Asymmetric Information
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Many business situations are plagued by information difficulties, in which one party to a transaction has better information than the other. (Think of the phrase: “Trust me on this.”) We refer to these situations as having “asymmetric information.” Inevitably, the party with superior information is tempted to exploit its advantage. And even if it isn’t, the other party may think it will. And the uninformed part has some leverage, too: it can walk away walking away from a deal may offer it some leverage. The result is one of the most interesting and challenging aspects of business.

Consider these examples:

- Health insurance company faces pricing dilemma. A low price leads to small margins. But a high price runs the risk of attracting only high-risk patients. What should it do? We refer to its problem as “adverse selection,” since the high-risk patients are more likely to “select” the plan. The problem is that the health of a patient may be known better by the patient than the insurance provider.

- Large firm would like to spin off subsidiary. Potential buyers ask: Is this a strategic move (the firm wants to concentrate on other businesses) or an attempt to unload what it knows to be an unprofitable business?

- Price as signal of quality. New firm enters market for luxury luggage. Would like to reduce price to gain market share, but worries that this might be interpreted by customers as a sign of low quality.

You get the idea. Information can be a serious friction to doing business. This class is devoted to exploring some of the ramifications of asymmetric information in stylized settings where the issues are clear, if a little unrealistic. We return to reality at the end and discuss ways in which information problems might be ameliorated.

Games with Asymmetric Information

Games with asymmetric information are simply games where one player has better information than the other. We can find many examples of asymmetric information in day-to-day life. When people apply for health insurance they often know more about their health status and history than the insurer. Manufacturers of products often know more about the quality of their product than do consumers. Firms presumably know more their assets than potential buyers. In a legal setting, defendants often know more than plaintiffs. And in Edgar Allen Poe’s “Telltale Heart,” the guilt-ridden criminal
knows about his crime while the investigators do not. (And, if he had kept his cool, he would have probably remained a free, yet disturbed, man.)

To see how asymmetric information affects strategic games between competitors, we can look at two polar cases. First, we can consider a game where the relatively less-informed player moves first. In this case, “adverse selection” becomes a risk for that first mover. Consider, for example, the case of litigation for medical malpractice. Before the trial proceeds to the discovery stage, it seems reasonable to assume the defendant has better information than the plaintiff. If the plaintiff makes the defendant an offer for an out-of-court settlement, he should take into account that such offer will be accepted if and only if liability is likely to be greater than the proposed settlement – the exact situation in which the plaintiff would want the offer not to be accepted.

Second, we could consider a game in which the informed player moves second. In this case, the first move may tell the other player something about the first player’s move, which the first player will take into account. If a firm knows the quality of its product, could a buyer infer quality from the seller’s price? Typically the move by the first player contains information that the second player can use to make a better decision. The first player knows this, of course, and uses it to guide its choice.

The takeaway point when the uninformed player moves first is that she must how the informed player will react: if this is really such a good deal, why is it being offered to me? The takeaway point when the informed player moves first is that the move conveys information. The trick to to convey the right information.

**Selling “Lemons”**

Suppose the uninformed player moves first; what information will guide her strategy? The classic example is the sale of a used car. It made more sense in the 1970s than it does now, when car quality is uniformly higher. But the idea is that when you buy a used car from an individual, you probably know less about the quality of the car than the seller. You move first in the sense that you don’t observe any informative moves by the seller before you make an offer. The risk is that you might buy a “lemon” (meaning a low-quality car, not what you season your fish with).

Consider a concrete example. In the game, the buyer makes an offer and the seller decides whether or not to take it. Suppose that you, a potential buyer of a used car, know from reading *Consumer Reports* that 50% turn out to be lemons. You decide that a lemon is worth zero and a non-lemon is worth 1500. If the chances of the two possibilities are 50% each, you might set your reservation price (the most you are willing to pay) at $750 based on the 50% probability of buying a dud [750 = (.5x0) + (.5x1500)]. Anything more, and you’d prefer to walk away. What about seller? Let us say that a seller would be unwilling to part with a non-lemon for less than 1000, the fair market value based on the blue-book value of the car, etc. Now we have a problem. Given your lack of information about whether you will get a lemon or not, you are willing to pay less
for the model than the reservation asking price of legitimate sellers. This means that anyone trying to sell you the car for your price is probably selling you a lemon!

It only gets worse. Fearing that you will get a lemon at $750, you change your reservation price downward because you think the likelihood of getting a worthless lemon is now 90%. Thus, my new bid is 150 [= (0.9 x 0) + (0.1 x 1500)]. Now who on earth would sell you a car that, worth 1500 without defects, sells for only a tenth of this price? Only people selling lemons. As this downward spiral continues, both buyers and legitimate sellers drop out of the market until the market vanishes. This happens because buyers do not have the information they need to make risk-free offers based on fair market values.

It’s a classic example of bad products driving out the good: if it’s impossible to demonstrate quality directly, no one would be willing to produce and sell high-quality products at the price buyers (who don’t know quality) will pay. Viewed from the perspective of game theory, we ask ourselves the basic question: Why is the seller willing to part with the product? If we fear that it’s because he knows that it’s of low quality, we decide not to buy and the market collapses. We would say (formally) that the only Nash equilibrium is in which no transactions take place. This extreme outcome is the result of the parameters we started with, but more generally the difference in information will lead some mutually beneficial transactions not to take place. Asymmetric information is a barrier to beneficial economic transactions.

The takeaway point is that the absence of good verifiable information makes it difficult to conclude transactions that are valuable to both sides. If only the owner of the non-lemon car could convey that information to the buyer in a convincing way. In practice, there are many institutions that play that role: warranties, legal systems, third-party ratings (Moody’s and S&P, Consumer Reports, Zagat Guides), the seller’s reputation, free trials, and so on. Protecting the integrity of these systems is often in the interest of sellers. For example, financial service firms in the US have been the beneficiaries, by and large, of SEC regulation designed to protect buyers.

“Signaling” Quality

The other application of asymmetric information we can consider is when the informed party moves first in a strategic-form game. In this case, the informed player must understand that her action will convey (“signal”) information to the less-informed party. For example, price is considered an important signaling mechanism. If you choose to bring a bottle of wine to a friend’s house for dinner and know very little about wine, you might buy a $20 bottle of wine instead of the $7.99 special. (Of course, beer is always good.) As a non-expert, you may not know how the two taste, but clearly the more expensive one seems a safer bet. The vintner in this case is signaling information that she possesses and you don’t about her wine’s quality. Similar things can occur with other products: stereos, consultants, surgeons, investment banking services. The key is that the seller has demonstrably better information about the product than the buyer. That’s
one of the hazards about using a low price to gain market share: it might convey to buyers that the product is low quality.

To understand this type of game better, suppose there is one seller of stereos and many buyers. The seller sets one price and buyers decide whether to buy. Only the seller knows the true quality of the stereo’s many components. In some theoretical examples, we would find that only a high-quality producer would charge a high price: If a stereo producer used high quality parts, and those parts cost more, she should set a higher price. If she is using low quality parts, which cost less, she should set a lower price.

How can we explain that, in equilibrium, price reflects quality? First, a high-quality product would not be profitable at a lower price because its parts cost more; these costs must be recovered via a higher price. But why would a low-quality producer not want to (falsely) signal high quality using a higher price? In many cases this will limit your market: fewer consumers are willing to spend more for high-priced stereos to feel more secure about quality (or not everyone has enough income to do so). Thus, by pricing your cheaper goods at a higher rate, you would lose the larger market of people looking for more affordable equipment. Based on what we know about revenue (price times quantity) we can see that we may very well lose more in quantity by selling high than we gain in a higher price. In addition, as people found out in the long run that your stereos were not worth their higher price, you would lose your market to the higher-quality competition.

In short, there are games in which the equilibrium is for the high-quality product to sell at a higher price than the low-quality product, which allows uninformed buyers to infer quality from price. This works if the signal has a cost (if it’s free, the low-quality producer will follow suit) and the cost is lower for high-quality producers. In practice, other factors play a role, too, including several we mentioned earlier: the reputation/brand of the seller, warranties (which are presumably more costly to the producer of the low-quality product), reviews by consumer product firms and other buyers, and so on.

**Historical Note**

The 2001 Nobel Prize went to three economists who were instrumental in developing the theory of economic behavior in situations of asymmetric information. George Akerlof is responsible for the lemons model. Mike Spence developed the signaling model. In his example, students used education to signal ability. We prefer to think of education having value in its own right, but we suspect you can see his point. Joe Stiglitz applied the theory to capital markets; in particular, to an entrepreneur trying to finance a new venture.
Examples

Health insurance. Many policies exclude “preexisting conditions.” Why? Other policies offer better rates to groups. Why?

Life insurance. Most policies require a physical. Why?

Downsizing. Firm must reduce payroll by 10%. But if it offers a standard package to all of its employees, the best employees are the most likely to take it. Again, adverse selection. How might it reduce its payroll without losing its most productive employees? For example, Merrill Lynch announced such a plan in October of 2001. The plan allowed employees to apply for a severance package, but the company could decide which applications to accept. Why do you think they structured the plan this way?

Ethnic business ties. Some businesses involve important judgments about quality. The diamond business, for example. We sometimes see that such businesses are dominated by members of a single ethnic group. Why do you think this is?

American Express’s spinoff of Shearson. In 1993, American Express sold Shearson to Primerica (now part of Citigroup). In the March 9 Wall Street Journal: “Among the sticking points in acquiring Shearson’s brokerage operations would be the firm’s litigation costs. More than most brokerage firms, Shearson has been socked with big legal claims by investors who say they were mistreated, though the firm has made strides in cleaning up its backlog of investor cases. In 1992’s fourth quarter alone, Shearson took reserves of $90 million before taxes for ‘additional legal provisions.’” When the deal was completed, Primerica bought most of Shearson’s assets but left the legal liabilities with American Express. Why do you think the deal was structured this way? Was it fair to American Express?

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