

Ronald Coase (1910-2013)

Ronald Coase was an English-born economist who spent most of his professional career at the University of Chicago. Coase was instrumental in bringing historical analysis into economics, famously questioning the lighthouse as the paradigm example of a public good, and also in relating economics to the field of law. The Nobel Prize committee cited “his discovery and clarification of the significance of transaction costs and property rights for the institutional structure and functioning of the economy” and awarded him the prize in economics in 1991. By “institutional structure”, they meant Coase’s work on the theory of the firm where he was a major innovator.

Coase’s article “The Problem of Social Cost” published in 1960 in the newly founded *Journal of Law and Economics* (which Coase would later edit for many years) was a watershed event in a couple of ways. First, Coase showed that ascribing well-defined property rights to the parties in question is at least as good a solution --if not a better solution--to negative externalities than Pigouvian taxes. The article further argues that the harm from negative externalities is reciprocal. The introduction of property rights then gives the affected parties economic incentives to solve, or to leave unsolved if in their interest, the externality in question without appeal to government. The solution the parties come to would be reached by direct bargaining, sometimes now called “Coasean bargaining”. Coase was innovative as well in his extensive use of actual legal cases—as opposed to mathematical models--in which courts were asked to adjudicate damages arising from real-life examples of externalities. Based on the argument of this article, the “Coase Theorem” (coined as such by George Stigler) was formulated, holding that costless bargaining in a completely efficient market with perfect information would resolve property right disputes in an economically optimal way. Of course, zero transaction cost scenarios are rare in the real economy. Coase ends up concluding that it’s the presence of transaction costs that leads to specific institutional structures in the economy. Coase further challenges Pigou’s analysis of externalities using both economic and legal reasoning and rejects the Pigouvian tradition stemming from this.

The entire article is worth reading for those interested in doing so. It can be downloaded [here](#).

As you read these selections, ask whether property rights are as effective a solution to the problem of externalities as Pigouvian taxes. Also look at whether Coase’s bilateral approach, that is A and B are in a dispute where there are both property rights and a negative externality, takes into account all the relevant affected parties. Finally, ask whether his critique of Pigou is convincing.

# THE PROBLEM OF SOCIAL COST

## I. THE PROBLEM TO BE EXAMINED

This paper is concerned with those actions of business firms which have harmful effects on others. The standard example is that of a factory the smoke from which has harmful effects on those occupying neighbouring properties. The economic analysis of such a situation has usually proceeded in terms of a divergence between the private and social product of the factory, in which economists have largely followed the treatment of Pigou in *The Economics of Welfare*. The conclusions to which this kind of analysis seems to have led most economists is that it would be desirable to make the owner of the factory liable for the damage caused to those injured by the smoke, or alternatively, to place a tax on the factory owner varying with the amount of smoke produced and equivalent in money terms to the damage it would cause, or finally, to exclude the factory from residential districts (and presumably from other areas in which the emission of smoke would have harmful effects on others). It is my contention that the suggested courses of action are inappropriate, in that they lead to results which are not necessarily, or even usually, desirable.

## II. THE RECIPROCAL NATURE OF THE PROBLEM

The traditional approach has tended to obscure the nature of the choice that has to be made. The question is commonly thought of as one in which A inflicts harm on B and what has to be decided is: how should we restrain A? But this is wrong. We are dealing with a problem of a reciprocal nature. To avoid the harm to B would inflict harm on A. The real question that has to be decided is: should A be allowed to harm B or should B be allowed to harm A? The problem is to avoid the more serious harm. I instanced in my previous article the case of a confectioner, the noise and vibrations from whose machinery disturbed a doctor in his work. To avoid harming the doctor would inflict harm on the confectioner. The problem posed by this case was essentially whether it was worthwhile, as a result of restricting the methods of production which could be used by the confectioner, to secure more doctoring at the cost of a reduced supply of confectionery products. Another example is afforded by the problem of straying cattle which destroy crops on neighbouring land. If it is inevitable that some cattle will stray, an increase in the supply of meat can only be obtained at the expense of a decrease in the supply of crops. The nature of the choice is clear: meat or crops. What answer should be given is, of course, not clear unless we know the value of what is obtained as

well as the value of what is sacrificed to obtain it. To give another example, Professor George J. Stigler instances the contamination of a stream. If we assume that the harmful effect of the pollution is that it kills the fish, the question to be decided is: is the value of the fish lost greater or less than the value of the product which the contamination of the stream makes possible. It goes almost without saying that this problem has to be looked at in total and at the margin.

*[In Sections III and IV, Coase analyses the case of crops damaged by a neighbor's straying cattle, both with and without liability for the damage. In Section V, Coase shows how direct bargaining by those affected can yield the optimal outcome.]*

## **V. THE PROBLEM ILLUSTRATED ANEW**

The harmful effects of the activities of a business can assume a wide variety of forms. An early English case concerned a building which, by obstructing currents of air, hindered the operation of a windmill. A recent case in Florida concerned a building which cast a shadow on the cabana, swimming pool and sunbathing areas of a neighbouring hotel. The problem of straying cattle and the damaging of crops which was the subject of detailed examination in the two preceding sections, although it may have appeared to be rather a special case, is in fact but one example of a problem which arises in many different guises. To clarify the nature of my argument and to demonstrate its general applicability, I propose to illustrate it anew by reference to four actual cases.

Let us first reconsider the case of *Sturges v. Bridgman* which I used as an illustration of the general problem in my article on "The Federal Communications Commission." In this case, a confectioner (in Wigmore Street) used two mortars and pestles in connection with his business (one had been in operation in the same position for more than 60 years and the other for more than 26 years). A doctor then came to occupy neighbouring premises (in Wimpole Street). The confectioner's machinery caused the doctor no harm until, eight years after he had first occupied the premises, he built a consulting room at the end of his garden right against the confectioner's kitchen. It was then found that the noise and vibration caused by the confectioner's machinery made it difficult for the doctor to use his new consulting room. "In particular... the noise prevented him from examining his patients by auscultation<sup>1</sup> for diseases of the chest. He also found it impossible to engage with effect in any occupation which required thought and attention." The doctor therefore brought a legal action to force the confectioner to stop using his machinery. The courts had little difficulty in granting the doctor the injunction he sought. "Individual cases of hardship

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<sup>1</sup> Auscultation is the act of listening by ear or stethoscope in order to judge by sound the condition of the body.

may occur in the strict carrying out of the principle upon which we found our judgment, but the negation of the principle would lead even more to individual hardship, and would at the same time produce a prejudicial effect upon the development of land for residential purposes."

The court's decision established that the doctor had the right to prevent the confectioner from using his machinery. But, of course, it would have been possible to modify the arrangements envisaged in the legal ruling by means of a bargain between the parties. The doctor would have been willing to waive his right and allow the machinery to continue in operation if the confectioner would have paid him a sum of money which was greater than the loss of income which he would suffer from having to move to a more costly or less convenient location or from having to curtail his activities at this location or, as was suggested as a possibility, from having to build a separate wall which would deaden the noise and vibration. The confectioner would have been willing to do this if the amount he would have to pay the doctor was less than the fall in income he would suffer if he had to change his mode of operation at this location, abandon his operation or move his confectionery business to some other location. The solution of the problem depends essentially on whether the continued use of the machinery adds more to the confectioner's income than it subtracts from the doctor's.<sup>2</sup> But now consider the situation if the confectioner had won the case. The confectioner would then have had the right to continue operating his noise and vibration-generating machinery without having to pay anything to the doctor. The boot would have been on the other foot: the doctor would have had to pay the confectioner to induce him to stop using the machinery. If the doctor's income would have fallen more through continuance of the use of this machinery than it added to the income of the confectioner, there would clearly be room for a bargain whereby the doctor paid the confectioner to stop using the machinery. That is to say, the circumstances in which it would not pay the confectioner to continue to use the machinery and to compensate the doctor for the losses that this would bring (if the doctor had the right to prevent the confectioner's using his machinery) would be those in which it would be in the interest of the doctor to make a payment to the confectioner which would induce him to discontinue the use of the machinery (if the confectioner had the right to operate the machinery). The basic conditions are exactly the same in this case as they were in the example of the cattle which destroyed crops. With costless market transactions, the decision of the courts concerning liability for damage would be without effect on the allocation of resources. It was of course the view of the judges that they were affecting the working of the economic system and in a desirable direction. Any other decision would have had "a prejudicial effect upon the development of land for residential

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<sup>2</sup> Note that what is taken into account is the change in income after allowing for alterations in methods of production, location, character of product, etc.

purposes," an argument which was elaborated by examining the example of a forge operating on a barren moor, which was later developed for residual purposes. The judges' view that they were settling how the land was to be used would be true only in the case in which the costs of carrying out the necessary market transactions exceeded the gain which might be achieved by any rearrangement of rights. And it would be desirable to preserve the areas (Wimpole Street or the moor) for residential or professional use (by giving non-industrial users the right to stop the noise, vibration, smoke, etc., by injunction) only if the value of the additional residential facilities obtained was greater than the value of cakes or iron lost. But of this the judges seem to have been unaware...

Bryant v. Lefever raised the problem of the smoke nuisance in a novel form. The plaintiff and the defendants were occupiers of adjoining houses, which were of about the same height.

"Before 1876 the plaintiff was able to light a fire in any room of his house without the chimneys smoking; the two houses had remained in the same condition some thirty or forty years. In 1876 the defendants took down their house, and began to rebuild it. They carried up a wall by the side of the plaintiff's chimneys much beyond its original height, and stacked timber on the roof of their house, and thereby caused the plaintiff's chimneys to smoke whenever he lighted fires."

The reason, of course, why the chimneys smoked was that the erection of the wall and the stacking of the timber prevented the free circulation of air. In a trial before a jury, the plaintiff was awarded damages of £40. The case then went to the Court of Appeals where the judgment was reversed. Bramwell, L.J., argued:

"... it is said, and the jury have found, that the defendants have done that which caused a nuisance to the plaintiff's house. We think there is no evidence of this. No doubt there is\_ a nuisance, but it is not of the defendant's causing. They have done nothing in causing the nuisance. Their house and their timber are harmless enough. It is the plaintiff who causes the nuisance by lighting a coal fire in a place the chimney of which is placed so near the defendants' wall, that the smoke does not escape, but comes into the house. Let the plaintiff cease to light his fire, let him move his chimney, let him carry it higher, and there would be no nuisance. Who then, causes it? It would be very clear that the plaintiff did, if he had built his house or chimney after the defendants had put up the timber on theirs, and it is really the same though he did so before the timber was there. But ( what is in truth the same answer), if the defendants cause the nuisance, they have a right to do so. If the plaintiff has not the right to the passage of air, except subject to the defendants' right to build or put timber on their house, then his right is subject to their right, and though a nuisance follows from the exercise of their right, they are not liable."

And Cotton, L.J ., said:

"Here it is found that the erection of the defendants' wall has sensibly and materially interfered with the comfort of human existence in the plaintiff's house, and it is said this is a nuisance for which the defendants are liable. Ordinarily this is so, but the defendants have done so, not by sending on to the plaintiff's property any smoke or noxious vapour, but by interrupting the egress of smoke from the plaintiff's house in a way to which ... the plaintiff has no legal right. The plaintiff creates the smoke,

which interferes with his comfort. Unless he has ... a right to get rid of this in a particular way which has been interfered with by the defendants, he cannot sue the defendants, because the smoke made by himself, for which he has not provided any effectual means of escape, causes him annoyance. It is as if a man tried to get rid of liquid filth arising on his own land by a drain into his neighbour's land. Until a right had been acquired by user, the neighbour might stop the drain without incurring liability by so doing. No doubt great inconvenience would be caused to the owner of the property on which the liquid filth arises. But the act of his neighbour would be a lawful act, and he would not be liable for the consequences attributable to the fact that the man had accumulated filth without providing any effectual means of getting rid of it.”

I do not propose to show that any subsequent modification of the situation, as a result of bargains between the parties (conditioned by the cost of stacking the timber elsewhere, the cost of extending the chimney higher, etc.), would have exactly the same result whatever decision the courts had come to since this point has already been adequately dealt with in the discussion of the cattle example and the two previous cases. What I shall discuss is the argument of the judges in the Court of Appeals that the smoke nuisance was not caused by the man who erected the wall but by the man who lit the fires. The novelty of the situation is that the smoke nuisance was suffered by the man who lit the fires and not by some third person. The question is not a trivial one since it lies at the heart of the problem under discussion. Who caused the smoke nuisance? The answer seems fairly clear. The smoke nuisance was caused both by the man who built the wall and by the man who lit the fires. Given the fires, there would have been no smoke nuisance without the wall; given the wall, there would have been no smoke nuisance without the fires. Eliminate the wall or the fires and the smoke nuisance would disappear. On the marginal principle it is clear that both were responsible and both should be forced to include the loss of amenity due to the smoke as a cost in deciding whether to continue the activity which gives rise to the smoke. And given the possibility of market transactions, this is what would in fact happen. Although the wall-builder was not liable legally for the nuisance, as the man with the smoking chimneys would presumably be willing to pay a sum equal to the monetary worth to him of eliminating the smoke, this sum would therefore become for the wall-builder, a cost of continuing to have the high wall with the timber stacked on the roof.

The judges' contention that it was the man who lit the fires who alone caused the smoke nuisance is true only if we assume that the wall is the given factor. This is what the judges did by deciding that the man who erected the higher wall had a legal right to do so. The case would have been even more interesting if the smoke from the chimneys had injured the timber. Then it would have been the wall-builder who suffered the damage. The case would then have closely paralleled *Sturges v. Bridgman* and there can be little doubt that the man who lit the fires would have been liable for the ensuing damage to the timber, in spite of the fact that no damage had occurred until the high wall was built by the man who owned the timber.

Judges have to decide on legal liability but this should not confuse economists about the nature of the economic problem involved. In the case of the cattle and the crops, it is true that there would be no crop damage without the cattle. It is equally true that there would be no crop damage without the crops. The doctor's work would not have been disturbed if the confectioner had not worked his machinery; but the machinery would have disturbed no one if the doctor had not set up his consulting room in that particular place. The matting was blackened by the fumes from the sulphate of ammonia manufacturer; but no damage would have occurred if the matting manufacturer had not chosen to hang out his matting in a particular place and to use a particular bleaching agent. If we are to discuss the problem in terms of causation, both parties cause the damage. If we are to attain an optimum allocation of resources, it is therefore desirable that both parties should take the harmful effect (the nuisance) into account in deciding on their course of action. It is one of the beauties of a smoothly operating pricing system that, as has already been explained, the fall in the value of production due to the harmful effect would be a cost for both parties....

The reasoning employed by the courts in determining legal rights will often seem strange to an economist because many of the factors on which the decision turns are, to an economist, irrelevant. Because of this, situations which are, from an economic point of view, identical will be treated quite differently by the courts. The economic problem in all cases of harmful effects is how to maximise the value of production...

## **VI. THE COST OF MARKET TRANSACTIONS TAKEN INTO ACCOUNT**

The argument has proceeded up to this point on the assumption (explicit in Sections III and IV and tacit in Section V) that there were no costs involved in carrying out market transactions. This is, of course, a very unrealistic assumption. In order to carry out a market transaction it is necessary to discover who it is that one wishes to deal with, to inform people that one wishes to deal and on what terms, to conduct negotiations leading up to a bargain, to draw up the contract, to undertake the inspection needed to make sure that the terms of the contract are being observed, and so on. These operations are often extremely costly, sufficiently costly at any rate to prevent many transactions that would be carried out in a world in which the pricing system worked without cost.

In earlier sections, when dealing with the problem of the rearrangement of legal rights through the market, it was argued that such a rearrangement would be made through the market whenever this would lead to an increase in the value of production. But this assumed costless market transactions. Once the costs of carrying out market transactions are taken into account it is clear that such a rearrangement of rights will only be undertaken when the increase in the value of production consequent upon the

rearrangement is greater than the costs which would be involved in bringing it about. When it is less, the granting of an injunction (or the knowledge that it would be granted) or the liability to pay damages may result in an activity being discontinued (or may prevent its being started) which would be undertaken if market transactions were costless. In these conditions the initial delimitation of legal rights does have an effect on the efficiency with which the economic system operates. One arrangement of rights may bring about a greater value of production than any other. But unless this is the arrangement of rights established by the legal system, the costs of reaching the same result by altering and combining rights through the market may be so great that this optimal arrangement of rights, and the greater value of production which it would bring, may never be achieved. The part played by economic considerations in the process of delimiting legal rights will be discussed in the next section. In this section, I will take the initial delimitation of rights and the costs of carrying out market transactions as given.

It is clear that an alternative form of economic organisation which could achieve the same result at less cost than would be incurred by using the market would enable the value of production to be raised. As I explained many years ago, the firm represents such an alternative to organising production through market transactions. Within the firm individual bargains between the various cooperating factors of production are eliminated and for a market transaction is substituted an administrative decision. The rearrangement of production then takes place without the need for bargains between the owners of the factors of production. A landowner who has control of a large tract of land may devote his land to various uses taking into account the effect that the interrelations of the various activities will have on the net return of the land, thus rendering unnecessary bargains between those undertaking the various activities. Owners of a large building or of several adjoining properties in a given area may act in much the same way. In effect, using our earlier terminology, the firm would acquire the legal rights of all the parties and the rearrangement of activities would not follow on a rearrangement of rights by contract, but as a result of an administrative decision as to how the rights should be used...

But the firm is not the only possible answer to this problem. The administrative costs of organising transactions within the firm may also be high, and particularly so when many diverse activities are brought within the control of a single organisation. In the standard case of a smoke nuisance, which may affect a vast number of people engaged in a wide variety of activities, the administrative costs might well be so high as to make any attempt to deal with the problem within the confines of a single firm impossible. An alternative solution is direct Government regulation. Instead of instituting a legal system of rights which can be modified by transactions on the market, the government may impose regulations which state what people must or must not do



and which have to be obeyed. Thus, the government (by statute or perhaps more likely, through an administrative agency) may, to deal with the problem of smoke nuisance, decree that certain methods of production should or should not be used (e.g. that smoke preventing devices should be installed or that coal or oil should not be burned) or may confine certain types of business to certain districts (zoning regulations).

The government is, in a sense, a super-firm (but of a very special kind) since it is able to influence the use of factors of production by administrative decision. But the ordinary firm is subject to checks in its operations because of the competition of other firms, which might administer the same activities at lower cost and also because there is always the alternative of market transactions as against organisation within the firm if the administrative costs become too great. The government is able, if it wishes, to avoid the market altogether, which a firm can never do. The firm has to make market agreements with the owners of the factors of production that it uses. Just as the government can conscript or seize property, so it can decree that factors of production should only be used in such-and-such a way. Such authoritarian methods save a lot of trouble (for those doing the organising). Furthermore, the government has at its disposal the police and the other law enforcement agencies to make sure that its regulations are carried out.

It is clear that the government has powers which might enable it to get some things done at a lower cost than could a private organisation (or at any rate one without special governmental powers). But the governmental administrative machine is not itself costless. It can, in fact, on occasion be extremely costly. Furthermore, there is no reason to suppose that the restrictive and zoning regulations, made by a fallible administration subject to political pressures and operating without any competitive check, will necessarily always be those which increase the efficiency with which the economic system operates. Furthermore, such general regulations which must apply to a wide variety of cases will be enforced in some cases in which they are clearly inappropriate. From these considerations it follows that direct governmental regulation will not necessarily give better results than leaving the problem to be solved by the market or the firm. But equally there is no reason why, on occasion, such governmental administrative regulation should not lead to an improvement in economic efficiency. This would seem particularly likely when, as is normally the case with the smoke nuisance, a large number of people are involved and in which therefore the costs of handling the problem through the market or the firm may be high.

There is, of course, a further alternative, which is to do nothing about the problem at all. And given that the costs involved in solving the problem by regulations issued by the governmental administrative machine will often be heavy (particularly if the costs are interpreted to include all the consequences which follow from the Government engaging in this kind of activity), it will no doubt be commonly the case

that the gain which would come from regulating the actions which give rise to the harmful effects will be less than the costs involved in Government regulation.

The discussion of the problem of harmful effects in this section (when the costs of market transactions are taken into account) is extremely inadequate. But at least it has made clear that the problem is one of choosing the appropriate social arrangement for dealing with the harmful effects. 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. Satisfactory views on policy can only come from a patient study of how, in practice, the market, firms and governments handle the problem of harmful effects. Economists need to study the work of the broker in bringing parties together, the effectiveness of restrictive covenants, the problems of the large-scale real-estate development company, the operation of Government zoning and other regulating activities. It is my belief that economists, and policy-makers generally, have tended to overestimate the advantages which come from governmental regulation. But this belief, even if justified, does not do more than suggest that government regulation should be curtailed. It does not tell us where the boundary line should be drawn. This, it seems to me, has to come from a detailed investigation of the actual results of handling the problem in different ways. But it would be unfortunate if this investigation were undertaken with the aid of a faulty economic analysis. The aim of this article is to indicate what the economic approach to the problem should be...

*[In Section VII, Coase cites a series of court decisions in the UK and in the US. In Section VIII, he turns to his critique of Pigou.]*

## **VIII. PIGOU'S TREATMENT IN "THE ECONOMICS OF WELFARE"**

The fountainhead for the modern economic analysis of the problem discussed in this article is Pigou's *Economics of Welfare* and, in particular, that section of Part II which deals with divergences between social and private net products which come about because one person A, in the course of rendering some service, for which payment is made, to a second person B, incidentally also renders services or disservices to other persons (not producers of like services), of such a sort that payment cannot be exacted from the benefited parties or compensation enforced on behalf of the injured parties.

Pigou tells us that his aim in Part II of *The Economics of Welfare* is to ascertain how far the free play of self-interest, acting under the existing legal system, tends to distribute the country's resources in the way most favorable to the production of a large national dividend, and how far it is feasible for State action to improve upon 'natural' tendencies.

To judge from the first part of this statement, Pigou's purpose is to discover whether any improvements could be made in the existing arrangements which determine the use of resources. Since Pigou's conclusion is that improvements could be made, one might have expected him to continue by saying that he proposed to set out the changes required to bring them about. Instead, Pigou adds a phrase which contrasts "natural" tendencies with State action, which seems in some sense to equate the present arrangements with "natural" tendencies and to imply that what is required to bring about these improvements is State action (if feasible). That this is more or less Pigou's position is evident from Chapter I of Part II. Pigou starts by referring to "optimistic followers of the classical economists" who have argued that the value of production would be maximised if the Government refrained from any interference in the economic system and the economic arrangements were those which came about "naturally." Pigou goes on to say that if self-interest does promote economic welfare, it is because human institutions have been devised to make it so. (This part of Pigou's argument, which he develops with the aid of a quotation from Cannan, seems to me to be essentially correct.) Pigou concludes:

“But even in the most advanced States there are failures and imperfections. . . . there are many obstacles that prevent a community's resources from being distributed ... in the most efficient way. The study of these constitutes our present problem. . . its purposes is essentially practical. It seeks to bring into clearer light some of the ways in which it now is, or eventually may become, feasible for governments to control the play of economic forces in such wise as to promote the economic welfare, and through that, the total welfare, of their citizens as a whole.”

Pigou's underlying thought would appear to be: Some have argued that no State action is needed. But the system has performed as well as it has because of State action. Nonetheless, there are still imperfections. What additional State action is required? If this is a correct summary of Pigou's position, its inadequacy can be demonstrated by examining the first example he gives of a divergence between private and social products.

It might happen ... that costs are thrown upon people not directly concerned, through, say, uncompensated damage done to surrounding woods by sparks from railway engines. All such effects must be included-some of them will be positive, others negative elements-in reckoning up the social net product of the marginal increment of any volume of resources turned into any use or place.

The example used by Pigou refers to a real situation. In Britain, a railway does not normally have to compensate those who suffer damage by fire caused by sparks from an engine. Taken in conjunction with what he says in Chapter 9 of Part II, I take Pigou's policy recommendations to be, first, that there should be State action to correct this "natural" situation and, second, that the railways should be forced to compensate those whose woods are burnt. If this is a correct interpretation of Pigou's position, I would argue that the first recommendation is based on a misapprehension of the facts and that the second is not necessarily desirable...

Let us return to Pigou's example of uncompensated damage to surrounding woods caused by sparks from railway engines. This is presumably intended to show how it is possible "for State action to improve on 'natural' tendencies." If we treat Pigou's example as referring to the position before 1905, or as being an arbitrary example (in that he might just as well have written "surrounding buildings" instead of "surrounding woods"), then it is clear that the reason why compensation was not paid must have been that the railway had statutory authority to run steam engines (which relieved it of liability for fires caused by sparks). That this was the legal position was established in 1860, in a case, oddly enough, which concerned the burning of surrounding woods by a railway,<sup>8</sup> and the law on this point has not been changed (apart from the one exception) by a century of railway legislation, including nationalisation. If we treat Pigou's example of "uncompensated damage done to surrounding woods by sparks from railway engines" literally, and assume that it refers to the period after 1905, then it is clear that the reason why compensation was not paid must have been that the damage was more than £100 (in the first edition of *The Economics of Welfare*) or more than £200 (in later editions) or that the owner of the wood failed to notify the railway in writing within seven days of the fire or did not send particulars of the damage, in writing, within twenty-one days. In the real world, Pigou's example could only exist as a result of a deliberate choice of the legislature. It is not, of course, easy to imagine the construction of a railway in a state of nature. The nearest one can get to this is presumably a railway which uses steam engines "without express statutory authority." However, in this case the railway would be obliged to compensate those whose woods it burnt down. That is to say, compensation would be paid in the absence of Government action. The only circumstances in which compensation would not be paid would be those in which there had been Government action. It is strange that Pigou, who clearly thought it desirable that compensation should be paid, should have chosen this particular example to demonstrate how it is possible "for State action to improve on 'natural' tendencies."

Pigou seems to have had a faulty view of the facts of the situation. But it also seems likely that he was mistaken in his economic analysis. It is not necessarily desirable that the railway should be required to compensate those who suffer damage by fires caused by railway engines. I need not show here that, if the railway could make a bargain with everyone having property adjoining the railway line and there were no costs involved in making such bargains, it would not matter whether the railway was liable for damage caused by fires or not. This question has been treated at length in earlier sections. The problem is whether it would be desirable to make the railway liable in conditions in which it is too expensive for such bargains to be made. Pigou clearly thought it was desirable to force the railway to pay compensation and it is easy to see the kind of argument that would have led him to this conclusion. Suppose a railway is

considering whether to run an additional train or to increase the speed of an existing train or to install spark-preventing devices on its engines. If the railway were not liable for fire damage, then, when making these decisions, it would not take into account as a cost the increase in damage resulting from the additional train or the faster train or the failure to install spark-preventing devices. This is the source of the divergence between private and social net products. It results in the railway performing acts which will lower the value of total production—and which it would not do if it were liable for the damage. This can be shown by means of an arithmetical example.

Consider a railway, which is not liable for damage by fires caused by sparks from its engines, which runs two trains per day on a certain line. Suppose that running one train per day would enable the railway to perform services worth \$150 per annum and running two trains a day would enable the railway to perform services worth \$250 per annum. Suppose further that the cost of running one train is \$50 per annum and two trains \$100 per annum. Assuming perfect competition, the cost equals the fall in the value of production elsewhere due to the employment of additional factors of production by the railway. Clearly the railway would find it profitable to run two trains per day. But suppose that running one train per day would destroy by fire crops worth (on an average over the year) \$60 and two trains a day would result in the destruction of crops worth \$120. In these circumstances running one train per day would raise the value of total production but the running of a second train would reduce the value of total production. The second train would enable additional railway services worth \$100 per annum to be performed. But the fall in the value of production elsewhere would be \$110 per annum; \$50 as a result of the employment of additional factors of production and \$60 as a result of the destruction of crops. Since it would be better if the second train were not run and since it would not run if the railway were liable for damage caused to crops, the conclusion that the railway should be made liable for the damage seems irresistible. Undoubtedly it is this kind of reasoning which underlies the Pigovian position.

The conclusion that it would be better if the second train did not run is correct. The conclusion that it is desirable that the railway should be made liable for the damage it causes is wrong. Let us change our assumption concerning the rule of liability. Suppose that the railway is liable for damage from fires caused by sparks from the engine. A farmer on lands adjoining the railway is then in the position that, if his crop is destroyed by fires caused by the railway, he will receive the market price from the railway; but if his crop is not damaged, he will receive the market price by sale. It therefore becomes a matter of indifference to him whether his crop is damaged by fire or not. The position is very different when the railway is not liable. Any crop destruction through railway-caused fires would then reduce the receipts of the farmer. He would therefore take out of cultivation any land for which the damage is likely to be greater

than the net return of the land (for reasons explained at length in Section III). A change from a regime in which the railway is not liable for damage to one in which it is liable is likely therefore to lead to an increase in the amount of cultivation on lands adjoining the railway. It will also, of course, lead to an increase in the amount of crop destruction due to railway-caused fires...

How is it that the Pigovian analysis seems to give the wrong answer? The reason is that Pigou does not seem to have noticed that his analysis is dealing with an entirely different question. The analysis as such is correct. But it is quite illegitimate for Pigou to draw the particular conclusion he does. The question at issue is not whether it is desirable to run an additional train or a faster train or to install smoke-preventing devices; the question at issue is whether it is desirable to have a system in which the railway has to compensate those who suffer damage from the fires which it causes or one in which the railway does not have to compensate them. When an economist is comparing alternative social arrangements, the proper procedure is to compare the total social product yielded by these different arrangements. The comparison of private and social products is neither here nor there. A simple example will demonstrate this. Imagine a town in which there are traffic lights. A motorist approaches an intersection and stops because the light is red. There are no cars approaching the intersection on the other street. If the motorist ignored the red signal, no accident would occur and the total product would increase because the motorist would arrive earlier at his destination. Why does he not do this? The reason is that if he ignored the light he would be fined. The private product from crossing the street is less than the social product. Should we conclude from this that the total product would be greater if there were no fines for failing to obey traffic signals? The Pigovian analysis shows us that it is possible to conceive of better worlds than the one in which we live. But the problem is to devise practical arrangements which will correct defects in one part of the system without causing more serious harm in other parts.

I have examined in considerable detail one example of a divergence between private and social products and I do not propose to make any further examination of Pigou's analytical system. But the main discussion of the problem considered in this article is to be found in that part of Chapter 9 in Part II which deals with Pigou's second class of divergence and it is of interest to see how Pigou develops his argument. Pigou's own description of this second class of divergence was quoted at the beginning of this section. Pigou distinguishes between the case in which a person renders services for which he receives no payment and the case in which a person renders disservices and compensation is not given to the injured parties. Our main attention has, of course, centred on this second case. It is therefore rather astonishing to find, as was pointed out to me by Professor Francesco Forte, that the problem of the smoking chimney-the

"stock instance" or "classroom example" of the second case-is used by Pigou as an example of the first case (services rendered without payment) and is never mentioned, at any rate explicitly, in connection with the second case. Pigou points out that factory owners who devote resources to preventing their chimneys from smoking render services for which they receive no payment. The implication, in the light of Pigou's discussion later in the chapter, is that a factory owner with a smokey chimney should be given a bounty to induce him to install smoke-preventing devices. Most modern economists would suggest that the owner of the factory with the smokey chimney should be taxed. It seems a pity that economists (apart from Professor Forte) do not seem to have noticed this feature of Pigou's treatment since a realisation that the problem could be tackled in either of these two ways would probably have led to an explicit recognition of its reciprocal nature.

In discussing the second case (disservices without compensation to those damaged), Pigou says that they are rendered "when the owner of a site in a residential quarter of a city builds a factory there and so destroys a great part of the amenities of neighbouring sites; or, in a less degree, when he uses his site in such a way as to spoil the lighting of the house opposite; or when he invests resources in erecting buildings in a crowded centre, which by contracting the air-space and the playing room of the neighbourhood, tend to injure the health and efficiency of the families living there." Pigou is, of course, quite right to describe such actions as "uncharged disservices." But he is wrong when he describes these actions as "anti-social." They may or may not be. It is necessary to weigh the harm against the good that will result. Nothing could be more "anti-social" than to oppose any action which causes any harm to anyone....

Pigou seems to make a distinction between the case in which no contract is possible (the second class) and that in which the contract is unsatisfactory (the first class). Thus he says that the second class of divergences between private and social net product cannot, like divergences due to tenancy laws, be mitigated by a modification of the contractual relation between any two contracting parties, because the divergence arises out of a service or disservice rendered to persons other than the contracting parties.

But the reason why some activities are not the subject of contracts is exactly the same as the reason why some contracts are commonly unsatisfactory: it would cost too much to put the matter right. Indeed, the two cases are really the same since the contracts are unsatisfactory because they do not cover certain activities. The exact bearing of the discussion of the first class of divergence on Pigou's main argument is difficult to discover. He shows that in some circumstances contractual relations between landlord and tenant may result in a divergence between private and social products. But he also goes on to show that Government-enforced compensation schemes and rent-controls will also produce divergences. Furthermore, he shows that,

when the Government is in a similar position to a private landlord, e.g. when granting a franchise to a public utility, exactly the same difficulties arise as when private individuals are involved. The discussion is interesting but I have been unable to discover what general conclusions about economic policy, if any, Pigou expects us to draw from it.

Indeed, Pigou's treatment of the problems considered in this article is extremely elusive and the discussion of his views raises almost insurmountable difficulties of interpretation. Consequently it is impossible to be sure that one has understood what Pigou really meant. Nevertheless, it is difficult to resist the conclusion, extraordinary though this may be in an economist of Pigou's stature, that the main source of this obscurity is that Pigou had not thought his position through.

## **IX. THE PIGOVIAN TRADITION**

It is strange that a doctrine as faulty as that developed by Pigou should have been so influential, although part of its success has probably been due to the lack of clarity in the exposition. Not being clear, it was never clearly wrong. Curiously enough, this obscurity in the source has not prevented the emergence of a fairly well-defined oral tradition. What economists think they learn from Pigou, and what they tell their students, which I term the Pigovian tradition, is reasonably clear. I propose to show the inadequacy of this Pigovian tradition by demonstrating that both the analysis and the policy conclusions which it supports are incorrect.

I do not propose to justify my view as to the prevailing opinion by copious references to the literature. I do this partly because the treatment in the literature is usually so fragmentary, often involving little more than a reference to Pigou plus some explanatory comment, that detailed examination would be inappropriate. But the main reason for this lack of reference is that the doctrine, although based on Pigou, must have been largely the product of an oral tradition. Certainly economists with whom I have discussed these problems have shown a unanimity of opinion which is quite remarkable considering the meagre treatment accorded this subject in the literature. No doubt there are some economists who do not share the usual view but they must represent a small minority of the profession.

The approach to the problems under discussion is through an examination of the value of physical production. The private product is the value of the additional product resulting from a particular activity of a business. The social product equals the private product minus the fall in the value of production elsewhere for which no



compensation is paid by the business. Thus, if 10 units of a factor (and no other factors) are used by a business to make a certain product with a value of \$105; and the owner of this factor is not compensated for their use, which he is unable to prevent; and these 10 units of the factor would yield products in their best alternative use worth \$100; then, the social product is \$105 minus \$100 or \$5. If the business now pays for one unit of the factor and its price equals the value of its marginal product, then the social product rises to \$15. If two units are paid for, the social product rises to \$25 and so on until it reaches \$105 when all units of the factor are paid for. It is not difficult to see why economists have so readily accepted this rather odd procedure. The analysis focuses on the individual business decision and since the use of certain resources is not allowed for in costs, receipts are reduced by the same amount. But, of course, this means that the value of the social product has no social significance whatsoever. It seems to me preferable to use the opportunity cost concept and to approach these problems by comparing the value of the product yielded by factors in alternative uses or by alternative arrangements. The main advantage of a pricing system is that it leads to the employment of factors in places where the value of the product yielded is greatest and does so at less cost than alternative systems (I leave aside that a pricing system also eases the problem of the redistribution of income). But if through some God-given natural harmony factors flowed to the places where the value of the product yielded was greatest without any use of the pricing system and consequently there was no compensation, I would find it a source of surprise rather than a cause for dismay...

The same fault is to be found in proposals for solving the problem of harmful effects by the use of taxes or bounties. Pigou lays considerable stress on this solution although he is, as usual, lacking in detail and qualified in his support. Modern economists tend to think exclusively in terms of taxes and in a very precise way. The tax should be equal to the damage done and should therefore vary with the amount of the harmful effect. As it is not proposed that the proceeds of the tax should be paid to those suffering the damage, this solution is not the same as that which would force a business to pay compensation to those damaged by its actions, although economists generally do not seem to have noticed this and tend to treat the two solutions as being identical.

Assume that a factory which emits smoke is set up in a district previously free from smoke pollution, causing damage valued at \$100 per annum. Assume that the taxation solution is adopted and that the factory owner is taxed \$100 per annum as long as the factory emits the smoke. Assume further that a smoke-preventing device costing

\$90 per annum to run is available. In these circumstances, the smoke-preventing device would be installed. Damage of \$100 would have been avoided at an expenditure of \$90 and the factory-owner would be better off by \$10 per annum. Yet the position achieved may not be optimal. Suppose that those who suffer the damage could avoid it by moving to other locations or by taking various precautions which would cost them, or be equivalent to a loss in income of \$40 per annum. Then there would be a gain in the value of production of \$50 if the factory continued to emit its smoke and those now in the district moved elsewhere or made other adjustments to avoid the damage. If the factory owner is to be made to pay a tax equal to the damage caused, it would clearly be desirable to institute a double tax system and to make residents of the district pay an amount equal to the additional cost incurred by the factory owner (or the consumers of his products) in order to avoid the damage. In these conditions, people would not stay in the district or would take other measures to prevent the damage from occurring, when the costs of doing so were less than, the costs that would be incurred by the producer to reduce the damage (the producer's object, of course, being not so much to reduce the damage as to reduce the tax payments). A tax system which was confined to a tax on the producer for damage caused would tend to lead to unduly high costs being incurred for the prevention of damage. Of course this could be avoided if it were possible to base the tax, not on the damage caused, but on the fall in the value of production (in its widest sense) resulting from the emission of smoke. But to do so would require a detailed knowledge of individual preferences and I am unable to imagine how the data needed for such a taxation system could be assembled. Indeed, the proposal to solve the smoke-pollution and similar problems by the use of taxes bristles with difficulties: the problem of calculation, the difference between average and marginal damage, the interrelations between the damage suffered on different properties, etc. But it is unnecessary to examine these problems here. It is enough for my purpose to show that, even if the tax is exactly adjusted to equal the damage that would be done to neighboring properties as a result of the emission of each additional puff of smoke, the tax would not necessarily bring about optimal conditions. An increase in the number of people living or of business operating in the vicinity of the smoke-emitting factory will increase the amount of harm produced by a given emission of smoke. The tax that would be imposed would therefore increase with an increase in the number of those in the vicinity. This will tend to lead to a decrease in the value of production of the factors employed by the factory, either because a reduction in production due to the tax will result in factors being used elsewhere in ways which are

less valuable, or because factors will be diverted to produce means for reducing the amount of smoke emitted. But people deciding to establish themselves in the vicinity of the factory will not take into account this fall in the value of production which results from their presence. This failure to take into account costs imposed on others is comparable to the action of a factory-owner in not taking into account the harm resulting from his emission of smoke. Without the tax, there may be too much smoke and too few people in the vicinity of the factory; but with the tax there may be too little smoke and too many people in the vicinity of the factory. There is no reason to suppose that one of these results is necessarily preferable....

## **X. A CHANGE OF APPROACH**

It is my belief that the failure of economists to reach correct conclusions about the treatment of harmful effects cannot be ascribed simply to a few slips in analysis. It stems from basic defects in the current approach to problems of welfare economics. What is needed is a change of approach.

Analysis in terms of divergences between private and social products concentrates attention on particular deficiencies in the system and tends to nourish the belief that any measure which will remove the deficiency is necessarily desirable. It diverts attention from those other changes in the system which are inevitably associated with the corrective measure, changes which may well produce more harm than the original deficiency. In the preceding sections of this article, we have seen many examples of this. But it is not necessary to approach the problem in this way. Economists who study problems of the firm habitually use an opportunity cost approach and compare the receipts obtained from a given combination of factors with alternative business arrangements. It would seem desirable to use a similar approach when dealing with questions of economic policy and to compare the total product yielded by alternative social arrangements. In this article, the analysis has been confined, as is usual in this part of economics, to comparisons of the value of production, as measured by the market. But it is, of course, desirable that the choice between different social arrangements for the solution of economic problems should be carried out in broader terms than this and that the total effect of these arrangements in all spheres of life should be taken into account. As Frank H. Knight has so often emphasized, problems of welfare economics must ultimately dissolve into a study of aesthetics and morals.

A second feature of the usual treatment of the problems discussed in this article is that the analysis proceeds in terms of a comparison between a state of laissez faire and some kind of ideal world. This approach inevitably leads to a looseness of thought since the nature of the alternatives being compared is never clear. In a state of laissez faire, is there a monetary, a legal or a political system and if so, what are they? In an ideal world, would there be a monetary, a legal or a political system and if so, what would they be? The answers to all these questions are shrouded in mystery and every man is free to draw whatever conclusions he likes. Actually very little analysis is required to show that an ideal world is better than a state of laissez faire, unless the definitions of a state of laissez faire and an ideal world happen to be the same. But the whole discussion is largely irrelevant for questions of economic policy since whatever we may have in mind as our ideal world, it is clear that we have not yet discovered how to get to it from where we are. A better approach would seem to be to start our analysis with a situation approximating that which actually exists, to examine the effects of a proposed policy change and to attempt to decide whether the new situation would be, in total, better or worse than the original one. In this way, conclusions for policy would have some relevance to the actual situation...

If factors of production are thought of as rights, it becomes easier to understand that the right to do something which has a harmful effect (such as the creation of smoke, noise, smells, etc.) is also a factor of production. Just as we may use a piece of land in such a way as to prevent someone else from crossing it, or parking his car, or building his house upon it, so we may use it in such a way as to deny him a view or quiet or unpolluted air. The cost of exercising a right ( of using a factor of production) is always the loss which is suffered elsewhere in consequence of the exercise of that right-the inability to cross land, to park a car, to build a house, to enjoy a view, to have peace and quiet or to breathe clean air.

It would clearly be desirable if the only actions performed were those in which what was gained was worth more than what was lost. But in choosing between social arrangements within the context of which individual decisions are made, we have to bear in mind that a change in the existing system which will lead to an improvement in some decisions may well lead to a worsening of others. Furthermore we have to take into account the costs involved in operating the various social arrangements (whether it be the working of a market or of a government department), as well as the costs involved in moving to a new system. In devising and choosing between social

arrangements we should have regard for the total effect. This, above all, is the change in approach which I am advocating.