THE THEORY
OF PRICE

third edition

George J. Stigler

The University of Chicago

For a gratifyingly large number of economic problems, the non-monetary elements need not be estimated. Often they are essentially irrelevant, as in the choice whether to grow rye or wheat on a farm, or to invest funds in chemicals or paper and pulp. Often they are stable over substantial periods of time, so that the more volatile monetary elements will dominate the movements of resources. For example, one would have expected the preference for investing at home rather than abroad to be stable as between Canada and the United States, so total returns would move from year-to-year by the same amount as monetary returns—until the recent era of discriminatory rules imposed by the two nations under the benevolent influence of economic nationalism.

Private Costs and Social Costs

A chemical plant, let us assume, collects waste products and discharges them into a stream which flows by the plant. The cost to this plant of disposing of waste is then the cost of pumping the waste to the stream (or, in more precise language, the cost is the foregone alternatives of the resources necessary to do the pumping). If pollution of the stream reduces the income of other people (destroying recreational uses, making the water unpotable, and so on), there are additional costs borne by others. The costs to the individual firm are termed *private* costs, while the sum of costs to everyone is called the *social cost* of waste disposal.[7]

There can be no doubt of the existence of these external effects of an individual's behavior. In fact, in strictest logic there are very few actions whose entire consequences accrue to the actor. If I educate my children well, the community (it is hoped) will benefit by reduced crime, more enlightened citizenship, and so forth. If I grow an attractive lawn, my neighbors are pleased; if Smith dresses shabbily, the other members of the United States Senate become annoyed.

One of the most tendencious questions in economics has been: when social and private costs diverge appreciably, will competition lead to correct amounts (and prices) of goods? Will not the chemical plant, under competition, sell at a price which does not cover

[7] The terms are due to A. C. Pigou, *The Economics of Welfare,* 4th ed. (London: Macmillan, 1932), Part II, Ch. 9.

the costs of pollution, so its costs will be too low and its output too large (with given demands for chemicals)?

To answer the question, let us shift to another example, which happens to have a long legal history, that of wandering cattle.[8] In a region hitherto devoted to unfenced farms growing grain, a cattle raiser comes. His cattle will, unless fenced in, occasionally wander into the neighboring grain fields and damage the crops.

Taking account of this damage, from the social viewpoint the use of the farm for cattle is desirable only if the additional net income of the land is larger than that in growing grain by the lesser of the two amounts: (1) the annual cost of fencing the cattle farm, or (2) the damage to the neighboring crops. Let us assume that cattle raising just meets this test.

If the cattle raiser has no responsibility, or only partial responsibility, for the costs imposed upon others by his wandering cattle, it appears that he will earn a larger rent in cattle than in grain. As a result, more farms will be converted to cattle, and there will be too much meat and not enough grain in the community.

We mean a specific thing by too much meat and not enough grain. Suppose the social costs of 100 bushels of wheat and 400 pounds of meat are the same—the same resources can produce either. Then if their prices (for these quantities) are not equal, consumers will buy relatively more of the cheaper product. Perhaps the equilibrium is reached when 500 pounds of meat sells for the same price as 100 bushels of wheat. The consumer is then indifferent if one bushel of wheat is added and 5 pounds of meat taken away from him. But given the social costs, it would be possible by reducing meat output 5 pounds to obtain 1.25 bushels of wheat, and the consumer would consider this 0.25 bushels a clear gain.

This is in fact an instance of a general theorem: consumers will be best off (on the highest indifference curves) when the relative prices of goods are equal to their relative (marginal) social costs. Where private costs differ from social costs, obviously this optimum position will not be reached, because producers will gear output to their private costs.

In our case of wandering cattle, it is clear that a legal require-

[8] The discussion to follow is based upon the profound article of Ronald Coase, "The Problem of Social Cost," *Journal of Law and Economics,* 3 (1961).

ment that the cattle raiser bear the cost of fencing or damage to crops will make private and social costs equal; a contrary law (it would appear) will not. But suppose, to reverse the whole situation, that the area had originally been devoted to cattle raising and now a wheat farmer enters. The argument is completely analogous, but this time we reach the conclusion that the wheat farmer should pay for the fencing! It is his arrival which creates the problem of wandering cattle, and therefore to get the true (social) cost of his wheat we should take account of the damage he inflicts on cattle raisers if they should for example have to erect fences. We need two laws: one imposing fencing costs on grain growers, the other imposing the costs on cattle raisers.

The fundamental symmetry in the relations of cattle and grain farmers, no matter where the law places the liability for damages, deserves elaboration. Let us consider more closely the intruding cattle raiser. He has, let us assume, the following production schedule (all quantities per year):

CATTLE	TOTAL NET PRIVATE RETURN	DAMAGE TO GRAIN FARMERS
9	$ 94	$ 0
10	100	2
11	105	3
12	109	6
13	111	10
14	112	15
15	111	21

If he considered only his private net returns, he would have a herd of 14 cattle, for then his return is maximized. But since he must compensate for damage to grain, he will stop before this point. If he has (say) 12 cattle and contemplates a 13th, he will have to pay grain growers an additional $4 for the additional damage. Similarly, he will reduce payments for damages to $3 if he reduces the herd to 11. (If fencing costs, say, $6 a year, the alternative will be adopted and a herd of 14 reared.)

When the cattle raiser increases his herd from 10 to 11, his revenue rises by $5, but this is at a cost of $1—the marginal damage to grain growers. Hence his net gain is $4. Similarly he adds $4 to revenue, and $3 to cost (for damages) by the 12th animal, a net gain of $1. The thirteenth animal adds more to cost ($4) than to revenue ($2), and will not be reared.

If the law puts the burden of damage on the grain grower, the herd will still be 12. For now the grain growers will offer him sums equal to the marginal damage if he does not increase the herd. If the herd is 12, for example, they will offer up to $4 if he will not add a thirteenth animal. Since he foregoes this receipt by adding the 13th animal this is the cost (for costs are foregone alternatives). The manner in which the law assigns liability will not affect the relative private marginal costs of production of cattle and grain.

But this procedure obviously leads to the correct social results—the results which would arise if the cattle and grain farms were owned by the same man. The Coase theorem thus asserts that under perfect competition private and social costs will be equal. It is a more remarkable proposition to us older economists who have believed the opposite for a generation, than it will appear to the young reader who was never wrong, here.

The proposition that the composition of output will not be affected by the manner in which the law assigns liability for damage seems astonishing. But it should not be. Laws often prove to be unimportant: the laws which specify that the seller or, alternatively, the buyer should pay a retail sales tax are wholly equivalent in effect. The assignment of responsibility for damages, similarly, can be ignored: assume that the same farmer grows grain and cattle, and it is obvious that his determination of output will be independent of the assignment. Either it will be profitable to raise both cattle and grain, and then one "product" will "pay" the amount necessary to maximize the sum of outputs of the two (no matter what the legal arrangements), or it will be unprofitable, and one of the products will not be raised.[9]

The proposition must, to be sure, be qualified by an important fact. When a factory spews smoke on a thousand homes, the ideal solution is to arrange a compensation system whereby the homeowners pay the factory to install smoke reduction devices up to the point where the marginal cost of smoke reduction equals the sum of the marginal gains to the homeowners. But the costs of

[9] One product, say cattle, may impose (for every possible number of cattle) more costs on grain than the net yield from the cattle. However, the cattle land is either (1) already in grain, and could not be competed for by cattle, or (2) has no use except to grow cattle, and then the payment must be made (with this assignment of liability) for foregone profits from cattle grazing, and in either case the use of land is not affected.

this transaction may be prohibitive—of getting the people together, of assessing damages, and so on—so only a statutory intervention may be feasible. The statutory policy is itself far from simple to devise: the amount of smoke reduction that is socially optimal depends upon the technology of smoke reduction, the number of people involved, and so forth, and none of these factors remains constant over time.

The differences between private and social costs or returns have provided a fertile field for public control of economic activity. In fact one can attribute most limitations on private ownership or control of property to this source.[10] These controls are of every degree of perspicacity, ranging from traffic controls (where private contracts between rapidly converging drivers would be difficult to arrange) to petroleum import restrictions (designed to conserve the supply of domestic petroleum!).

Isolating the Product of One Factor

If the alternative cost of a unit of a productive resource is its maximum product elsewhere, it is necessary to isolate its separate contribution from that of the other resources with which it is almost invariably used. Can this be done? On its face this seems difficult, and a considerable number of people have said that since wheat cannot be harvested unless there is land in which to plant it and men to reap it, any division of the product between land and men is arbitrary. Let us see.

Variable Production Coefficients. Let us define the production coefficient of land in growing wheat as the amount of land necessary to grow one bushel of wheat—it is a number such as 1/60 acre year. Similarly the production coefficient of tractors might be 1/6,000 tractor year, and that of labor 1 man hour (or 1/2,000 man year). These production coefficients are merely accepted names for input-output ratios.

The production coefficients are in general variable: there is no unique quantity of land (or other input) necessary to produce a bushel of wheat. One can use less land if he uses more fertilizer

---

[10] Although most public controls are due to this source, they are not always the most important controls. Some measures have purely ethical bases—the redistribution of income, the censorship of some forms of behavior (gambling, for example).