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### **The Swedes Get It Right**

When the Swedish Academy awarded the Nobel Prize in Economics to Ronald Coase this year, it was a surprise for two different groups of people. The larger group consisted of people who had either never heard of Coase, or heard of him only as the author of something called the "Coase Theorem," generally presented as a theoretical curiosity of no practical importance. The second and much smaller group consisted of people who were familiar with the importance of Coase's work--and assumed that the Swedish Academy was not.

Some people get the Nobel prize for complicated and technical work that is difficult for an outsider to understand. Coase is at the other extreme. His contribution to economics has largely consisted of thinking through certain questions more carefully and correctly than anyone else, and in the process demonstrating that answers accepted by virtually the entire profession were false. One side effect of his work was a new field of economics: economic analysis of law, the attempt to use economic theory to understand legal systems. While there would probably be something called economic analysis of law if Coase had not existed, it would be a very different field.

One of Coase's important contributions to economics was to rewrite the theory of externalities--the analysis of situations, such as pollution, where one person's actions impose costs (or benefits) on another. His ideas are sufficiently simple to be understood by a layman, as I will try to demonstrate in the next few pages, and sufficiently deep so that they have not yet been entirely absorbed by the profession; to a considerable extent what is still taught in the textbooks is the theory as it existed before Coase.

To understand the significance of Coase's contribution to the theory of externalities, it is useful to start with the theory as it existed before Coase published "The Problem of Social Cost," the essay that first introduced the Coase Theorem to economics. The basic argument went as follows:

In an ideal economic system, goods worth more than they cost to produce get produced, goods worth less than they cost to produce do not; this is part of what economists mean by economic efficiency. In a perfectly competitive private property system, producers pay the value of the inputs they use when they buy them from their owners (wages to workers in exchange for their labor, rent to land owners for the use of their land, etc.) and receive the value of what they produce when they sell it. If a good is worth more than it costs to produce, the producer receives more than he pays

and makes a profit; if the good is worth less than it costs to produce he takes a loss. So goods that should be produced are and goods that should not be produced are not.

This only works if producers must pay all of the costs associated with production. Suppose that is not the case. Suppose, for example, that a steel producer, in addition to using iron ore, coal, etc., also "uses" clean air. In the process of producing a ton of steel he puts ten pounds of sulfur dioxide into the air, imposing (say) \$100 worth of bad smells, sore throats, and corrosion on people down wind. Since he does not pay for that cost, he does not include it in his profit and loss calculations. As long as the price he sells his steel for at least covers his costs it is worth making steel. The result is inefficient: Some goods may be produced even though their cost, including the resulting pollution, is greater than their value.

It is inefficient in another respect as well. The steel producer may be able to reduce the amount of pollution by various control devices--air filters, low sulfur coal, high smokestacks--at a cost. Calculated in terms of the net effect on everyone concerned, it is worth eliminating pollution as long as the cost is less than the pollution damage prevented--in our example, as long as it costs less than \$10 to prevent a pound of sulfur dioxide emission. But the steel producer, in figuring out how to maximize his profit, includes in his calculations only the costs he must pay. So long as he does not bear the cost of the pollution, he has no incentive to prevent it. So the fact that air pollution is an external cost results in both an inefficiently high level of steel production (it may be produced even when it is not worth producing) and an inefficiently low level of pollution control.

There are two obvious solutions. One is direct regulation--the government tells the steel company how much it is allowed to pollute. The other is emission fees--referred to by economists as Pigouvian taxes (named after A. C. Pigou, the economist whose ideas I am describing).

Under a system of Pigouvian taxes, the government charges the steel company for the damage done by its pollution--\$10 per pound in this example. By doing so it converts the external cost into an internal cost--internalizes the externality. In deciding how much steel to produce and what price to sell it at, the company will now include the cost of its pollution--paid as an emission fee--along with other costs. In deciding how much pollution control equipment to buy, the company balances the cost of control against its benefits, and buys the optimal amount. So a system of emission fees can produce both an efficient amount of steel and an efficient amount of pollution control.

In order to achieve that result, the government imposing the fees must be able to measure the cost imposed by pollution. But, unlike direct regulation, the use of emission fees does not require the government to measure the cost of preventing

pollution--whether by installing air filters or by producing less steel. That will be done by the steel company, acting in its own interest.

I have just described the theory of externalities as it existed before Coase. Its conclusion is that, as long as externalities exist and are not internalized via Pigouvian taxes, the result is inefficient. The inefficiency is eliminated by charging the polluter an emission fee equal to the damage done by his pollution. In some real world cases it may be difficult to measure the amount of the damage, but, provided that that problem can be solved, using Pigouvian taxes to internalize externalities produces the efficient outcome.

That analysis was accepted by virtually the entire economics profession prior to Coase's work in the field. It is wrong--not in one way but in three. The existence of externalities does not necessarily lead to an inefficient result. Pigouvian taxes, even if they can be correctly calculated, do not in general lead to the efficient result. Third, and most important, the problem is not really externalities at all--it is transaction costs.

I like to present Coase's argument in three steps: *Nothing works, Everything works, It all depends.*

### **Nothing Works**

The first step is to realize that an external cost is not simply a cost produced by the pollutor and born by the victim. In almost all cases, the cost is a result of decisions by both parties. I would not be coughing if your steel mill were not pouring out sulfur dioxide. But your steel mill would do no damage to me if I did not happen to live down wind from it. It is the joint decision--yours to pollute and mine to live where you are polluting--that produces the cost.

Suppose that, in a particular case, the pollution does \$100,000 a year worth of damage and can be eliminated at a cost of only \$80,000 a year (from here on, all costs are per year). Further assume that the cost of shifting all of the land down wind to a new use unaffected by the pollution--growing timber instead of renting out summer resorts, say-- is only \$50,000. If we impose an emission fee of a hundred thousand dollars a year, the steel mill stops polluting and the damage is eliminated--at a cost of \$80,000. If we impose no emission fee the mill keeps polluting, the owners of the land stop advertising for tenants and plant trees instead, and the problem is again solved--at a cost of \$50,000. In this case the result without Pigouvian taxes is efficient--the problem is eliminated at the lowest possible cost--and the result with Pigouvian taxes is inefficient.

Moving the victims may not be a very plausible solution in the case of air pollution; it seems fairly certain that even the most draconian limitations on emissions in southern California would be less expensive than evacuating that end of the state. But the problem of externalities applies to a wide range of different situations, in many of which it is far from obvious which party can avoid the problem at lower cost, and in some of which it is not even obvious which one we should call the victim.

Consider the question of airport noise. One solution is to reduce the noise. Another is to soundproof the houses. A third is to use the land near airports for noisy factories instead of housing. There is no particular reason to think that one of those solutions is always best. Nor is it entirely clear whether the "victim" is the landowner who finds it difficult to sleep in his new house with jets going by overhead or the airline forced by a court or a regulatory agency to adopt expensive sound control measures in order to protect the sleep of people who chose to build their new houses in what used to be wheat fields--directly under the airport's flight path.

Consider a simpler case, where the nominal offender is clearly not the lowest cost avoider. The owner of one of two adjoining tracts of land has a factory, which he has been running for twenty years with no complaints from his neighbors. The purchaser of the other tract builds a recording studio on the side of his property immediately adjacent to the factory. The factory, while not especially noisy, is too noisy for something located two feet from the wall of a recording studio. So the owner of the studio demands that the factory shut down, or else pay damages equal to the full value of the studio. There are indeed "external costs" associated with operating a factory next to a recording studio--but the efficient solution is building the studio at the other end of the lot, not building the studio next to the factory and then closing down the factory.

So Coase's first point is that externalities are a joint product of "pollutor" and "victim," and that a legal rule that arbitrarily assigns blame to one of the parties only gives the right result if that party happens to be the one who can avoid the problem at the lower cost. Pigou's solution is correct only if the agency making the rules already knows which party is the lower cost avoider. In the more general case, nothing works--whichever party the blame is assigned to, by government regulators or by the courts, the result may be inefficient if the other party could prevent the problem at a lower cost.

One of the arguments commonly offered in favor of using Pigouvian taxes instead of direct regulation is that the regulator does not have to know the cost of pollution control in order to produce the efficient outcome--he just sets the tax equal to damage done, and lets the pollutor decide how much pollution to buy at that price. But one of the implications of Coase's argument is that the regulator can only guarantee the

efficient outcome if he knows enough about the cost of control to decide which party should be considered the pollutor (and taxed) and which should be considered the victim.

### **Everything Works**

The second step in Coase's argument is to observe that, as long as the parties involved can readily make and enforce contracts in their mutual interest, neither direct regulation nor Pigouvian taxes are necessary in order to get the efficient outcome. All you need is a clear definition of who has a right to do what and the market will take care of the problem.

To see how that works, let us go back to the case of the steel mill and the resorts. Suppose first that the mill has a legal right to pollute. In that case, as I originally set up the problem, the efficient result occurs immediately. The lowest cost avoiders are the owners of the land downwind; they shift from operating resorts to growing timber.

What if, instead, the legal rule is that the people downwind have a right not to have their air polluted? The result will be exactly the same. The mill could eliminate the pollution at a cost of \$80,000 a year. But it is cheaper to pay the landowners some amount, say \$60,000 a year, for permission to pollute. The landowners will be better off, since that is more than the cost to them of changing the use of the land, and the steel mill will be better off, since it is less than the cost of eliminating the pollution. So it will pay both parties to make some such agreement.

Now suppose we change the numbers in the example, to make pollution control the more efficient option--say lower its cost to \$20,000. In that case, whether or not the mill has the right to pollute, it will find that it is better off not polluting. If it has the right to pollute, the landowners will pay more than the \$20,000 cost of pollution control in exchange for a guarantee that it will not exercise its right. If it does not have the right to pollute, the most the steel mill will be willing to offer the landowners for permission to pollute is \$20,000, and the landowners will turn down that offer.

The generalization of this example is straightforward:

*If transaction costs are zero--if, in other words, any agreement that is in the mutual benefit of the parties concerned gets made--then any initial definition of property rights leads to an efficient outcome.*

It is this result that is sometimes referred to as the "Coase Theorem." It leads immediately to the final stage of the argument.

## **It All Depends (On Transaction Costs)**

Why is it, if Coase is correct, that we still have pollution in Los Angeles? One possible answer is that the pollution is efficient--that the damage it does is less than the cost of preventing it. A more plausible answer is that much of the pollution is inefficient, but that the transactions necessary to eliminate it are prevented by prohibitively high transaction costs.

Let us return to the steel mill. Suppose the mill has the right to pollute, but that doing so is inefficient--pollution control is cheaper than either putting up with the pollution or changing the use of the land down wind. Further suppose that there are a hundred landowners down wind.

With only one landowner, there would be no problem--he would offer to pay the mill for the cost of the pollution control equipment, plus a little extra to sweeten the deal. But a hundred landowners face what economists call a public good problem. If ninety of them put up the money and ten do not, the ten get a free ride--no pollution and no cost for pollution control. Each landowner has an incentive to refuse to pay, figuring that his payment is unlikely to make the difference between success and failure in the attempt to bribe the steel mill to eliminate its pollution. If the attempt is going to fail even with him, then it makes no difference whether or not he contributes. If it is going to succeed even without him, then refusing to contribute gives him a free ride. Only if his contribution makes the difference does he gain by agreeing to contribute.

There are a variety of ways in which such problems may sometimes be solved, but none that can always be expected to work. The problem becomes harder the larger the number of people involved. With many millions of people living in southern California, it is hard to imagine any plausible way in which they could voluntarily raise the money to pay all polluters to reduce their pollution.

This is one example of the sort of problem referred to under the general label of "transaction costs." Another would occur if we reversed the assumptions, making pollution (and timber) the efficient outcome but giving the landowners the right to be pollution free. If there were one landowner the steel mill could buy from him the right to pollute. With a hundred, the mill must buy permission from all of them. Any one has an incentive to be a holdout--to refuse his permission in the hope of getting paid off with a large fraction of the money the mill will save from not having to control its pollution. If too many landowners try that approach the negotiations will break down, and the parties will never get to the efficient outcome.

Seen from this perspective, one way of stating Coase's insight is that the problem is not really due to externalities at all, but to transaction costs. If there were externalities

but no transaction costs there would be no problem, since the parties would always bargain to the efficient solution. When we observe externality problems (or other forms of market failure) in the real world, we should ask not merely where the problem comes from, but what the transaction costs are that prevent it from being bargained out of existence.

### **Coase, Meade, and Bees**

Ever since Coase published "The Problem of Social Cost," economists unconvinced by his analysis have argued that the Coase Theorem is merely a theoretical curiosity, of little or no practical importance in a world where transaction costs are rarely zero. One famous example was in an article by James Meade (who later received a Nobel prize for his work on the economics of international trade).

Meade offered, as an example of the sort of externality problem for which Coase's approach offered no practical solution, the externalities associated with honey bees. Bees graze on the flowers of various crops, so a farmer who grows crops that produce nectar benefits the beekeepers in the area. The farmer receives none of the benefit himself, so he has an inefficiently low incentive to grow such crops. Since bees cannot be convinced to respect property rights or keep contracts, there is, Meade argued, no practical way to apply Coase's approach. We must either subsidize farmers who grow nectar rich crops (a negative Pigouvian tax) or accept inefficiency in the joint production of crops and honey.

It turned out that Meade was wrong. In two later articles, supporters of Coase demonstrated that contracts between beekeepers and farmers had been common practice in the industry since early in this century. When the crops were producing nectar and did not need pollenization, beekeepers paid farmers for permission to put their hives in the farmers' fields. When the crops were producing little nectar but needed pollenization (which increases yields), farmers paid beekeepers. Bees may not respect property rights but they are, like people, lazy, and prefer to forage as close to the hive as possible.

The fact that a Coasian approach solves that particular externality problem does not imply that it will solve all such problems. But the observation that an economist as distinguished as Meade assumed Coase's approach was of no practical significance in a context where it was actually standard practice suggests that the range of problems to which the Coasian solution is relevant may be much greater than many would at first guess.

### **Coase, Property, and the Economic Analysis of Law**

"The Problem of Social Cost" provides more than merely a revolutionary rethinking of the question of externalities. It also suggests a new and interesting approach to the problem of defining property rights.

A court, in settling disputes involving property, or a legislature in writing a law code to be applied to such disputes, must decide just which of the rights associated with land are included in the bundle we call "ownership." Does the owner have the right to prohibit airplanes from crossing his land a mile up? How about a hundred feet? How about people extracting oil from a mile under the land? What rights does he have against neighbors whose use of their land interferes with his use of his? If he builds his recording studio next to his neighbor's factory, who is at fault? If he has a right to silence in his recording studio, does that mean that he can forbid the factory from operating, or only that he can sue to be reimbursed for his losses? It seems simple to say that we should have private property in land, but ownership of land is not a simple thing.

The Coasian answer to this set of problems is that the law should define property in such a way as to minimize the costs associated with the sorts of incompatible uses we have been discussing--factories and recording studios, or steel mills and resorts. The first step in doing so is to try to define rights in such a way that, if right A is of most value to someone who also holds right B, they come in the same bundle. The right to decide what happens two feet above a piece of land is of most value to the person who also holds the right to use the land itself, so it is sensible to include both of them in the bundle of rights we call "ownership of land." On the other hand, the right to decide who flies a mile above a piece of land is of no special value to the owner of the land, hence there is no good reason to include it in that bundle.

If, when general legal rules were being established, we somehow knew, for all cases, what rights belonged together, the argument of the previous paragraph would be sufficient to tell us how property rights ought to be defined. But that is very unlikely to be the case. In many situations a right, such as the right not to have noises of more than X decibels made over a particular piece of property, may be of substantial value to two or more parties--the owner of the property and the owner of the adjacent factory in my earlier example, for instance. There is no general legal rule that will always assign it to the right one.

In this case, the argument underlying the Coase Theorem comes into play. If we assign the right initially to the wrong person, the right person, the one to whom it is of most value, can still buy it. So one of the considerations in the initial definition of property rights is doing it in such a way as to minimize the transaction costs associated with fixing, via private contracts, any initially inefficient definition.

An example may make this clearer. Suppose that, in the pollution case discussed earlier, damages from pollution are easy to measure and the number of people downwind is large. In that case, the efficient rule is probably to give downwind landowners a right to collect damages from the pollutor, but not a right to forbid him from polluting. Giving the right to the landowners avoids the public good problem that we would face if the landowners (in the case where pollution is inefficient) had to raise the money to pay the steel mill not to pollute. Giving them a right to damages rather than giving each landowner the right to an injunction forbidding the steel mill from polluting avoids the holdout problem that the mill would face (in the case where pollution is efficient) in buying permission from all of the landowners.

A full explanation of how Coase's argument can be applied to figuring out what the law ought to be (more precisely, what legal rules lead to the best outcome from the standpoint of economic efficiency) would require a much longer article--perhaps a book. I hope I have said enough to make clear the basic idea, and enough to show the unique and extraordinary nature of one of Ronald Coase's principal contributions to economics. He started with a simple insight, based in part on having read cases in the common law of nuisance--the branch of law that deals with problems such as noisy factories next door to recording studios. He ended by demonstrating that what everyone else in the profession thought was the correct analysis of the problem of externalities was wrong, and, in the process, opening up a whole new approach to the use of economics to analyze law.

There is at least one more thing worth saying about "The Problem of Social Cost." Economists, then and (to some degree) now, tend to jump from the observation that the market produces an inefficient result in some situation to the conclusion that the government ought to intervene to fix the problem. Part of what Coase showed was that, for some problems, there is no legal rule, no form of regulation, that will generate a fully efficient solution. He thus anticipated public choice economists, such as James Buchanan (another Nobel winner), in arguing that the real choice was not between an inefficient market and an efficient government solution but rather among a variety of inefficient alternatives, private and governmental. In Coase's words: "All solutions have costs and there is no reason to suppose that government regulation is called for simply because the problem is not well handled by the market or the firm."

### **References**

Cheung, Steven N. S., "The Fable of the Bees: An Economic Investigation," *Journal of Law and Economics* XVI (1973), 11-33.

Coase, R.H. , The Problem of Social Cost, *Journal of Law and Economics* 3, 1-44 (1960).

Friedman, D., *The Machinery of Freedom*, 2nd Edn., Open Court: La Salle, 1989, Chapters 41-43.

Johnson, David B., "Meade, Bees, and Externalities," *Journal of Law and Economics* XVI (1973), 35-52.

Meade, J. E., "External Economies and Diseconomies in a Competitive Situation," *Economic Journal* 54 (1952).

Pigou, A.C., *Wealth and Welfare* (1912) and *The Economics of Welfare* (1920).

Posner, R., *Economic Analysis of Law*, 3rd Edn., Little Brown & Co. Boston, 1986.