~~airspace above these houses without paying a penny. This pattern of rights is not a matter of historical accident. It has emerged, as we will see, as a means of making the most efficient use of property when it is difficult to negotiate agreements on a case-by-case basis.~~

Excerpts from Frank, Microeconomics & Behavior, Ch. 16 on externalities.

CHAPTER PREVIEW

Our subjects in this chapter are externalities and property rights. We will begin with a series of examples illustrating what happens when an action by one party harms another and the parties are able to negotiate costlessly with one another. Next we will consider a related set of examples in which negotiation is costly. We will then apply the principles that emerge from these examples to a variety of questions regarding the design of property rights. Should the owner of a dock be allowed to exclude a boater from tying up during a storm? When should a person be allowed to exclude others from walking across his land? Or from blocking his view? Should pastureland be owned privately or in common? Should a developer be allowed to construct an office building over someone else's property without her consent? Should airplanes be allowed to fly over houses? The answers to such questions, we will see, depend on the kinds of accommodations people would reach among themselves if they were free to negotiate costlessly with one another.

Next we will apply the theory of property rights and externalities to the topic of contests for relative position. We will conclude this chapter with an examination of taxation as a possible solution to the problem of negative externalities.

THE RECIPROCAL NATURE OF EXTERNALITIES

In the first edition of this text (1991), I began this section with the following sentence:

> One of the great injustices of academic life is that Ronald H. Coase[1] has never been awarded the Nobel Prize in economics.

I was thus delighted when I learned that Coase was at last awarded the prize in 1992. Now an emeritus professor at the University of Chicago Law School, Coase is the author of the most influential and widely cited economics paper of the postwar era. Titled "The Problem of Social Cost,"[2] this paper profoundly changed the way economists, legal scholars, political philosophers, and others think about externalities and the legal and social institutions that have evolved to deal with them.

Coase began with an example involving a doctor whose ability to examine patients was disrupted by the noise of machinery operated by a confectioner in an adjacent building. Historically, the economic and legal view toward such a situation was simple and clear: The candy maker's noise was harming the doctor and it ought to be restrained. Coase's seminal insight was that this view completely overlooks the reciprocal nature of the problem. True enough, the confectioner's noise does harm the doctor. *But if we prevent the noise, we harm the confectioner.* After all, the confectioner makes the noise, not for the purpose of harming the doctor, but in pursuit of his own livelihood. In such situations, there will be harm to *someone,* no matter what happens. Whether the harm caused to the doctor by the noise is greater than the harm that would be caused to the confectioner if he were prohibited from making it is strictly an empirical question. The common interest of each party, Coase recognized, is to avoid the larger of these two unpleasant outcomes.

The earlier, one-sided view of externalities led to a legal tradition in which the confectioner was generally held liable for any damage his noise caused to the doctor.

[1]Rhymes with "dose."
[2]*Journal of Law and Economics, 3,* 1960: 144–171.

Coase pointed out, however, that if the doctor and the confectioner were able to negotiate costlessly with one another, the most efficient outcome would occur regardless of whether the confectioner was liable. His simple and elegant argument in support of this claim is illustrated in the following series of numerical examples.

EXAMPLE 16.1

Suppose the benefit to the confectioner of continuing to make noise is 40, while the cost of the noise to the doctor is 60 (see footnote 3). If the confectioner's only alternative to making the noise is to produce nothing, what will happen if he is made liable for the noise damage? (To be liable for the damage means being required to compensate the doctor for any damage caused by the noise.)

The confectioner will examine his two options—shutting down or compensating the doctor—and choose the one that makes him best off. If he stays open, he will earn 40, but will have to pay 60 to the doctor, for a net loss of 20. If he shuts down, his net gain is 0, and since this is clearly better than losing 20, he will discontinue operation.

Alternatively, suppose the confectioner had not been liable for noise damage. That is, suppose the law grants him the right to continue operating without compensation to the doctor. Coase argued that in this case the doctor will pay the confectioner to shut down. If the confectioner stays open, he will gain only 40 while the doctor will lose 60. But the doctor can compensate the confectioner for the loss of shutting down and still have enough left over to be better off than if the confectioner had stayed open. Suppose, for example, the doctor pays the confectioner 50 to shut down. The confectioner's net gain will now be 10 more than if he had stayed open. And the doctor's net gain of 10 is 10 more than if the noise had continued.

If P denotes the payment the doctor makes to the confectioner to compensate him for shutting down, we know that P must be at least 40 (what the confectioner would get by staying open) and no larger than 60 (what the doctor would get if there were no noise). The net results under the two legal regimes (confectioner liable versus confectioner not liable) are summarized in Table 16.1.

TABLE 16.1
Outcome and Payoff Summary for Example 16.1

		Net Benefit		
Legal regime	**Outcome**	**Doctor**	**Confectioner**	**Total**
Liable	Confectioner shuts down to avoid liability payment	60	0	60
Not liable	Doctor pays confectioner P to shut down, $40 \leqslant P \leqslant 60$	$60 - P$	P	60

The gain to the confectioner from operating is 40. The loss to the doctor from the noise is 60. The efficient outcome is for the confectioner to shut down, and this happens under both legal regimes.

Note that because the gain to the confectioner of operating his machinery (40) is smaller than the noise damage it imposes on the doctor (60), the most efficient outcome is for the confectioner to shut down. Example 16.1 makes clear that if both the doctor and confectioner are rational and can negotiate costlessly with one another, this will happen regardless of whether the confectioner is liable for noise

[3]The numerical cost and benefit values used in this and in the following examples represent the present values of all current and future costs and benefits to the parties in question.

damage. On efficiency grounds, the legal regime is thus a matter of complete indifference here. On distributional grounds, however, the parties will be anything but neutral about liability. If the confectioner is not liable, his gain is $P \geqslant 40$, whereas he will be forced to shut down and earn nothing if he is liable. The doctor's net gain will be 60 if the confectioner is liable, but only $60 - P$ if the confectioner is not liable.

EXAMPLE 16.2

Same as Example 16.1, except now the benefit to the *confectioner* of operating is 60, the benefit to the doctor in a noise-free environment only 40. Assume that the doctor must shut down if the noise continues.

This time the efficient outcome is for the confectioner to continue operating, since his gain exceeds the cost he imposes on the doctor. If he is not liable for noise damages, the confectioner will stay open and the doctor's best option will be to shut down. Alternatively, if the confectioner is liable for noise damage, he will again continue to operate and pay the doctor 40 to compensate him for his losses. The net results for this example are summarized in Table 16.2. Note that, as in Example 16.1, both legal regimes lead to the most efficient outcome, but have very different distributional consequences.

TABLE 16.2
Outcome and Payoff Summary for Example 16.2

		Net Benefit		
Legal regime	**Outcome**	**Doctor**	**Confectioner**	**Total**
Liable	Confectioner stays open and pays doctor 40	40	20	60
Not liable	Confectioner stays open; doctor shuts down	0	60	60

The gain to the confectioner from operating is 60. The loss to the doctor from the confectioner's noise is 40. The efficient outcome is for the confectioner to continue operating, and this happens under both legal regimes.

The preceding examples assumed that the only alternatives open to two parties were either to continue operations in the current form or to shut down entirely. In practice, however, one or both parties often face a broader range of alternatives. As the following examples will illustrate, here too the ability to negotiate costlessly leads to efficient outcomes.

EXAMPLE 16.3

Same as Example 16.1, except now the *confectioner* has access to a soundproofing device that will completely eliminate the noise from his machines. The cost of the device is 20, which means that if he installs it, his net gain from operating will fall from 40 to 20. As in Example 16.1, the doctor will gain 60 if there is no noise, 0 if there is noise.

If the confectioner is liable for noise damage, his best option will be to install the soundproofing. His alternatives are either to shut down or to pay the doctor 60 in noise damages, and each of these is clearly worse. If the confectioner is not liable, it will be in the doctor's interest to pay the confectioner to install the soundproofing. His alternative, after all, is to shut down or to endure the noise damage. The minimum payment that would be acceptable to the confectioner to install the soundproofing is 20, its cost. The most the doctor would be willing to pay for him to install it is 60, the amount the doctor would lose if it weren't installed. Again

letting P denote the payment from the doctor to the confectioner, the outcomes and payoffs for the two legal regimes are as summarized in Table 16.3.

TABLE 16.3
Outcome and Payoff Summary for Example 16.3

		Net Benefit		
Legal regime	**Outcome**	**Doctor**	**Confectioner**	**Total**
Liable	Confectioner installs soundproofing at own expense	60	0	80
Not liable	Doctor pays confectioner P to install soundproofing, $20 \leqslant P \leqslant 60$	$60 - P$	$20 + P$	80

The gain to the confectioner from operating without soundproofing is 40. Soundproofing costs 20. The loss to the doctor from the confectioner's noise is 60. The efficient outcome is for the confectioner to install soundproofing and to continue operating, and this happens under both legal regimes.

Let us now consider what happens when the doctor too has some adjustment he can make to escape the damage caused by the confectioner's noise.

EXAMPLE 16.4

Same as Example 16.3, except now the doctor can escape the noise damage by moving his examination room to the other side of his office. The noisy room in which he now examines patients could then be used for storage. The cost to the doctor of this rearrangement is 18.

With this new option available, the doctor is the one who is able to eliminate the noise damage at the lowest possible cost. If the confectioner is liable for noise damage, he will offer the doctor a payment P to compensate him for rearranging his office. The payment must be at least 18, or else the doctor would not make the accommodation. (Recall that, with the confectioner liable, the doctor has the option of being fully compensated for any noise damage.) And the payment cannot exceed 20, or else the confectioner could install soundproofing and solve the problem on his own. If the confectioner is not liable for noise damage, the doctor will rearrange his office at his own expense. The outcomes and payoffs for this example are summarized in Table 16.4. Note that we again get the efficient outcome no matter which legal regime we choose. Note also that the choice of legal regime again affects the distribution of costs and benefits, only this time by a much smaller margin than in Example 16.3. The difference is that each party now has a relatively inexpensive method for solving the noise problem unilaterally. In Example 16.3, the doctor lacked such an alternative, making the confectioner's bargaining power very strong when he was not liable for noise damage. In this example, by contrast, the confectioner cannot extract a large payment from the doctor for keeping quiet because the doctor can solve the noise problem on his own.

The patterns revealed in the preceding examples may be stated formally as:

> **The Coase Theorem:** When the parties affected by externalities can negotiate costlessly with one another, an efficient outcome results no matter how the law assigns responsibility for damages.

In the wake of its publication, Coase's classic paper became a subject of great controversy. Many took him to be saying that there is no real role for government

TABLE 16.4
Outcome and Payoff Summary for Example 16.4

Legal regime	Outcome	Net Benefit		
		Doctor	Confectioner	Total
Liable	Confectioner pays doctor P to rearrange his office, $18 \leq P \leq 20$	$42 + P$	$40 - P$	82
Not liable	Doctor rearrange, his office at his own expense	42	40	82

The gain to the confectioner from operating without soundproofing is 40. Soundproofing costs 20. The loss to the doctor from the confectioner's noise is 60. The doctor can rearrange his office to eliminate the noise problem at a cost of 18. The efficient outcome is for the doctor to rearrange his office, and this happens under both legal regimes.

in solving problems related to pollution, noise, and other externalities. By this interpretation, Coase's message seemed to be that if government stays out of the way, people will always come up with efficient solutions on their own. And yet Coase stated clearly that this conclusion holds only for a world in which parties can negotiate with one another at relatively low cost. He recognized that for many important externalities this assumption is not satisfied. At the simplest level, time and energy are required for negotiation, and when the potential benefits are small, it may simply not be worth it. Alternatively, there are situations in which a single polluter causes damage to a large number of people. Negotiating with large groups is inherently difficult and costly, and each person in the group faces strong incentives to escape these costs. Another serious barrier to negotiation is the problem of how to divide the surplus. Recall from Example 16.3 that the efficient outcome was for the doctor to pay the confectioner to install soundproofing. The minimum payment acceptable to the confectioner was 20, the cost of the soundproofing. The most the confectioner could hope to extract from the doctor was 60, the value to the doctor of eliminating the noise. The doctor would naturally like to pay only 20, and the confectioner would like to get 60. If each takes a hard line in the discussion, animosities may emerge and the possibility of a deal may break down altogether. For these and a host of other reasons, negotiations are often costly. When they are, it matters very much indeed which legal regime we choose, as the following examples will illustrate.

EXAMPLE 16.5

As in Example 16.2, suppose that the gain to the doctor in a noise-free environment is 40, while the gain to the confectioner from unfettered operations is 60. Suppose also that the confectioner has access to a soundproofing device that eliminates all noise damage at a cost of 20. And suppose, finally, that it costs the doctor and confectioner 25 to negotiate a private agreement between themselves. For negotiation to be a worthwhile alternative, they must be able to share this cost in some way that makes each of them better off than if they did not negotiate.

If the confectioner is made liable for noise damage, he will install the soundproofing. His next-best alternative, after all, is to pay the doctor 40 in noise

damages,[4] and the installation of soundproofing costs him only 20. Because being liable gives the confectioner an incentive to install the soundproofing on his own, there is no need for him to negotiate an agreement with the doctor, and thus no need to incur the cost of negotiation.

But now suppose that the confectioner is not liable for noise damage. If there were no costs of negotiation, the doctor would pay the confectioner P, where $20 \leqslant P \leqslant 40$, to install soundproofing. If it costs 25 to negotiate an agreement, however, then it is no longer possible for the doctor to compensate the confectioner for installing soundproofing. The soundproofing makes it possible for the doctor to gain 40, which is insufficient to cover both the cost of the soundproofing (20) and the cost of negotiating the agreement (25), which total 45. When it is costly to negotiate, we no longer get the efficient outcome irrespective of which legal regime we choose. In this example, for which the relevant data are summarized in Table 16.5, we get the most efficient result only if the confectioner is liable.

TABLE 16.5
Outcome and Payoff Summary for Example 16.5

Legal regime	Outcome	Net Benefit		
		Doctor	Confectioner	Total
Liable	Confectioner installs soundproofing at his own expense	40	40	80
Not liable	Confectioner does not install soundproofing; doctor shuts down	0	60	60

The gain to the confectioner from operating without soundproofing is 60. Soundproofing costs 20. The loss to the doctor from the confectioner's noise is 40. The cost of negotiating a private agreement is 25. The efficient outcome is for the confectioner to install soundproofing, but this happens only when he is made liable for noise damage.

In Example 16.5, the total gain for society as a whole is 80 if the confectioner is liable, only 60 if he is not liable. But as the following example will illustrate, the existence of barriers to negotiation does not guarantee that we will always get an efficient outcome by making parties liable for the damage caused by external effects.

EXAMPLE 16.6

Same as Example 16.5, except the confectioner no longer has a soundproofing option; instead, the doctor has the option of avoiding the noise by rearranging his office, which will cost him 18.

If the confectioner is not liable for noise damage, this is exactly what the doctor will do. But if the confectioner is liable, the cost of negotiation now stands in the way of his paying the doctor to rearrange his office. The sum of negotiating costs (25) and rearrangement costs (18) comes to 43, which is 3 more than the 40 that will be saved by avoiding the noise. So if he is liable, the best option available to the confectioner is simply to continue operating and pay the doctor 40 for the noise damage.[5] Here, unlike Example 16.5, we get the efficient outcome when the confectioner is not liable. The data for Example 16.6 are summarized in Table 16.6.

[4]For the confectioner to operate and pay noise damages to the doctor, it is not necessary for them to incur the cost of negotiating a private agreement.
[5]Again, making a liability payment does not require the parties to incur the costs of negotiation.

TABLE 16.6
Outcome and Payoff Summary for Example 16.6

Legal regime	Outcome	Net Benefit		
		Doctor	Confectioner	Total
Liable	Confectioner operates and pays doctor 40 for noise damage	40	20	60
Not liable	Doctor rearranges his office at his own expense	22	60	82

The gain to the confectioner from operating is 60. The loss to the doctor from the confectioner's noise is 40. The doctor can escape the noise by rearranging his office at a cost of 18. The cost of negotiating a private agreement is 25. The efficient outcome is for the doctor to rearrange his office, but this happens only when the confectioner is not liable for noise damage.

EXERCISE 16.1

How would the entries in Table 16.6 be affected if the cost of negotiation were 20 instead of 25?

APPLICATION: EXTERNAL EFFECTS FROM NUCLEAR POWER PLANTS

Although Austria itself has had a law banning nuclear power plants since 1978, it is surrounded by countries that operate a total of 41 such plants. Two of these plants, located just 35 miles from the Austrian border with Slovakia, share important design features with the ill-fated Chernobyl plant that in 1986 experienced the worst nuclear accident in history. Thus the citizens of Austria were understandably concerned about their vulnerability to a similar mishap.

In a remarkably bold application of the reasoning Coase suggested, Austrian officials offered in January 1991 to provide Slovakia (then part of Czechoslovakia) with free electric power as an inducement to shut down the two Soviet-designed reactors.[6] Austrian Economics Minister Wolfgang Scheussel estimated that the cost of the replacement power would be about $350 million annually.

Czech Premier Marian Calfa expressed interest in the Austrian offer and pledged that a working group would study it. But no agreement was ever reached to implement it. As this experience illustrates, the costs of negotiation sometimes stand in the way even of agreements that would substantially benefit both parties.

Coase's observation that people will reach efficient outcomes when they can negotiate costlessly has widespread application. In many situations, after all, the costs of negotiation are small relative to the benefits of reaching agreements about externalities. But the more far-reaching implications of Coase's work lie in the pattern illustrated in Examples 16.5 and 16.6, where we find the seeds of a powerful theory of law and social institutions. Boiled down to its essence, the theory can be stated as the following rule:

[6]See Michael Z. Wise, "Prague Offered Payoff to Shut Nuclear Plant," *The Washington Post*, January 30, 1991.

> Efficient laws and social institutions are the ones that place the burden of adjustment to externalities on those who can accomplish it at least cost.

One of the immediate implications of this rule is that the best laws regarding harmful effects cannot be identified unless we know something about how much it costs different parties to avoid harmful effects. If, as in Example 16.5, the emitter of noise has lower costs, we get an efficient outcome by making him liable for damages. But if the person adversely affected by the noise has a lower cost of avoidance, as in Example 16.6, we do better by not making the noisemaker liable.

The efficiency rule finds application in a rich variety of situations, several of which we examine in the sections that follow.

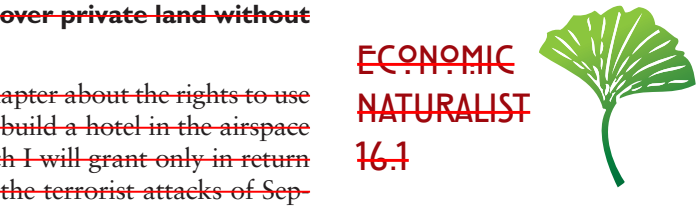
PROPERTY RIGHTS

PRIVATE PROPERTY LAWS AND THEIR EXCEPTIONS

No free-market economy can function successfully without laws that govern the use of private property. Among other things, these laws describe how people can lawfully acquire different types of property—by inheriting it, purchasing it, or receiving it as a gift, but not by theft or other means that entail the use of force. In most cases, these laws grant owners of property the right to exclude others from using it without permission. Yet hosts of detailed exceptions sharply limit this right to exclude. As the following Economic Naturalist examples suggest, these exceptions are not random. Rather, they follow a systematic pattern, one that the insights of Coase help us to understand.

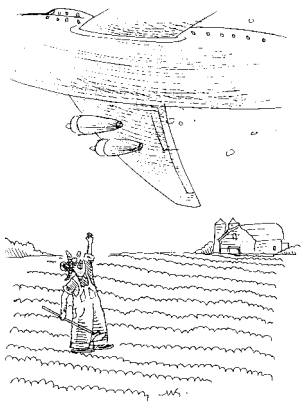
Why does the law permit airlines to operate flights over private land without permission?

ECONOMIC NATURALIST 16.1



Think back to the discussion with which we began this chapter about the rights to use airspace over various parcels of land. For a developer to build a hotel in the airspace above my land, he must first secure my permission, which I will grant only in return for a substantial payment. But even in the aftermath of the terrorist attacks of September 11, 2001, the law permits commercial airliners to fly over my land without payment whenever they choose. Why this distinction?

Note first that each case involves an externality—the visual blight and inconvenience of having a hotel overhead in the first case, the noise and possible danger from the airplanes in the second. The cost to me of the first externality is much larger than the second, but that alone cannot account for why we treat the two cases differently, since the benefits to the developer from erecting a building over my land are also likely to be great. The crucial distinction is that individual negotiation is much more practical in the case of the developer than in the case of the airlines. In the former case, there are only two parties involved, and the benefits from an efficient outcome are likely to be large enough to justify the costs of negotiation. So in this case, we can feel confident of achieving an efficient outcome most of the time if we define property rights to exclude developers from building in the airspace above our houses. In the airline case, by contrast, the benefits of flying over any single house are small, and in any event, the cost of negotiating with all the potentially affected parties would be prohibitive. Because the total benefits of overflight are large relative to the total costs imposed on homeowners, we get an efficient outcome here if property rights do not permit landowners to exclude planes from flying overhead.



Should commercial aircraft be allowed to fly over private land without the property owner's permission?