York: Cambridge University Press, 1993).
3. We assume in this paper that sellers post signs about their products, and that buyers decode the signs; this reflects the division of labor observed in practice. But why don't buyers post signs about what they are looking for? There are several reasons.

First, in "product space," the seller's product occupies a *point* (e.g., he is offering an apartment with three rooms, one bath, and a fireplace), but the buyer has an *indifference curve* (e.g., he might give up a fireplace to get

a second bath). It is probably easier for the seller to describe his point than for the buyer to describe his curve.

Second, it may be easier for the seller to describe the characteristics of a product than it is for the buyer to describe what he seeks in a product. For example, a seller can use photographs to communicate what his apartment looks like. It may be more difficult for buyers to describe what they want an apartment to look like.

Third, sellers will typically be able to exploit greater economies of scale in sign posting than could buyers. A company that makes and sells thousands of cars can spread among all of its sales the cost of posting signs; the car buyer typically buys just one car and therefore cannot similarly spread such cost. (Of course, when buyers can exploit economies of scale—as can, say, Walmart’s wholesale buyers—then they may well post signs.)

4. Sellers will typically post only favorable information about their products, but may occasionally post unfavorable information, for at least five reasons. First, if the seller chooses a sufficiently insignificant flaw, the benefit of demonstrating his honesty by posting it may outweigh the detriment of having revealed it. Second, posting unfavorable information about a “bad” characteristic that the buyer does not care strongly about may counteract the otherwise problematic effect—discussed below—that low price is often a signal of low quality.

Third, posting unfavorable information (“We’re number two”) may indicate complementary favorable characteristics (“We try harder”). Fourth, sellers may post bad characteristics because prospective buyers ask them to.

Fifth, a seller may post an unfavorable characteristic in the belief that buyers will misunderstand it. For example, a seller might truthfully report that his car has a certain compression ratio. The stated ratio may actually be bad, but naive buyers will assume that it must be good or the seller would not mention it. Similarly, a bank might post its CD rates in a large sign, or a gas station its gas prices, even if the posted numbers are not really competitive.

Interestingly, sellers appear to be less likely to post bad characteristics of their competitors’ products. (The conspicuous exception is politicians, who commonly engage in negative campaigning.) One reason is probably that mentioning a competitor’s name—even in the context of making a negative comment—promotes awareness of that name.

An *excuse* is a sign intended to cause observers to interpret an apparently bad characteristic less harshly than they otherwise would. For example, explaining to a visitor that the seller just returned from out of town could cause the visitor to discount the messiness of the seller’s office.

5. Steve Johnson, Co-CEO of Johnson-Grace, the leading image compression

company on the Internet, observes: “We present our potential customers with a range of examples of compressed images. Naturally, the greater our advantage over the competition for an image, the more likely it is to be included.” Personal communication, May 1995.

6. While price is generally a variable characteristic, there may be exceptions, as with government-imposed price controls.
  7. Thus, buyers sometimes determine the requirements that will be imposed on sellers. Consider the problem facing an employer who wishes to hire a research leader with administrative and research responsibilities. Should the job description require a Ph.D.? On the face of it, an employer might be inclined to omit this requirement, believing that some qualified candidates may not hold a Ph.D. But then potential applicants with Ph.D.s might not apply, either because they do not wish to take a job that does not require a Ph.D., or because they wrongly infer that the job is primarily administrative. On the other hand, an applicant without a Ph.D. who does receive a job offer will be very happy.
  8. David Marks and Richard Zeckhauser, “Sign Posting: Selected Product Information and Market Function,” working paper, 1994.
  9. This suggests that signs are postable if they contain objectively rebuttable information. For example, the number of tennis courts is postable because sellers will be reluctant to say they have four courts if they only have two. On the other hand, there may be a tendency to exaggerate subjective items.
  10. See Michael Spence, *Market Signaling: Informational Transfer in Hiring and Related Screening Processes* (Cambridge, MA: Harvard University Press, 1974).
  11. There has been much discussion of advertising as a signal. See, for example, Philip Nelson, “Advertising as Information,” *Journal of Political Economy* 81 (1974): 729–754; Richard Kihlstrom and Michael Riordan, “Advertising as a Signal,” *Journal of Political Economy* 92 (1984): 427–450; and Paul Milgrom and John Roberts, “Prices and Advertising Signals of Product Quality,” *Journal of Political Economy* 94 (1986): 796–821.
- This paper employs a different approach to explain the use of signs. Whereas the signaling models generally assume that advertising is uninformative, we assume that signs *are* informative.
12. Rizzo and Zeckhauser show that advertising has no effect on price in physician markets. John Rizzo and Richard Zeckhauser, “Advertising and the Price and Quality of Primary Care Physician Services,” *Journal of Human Resources* 27 (1992): 381–421.
  13. Thus, New York City consumer protection laws prohibit a seller from advertising a product as being sold at a marked-down price unless the seller actually sold the product at the original price. The posted price of new cars is the point from which expected discounts are computed. The major long distance telephone services offer so many discount programs



- that most people do not pay the full listed rates; therefore, discount percentages are uninformative, and some long distance advertising mentions comparative prices, rather than percentage discounts.
14. Marketing experts tend to believe that it is often better to provide less information in signs. A widely accepted principle in marketing is that advertisements should focus on no more than a few of a product's features.
  15. Posting just one characteristic, rather than a few, may be less likely to prompt prospective buyers to think about which characteristics are not posted. This may help explain why sellers often post only one characteristic, even when their product has a large number of characteristics. Car ads, for example, often focus on just one feature.
  16. The cost of being known to have made a false statement can be high. (For example, at a university the penalty for falsely denying a true allegation of plagiarism may be more severe than the penalty for having plagiarized.) This cost increases the likelihood that signs are truthful and therefore increases the effectiveness of sign posting.
  17. It is important to be careful about our assumptions about buyers and sellers. Sometimes a naive buyer can rely on the fact that other buyers are informed. This might be true if the salesman could not distinguish between sophisticated and unsophisticated buyers, and was targeting both groups. In this case, the seller might not make a claim unless it would impress a sophisticated buyer. But if the seller only counts on selling cars to naive buyers, this reasoning does not apply. In some models, it will be sufficient for naive buyers to know that some buyers are sophisticated. However, this will not work if the product is targeted at unsophisticated buyers.
  18. John Pratt, David Wise, and Richard Zeckhauser, "Price Differences in Almost Competitive Markets," *Quarterly Journal of Economics* 53 (1979): 189-211.
  19. In reality, different prospective buyers have different inferential abilities, and sellers presumably try to exploit this, by posting different kinds of signs for different target audiences. Times Square signs saying "GOING OUT OF BUSINESS, 50% OFF" may fool unsophisticated tourists, but are not likely to fool more sophisticated New Yorkers.
  20. Daniel Kahneman, Paul Slovic, and Amos Tversky, eds., *Judgement Under Uncertainty: Heuristics and Biases* (New York: Cambridge University Press, 1982).
  21. Richard Cavanaugh, search committee member, personal communication, October 3, 1994.
  22. Because of the advantage to a seller of posting different characteristics than his competitors post, a seller may choose to post signs that his competitors can't imitate (e.g., "oldest restaurant in Boston").
  23. For a related discussion, see Asher Wolinsky, "True Monopolistic Compe-

- tion as a Result of Imperfect Information," *Quarterly Journal of Economics* 101 (1986): 493-511.
24. For example, posting referees' names on journal articles would reward their effort, provide incentives for better assessments, and guide prospective readers.
  25. The differing quality of Korean and Taiwanese manufactured exports illustrates this. See Dani Rodrik, "Industrial Organization and Product Quality: Evidence from South Korean and Taiwanese Exports," in *Empirical Studies of Strategic Trade Policy*, eds. Paul Krugman and Alasdair Smith (Chicago: University of Chicago Press, 1994). Rodrik found that the quality of Korean manufactured exports is higher, at least as indicated by price received, and attributes this to the superior ability of Korean firms to internalize reputational externalities. Korean industry is dominated by large conglomerates, whereas Taiwanese industry is less concentrated. The large Korean firms, with well-known brand names (such as Hyundai, Samsung, and Lucky Goldstar), have a greater incentive to provide high quality goods.  
Rodrik found that Korean goods sell for about 20 percent more than their Taiwanese counterparts, reflecting that Korean goods have systematically higher quality. Country names could also function as signs of quality, as brand names do. For example, Korean products could come to have a reputation for being of higher quality than Taiwanese products.
  26. While signs create incentives for sellers to enhance postable characteristics, sellers also have other incentives to enhance unpostable characteristics. First, if a buyer can observe certain characteristics before a purchase becomes final, then the seller has an incentive to improve those characteristics even if they are not postable. Second, if the seller hopes for repeat business or referrals, he will be concerned that his product's nonpostable characteristics satisfy the buyer's expectations. Third, the seller may have legal or moral obligations to produce the characteristics or, as master woodworkers will tell you, may take pleasure in producing excellent hidden work.  
Sellers may also try to imply that unpostable characteristics are better than they actually are: A freshly painted home interior suggests a fastidious homeowner and better conditions under the walls. Slovenly homeowners can capitalize on this to paint a false picture.
  27. Private organizations, such as Consumers Union or Underwriters Laboratories, can also affect product quality by posting signs of their own, or by allowing their signs to be posted.
  28. For example, the Pure Food and Drug Act of 1906 prohibits shipment of misbranded food and drugs. The Federal Trade Commission Act of 1914 established the FTC, which is today the single most important government agency concerned with advertising. The Lanham Trademark Act of 1947

protects firms' interests in trademarks and slogans. The Fair Packaging and Labeling Act of 1966 requires that manufacturers label packages with the content, the manufacturer, and the quantity. The Public Health Cigarette Smoking Act of 1970 banned cigarette advertising on the broadcast media, and required health warnings on cigarette ads in the print media. See C. Bovee and W. Arens, *Contemporary Advertising* (Homewood, IL: Irwin, 1986), pp. 50–51.

29. Independent private entities may also post signs about sellers' products. For example, *Consumer Reports* posts detailed signs evaluating different brands of particular products.
30. There are exceptions to this requirement. For example, "puffing" is generally permitted, on the grounds that most consumers will correctly unravel the seller's hyperbole. Thus, a beer seller might be permitted to assert that his beer has "the smoothest taste."
31. Interestingly, government regulations sometimes bar sellers from posting truthful information. For example, drug companies are not allowed to post the beneficial effects for unapproved uses of drugs approved for certain uses. Liquor companies are not allowed to post the nutritional content of alcoholic beverages.
32. The use of standardized methods of accounting is an important example of this, albeit regulated by the Financial Accounting Standards Board, a private, nonprofit organization.

Some products do not lend themselves to standardized labeling or reporting. When the government began to regulate the labeling of juice beverages several years ago, it required beverages being called a "juice drink" to contain no more than a certain percentage of water. This particularly hurt cranberry juice producers because undiluted cranberry juice is practically unpotable, and producers must add a lot of water. Ocean Spray's "Cranberry Juice" had to be renamed "Cranberry Juice Cocktail."

33. Whether insurance packages should be standardized was a critical issue in the national health insurance debate of 1994. Already Supplementary Insurance for Medicare must be sold in one of a number of standardized packages. Economists usually talk about the benefits of standardization in avoiding adverse selection, and the costs in terms of discouraging innovation or product diversity. Sign posting concerns suggest that standardization facilitates comparison shopping.
34. Such labeling is hardly helpful, however, if individuals have difficulty understanding the risks. Kip Viscusi and Wesley Magat, *Informational Approaches to Regulation* (Cambridge, MA: MIT Press, 1992).
35. *Reducing the Health Consequences of Smoking: 25 Years of Progress*, a Report of the Surgeon General (Rockville, MD: Office on Smoking and Health, Center for Chronic Disease Prevention and Health Promotion, Centers for

Disease Control, Public Health Service, U.S. Department of Health and Human Services, 1989).

36. Mutual funds also must now report their performance in a standardized way. We would not expect this to affect significantly their incentives to perform well because such incentives have always existed. But it may now be easier for investors to learn about funds' past performance. Thus, in this case, the "consumer" effect will probably be large compared to the "manufacturer" effect.
37. I. Molotsky, "Major Airlines Are Ranked on Delays and Other Woes," *New York Times*, November 11, 1987, p. B9. A flight is deemed to have arrived on time if it arrives within 15 minutes of the scheduled time. Thus, being 16 minutes late and being 5 hours late have the same effect on an airline's rating.
38. T. Waite, "Q. and A.: Airline Ratings a Year Later," *New York Times*, August 28, 1988, Travel Section, pp. 12, 26.
39. *Ibid.*
40. Inhibitions on and difficulties in portraying the future are thought to be an important cause of leveraged buyouts.