

## 23. Credibility and Reputation

This chapter concerns two linked phenomena: credibility and reputation. First we ask, What renders a promise or a threat credible? Several answers are given, but we dwell in particular on the role that reputation—and the desire to protect it—can play in lending credibility to a promise or threat. After discussing these phenomena somewhat generally, we apply them to the problems facing real-life monopolists and oligopolists.

Monopolists are rarely the object of sympathy or pity. After all, according to the standard theory of monopoly, a monopolist examines the demand function for its product, determines what price maximizes profit, declares this to be the price, then watches profit roll in. What other subspecies of economic animal has a board game named after it?

The life of a real monopolist is not so smooth, however:

- When the 086 chip, the central processor of the original IBM PC, was first developed and sold by Intel, personal computer manufacturers were wary of designing computers that would use the chip. They were concerned that once they built a product around the 086 chip, had software developed for it, and established a base of customers who used the chip, they would be at the mercy of Intel, which could raise prices and thereby extract any profits the manufacturer might earn in the PC business. *How could Intel convince computer manufacturers that, once they were hooked on the 086 chip, they would not be subjected to rising prices?*
- In the early days of the copier business, Xerox had a virtual monopoly on the manufacture and sale of plain paper copiers. The technology was vastly superior to available alternatives—how many readers remember the days of carbon paper?—and some potential users, such as law firms, were willing to pay a premium price for a copier. But Xerox encountered some resistance: Potential customers anticipated that Xerox, having sold its copiers to such high-end users at a premium price, might then cut prices for the next tier of users. Anticipating this, many high-end users waited for prices to fall. *How could Xerox convince its high-end customers that it would not allow prices to fall if it saturated the high-end-customer segment of its potential market?*
- For many years, Polaroid enjoyed a virtual monopoly in the instant photography segment of the photography industry. To be sure, instant pho-

tography was small potatoes compared to standard photography, but if Polaroid's position was limited, it was enviable. Then, in 1976, Kodak announced that it was going to enter this line of business. Kodak tailored its entry strategy in a way that left Polaroid somewhat protected: Profits in instant photography come from selling film rather than cameras, and Kodak entered with a camera-film package incompatible with Polaroid's cameras and film and with a fairly expensive camera. Kodak was as much as saying that it wanted to share in the market and not drive Polaroid out. Polaroid had to choose: It could respond in "businesslike" fashion, accommodating itself to Kodak's entry, which would probably have left it with substantial profit. Or it could choose to go to war against Kodak, an expensive and uncertain proposition, especially given Kodak's immense financial strength. *Both to protect its monopoly against this incursion by Kodak and to forestall other entrants, how should Polaroid react?*

- In the mid-1970s, Boeing, McDonnell-Douglas, and Lockheed almost simultaneously introduced the first jumbo jets, the 747, DC-10, and L-1011. While the DC-10 and L-1011 were quite similar in operational characteristics, the 747 was something unique. It was larger, of course, but it also had some range advantages, especially the 747SP, which compromised size for a very impressive flight range. As a result, Boeing had a niche in the civil air transport business all to itself. Yet, despite this very impressive position in the market, major customers of Boeing continued to insist on favored treatment. *How could Boeing convince these customers that, by virtue of being a monopolist, it would set the price for its widebodies?*

This chapter examines two intertwined topics that bear on these four problems: credibility and reputation. Section 23.1 discusses the basic issue of credibility and some solutions that work in specific instances. In the course of this discussion, we further examine the cases of Intel and Polaroid. Section 23.2 discusses the economic model of reputation, emphasizing how reputation can—sometimes—repair problems of credibility. To illustrate these general ideas, we return to cases of problems facing real-life monopolists.

### 23.1. Credibility

Consider the extensive-form games depicted in Figure 23.1. In this game, called the *threat game*, Player B (he) must decide whether to challenge Player A (she). If there is no challenge, B nets 0, and A gets 2. But, if A is challenged, then she must decide whether to fight or acquiesce. Acquiescence nets 1 for

A, while fighting costs her 1, so it seems likely that A would acquiesce if challenged. Thus, Player B can safely challenge A and get a payoff of 1.

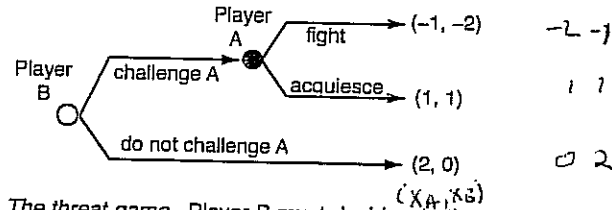


Figure 23.1. The threat game. Player B must decide whether to challenge A. If B challenges A, A must decide whether to acquiesce or to fight. Fighting is bad for A once A has been challenged, but if B is convinced that A would fight, B does not challenge A, which is good for A. Therefore, A would like to threaten B that she would fight if challenged. But is this threat credible? (A's payoffs are listed first and B's second.)

Or can he? What if, as he starts to issue the challenge, A bares her teeth, growls, and issues a warning that, *even though* it will cost her 1 to fight, she will fight if challenged. If he believes this threat, he stays out, and she gets 2. Since it does not hurt her to make such a threat—talk is cheap—she can growl away. But precisely because talk is cheap, Player B probably should disregard this threat as mere posturing. Assuming we have the payoffs right, Player A's threat lacks credibility.

Now consider the extensive-form game depicted in Figure 23.2. This game, called the *trust game*, has the same basic structure of moves as the threat game, but the payoffs (hence the names of the moves) are quite different. Player B must decide at the outset whether to trust A. If B does not trust A, both sides net 0. If B trusts A, A must choose between treating B fairly, netting 1 apiece, or abusing B's trust, which nets 2 for A and -1 for B.

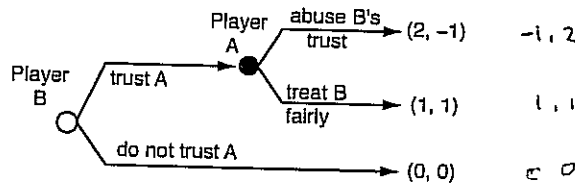


Figure 23.2. The trust game. Player B must decide whether to trust A. If B trusts A, A must decide whether to treat B fairly or be abusive. Abuse is best for A once she gets B's trust, but if B anticipates this, he will refrain from trusting A, to the detriment of both. Therefore, A would like to promise B that she will not abuse him. But is this promise credible? (A's payoffs are listed first and B's second.)

1 1 -1 2  
0 0 0 0

In this game, if B trusts A, A gets a higher payoff by abusing him than by treating him fairly. Seeing this, B would not trust A, to the detriment of both. So, before he decides, perhaps she should smile at him, make soothing noises, and tell him that she promises no abuse. Perhaps she can convince him to trust her. But is this credible? If A plans to abuse B, would she not smile and offer a promise of no abuse? This sort of promise is cheap talk once again, lacking credibility.

These two examples are two sides of the same coin. In each case, B must take an action, forecasting A's response. In each case, the best action for A once B has acted is clear. And, in each case, to elicit a particular initial action from B, A wishes to convince B that she would not act in her own best ex post interests. How can she do this credibly?

The term *credibility* has a number of meanings in English. In this chapter, we use the term as follows: We are always concerned, as in these games, with what some parties (call them Bs) expect, anticipate, fear, or hope would be the future actions of some other party (A). To induce desired behavior by others today, A wants to influence the expectations, anticipations, and, in some cases, fears or hopes of the Bs. Intel wanted to convince potential clients that it (Intel) would not dramatically increase the price of its microprocessors, once it has "hooked" a client base. Xerox wanted to convince potential high-end clients that it would not lower the price of its copiers in the future. Boeing wanted to convince its clientele that it would not bargain over the price of 747s. Polaroid wanted to convince prospective entrants such as Kodak that entry into Polaroid's domain of instant photography would be an unpleasant, unprofitable experience for the entrant. Is any of this credible? Unless it is, Bs cannot reasonably be expected to adopt the desired expectations, anticipations, fears, or hopes.

So the question becomes, How can A render credible what she wants to be credible?

### Tying Your Own Hands, Alone

Notwithstanding their differences, the promise and threat games point out the basic conundrum: What is credible, in most cases, is what is in the interests of A when it comes time for A to choose. And, in many situations, A's interests when it comes time for her to choose are different from what she would prefer ex ante to be credible. A simple promise or threat is insufficient, when the promise or threat does not change A's ex post incentives.

The most obvious way for A to render credible the actions she wants to be credible is to redesign the situation so that those actions are in her interests ex post. She can take steps that improve the payoff to herself if she takes those actions or worsen her payoff if she does anything else. Since it is typically

harder to improve one's payoffs from one action than it is to worsen them from another, we look for steps A can take that effectively tie her own hands, by substantially worsening her payoffs if she takes the "wrong" action.

Contracts promising specific performance are the most obvious examples of this. If the contract is enforceable by the courts, if it is clear that the Bs will avail themselves of court enforcement, and if the penalty for breach is substantial enough, party A, by entering into a contract, can render the promise of contractually stipulated performance quite credible. Do not go past the first two *ifs* in the previous sentence too quickly, however. Contracts work only to the extent that the courts enforce them, which requires first of all that the aggrieved party sees it in his interests to take the matter to court (see Problem 23.1).

Contracts are promises secured by court-enforced penalties in the event of breach. But they require third-party enforcement, which can be costly. Rather than enter into a contract, party A may simply structure matters so that the Bs, on their own, can punish A for misbehavior or malfeasance.

Consider, for instance, the problem facing Intel, which was to reassure its potential customers that it would not increase microprocessor prices once they were hooked. Intel could write a contract guaranteeing customers access to a certain number of microprocessors at a certain cost, but such a contract would either be extraordinarily rigid (unable to adapt to changes in the cost conditions facing Intel, technological innovations, or changes in the demands of customers) or, if it attempted to be flexible to these things, too complex to be enforceable.

Instead of offering rigid or unenforceable contractual guarantees, Intel simply licensed production of its microprocessors to several competitors. This reassured potential customers that, *if* Intel raised prices or rationed supply, the customers would have alternative sources. Intel could not successfully hold up its clients, and so it had no incentive to try.

(The Intel story is more complex than this quick recapitulation indicates, however, because for later generations of the 086 microprocessor, Intel drew back its licenses. Specifically, Intel licensed the 086 chip to 12 other manufacturers and, in fairly short order, was left with only a 30% market share in these chips. For the 286 chip, Intel cut the number of licensees to five and retained a 75% market share. And for the 386 chip, only IBM was given a license, to produce only for IBM's own computers. To the substantial extent that clients of the 086 chip were thereby addicted to subsequent generations of X86 chips, Intel's initial assurances provided by the licenses did not, in the end, provide all that much protection. It is doubtful that potential clients, when deciding whether to adopt the Pentium, would have been very reassured had Intel licensed broadly production of the first generation of Pen-

tiums. So why has Intel not engaged in the holdup originally feared? The stories in the next section, about reputation, may be the answer. And some of Intel's clients might argue that, to some extent, Intel has taken advantage of its very strong position as a monopoly supplier of a good to which many downstream manufacturers are somewhat addicted.)

A second example involves the actions of James Casey, the founder of the United Parcel Service, the leading package delivery company in the United States. When Casey first organized UPS, his plans for the business put a premium on getting the cooperation of the truck drivers, who would be largely unmonitorable, since they work out of the eye of any supervisors. To reassure his employees that he would not take advantage of them once they entered employment and set down roots, Casey invited the Teamsters labor union to organize his workforce. This happened at a time when management in the United States was generally extremely hostile to efforts by their workforce to organize. But Casey reasoned that, by inviting the Teamsters in and, from the start, building a constructive relationship with the union, he would give his workforce a hammer with which to pound UPS if UPS management tried to take advantage of the workforce. Therefore, the workforce could trust that UPS management would not try to take advantage, which in turn would benefit the company.

The punishment for misbehavior or malfeasance need not be rendered by a court or the injured party. To make a particular sort of behavior credible, party A might enlist social sanctions. The idea, roughly, is to set things up so that, if A acts badly, she is guilty of the violation of a social norm and will be punished socially accordingly. Promising good behavior in the presence of witnesses—and being demonstrative about this—can sometimes work. Promises made within a family-owned business are generally held to be fairly credible, because breaking a promise to a family member often results in social sanctions from the family. Although there are obvious problems with business done solely in an old-boy network or (only) with "members of the club," promises made within such a closed and close social circle can gain credibility on similar grounds.

### Tying Your Hands, So You Must Fight

Notions of contracts and the examples of Intel and of UPS concern situations strategically similar to the trust game: Party A wishes to ensure the Bs that she would not abuse them in the future. On the other side of the coin are situations resembling the threat game, where party A wants to render credible the threat that she will fight any B that challenges her. *Tying your hands*, in this context, means constructing the situation so that, when challenged, it is more costly to acquiesce than to fight. The idea usually is not that A makes

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fighting more attractive but that she makes acquiescing so unattractive that she must fight.

For instance, the threat game is a parable for entry deterrence: A potential rival (B) must decide whether to enter a market; and if it enters, the incumbent firm (A) must decide whether to accept the entry or fight, which is costly to both firms. In this context, the incumbent firm might choose a production technology that has very high fixed costs; it might commit to irrevocable agreements to purchase expensive raw materials, turning variable costs of inputs into fixed costs; it might load up on debt that can be serviced only if it maintains market share; or it might covenant its debt so incumbent management loses control of the firm if its market share slips. Then, the incumbent firm's back is to the wall, and it will fight.

A model of this is given by the game in Figure 23.3. Player A moves first, choosing between an optimal technology and a high fixed-cost (FC) technology. The word *optimal* here means that the first choice is better than the second, *fixing the action of Player B*. To see this, simply compare the payoffs to A in the top and bottom halves of the game tree.

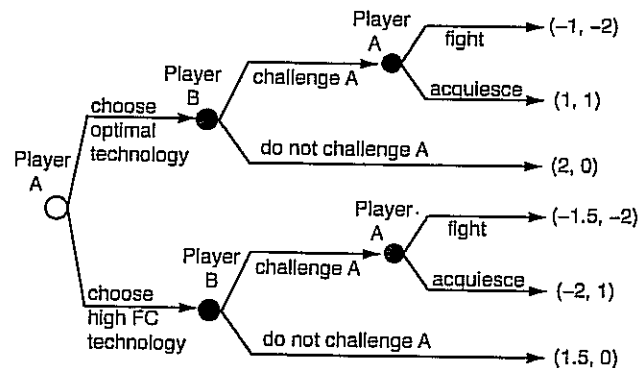


Figure 23.3. Making fighting credible by choosing a suboptimal technology. By choosing the high fixed-cost technology, A lowers its own payoffs at the end of each branch. But, because this choice is extremely harmful to A's payoffs if it acquiesces to entry, B is convinced that A would fight, and so B chooses not to challenge A.

The virtue of choosing the high FC technology for A is that it is particularly costly if A acquiesces to B's entry, so costly that, if A chose the high FC technology, it would rather fight than acquiesce to entry. If A chooses the high FC technology, B expects a fight if it enters and so chooses not to enter. Since the cost of maintaining the high fixed-cost technology (if it guarantees

no entry) is not high relative to using the so-called optimal technology and suffering from entry, the so-called optimal technology is not optimal at all.

This, in essence, is a Porter-esque entry barrier, one that lies on the interface between tangible and psychological barriers. A standard interpretation of an entry barrier is some action that makes entry unattractive to a potential entrant by lowering its payoffs if it enters; for instance, firms in the industry might lock up favored resources or channels of distribution, so that an entrant's costs would be high. What we see here is that it may work equally well for firms in the industry to take actions that commit them to a post-entry course of action costly for the entrant. In the game, A's choice of technology has no direct impact on B's payoffs; B's payoffs in each half of the tree are identical. But B's evaluation of whether to challenge A changes decisively in the top and bottom parts of the game, because of the effect of A's choice of technology on A's payoffs.

This sort of strategem is not danger free. Choosing a high fixed-cost technology can be a good move if it keeps at bay rivals, who fear that the technology compels the incumbent to fight. But no such strategem comes with a guarantee. Suppose A chooses the high FC technology then finds that B enters anyway. Party B might do this because its cost structure is such that it prefers to enter, even if it knows a fight will ensue, because it has its own reputation to protect (see the next section) or even out of pique. Then A is in a worse state for having tried to make its threat credible by these means.

If this warning sounds fanciful, please recall the story from Chapter 22 about Pratt and Whitney's unsuccessful attempt to knock Rolls-Royce out of a particular segment of the air-engine market. The game involved a third player, the British government, but the idea was not that different: Pratt and Whitney issued fuel-efficiency guarantees that would be costly for it if Rolls-Royce developed an upgraded engine. Since these guarantees starved Rolls-Royce of orders, they should have ensured that Rolls did not develop the upgraded engine, and thus they should not have been costly. This was a brilliant strategic move, *except* that the British government took umbrage and, notwithstanding the economics of the situation, gave Rolls-Royce the money it needed to develop the upgrade, moving Pratt and Whitney to a particularly bad outcome. Or, to cast this in classical military terms, burning your bridges behind you can be a great strategy if it convinces your rival not to attack, because you cannot retreat and your army, realizing this, would fight ferociously. But, if your rival attacks anyway and your ferociously fighting army loses the battle, burning those bridges would look pretty stupid in the history books.

### Tying Your Own Hands, and Everyone Else's

The major chemical firms in the United States, such as Dow or Monsanto, are among the strongest lobbyists for tough safety and environmental standards. Since these standards increase the costs of these firms, we might ask, "Why do these firms lobby for such tough standards?"

One explanation, based on the discussion in the preceding subsections, is that the firms are trying to make a credible promise to various constituencies that they conduct safe, environmentally clean operations.

This is not the only possible explanation, however. Legislation of this sort binds not only the major chemical firms but also their domestic competitors. Compliance with these sorts of regulations is generally an activity with a substantial fixed-cost component, so it is an activity relatively less expensive for the biggest firms than for smaller competitors. By supporting this sort of legislation, the big firms impose on smaller domestic competitors average costs substantially higher than the costs they impose on themselves.

This strategy (tying your own hands to tie those of your competitors) can go beyond lobbying for government regulations. Go back to the story of Jim Casey, inviting the Teamsters to organize the UPS workforce. One reading of Casey's intentions was given earlier: By empowering his workers, his promises that he would not try to take advantage of them gained credibility. Another reading is that he felt that his management style and business plan was particularly well suited to an empowered workforce; and he had the ability to work in businesslike fashion with the Teamsters, more so than his competitors. His recognition of the Teamsters did not guarantee that the union would subsequently be able to organize his rivals, but it increases the odds that his rivals would find their workforces organized, which, relatively, would be to UPS's benefit.

### What If Cheap Talk Is a Little Expensive?

In the preceding discussion of both the trust and the threat games, it was asserted that growling and hissing in B's direction as he decides whether to challenge A in the threat game and smiling at B as he decides whether to trust her in the trust game are unlikely to be effective. These things cost A nothing, and if they were at all efficacious, A would do them regardless of her intentions for subsequent action. So they are meaningless; and B should disregard them. In the language of game theory, they are *cheap talk*, as in "talk is cheap," with the implicit corollary that, when talk is cheap, only actions mean anything.

Having said this, it must be admitted that cheap talk does work on some individuals. Individuals in the role of party B sometimes are impressed by hisses and growls or smiles. So, in real-life encounters, don't forswear these

apparent indications of your intentions. Maybe your rival will be impressed, even if a game theorist would not be.

This presumes that the hisses, growls, and smiles are costless. In fact, they sometimes cost something, especially when the party who issues them subsequently acts in a manner at variance with her earlier expressions of intent. The cost might be psychological or trace from a loss in general reputation. Abusing a trading partner after smiling at him might, if the smile were observed by others, excite social sanctions. Growling and then backing down might cause a loss of self-esteem or exposure to ridicule.

If the cost of the hisses, growls, and smiles is high enough to guarantee that, once issued, they guarantee the desired subsequent behavior (if, for instance, to back down from a challenge after growling is so costly that, having growled, one is ready and willing to fight), then we are back to the sort of story told earlier. These are actions that, by changing A's payoffs enough, render credible promises of good behavior following smiles or threats of an aggressive response to a challenge in the wake of growls and hisses.

But what if these actions, while costly, are not so costly as to lend full credibility to the desired action? Do they then have any impact? This is a difficult and subtle question. The answers suggested by a game theoretic analysis are not entirely satisfactory. But a game theoretic analysis indicates that they may have an impact. Let me briefly illustrate this point by working with the threat game or, more precisely, the variation depicted in Figure 23.4. Prior to B's decision whether to challenge A, A can take an action, called *costly growling*, that decreases her payoffs everywhere in the game but decreases them in particular if B enters and A does not fight.

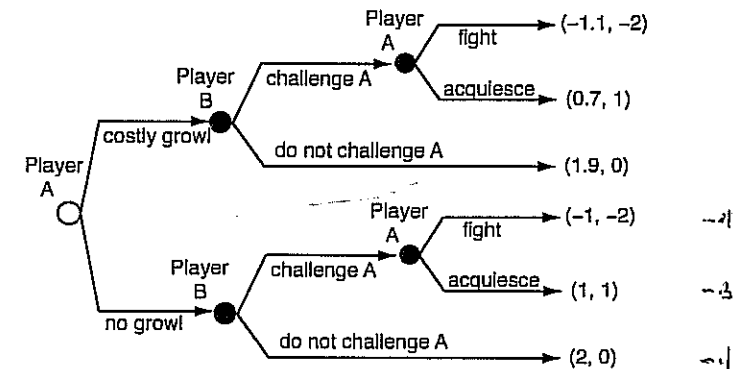


Figure 23.4. Is irrational growling rational? By choosing to growl, A lowers her payoffs at the end of each branch but not by enough that growling makes a fighting response credible. So what impact does growling have? (See the text.)

Compare Figure 23.4 with Figure 23.3, where costly growling is identified with high FC technology. In both cases, a choice of costly growling—high FC by A lowers A's payoffs relative to no growls—optimal technology. In both cases, B's payoffs are unaffected. But the crucial difference is that, while costly growling is more expensive to A if she does not fight than if she does, the relative expense is insufficient to make fighting better than acquiescing in the event of a challenge. Growling is costly, but not so costly that it makes a fighting response credible.

So what does a simple rollback of the game tree tell us? Player A would acquiesce if challenged in either half of the tree. Hence, B should enter in either half. Hence, there is no point to costly growling.

Now imagine you are Player B. You have done the analysis just given. You confidently await a lack of throaty noises from A, following which you will enter—then A growls. What do you make of this? How do you respond?

Your worry as B is that A would fight you if you challenge her. You were relatively sure she would not do so, because it is not in her interests *ex post* to do so. But this assurance is predicated on a presumption that A is not a crazy person who might strike out irrationally. And if A is not crazy—if you can be assured that she would acquiesce to entry—why did she engage in this pointless, costly growling? Maybe this is a sign that she is crazy. Maybe you should, on this basis, pick your fights with someone else.

Except, if this growling causes you to forgo the challenge, then growling is an entirely rational thing for A to do. In which case, you should read nothing into it and confidently challenge her. Except, if that is right, then growling is not rational.

To carry out a full analysis of this situation, you need a few techniques from the arsenal of game theorists that I have not introduced. In particular, you need to be able to put within your model the possibility (at least the possibility in the mind of player B) that A might be a crazy person who, notwithstanding the costs of fighting, is willing to fight if challenged. Further, you need to introduce into the model the notion that, if A is crazy in this fashion, she is likely to be growling. Interested readers can consult more advanced textbooks on game theory to see the ideas worked out.

### On Kodak's Entry into Instant Photography

Without going into the technical details, I can still give a case history that illustrates the conundrum faced by B, when to his surprise, he hears growls from A. When Eastman Kodak attempted to enter the instant photography business, which had been completely monopolized by Polaroid, it entered

in a particularly gentle fashion.<sup>1</sup> Its strategy seemed tailored to reassure Polaroid that Kodak would not use its immense financial and marketing strengths to knock Polaroid out of the market. In particular, Kodak designed cameras and film that were incompatible with Polaroid's cameras, so that Polaroid would be relatively reassured that it (Polaroid) would be able to continue to make money, selling film to its established customer base. In many ways, this constituted a tying our own hands strategy by Kodak.

Based on any reasonable financial calculations, it seemed better for Polaroid to acquiesce to Kodak's entry than to fight. This did not seem a fight that Polaroid could win, except by knocking Kodak out of the game with a legal victory in a patent infringement suit. Kodak had enormous financial and marketing strengths, and if the two firms went to war, it was hard to see how a "win" for Polaroid would, on financial grounds, be anything other than a loss.

Notwithstanding these considerations, Polaroid chose war. It launched patent infringement actions. It lowered the prices of its cameras. It brought to market a sequence of improved products, which it had been saving "on the shelf," presumably for just such a situation. And, right at the outset, Polaroid trotted out its founder, Edwin Land, who was quoted in the *New York Times* (April 28, 1976) as saying, "This is our very soul . . . our whole life. For them, it's just another field."

It is not hard to imagine Kodak looking at Land's statements and Polaroid's actions and wondering what was going on. Trotting out Land was not entirely cheap talk. If Polaroid planned to accommodate Kodak's entry, putting Land on display would mean a somewhat painful backing down. So if Polaroid were going to accommodate Kodak, why send Land out in this fashion? Taking into account the patent infringement suits, the new products, and the lowered prices, Kodak had to wonder whether Polaroid was willing to defend its "turf," even at the cost of ruining the company's financial position. Should Kodak be influenced by this? Should it back away from what was beginning to look like a costly fight? If it could be pushed out by such saber rattling, then the saber rattling was rational after all, in which case Kodak should expect Polaroid to back down. But, if Polaroid were going to back down, why rattle those sabers, at some immediate expense, in the first place?

In the event, Polaroid's saber rattling worked. It took quite a while, but every time Kodak tried to signal its firm intentions to stay, Polaroid took what seemed to be another warlike action. In the end, Kodak folded its hand,

<sup>1</sup> For details of this case, see the HBS case study *Polaroid vs. Kodak in Instant Photography*, HBS 9-376-266.

leaving instant photography to Polaroid, a monopoly Polaroid maintained until the advent of digital photography revolutionized the industry.

## 23.2. Reputation

We now take up the notion of reputation. As with credibility, I have something fairly specific in mind when I use the term. Imagine you are engaged in an encounter with some other party, whom I label B. You wish to predict how B would act in a particular circumstance. Of course, your prediction is influenced by the specific circumstances of the current situation: What specific options and payoffs are open to the other party? What might he reasonably expect you to do? Beyond this, it is entirely natural for you to study his past behavior, especially in similar situations, as a guide to what he will do next. A consistent pattern of his past behavior that helps you to predict how he would behave in the current situation is his *reputation*.

Reputations are usually fairly compact descriptions of predicted future behavior. *Procter & Gamble has the reputation of fighting entry fiercely* is shorthand for P&G has fought most (perhaps not all) entrants fiercely and can be expected to do so again. A less compact version would explain the caveat—for instance, P&G has in the past shown itself willing to accommodate entrants that would not threaten its particular market niches—and in so doing sharpen the prediction conveyed by the reputation.

Also, when I use the term *reputation*, I have in mind actions taken with a conscious appreciation for how they will be looked at in the future. Suppose, for instance, that in the Sam and Jan game of Chapter 21, Jan consistently alternated his Tuesday nights between Old Pros and the art museum. Then Sam would have no difficulty in knowing where to go on any particular Tuesday, assuming she knew where Jan went the week before. But do we say that Jan's *reputation* is that he alternates between the two destinations? It is probably more appropriate to say that this is Jan's *habit* or *pattern of behavior*.

United States Supreme Court Justice Potter Stewart once famously wrote, "I shall not today attempt to further define pornography, ... but I know it when I see it." So, to some extent, it is with reputation: To understand what I mean by reputation, concrete examples are needed.

### A Reputation for Trustworthiness

Imagine that A (she) and B (he) play the trust game repeatedly. To be very specific, suppose that, after each round of play there is a 0.2 chance that the just-completed encounter was the last and a 0.8 chance that they play at least one more time. The payoffs from the sequence of encounters they have is

just the expected sum of payoffs. (In exactly the fashion of Chapter 22, you could alternatively imagine that they play the game infinitely many times, with a discount factor 0.8 used to compute net present values.)

As we saw earlier, the only Nash equilibrium in this game played once has B refusing to trust A, because A would abuse B if B were foolish enough to trust to A's good nature. But if we repeat the game in the preceding fashion, the folk theorem kicks in and lots of other outcomes are part of equilibria. For instance, suppose that A and B adopt the following pair of strategies:

B trusts A in the first round and continues to trust A as long as A respects that trust by treating him fairly. But, if A ever abuses B's trust, B grimly refuses to offer trust ever again.

A treats B fairly in the first round and for as long as she has done so in the past. But if she ever—by mistake, presumably—abuses B, she will abuse him in all subsequent rounds given the chance.

Computation shows that these two strategies constitute a Nash equilibrium for the repeated game. The crucial computation is, Will A treat B fairly when trusted? She can do so and continue to do so, garnering payoffs of 1 in each round, for as long as the game persists. This gives her an expected payoff of

$$1 + (0.8)1 + (0.8)^2 1 + \dots = 1/0.2 = 5.$$

Or she can act abusively, netting an immediate payoff of 2. But then she would never be trusted again, getting 0 in all subsequent rounds, for an expected payoff of

$$2 + (0.8)0 + (0.8)^2 0 + \dots = 2.$$

It is pretty clear that she prefers to stick with her part of the equilibrium. And, fixing her strategy, the optimality of A's strategy for him is clear.

Now let me rephrase those two strategies:

B will trust A in any round if A has the reputation of a trustworthy individual. But B will not trust A if A's reputation is that she is untrustworthy.

A lives up to her current reputation. She treats B fairly if her (A's) reputation is that of a trustworthy person. But she acts abusively if her reputation is that she is not trustworthy.

A's reputation begins as a trustworthy person and remains that way as long as she never abuses B's trust. If she does abuse B, she gains a reputation for being untrustworthy, a reputation that can never be shed.

Note that the two players' strategies are described somewhat implicitly here: The actions of A and B both depend on this mysterious new thing, A's reputation. Then the "rule" by which A's reputation evolves is specified. You can turn this into a standard pair of strategies if you wish—in which case you get the strategies just given—but the point is to phrase things in terms of A's reputation, which is a product of her past.

Of course, since the strategies defined here implicitly are the strategies given before, which form a Nash equilibrium, this is just another way of describing an equilibrium.

The key to this being an equilibrium is the answer to the question, When A has the reputation of being trustworthy, why does she protect this reputation? Why does she forgo the short-run payoff of acting abusively? Preservation of her reputation, while it sacrifices short-run payoff, is better in terms of A's long-run payoff. Protecting her reputation is A's ticket to getting B to trust her, which means good payoffs in the future. In general, a good reputation is worth something, even if it means sacrifice in the short run, if it elicits behavior from others that sufficiently improves the reputation holder's long-run prospects.

Of course, this is not the only equilibrium in the repeated encounter. The folk theorem guarantees that there will be a lot more. For instance, consider the reputation-based decision rules just given, but replace the rule for the evolution of A's reputation with *A's reputation is that she is not trustworthy and never will be*. This gives Nash equilibrium strategies where B never trusts A and A would abuse B any time B is silly enough to trust her. There are other equilibria: where B trusts A and A acts fairly on all even-numbered rounds; where A is trustworthy, hence trusted, on all rounds whose number is not prime; and so forth. When you deal with the folk theorem, you get lots of equilibria.

### A Sequence of Trading Partners

The folk theorem, as related in Chapter 22, depends on the folks involved playing the game repeatedly. Specialized to this encounter, the notion is that B, if abused by A, punishes A by refusing to trust her in the future. Suppose instead that A plays the game with one B; call him B1, for the first B. Then, if there is a second round, A plays the game with a different individual, B2. B3 is the other party in the third round, if there is one, and so on. Does this really matter to the equilibria we described?

It does not. Let me restate the first equilibrium for this context, using the language of reputation. Not much changes:

$B_n$  will trust A if A has the reputation of a trustworthy individual and not otherwise, when and if round  $n$  comes along.

A behaves in conformance with her reputation, as before.

A's reputation evolves as before: A is perceived at the outset as a trustworthy person, and this remains her reputation as long as she never abuses any B's trust. But, if she does abuse some B, she loses her reputation for trustworthiness, a reputation that can never be reclaimed.

Even though the Bs change, this is still a Nash equilibrium. Now the language of reputation is even more appropriate, since we can imagine  $B_n$  asking Bs with earlier experiences with A, "How did she treat you? What's her reputation?" In fact, as long as each  $B_n$  asks his immediate predecessor these questions and passes on the information according to the reputation rule, everything works.

To tie this back to credibility, in the promise game played once, according to the payoffs in Figure 23.2, it is not credible that A, if trusted, would treat B fairly. The payoffs facing A motivate her to act abusively once trust is given. Credibility of fair treatment can be restored by a contractual guarantee (backed by the threat of court-ordered sanctions and punishments if A breaches the contract) or by some other structuring of the situation that makes abuse relatively less attractive to A than fair treatment. *Giving A a reputation stake in a repeated game situation is one way that abuse can be made less attractive than fair treatment*. If she is trusted at some date, A does better in the short run by abuse. But traded off against this is the long-run value of her reputation, *assuming* (1) her reputation is valuable, because it induces future Bs to trust her, and (2) abuse would shatter or, at least, damage that reputation. A's desire to protect her reputation, because of its value and fragility, makes fair treatment in any single encounter a credible action.

### A Reputation for Toughness: Making Threats Credible

Next imagine that A and B play the threat game repeatedly. As before, suppose that, after each round of play, there is a 0.2 chance that the just-completed encounter was the last and a 0.8 chance that they play at least one more time. The payoffs from the sequence of encounters they have is the expected sum of payoffs.

Played once, the equilibrium (obtained when you consider how credible is a threat that A would fight) has B enter and A acquiesce. Repeating

the encounter opens other possibilities; consider, for instance, the following strategies for A and B, done up in the language of reputation:

As long as A has a reputation for being tough, B will not challenge her. He will challenge A if ever A's reputation is that she is a wimp.

A will fight any entry that occurs, as long as she has a reputation for being tough. She will acquiesce if her reputation is that of a wimp.

A's reputation at the outset is that she is tough. It stays that way unless she acquiesces to some entry, after which her reputation is irrevocably that of a wimp.

This holds together as an equilibrium. Moreover, it is an equilibrium where A's threat to fight is now credible. To see this, suppose B challenges A. If A fights, she loses a unit of utility this round but preserves her reputation. Assuming B reverts to the strategy of no entry, this gives a stream of payoffs of 2, the expected value of which is

$$-1 + (0.8)2 + (0.8)^2 2 + (0.8)^3 2 + \dots = 7.$$

(Trust me on the calculation.) If, on the other hand, she acquiesces, she nets 1 immediately, destroys her reputation, and gets a payoff of 1 for the rest of the game, as long as it lasts. This gives her an expected payoff of

$$1 + (0.8)1 + (0.8)^2 1 + \dots = 5.$$

It is a near thing, but A is better off protecting her reputation than acquiescing and losing it. And if A is going to fight to protect her reputation, B's best response is not to challenge her.

Once again, it is not necessary that one A play one B repeatedly. It suffices that A plays repeatedly, even if A plays a different B in each round, as long as B in round  $n$  bases his entry decision on A's reputation, A's reputation evolves as given, and (presumably) B in round  $n$ , prior to his entry decision, asks B in round  $n - 1$ , "What sort of reputation does A have? What happened in the last round?"

As in the first example, we see reputation providing credibility. Player A's threat to fight is credible because if she does not fight, she faces a much bleaker future than if she does. Acquiescence is relatively more expensive, not in the short run but overall, which is what it takes to make the threat to fight credible.

Sometimes objections to this equilibrium are heard. If the equilibrium describes how the game is played, then A never faces any entry and never

has to fight. Put it this way: In the one A against a sequence of Bs version of the game, the answers given by B in round  $n - 1$  to B in round  $n$  are, "A is tough; she'll fight if you challenge her. But I don't know this from personal experience, because I respected A's reputation and failed to challenge her." Hearing this, B in round  $n$  might ask, "Has anyone ever seen A fight?" To which, in the equilibrium described, the answer is, "Nope. She's never been challenged." How did A manage to get this very convenient reputation for toughness? Two answers to this question can be offered:

1. Suppose that a certain fraction of the Bs (say 10%, on average) challenge A no matter what is her reputation, because even if abused, they are better off than if they fail to challenge her. Then, every so often, A faces a challenge, which she must fight to maintain her reputation. A calculation is needed here. If A faces challenges 10% of the time on average no matter what is her reputation and she fights all challenges to forestall others, then instead of averaging 2 per round, she expects to get  $(0.9)2 + (0.1)(-1) = 1.7$ . If challenged and she fights, her expected payoff is  $-1 + (0.8)(1.7) + (0.8)^2 1.7 + \dots = 5.8$ , versus  $1 + (0.8)1 + (0.8)^2 1 + \dots = 5$ . The reputation is still worthwhile, but only barely so.

We see this in real life. Procter & Gamble has a reputation for aggressively fighting entrants into its markets. This reputation forestalls most potential rivals, but not all. Those entrants that challenge P&G soon learn that P&G is willing to defend its reputation—which, in the end, is the real source of P&G's very valuable reputation.

2. The equilibrium describes a situation in which A has her reputation. At the outset of the sequence of encounters, she has to work to obtain it. This might mean facing entry one or two times and fighting that entry to obtain the desirable reputation; the point is that the reputation-acquisition phase describes a situation where her rivals do not know what to expect from her; hence, it is not described by an equilibrium.

### One Enduring Player versus Two

In the two examples we explored, reputation works in the general fashion of the folk theorem, but both sides to the encounter need not be enduring. It is important that A is enduring, because her credibility is at stake.

Do not conclude from this that everything the folk theorem gives us can be gotten with just one enduring player, facing a sequence of rivals. For instance, imagine one enduring player playing a sequence of prisoners' dilemma games against a sequence of rivals, each of whom plays once. The short-lived players have no reputation at stake, hence they follow their short-run interests and fink. Because they do, the enduring player has no reason

to do otherwise. In the repeated prisoners' dilemma game, it takes two enduring players to get away from fink-fink.

On the other hand, when two enduring players are in a conflict situation, the fact that each has a reputation stake has different consequences. Consider the threat game. Do we really expect an enduring A, playing a sequence of threat games, to be able to acquire and defend a reputation for fighting entry? If an enduring A plays a sequence of Bs, each of whom plays only once, this seems entirely plausible. The Bs, since they play only once, have no long-run incentive to press A; each is concerned with what A will do only in their one round of play. Because A has a reputation at stake and the Bs do not, A would seem to have the upper hand. But if A plays a single, enduring B, that B might seek to acquire a reputation for never backing down from a fight by challenging A. If B can convince A that he cannot be cowed by a fighting response by A, A has no incentive to fight. When an enduring A meets an enduring B in the repeated threat game, it seems natural to suppose that a war of attrition would start the encounter, where B challenges A and A fights, until one or the other side "gives in" to the superior staying power of the other. (If you consult the advanced literature of game theory, you'll find substantial theoretical support for these intuitions.)

### Reputation and Simultaneous Play with Many Partners

In these reputation stories, either A faces a single rival repeatedly or a sequence of rivals, each of whom conditions his choice of action in his own encounter on A's previous behavior. This establishes a possible long-run vs. short-run trade-off for A, which is the basis for A's reputation.

In some instances, instead of facing the Bs in sequence, A faces them simultaneously, but in encounters that themselves take a while to develop. In such cases, A can be restrained by a desire to maintain a good reputation with all her trading partners simultaneously.

For instance, Toyota deals with many suppliers. For most of these suppliers, Toyota is an extremely important client. Toyota's dealings with its suppliers constitute an ongoing matter, but in many instances, especially since Toyota insists on double sourcing most subassemblies, the balance of power between Toyota and any single supplier is entirely in Toyota's favor. That is, Toyota's good behavior is not really guaranteed by the folk theorem applied to the two-player game involving Toyota and the single supplier, because an individual supplier lacks the muscle needed to hurt Toyota, if Toyota misbehaves.

But collectively Toyota's suppliers can punish Toyota. Toyota's network of subcontracting relationships is highly efficient because it is remarkably flexible, flexibility that derives from the fact that the "contracts" between

Toyota and its suppliers are very simple, essentially providing that contingencies will be met with goodwill as they arise. If Toyota used this lack of contractual detail and its superior muscle to abuse one of its suppliers and the other suppliers learned of this, their natural response would be to insist on detailed contracts spelling out how the parties would deal with contingencies that might arise. Toyota would lose a lot of the flexibility it has under the current system, at great cost and inconvenience.

That is the point. Toyota maintains a reputation for being a tough-but-fair client of its suppliers. It has the power to be tough and unfair in any single case, but it does not exercise that power because to do so would compromise its reputation with all its suppliers. Its desire to maintain this reputation, to preserve its relationships, is what protects individual suppliers. (We return to this story in the next chapter.)

### Noise in Reputations

In the two examples given at the start of this section, the games are simple and the ability to observe what A does in each round is total. There is neither noise in observables nor ambiguity about what A's reputation is for. In the real world, both noise and ambiguity abound, and both can be killing to reputation equilibria.

Take the trust game; more specifically, take the repeated trust game with an enduring A facing a sequence of short-lived Bs. Imagine that, every time a B trusts A, A chooses between abuse and fair behavior. But these are only A's intentions: Even if A intends to treat  $B_n$  fairly, there is a probability that the Bs see A's actions in round  $n$  as abusive.

If A *seemingly* abuses a given B, subsequent Bs must punish A to some extent or A has an incentive to abuse all the Bs and blame it on happenstance. But the punishment inflicted on A should not be more severe than necessary to keep A in line. A should be given the opportunity to show contrition if possible. She should be able to get her reputation back, after the punishment. And A and the Bs should jointly look for ways of constructing A's reputation so that it can be monitored relatively noiselessly, to avoid all or at least most of the costs of noise.

Although it is a bit more complex than the model of A and a sequence of Bs, consider in this regard public accounting firms that audit the financial reports of publicly held firms. The "trusting party" in these transactions is the community of investors in the companies being audited, which must trust the auditor to put in the long hours it takes to unravel what is going on at the firm being audited. If the auditing firm works hard and honestly, it is being "fair." If it slacks off or shades its report because of, say, the consulting work it might get from the audited firm, it abuses the trust of

the investing community. But, even if the auditing firm works hard and honestly, it might miss something. When that something comes to light, the auditing firm may appear to have abused the public's trust. To be more precise, the investing public would not be able to tell if the undiscovered facts were the result of abusive behavior or honest error. To let the flawed audit go by invites auditors to spend less effort on their audits or worse. But, if too little punishment invites abuse, punishment that is too harsh can also be counterproductive: If the auditors lose their reputation completely after the first honest mistake and such mistakes do happen, then *take the money and run* can become the optimal strategy. In this regard, two observations are worth making:

1. Public accounting firms protect their reputations to garner economic rewards, which arrive in the form of continuing audit engagements, based on a reputation for trustworthiness. In recent years, audit engagement fees have become much lower, as competition in the audit business has become more fierce. This has lowered the value of a good reputation, which means less incentive to behave.
2. An auditor that seems to have missed something defends itself, *ex post*, by showing that it followed standard auditing procedures. But to verify this means that the standard auditing procedures have to be somewhat formulaic, with less room for subjective judgment by the auditor about what to do at a particular engagement. The same phenomenon appears in the practice of medicine, where the increasing prevalence of malpractice suits (more severe punishment for a seeming abuse of a patient's trust) means greater reliance on the practice of medicine "by the book," instead of using the physician's best subjective judgment.

The general phenomenon of noise enters into the reputation constructions in a second way. In the theoretical analysis of the repeated trust game, it was assumed that each B, when it is his turn to decide whether to trust A, is able to learn how A acted in previous encounters with earlier Bs. More generally and more robustly, it is enough that the behavior of A can be credibly communicated from one generation of Bs to the next. Reputation, in other words, passes by word of mouth, modified perhaps by the current actions of A. But suppose B in round  $n$  cannot see how A acted previously and either has difficulty in comprehending what B from round  $n - 1$  is passing along or finds that testimony less than fully credible. Insofar as A can anticipate these difficulties, A has less incentive to treat fairly B in round  $n - 1$ , as it is less likely that abuse of this B would hurt A's prospects with the next B. If this is so and the Bs anticipate this, then they have less reason to trust A. In

other words, in a reputation construction, we must worry about both noise in observing A's actions and, when reputations are communicated by word of mouth, noise in the process of communication of reputation.

In real life, this leads to three further considerations:

1. Reputation constructions, especially of the sort that involve trust, work best when successive generations of A's trading partners can communicate effectively. A common language and a shared culture among the Bs is a plus on these grounds.
2. It is generally in the interest of A to facilitate this sort of communication among the Bs, because A's reputation is the basis on which the Bs trust A; if A's reputation does not work, there is no trust. Hence, we have examples such as Toyota, facilitating communication among its suppliers.
3. While it is often in A's interest to facilitate communication among the Bs, the interests of the Bs to allow for this communication is more complex. If the repeated encounters are like the trust game, then both A and the Bs benefit from clear communication channels. But if the interactions are more adversarial, as in the threat game, then the Bs want to cut channels of clear communication; they do not want A to gain the sort of backbone that preservation of her reputation gives her.

### Ambiguity

Ambiguity presents problems as well. Imagine a version of the repeated trust game where, instead of a dichotomous choice between fair treatment and abuse, A has a continuum of choices to make, all of which affect her own payoff and B's. Suppose as well that objective conditions of the game change from round to round. And suppose A wants to cultivate a reputation for being fair but not generous; she is fair enough to merit the trust of B but does not overdo it. Toyota's reputation is precisely this; it is fair with its suppliers, but it certainly is not generous.

The problem is, What does *fair but not generous* mean? What are reasonable demands for Toyota to make of its suppliers? What is a fair level of compensation for them? I do not assert that these things cannot be specified to the satisfaction of the parties concerned; after all, the Toyota-supplier network works quite well. But it is easy to see how, in a real-life example, coming to terms and then keeping to those terms is not easy. When serious ambiguity enters, especially when entirely novel situations arise that call for renegotiating terms, reputations and relationships can founder.

### Reputation and Multiple Constituencies

In the real world, actions taken by a particular entity are observed by multiple constituencies. An ideal action in terms of reputation with one party may cause problems in the relationships with other parties. For instance, some firms like to project to their employees an image of being a "family" rather than a business. Such firms eschew organization charts, visible signs of status differentiation, large pay differentials, and so forth. An example of such a "family" is Ben and Jerry's. If such a company decides to expand its operations and needs to raise the capital to do so externally, it has a delicate problem to solve: Bankers and others need to be reassured that the firms they lend money to mean business. Few bankers see the commune atmosphere of a Ben and Jerry's and think, "Now there's a tight ship, run on sound business principles." Accordingly, one typically sees businesses with this sort of family or commune culture run on internally generated capital, and such businesses typically are closely held.

### How Fragile Is a Reputation?

In the specific reputation equilibria discussed at the start of this section, A's reputation was extremely fragile. If A ever abused a B in the trust game, no B would trust A again. If A ever acquiesced to B in the threat game, every subsequent B would enter.

Are reputations in real life so fragile? If A damages her reputation by one abusive action or in a moment of weakness, is it really gone forever? Of course not. If, say, A acquiesces to some B in the threat game but then abuses the next 10 or so Bs in a row, A is likely to reacquire a reputation for fighting. A would have a harder time restoring her reputation in the trust game, since no subsequent B would, in the equilibrium, trust her and she would never have the opportunity to show that she is not abusive. In real life, she might obtain the trust of some trading partners, at least some of the time, giving her the opportunity to resuscitate a reputation soiled by a previous action.

When noise, ambiguity, or multiple constituencies enter the story, this consideration becomes crucial, because these factors imply that A will sometimes be perceived as taking actions inconsistent with the reputation she wishes to project. Then it is essential that she be able to repair the damage.

Having said this, let me drop the other shoe. While, in real life, reputations can be repaired, if it is too easy to do so, the reputation becomes worthless. When a soiled reputation is easily repaired, preserving the reputation is less of a concern to the individual who holds it, and thus it provides less in the way of credibility. Powerful reputations often gain their power *because* they are fragile, which gives the reputation holder the greatest incentive to maintain the reputation.

### Inertia and Reputation

The way to gain and maintain a particular reputation is to act in that fashion. It can be useful to talk about what you are doing in the press, through a website, and so forth, especially to explain the underlying principles that govern specific actions you take. But actions usually speak a lot louder than words in this domain.

As a consequence, it can be hard to change a reputation whenever a change suits you. A firm that projected a dog-eat-dog, take-no-prisoners, the-market-is-a-jungle-and-we-mean-to-survive attitude for years will have a hard time if management determines that a change of heart is called for. Going the other way, a company that has not been tough on suppliers in terms of timeliness of deliveries or quality of materials will have a hard time convincing those suppliers that times have changed.

This is not to say that change is impossible. Accompanied by symbolic acts, often including changes in top management or done in a period of crisis, reputations can be turned around. But it is not easy, and it is especially hard to shift reputation in some respects without undesirable consequences for other pieces of the reputation.

### The Bottom Line on Reputation

A firm's various reputations—with suppliers, workers, rivals, customers, investors, and the local community it inhabits—are often vitally important to its smooth and efficient functioning, both because it sets the expectations of others who deal with it and because it can lend credibility to the firm's intention to act in one way or another. In fact, we see in the final chapters of this book that what has been said so far concerning reputation probably understates its general importance.

But, as important as reputations are, it is not easy to "dial in" to the desired setting or make your reputation do what you want it to. This is also a point reinforced in the last two chapters.

## 23.3. The Tribulations (and Salvation) of Monopolists

To illustrate the ideas of credibility and reputation, we close with a discussion of the economics of being a monopolist. Recall the classic theory of monopoly: The monopolist faces a demand curve from which it can choose the price that maximizes its profit. Customers, who are many and fragmented, take that price as given and buy what they will. The monopolist's customers could band together and use the coercive powers of the state to regulate the monopolist, specifying what price can be set. If this happens,

all bets are off. Also, going the other way, the monopolist can use clever schemes of price discrimination to do even better than to set a single price. But set aside the possibilities of regulation and price discrimination and we come back to the question, Can a monopolist really set a price and then, essentially, ram it down the throats of customers?

### Customers That Want to Bargain

If you ask the Boeing Corporation, it will tell you that the world does not always work that way. As of 2001, Boeing holds, and has held for many years, a fairly unique market niche with its 747 aircraft. That monopoly position was coming to an end with Airbus's development of its superjumbo. But even when Boeing held this unique niche, it faced substantial resistance from important customers. You might imagine Boeing explaining to its customers that it holds a monopoly on planes with the 747's capability, and all the economics textbooks in the world insist that it can name the price it wants to charge. But big customers such as British Air are unimpressed by economics textbooks. They argue back that they hold a monopoly on something Boeing wants, their money, and if Boeing wants some of that money, it must bargain.

British Air is a very powerful customer, so it is not surprising that it resists when Boeing tries to set a price. What about other, smaller customers? What makes us think that any monopolist can set a price and stick to it, deaf to the demands for a bargain from customers large and small? What gives credibility to the monopolist's proclamation of a particular price? Here are five answers:

1. *Numbers and the costs of bargaining.* One source of the monopolist's bargaining strength may be that it is simply too costly to bargain with most individual customers. It posts a price and tells customers to send in their orders. If a customer tries to bargain, it shrugs its shoulders and says that it has no time for this; the profit on a single sale is too small to be bothered about; it has many more important and profitable things to attend to. This is credible because bargaining with small customers takes time that it truly cannot afford. It does better to walk away from any customer that insists on bargaining.
2. *Finite capacity.* Suppose the monopolist has only a limited supply to sell. Faced with a demand that it negotiate, it can argue credibly that if it sells one of its very valuable pieces of merchandise at a low cost, it loses the opportunity to sell it at a high cost. New car dealers use this argument a lot; it is particularly effective when the car in question is being rationed among dealers. Of course, this works only insofar as the monopolist's capacity comes close to matching the profit-maximizing quantity that it

wishes to sell. Whenever the monopolist can find a way to commit to the production level it desires, it is safe against demands to bargain.

3. *Resale.* If the good in question can be resold, the monopolist can say to a customer who wants a low price that it cannot afford to sell at that price, because the buyer will only resell the good to some customer that would otherwise pay its high price. This is like the finite supply argument, although the issue is not that the monopolist would lose the unit it could sell to another customer; rather, it would lose the customer by providing its own competition.
4. *Most-favored-customer guarantees.* The monopolist can strengthen its case with customers that want to bargain if, with each item it sells, it includes a most-favored-customer guarantee, which says that it will rebate the customer the difference between the price this customer paid and the (lower) price paid by any other customer it deals with. This may sound like a good deal for the customers, and it is to the extent that it protects them against price discrimination. But, if the monopolist is worried about customers that want to bargain, such guarantees are good for it and bad for bargaining customers. The monopolist that provides customers with such guarantees can say entirely credibly that although it would be happy to bargain, if it sells for a low price, it is going to cost a bundle. Since it cannot charge different customers different prices, it must sell for some single price. Obviously that price is going to be the single price that maximizes its profit.
5. *Reputation for no bargains.* Suppose the monopolist does not offer most-favored-customer guarantees, it has unlimited supply or can make the product in short order, and the good cannot be resold. It can still credibly refuse to bargain if it is cultivating a no-bargains reputation. While it is in the monopolist's immediate interests to bargain with this particular customer, to do so would puncture its reputation for not bargaining with enormous adverse consequences: Every customer would want to bargain, at prohibitive cost. Note that individual customers that want to bargain see it in their interest, on these grounds, to conduct negotiations behind closed doors, in secret. The monopolist would want to make sure that all deals are public.

For these reasons and others, it is generally held to be a reasonable assumption that the single monopolist, dealing with many small customers, can get away with naming a single price and sticking to it. This does not mean that Boeing can mail a copy of this subsection to British Air and escape negotiating with it. But had Boeing established its marketing policies and

reputation on a somewhat different basis than it did (had it hung tough in its initial negotiations, which would have taken a lot of nerve, since at the outset of the 747 program, Boeing did not really know what a goldmine it had in its possession), it might have been able to hold the line on this sort of thing better than it has done.<sup>2</sup>

### The Coase Conjecture and Durable Good Monopolies

Suppose the monopolist is one and its customers are many and disorganized, so it need not worry about being forced to negotiate with them. Even so, it faces a possible foe that may be too much to overcome: itself.

This was Xerox's problem. When the first Xerox copiers were produced, Xerox identified some high-end customers who were willing to pay premium prices, if the alternative was not to buy copiers at all. Once the demand from those high-end customers was satisfied, Xerox would still face an unsatisfied demand for copiers at lower prices. So, *ex post*, it made sense for Xerox to sell more copiers at lower prices.

Indeed, if the customers of Xerox consistently believed that Xerox's price quotations of the moment were the best price Xerox would ever offer, Xerox could engage in first-degree price discrimination. Xerox would begin by quoting a fantastically high price, then lower the price it charged. Imagine a customer just willing to buy a copier for \$100,000. When Xerox's price had fallen to, say, \$99,999, if this customer believed that Xerox would not lower price further, it would buy a machine, then curse its decision when, a few minutes or days later, Xerox cut the price to \$99,499.

The problem, from Xerox's perspective, is that its prospective customers, if they are at all intelligent, can work this out. Even if not, they would see a pattern emerge if Xerox continually lowers its prices, day after day. Even if you are willing to spend \$100,000 for a copier, why not wait the weeks or months it will take for price to fall to, say, \$10,000? Xerox, attempting first-degree price discrimination by starting at a very high price and letting price decline, would wind up getting no sales at high prices, as everyone waits for the seemingly inevitable price drops.

We cannot blame this entirely on a desire to engage in first-degree price discrimination. Suppose demand for copiers is given by the demand function  $D(p) = 100,000 - P$ , and Xerox's marginal costs are a constant \$10,000. Then, as a classic monopolist with no intention of engaging in price discrimination, Xerox would charge \$55,000 per copier, selling 45,000 copiers. What happens after those 45,000 copiers are sold? Xerox has another 45,000 customers willing to pay prices between \$55,000 and the firm's marginal cost of

<sup>2</sup> An excellent book on this subject in the context of civilian airframes is *The Sporty Game* by John Newhouse (New York: Knopf, 1982).

\$10,000. Perhaps a price of \$32,500 should be tried next. But then those of the first 45,000 customers who anticipate this would not buy at \$55,000 but wait for the price drop.

The monopolist's dilemma arises from the fact that customers want to wait for it to lower the price, as it chases after demand by unserved segments of the market. For this to work, it is necessary that the customers who would otherwise pay a high price be willing to wait for prices to come down. If those customers need the item quickly, then perhaps the monopolist gets back the power to name a high price and sell some of the item. Put another way, its ability to get some sales at a high price will depend, to some extent, on the impatience of its customers. The more patient they are, the harder it is for the monopolist.

Accordingly, this particular problem is felt to be most acute for monopolists who sell *durable goods*, items like cars, refrigerators, or copiers that last a long time. When the monopolist sells a durable good, its customers are more apt to be able to wait. When it sells, say, a service that must be received at a given time to be of value to the customer, it is in a much stronger position.

In the extreme case of a very durable good and very patient customers, the monopolist, according to this logic, really falls afoul of its own subsequent interests. Ronald Coase<sup>3</sup> advances the conjecture, the Coase conjecture, that absent some other sort of market friction, a monopolist selling a very durable good to very patient customers has no monopoly power: It essentially is forced to sell the product at marginal cost.

What saves monopolists from the dire fate conjectured by Coase?

- *Most-favored customer clauses* work well here, since when the monopolist sells units at a high price accompanied by a most-favored customer guarantee, it no longer has the incentive to chase lower-valued customers: To make sales to them, it has to give money back on the high-price sales already made.
- To return to the Xerox story, some durable good monopolists control the problem by refusing to sell their product. They *rent* it instead, with short-term leases. This practice, used for many years by Xerox in the copier market and by IBM in main-frame computers when they were close to being monopolists, works because it means that to charge lower rental rates for some customers would entail lower prices for all. (Short-term leases make it harder to convince a customer to pay the setup costs of getting used to new equipment, if the customer is not guaranteed that

<sup>3</sup> Winner of the Nobel Memorial Prize in Economics in 1991, Coase is also responsible for the notion that, to deal with problems of externalities, one should assign property rights and let the parties bargain, discussed in Chapter 14.

it could continue to rent the equipment at reasonable cost. To solve this problem, short-term leases are constructed that give the lessee the right to renew the lease at a given cost more or less indefinitely, but that does not give the same rights to the lessor. Thus, the lessee has the option to renegotiate a lower rate but cannot be held up for one higher.)

- Finally, *reputation* can play a role in defeating the logic of the Coase conjecture. There are two ways this can work. The monopolist sets a price and sticks to it, because if it ever drops its price to chase unfilled demand, its customers would believe that further dramatic price drops are coming and would wait for those very low prices.

Second, imagine that the manufacturer faces this problem repeatedly, because it produces many generations of products. Then it is possible to refrain credibly from lowering prices for the product currently being sold, despite a large unserved market waiting for lower prices, because to do so would signal to customers for later generations of products to wait for prices to drop.

A variation on the reputation story concerns the problem faced by artists, whose work is valuable in part because of its rarity. For this reason, for example, an artist producing a set of castings literally "breaks the mold," so that, after a given number have been produced, no more can be made. More subtly, consider the problem faced by Pablo Picasso, who could produce a prodigious number of paintings in a very short time. If he made and sold only a few, he could obtain high prices for them, because if there are only a few Picassos, each is rare and thus more valuable. But, if it is known that he could turn them out by the hundreds, his buying public would be wary. A Picasso is very nice on the wall, but it loses some of its value if enough Picassos are in circulation to put one on every wall. Picasso solved this problem by hiding the bulk of his work. Only after his death did it become clear how many Picassos there are to be hung. (Their value fell accordingly, although Picassos are so nice to hang on one's wall, that the value of each did not fall all that much.)

### Intel's Problem: A Promise Not to Hold Up Clients

Boeing's problem with customers was that they wanted to bargain. Xerox's problem was that customers might hold off making a purchase, in anticipation of price declines as Xerox served lower and lower segments of its demand curve. Intel's case history illustrates a third problem monopolists can have with customers, an unwillingness to purchase an "addictive" good without some sort of assurance that the monopolist would not try to hold up its clients, once they are addicted.

We already discussed how Intel used licensing (providing itself with competitors) to provide its clients the assurances they desired, at least in the early days of the 086 chip. Since those early days, though, Intel has pulled back on licenses. Some of Intel's clients believe that Intel nowadays is actively gouging addicted clients. But on at least three grounds, Intel is still restrained from fully exploiting its monopoly position:

1. Intel's ability to hold up its clients is directly connected to its lack of competition. Insofar as it lacks competitors, the Antitrust Division of the U.S. Justice Department can pursue antitrust action against it. Intel knows it is being watched, and it has to restrain itself, in consequence.
2. The microprocessor business is an ongoing business, with new generations of microprocessors arriving at breakneck speed. Intel therefore has the opportunity to cultivate a reputation for restraining itself, a reputation that works to some effect because its clients have options for changing microprocessor suppliers as entirely new generations of chips arrive.
3. The threat of entry restrains Intel. If it abuses its clientele badly, other major players in the industry, such as Microsoft, might see real advantage to enabling a competitor to Intel.

### Entry Deterrence

This takes us, finally, to the threat of entry and entry barriers. In this regard, Intel is in a fairly anomalous, delicate position. Clearly Intel does not like entrants invading its markets, and it has not been reluctant to use patent infringement suits as a weapon against firms it feels are getting too close to its market. But, to the extent that Intel relies on the threat of entry against it to reassure its clients that it would not engage in gouging, it does not want its barriers to be too high.

Whether this is correct (whether Intel benefits on the customer front by keeping alive the possibility that it may face competition), most monopolists and oligopolists have a primary interest in erecting stout barriers against entrants. We discussed entry and mobility barriers in Chapter 20, so only a little needs to be said here. But it is worth noting the connections among credibility, reputation, and what was called *psychological barriers to entry*.

An entrant that contemplates entering an industry, whether an oligopoly or a monopoly, must decide if it can be successful in the postentry competition. In part, its success is determined by tangible factors: access to channels of distribution, access to resources, technology, costs relative to those of firms already in the market, and so forth. But equally, the potential entrant has

to evaluate how forcefully incumbent firms would respond. Sometimes incumbent firms must fight ferociously to survive. And the need to fight to survive in itself is a tangible entry barrier, because it makes credible the implicit threat of the incumbent firm to fight ferociously.

Often, though, the economics of the industry are such that incumbent firms do best for themselves by accommodating the new entrant. They have the power to drive the entrant from the market, but the exercise of that power would cost them more than they gain back, once the entrant is gone. In other words, the threat by the incumbent firm(s) to fight is not credible, based on economic calculations.

Still, incumbent firms in this sort of situation can successfully threaten potential rivals; this, essentially, is a *psychological barrier to entry*. The question to be answered is, On what basis are threats to fight, notwithstanding the economic consequences, still credible?

Reputation can play an important role here. When a small-time crook invades Mafia turf, it may be costly for the organized criminal element to take "corrective actions." But if the local Mafia organization allows hood 1 to invade its markets, it essentially invites hoods 2 through 1000 to do the same. It is as if the Mafia enforcer is saying to hood 1, "I'm not breaking your legs to discipline you—it's more expensive for me to do this than it would be to live with you—but by breaking your legs, I convince others that this is how we do business." Because this makes breaking the legs of hood 1 a credible threat, even if the direct costs exceed the direct benefits, it is sufficient to deter hood 1 from encroaching on Mafia territory.

The same argument extends to entirely legitimate businesses. When Union Carbide attempted to enter the disposable diaper business, it decided on a rollout strategy: It entered one local market, which was to be developed into a region (New England), to be followed with a national rollout of the product. Moreover, Union Carbide made no bones about the fact that it was interested in general in consumer expendibles, the bread and butter of Procter & Gamble, and it was willing to experiment with diapers as an initial foray. It cost P&G rather a lot locally, but it responded by bombing UC's initial area with coupons, point-of-sale discounts, and everything else it could think of. Had UC decided to enter massively, P&G might have seen the battle as one that was lost or, at least, that could be won only at too high a price and might have accommodated itself to UC's presence. But with a rollout strategy, UC might as well have worn a sign saying, "Kick me, because I can be convinced to abandon this fight," which made P&G's willingness to fight region by region entirely credible. (UC gave up fairly quickly, in the actual case.)

In any discussion of this sort, it should not go unsaid that the U.S. gov-

ernment, the European Community, and other, similar bodies take a dim view of actions intended to create or preserve a monopoly (or a collusive oligopoly). The legal limits of entry-detering actions (predation) change as case law develops. So before you take too seriously some of the prescriptions offered here for forestalling entry, you might want to consult lawyers, as well as your conscience.

## Executive Summary

- A credibility problem arises when some party, which must take an action in the future, wishes to be perceived *ex ante* as planning to take an action that, *ex post*, runs counter to its own interests. In some instances, typified by the trust game, the problem is that the party wishes to be perceived as planning to be "good," even though "bad" behavior is in its interest *ex post*. In other instances, typified by the threat game, the party wishes to be perceived as ready to be "bad," even though the *ex post* costs of being bad outweigh the *ex post* benefits.
- A variety of methods can be used to solve such credibility problems. The party can tie its own hands, typically by increasing the *ex post* costs of the action that it does not wish to be perceived as its optimal response. This can be done by signing an enforceable contract, or by noncontractual actions, including actions that empower to partners, rivals, suppliers, or customers. Threats or promises may be effective, but these often lack credibility because they cost nothing. (When threats or promises are somewhat costly but not costly enough to ensure they will be carried out, the analysis becomes very subtle.)
- Reputation can lend credibility to threats or promises, if the reputation will be valuable in the future. This is very much like the folk theorem of last chapter: A party behaves in a way that not optimal for it in the short term, because the long-term benefits of behaving in this fashion (maintaining its reputation) outweigh short-term costs. Reputation can work in cases in which a party deals with one other party repeatedly, the party deals with a sequence of other parties, or the party deals with a number of others simultaneously. As with the folk theorem, noise and ambiguity can kill reputations. This includes noise or ambiguity in the transmission of the reputation from one generation of partners or rivals to the next. A reputation that is easily soiled is often more powerful for being so fragile. It can be difficult to shift from one beneficial reputation to another; reputations are often fraught with inertia.
- Notwithstanding the textbook theory of monopoly, which assumes monopolists set a price and watch the money roll in, a real-life monopoly firm has a host of problems connected to credibility: (1) It must convince customers that it will not bargain. (2) Especially for durable goods monopolies, customers may anticipate

prices that fall through time, as the monopolist pursues unserved portions of the market; the monopoly must convince its customers that it will not act in this fashion. (3) When the good the monopoly sells is "addictive," or requires the customer to make sunk cost investments in using the good, the monopoly may have to take action to convince customers that it will not hold them up for higher prices once they have become addicted or incurred the sunk costs. (4) To protect a monopoly position or a market niche in an oligopoly, a monopoly (or oligopoly) must deter entry into its business, which often involves convincing potential entrants that it (the monopoly) would respond vigorously to any attempted entry.

## Problems

One problem captures most of the ideas of this chapter.

**23.1** Two firms, Yaki Industries and Zenith Enterprise, are contemplating a joint venture. Yaki owns a proprietary technology that, unfortunately for Yaki, is unpatentable. This technology, if made available to Zenith Enterprise, could improve Zenith's profit by \$20 million, in a market that Zenith serves and that is not connected to any of Yaki's ventures. But, once Zenith has access to this technology, it could use it to invade Yaki's own market as well, which would be very costly to Yaki and quite profitable to Zenith. Zenith proposes to Yaki that it (Yaki) give Zenith access to the technology for a \$10 million fee. Zenith issues solemn promises that it will use the technology only in the market it currently serves, netting for it (Zenith) a net \$10 million: the \$20 million gain mentioned previously, less the \$10 million fee. But Yaki is concerned: If Zenith were to renege on its promise and invade Yaki's market with this technology, Yaki would lose a net \$10 million (including the \$10 million fee), while Zenith's net gain (from both markets, net of the \$10 million fee) would be \$20 million.

(a) Diagram the "game" played by Yaki and Zenith, where the sequence of actions is this: First Yaki must decide whether to accept Zenith's offer and then, if Yaki accepts the offer, Zenith must decide whether to restrict its behavior as promised or invade Yaki's market. Use rollback to analyze how this game would be played. Of the games discussed in the chapter, which does this resemble?

(b) In part a, you should have come to the conclusion that Yaki would not accept Zenith's offer, because Zenith could not be trusted to keep its promise. In light of this, Zenith decides to offer Yaki a contract that includes the promise. That way, if Zenith invades Yaki's territory, Yaki can take Zenith to court. The contract would be written so that, if Zenith is taken to court by

Yaki and Yaki wins its suit, Zenith must pay Yaki damages of \$20 million, which is the amount of damage that Yaki would in fact incur.

This sounds good to Yaki, but it has two concerns. The first is whether it would actually take Zenith to court in the event of a breach of contract. It would receive the \$20 million, but there are court costs to consider, costs for which it would not be compensated. The best estimate is that these costs would be \$12 million. Zenith's court costs would be \$9 million. Assume that, if Zenith breaches the contract and Yaki takes Zenith to court, Yaki is sure to win its case. Does this sort of contractual guarantee make Zenith's promise not to invade Yaki's market credible? Can Yaki sign the contract with Zenith in this case?

(c) Unfortunately, Yaki is not convinced that, if Zenith breaches the contract and Yaki takes it to court, Yaki would win its case. The contract is necessarily a bit murky (what does it mean, precisely, that Zenith invaded Yaki's market?), and the interpretation would be up to a civil-suit jury. In fact, Yaki assesses the probability of only 0.3 that it would prevail in a court case. Assume that the two sides pay their own court costs, win or lose. Also assume that each party is an expected-monetary-value maximizer; that is, both sides are risk neutral. Under these circumstances, would the contract work, in the sense that it provides sufficient guarantees for Yaki to sign?

(d) Suppose we modify part c as follows. If Yaki takes Zenith to court and Yaki wins, the courts might award Yaki punitive damages. The amount of punitive damages will be three times the compensatory damages of \$20 million. The odds of getting punitive damages awarded, conditional on Yaki's winning the suit (which has marginal probability 0.3), is  $\frac{2}{3}$ . Under these circumstances, will the contract work, in the sense that it provides sufficient guarantees for Yaki to sign?

(e) Suppose punitive damages, instead of being awarded to the successful plaintiff, were given to charity. That is, a losing defendant must pay the punitive damages, but the plaintiff receives only the compensatory damages. Under these circumstances, would the contract work, in the sense that it provides sufficient guarantees for Yaki to sign?

(f) Taking the case of part e, how might reputation in some form or other help get Zenith to a deal, where Yaki would be willing to sign? Think expansively here: The first question to ask yourself is, Whose reputation and for what?

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